

PROJECT SPECIAL PROVISIONS**ROADWAY****CLEARING AND GRUBBING – METHOD II:**

(9-17-02) (Rev 3-18-08)

SP2 R01

Perform clearing on this project to the limits established by Method “II” shown on Standard No. 200.02 of the *2006 Roadway Standard Drawings*.

Revise the *2006 Standard Specifications* as follows:

Page 2-2, Article 200-3, Clearing, add the following as the 6th paragraph:

At bridge sites, clear the entire width of the right of way beginning at a station 3 feet back of the beginning extremity of the structure and ending at a station 3 feet beyond the ending extremity of the structure.

EMBANKMENTS:

(5-16-06) (Rev 7-21-09)

SP2 R18

Revise the *Standard Specifications* as follows:

Page 2-22, Article 235-3 Materials, add the following as the second sentence of the second paragraph:

Aerate and dry material containing moisture content in excess of what is required to achieve embankment stability and specified density.

Page 2-22, Subarticle 235-4(B) Embankment Formation, add the following:

- (16) Do not place rock or broken pavement in embankment areas where piles or drilled shaft foundations are to be constructed. This shall include but not be limited to piles and foundations for structures, metal signal poles, overhead sign structures, and high mount lighting.

TEMPORARY DETOURS:

(8-15-00)(Rev 4-15-08)

SP2 R31

Construct the temporary detours required on this project in accordance with the typical sections in the plans or as directed by the Engineer.

Payment for the construction of the detours will be made at the contract unit prices for the various items involved. After the detours have served their purpose, remove the portions deemed unsuitable for use as a permanent part of the project as directed by the Engineer. Salvage and

stockpile the aggregate base course removed from the detours at locations within the right of way, as directed by the Engineer, for removal by State Forces. Pipe culverts removed from the detours remain the property of the Contractor. Remove pipe culverts from the project when they are no longer needed. Place pavement and earth material removed from the detour in embankments or dispose of in waste areas furnished by the Contractor. No direct payment will be made for removing the aggregate base course, earth material and pavement, as the cost of same shall be included in the lump sum price bid for *Grading*. Pipe culverts that are removed will be measured and will be paid for at the contract unit price per linear foot for *Pipe Removal*. Such prices and payments will be full compensation for the work of removing, salvaging, and stockpiling aggregate base course; removing pipe culverts; and for placing earth material and pavement in embankments or disposing of earth material and pavement in waste areas.

SHOULDER AND FILL SLOPE MATERIAL:

(5-21-02)

SP2 R45 A

Description

Perform the required shoulder and slope construction for this project in accordance with the applicable requirements of Section 226 of the *2006 Standard Specifications* except as follows:

Construct the top 6 inches of shoulder and fill slopes with soils capable of supporting vegetation.

Provide soil with a P.I. greater than 6 and less than 25 and with a pH ranging from 5.5 to 6.8. Remove stones and other foreign material 2 inches or larger in diameter. All soil is subject to test and acceptance or rejection by the Engineer.

Obtain material from within the project limits or approved borrow source.

Measurement and Payment

No direct payment will be made for this work, as the cost of this work will be considered to be a part of the work being paid for at the contract lump sum price for *Grading*.

SELECT GRANULAR MATERIAL:

(3-16-10)

SP2 R80

Revise the *Standard Specifications* as follows:

Page 2-29, Delete Section 265 **SELECT GRANULAR MATERIAL** and replace it with the following:

Description

Furnish and place select granular material in accordance with the contract or as directed by the Engineer.

Materials

Refer to Division 10 of the *Standard Specifications*.

| Item | Section |
|----------------------------|----------------|
| Select Material, Class II | 1016 |
| Select Material, Class III | 1016 |

Construction Methods

Use Class II or III Select Material over fabric for soil stabilization and only Class III Select Material for backfill in water.

Place select granular material to 3 ft above fabric and water level.

Measurement and Payment

Select granular material will be paid for as *Select Granular Material* unless the material is obtained from the same source as the borrow material and the contract includes a pay item for *Borrow Excavation*. When this occurs, select granular material will be paid for as *Borrow Excavation* in accordance with Article 230-5 of the *Standard Specifications* and no payment for *Select Granular Material* will be made.

Select Granular Material will be measured and paid for in cubic yards. When *Undercut Excavation* is in accordance with Section 226 (Comprehensive Grading) of the *Standard Specifications* and the Engineer requires undercut to be backfilled with select granular material, the second sentence of the sixth paragraph of Article 226-3 will not apply, as payment for the backfill will be made as specified in this provision.

Select granular material will be measured by in place measurement in accordance with Article 230-5 of the *Standard Specifications* or by weighing material in trucks in accordance with Article 106-7 of the *Standard Specifications* as determined by the Engineer. When select granular material is weighed in trucks, a unit weight of 135 pcf will be used to convert the weight of select granular material to cubic yards. At the Engineer's discretion, truck measurement in accordance with Article 230-5 of the *Standard Specifications* may be used in lieu of weighing material in trucks.

The contract unit prices for *Select Granular Material* and *Borrow Excavation* as described above will be full compensation for furnishing, hauling, handling, placing, compacting and maintaining select granular material.

Payment will be made under:

| Pay Item | Pay Unit |
|--------------------------|-----------------|
| Select Granular Material | Cubic Yard |

PIPE TESTING:

4-17-07

SP3 R33

Revise the *2006 Standard Specifications* as follows:

Page 3-3, Article 300-6, add the following as a new paragraph before **(A)**:

The Department reserves the right to perform forensic testing on any installed pipe.

DRAINAGE PIPE:

(7-18-06) (Rev 3-16-10)

SP3 R37

Description

Where shown in the plans the Contractor may use Reinforced Concrete Pipe, Aluminum Alloy Pipe, Aluminized Corrugated Steel Pipe, HDPE Pipe, or PVC pipe in accordance with the following requirements.

Material

| Item | Section |
|--|----------------|
| Corrugated Aluminum Alloy Pipe | 1032-2(A) |
| Aluminized Corrugated Steel Pipe | 1032-3(A)(7) |
| Corrugated Polyethylene Pipe (HDPE) | 1032-10 |
| Reinforced Concrete Pipe – Class II or III | 1032-9(C) |
| Polyvinyl-Chloride (PVC) | 1032-11 |
| Elbows | 1032 |

Corrugated Steel Pipe will not be permitted in counties listed in the contract documents.

Only pipe with smooth inside walls will be allowed for storm drain systems. Storm drain systems are defined as pipe under curb and gutter, expressway gutter, and shoulder berm gutter that connects drainage structures and is not open ended.

Construction Methods

Pipe Culverts shall be installed in accordance with the contract documents.

Where allowed by the plans, use any of the several alternate pipes shown herein, but only one type of pipe and elbow will be permitted between drainage structures or for the entire length of a cross line pipe.

Measurement and Payment

___ " *Drainage Pipe* will be paid for as the actual number of linear feet installed and accepted. Measurement will be in accordance with the contract documents.

___ " *Drainage Pipe Elbow* will be measured and paid for in units of each.

Payment will be made under:

| Pay Item | Pay Unit |
|---------------------------|-----------------|
| ___ " Drainage Pipe | Linear Foot |
| ___ " Drainage Pipe Elbow | Each |

PIPE INSTALLATION AND PIPE CULVERTS:

(1-19-10)

SP3 R40 B

Revise the *Standard Specifications* as follows:

Replace Section 300 and Section 310 with the following:

**SECTION 300
PIPE INSTALLATION**

300-1 DESCRIPTION

Excavate, undercut, provide material, condition foundation, lay pipe, joint and couple pipe sections, and furnish and place all backfill material as necessary to install the various types of pipe culverts and fittings required to complete the project.

Install pipe in accordance with the detail in the plans.

Do not waste excavation unless permitted. Use suitable excavated material as backfill; or in the formation of embankments, subgrades, and shoulders; or as otherwise directed. Furnish disposal areas for the unsuitable material. The Engineer will identify excavated materials that are unsuitable.

Where traffic is to be maintained, install pipe in sections so that half the width of the roadway is available to traffic.

300-2 MATERIALS

Refer to Division 10:

| Item | Section |
|--------------------|----------------|
| Flowable Fill | 1000 |
| Select Materials | 1016 |
| Joint Materials | 1032-9(G) |
| Engineering Fabric | 1056-1 |

Provide foundation conditioning material meeting the requirements of Article 1016-3 for Class V or VI as shown in the contract documents.

Provide bedding material meeting the requirements of Article 1016-3 for Class II (Type 1 only) or Class III as shown in contract documents.

Provide backfill material meeting the requirements of Article 1016-3 for Class II (Type 1 – for Flexible Pipe) or Class III material as shown in the contract documents.

Do not use corrugated steel pipe in the following counties:

Beaufort, Bertie, Bladen, Brunswick, Camden, Carteret, Chowan, Columbus, Craven, Currituck, Dare, Gates, Hertford, Hyde, Jones, Martin, New Hanover, Onslow, Pamlico, Pasquotank, Pender, Perquimans, Tyrrell, and Washington.

300-3 UNLOADING AND HANDLING

Unload and handle pipe with reasonable care. Do not roll or drag metal pipe or plates over gravel or rock during handling. Take necessary precautions to ensure the method used in lifting or placing the pipe does not induce stress fatigue in the pipe. Use a lifting device that uniformly distributes the weight of the pipe along its axis or circumference. Repair minor damage to pipe when permitted. Remove pipe from the project that is severely damaged or is rejected as being unfit for use. Undamaged portions of a joint or section may be used where partial lengths are required.

300-4 PREPARATION OF PIPE FOUNDATION

Prepare the pipe foundation in accordance with the applicable method as shown in the contract documents, true to line and grade, and uniformly firm.

Camber invert grade an amount sufficient to prevent the development of sag or back slope in the flow line. The Contractor shall determine the amount of camber required and submit to the Engineer for approval.

Where material is found to be of poor supporting value or of rock and when the Engineer cannot make adjustment in the location of the pipe, undercut existing foundation material within the limits established on the plans. Backfill the undercut with foundation conditioning material, Class V or VI select material. Encapsulate the foundation conditioning material with Type 4 engineering fabric prior to placing bedding material. Overlap all transverse and longitudinal joints in the fabric at least 18 inches.

Maintain the pipe foundation in a dry condition.

300-5 INVERT ELEVATIONS

The proposed pipe culvert invert elevations shown on the Drainage Summary Sheets are based upon information available when the plans were prepared. If proposed invert elevations are adjusted during construction based upon actual conditions encountered, no claim for an extension of time for any reason resulting from this information will be allowed.

When a pipe culvert is to be installed in a trench and the average actual elevation of the pipe between drainage structures deviates from the average proposed elevation shown on the Drainage Summary Sheets by more than one foot a pay adjustment will be made as follows:

Pay Adjustment (per linear foot) = [(APE-AAE)± 1 foot] (0.15 X CUP)

Where: CUP = Contract Unit Price of Pipe Culvert

AAE = Average Actual Elevation $\frac{(\text{Actual Inlet elev.} + \text{Actual Outlet elev.})}{2}$

APE = Average Plan Elevation $\frac{(\text{Plan Inlet elev.} + \text{Plan Outlet elev.})}{2}$

When the actual location of a pipe culvert is changed from the location shown on the plans, the Engineer will make a pay adjustment deemed warranted based upon the relation of the pipe culvert as shown on the plans to the finished roadway and the relation of the pipe culvert as constructed to the finished roadway.

The top elevation column on the drainage summary sheet indicates the flow elevation at the top of structures intended to collect surface water.

The top elevation column on drainage structures not intended to collect surface water indicates the elevation at the top of the cover.

300 -6 LAYING PIPE

The Department reserves the right to perform forensic testing on any installed pipe.

(A) Rigid Pipe

Concrete and welded steel pipe will be considered rigid pipe. Lay pipe on prepared foundation, bell or groove end upgrade with the spigot or tongue fully inserted. Check each joint for alignment and grade as the work proceeds.

Use flexible plastic joint material except when material of another type is specified in the contract documents. Joint material of another type may be used when permitted.

Repair lift holes in concrete pipe, if present. Thoroughly clean and soak the lift hole and completely fill the void with an approved non-shrink grout. Submit alternate details for repairing lift holes to the engineer for review and approval.

For all pipes 42 inches in diameter and larger, wrap filter fabric around all pipe joints. Use Type 3 Class B fabric. Extend fabric at least 12 inches beyond each side of the joint. Secure the filter fabric against the outside of the pipe by methods approved by the Engineer.

(B) Flexible Pipe (Except Structural Plate Pipe)

Corrugated steel, corrugated aluminum, corrugated polyethylene (HDPE), and polyvinylchloride (PVC) pipe will be considered flexible pipe. Place flexible pipe carefully on the prepared foundation starting at the downstream end with the inside circumferential laps pointing downstream and with the longitudinal laps at the side or quarter points.

Handle coated corrugated steel pipe with special care to avoid damage to coatings.

Join pipe sections with coupling band, fully bolted and properly sealed. Provide coupling bands for annular and helical corrugated metal pipe with circumferential and longitudinal strength sufficient to preserve the alignment, prevent separation of the sections, and prevent backfill infiltration. Match-mark all pipe 60 inches or larger in diameter at the plant for proper installation on the project.

At locations indicated in the plans, corrugated steel pipe sections shall be jointed together with rod and lug coupling bands, fully bolted. Sleeve gaskets shall be used in conjunction with rod and lug couplings and the joints properly sealed. Coupling bands shall provide circumferential and longitudinal strength sufficient to preserve the alignment, prevent separation of the sections and prevent infiltration of backfill material.

300-7 BEDDING AND BACKFILLING

Loosely place bedding material, in a uniform layer, a depth equal to the inside diameter of the pipe divided by 6 or 6 inches, whichever is greater. Leave bedding material directly beneath the pipe uncompacted and allow pipe seating and backfill to accomplish compaction. Excavate recesses to receive the bells where bells and spigot type pipe is used.

Place fill around the pipe in accordance with the applicable method shown on the plans in layers not to exceed 6 inches loose unless otherwise permitted. Compact to the density required by Subarticle 235-4(C). Approval of the backfill material is required prior to its use. Use select material as shown in the contract documents.

Take care during backfill and compaction operations to maintain alignment and prevent damage to the joints. Keep backfill free from stones, frozen lumps, chunks of highly plastic clay, or other objectionable material.

Grade and maintain all pipe backfill areas in such a condition that erosion or saturation will not damage the pipe foundation or backfill.

Excavatable flowable fill may be used for backfill when approved by the Engineer. When using excavatable flowable fill, ensure that the pipe is not displaced and does not float during backfill. Submit methods for supporting the pipe and material placement to the Engineer for review and approval.

Do not operate heavy equipment over any pipe until it has been properly backfilled with a minimum 3 feet of cover. Place, maintain, and finally remove the required cover that is above the proposed finished grade at no cost to the Department. Remove and replace, at no cost to the Department, pipe that becomes misaligned, shows excessive settlement, or has been otherwise damaged by the Contractor's operations.

300-8 INSPECTION AND MAINTENANCE

Prior to final acceptance, the Engineer will perform random video camera and or mandrel inspections to ensure proper jointing and that deformations do not exceed allowable limits. Replace pipes having cracks greater than 0.1 inches or deflections greater than 7.5 percent. Repair or replace pipes with cracks greater than 0.01 inches, exhibiting displacement across a crack, exhibiting bulges, creases, tears, spalls, or delamination. Maintain all pipe installations in a condition such that they will function continuously from the time the pipe is installed until the project is accepted.

300-9 MEASUREMENT AND PAYMENT

General

No measurement will be made of any work covered by this section except as listed below. Removal and disposal of existing pavement is a part of the excavation for the new pipe culvert installation. Repair of the pavement will be made in accordance with Section 654.

Foundation Conditioning

Using Local Material

Undercut excavation is all excavation removed by undercutting below the bottom of the trench as staked. *Undercut Excavation* will be measured as the actual number of cubic yards of undercut excavation, measured in its original position and computed by the average end area method, that has been removed as called for in the contract and will be paid for at double the contract unit price for *Unclassified Excavation* as provided in Article 225-7.

Local material used for conditioning the foundation will be measured and paid for in accordance with Article 225-7 for *Unclassified Excavation* or in accordance with Article 230-5 for *Borrow Excavation* depending on the source of the material.

Local material used to replace pipe undercut excavation will be measured and paid for in accordance with Article 225-7 or Article 230-5.

Using Other Than Local Material

No measurement and payment will be made for *Undercut Excavation*. The material used to replace pipe undercut excavation will be classified as foundation conditioning material.

Foundation Conditioning Material, Minor Structures will be measured and paid for as the actual number of tons of this material weighed in trucks on certified platform scales or other certified weighing devices.

No direct payment will be paid for undercut excavation. Payment at the contract unit price for *Foundation Conditioning Material, Minor Structures* will be full compensation for all work of pipe undercut excavation.

Foundation Conditioning Fabric

Foundation Conditioning Fabric will be measured and paid for in square yards. The measurement will be based on the theoretical calculation using length of pipe installed and two times the standard trench width. No separate measurement will be made for overlapping fabric or the vertical fabric dimensions required to encapsulate the foundation conditioning material.

Bedding and Backfill - Select Material

No measurement will be made for select bedding and backfill material required in the contract documents. The select bedding and backfill material will be included in the cost of the installed pipe.

Where unclassified excavation or borrow material meets the requirements for select bedding and backfill and is approved for use by the Engineer, no deductions will be made to these pay items to account for use in the pipe installation.

Payment will be made under:

| Pay Item | Pay Unit |
|--|-----------------|
| Foundation Conditioning Material, Minor Structures | Ton |
| Foundation Conditioning Fabric | Square Yard |

**SECTION 310
PIPE CULVERTS**

310-1 DESCRIPTION

Furnish and install drainage pipe at locations and size called for in the contract documents. The work includes construction of joints and connections to other pipes, endwalls, and drainage structures.

310-2 MATERIALS

Refer to Division 10:

| Item | Section |
|--|----------------|
| Plain Concrete Pipe Culvert | 1032-9(B) |
| Reinforced Concrete Pipe Culvert | 1032-9(C) |
| Precast Concrete Pipe End Sections | 1032-9(D) |
| Concrete Pipe Tees and Elbows | 1032-9(E) |
| Corrugated Aluminum Alloy Pipe Culvert | 1032-2(A) |
| Corrugated Aluminum Alloy Pipe Tees and Elbows | 1032-2(B) |
| Corrugated Steel Culvert Pipe and Pipe Arch | 1032-3(A) |
| Prefabricated Corrugated Steel Pipe End Sections | 1032-3(B) |
| Corrugated Steel Pipe Tees and Elbows | 1032-3(C) |
| Corrugated Steel Eccentric Reducers | 1032-3(D) |
| HDPE Smooth Lined Corrugated Plastic Pipe | 1032-10B |
| Polyvinylchloride (PVC) Pipe | 1032-11(B) |

Suppliers that provide metal pipe culverts, fittings, and all other accessories covered by this section shall meet the requirements of the Department’s Brand Certification program for metal pipe culverts, and be listed on the Department’s pre-approved list for suppliers of metal pipe culvert.

Do not use corrugated steel pipe in the following counties:

Beaufort, Bertie, Bladen, Brunswick, Camden, Carteret, Chowan, Columbus, Craven, Currituck, Dare, Gates, Hertford, Hyde, Jones, Martin, New Hanover, Onslow, Pamlico, Pasquotank, Pender, Perquimans, Tyrell, and Washington.

310-3 PIPE INSTALLATION

Install pipe, pipe tees, and elbows in accordance with Section 300.

310-4 SIDE DRAIN PIPE

Side drain pipe is defined as storm drain pipe running parallel to the roadway to include pipe in medians, outside ditches, driveways, and under shoulder berm gutter along outside shoulders greater than 4 feet wide.

Where shown in the plans, side drain pipe may be class II reinforced concrete pipe, aluminized corrugated steel pipe, corrugated aluminum alloy pipe, HDPE pipe, or PVC pipe. Corrugated steel pipe is restricted in the counties listed in Article 310-2. Install side drain pipe in accordance to Section 300. Cover for side drain pipe shall be at least one foot.

310-5 PIPE END SECTIONS

Choose which material to use for the required end sections. Both corrugated steel and concrete pipe end sections will work on concrete pipe, corrugated steel pipe, and HDPE smooth lined corrugated plastic pipe.

310-6 MEASUREMENT AND PAYMENT

Pipe will be measured and paid for as the actual number of linear feet of pipe that has been incorporated into the completed and accepted work. Measurement of pipe will be made by counting the number of joints used and multiplying by the length of the joint to obtain the number of linear feet of pipe installed and accepted. Measurements of partial joints will be made along the longest length of the partial joint to the nearest 0.1 of a foot. Select bedding and backfill material will be included in the cost of the installed pipe.

Pipe end sections, tees, elbows, and eccentric reducers will be measured and paid for as the actual number of each of these items that have been incorporated into the completed and accepted work.

Payment will be made under:

| Pay Item | Pay Unit |
|---|-----------------|
| ___ " R.C. Pipe Culverts, Class ____. | Linear Feet |
| ___ " x ___ " x ___ " R.C. Pipe Tees, Class ____ | Each |
| ___ " R.C. Pipe Elbows, Class ____. | Each |
| ___ " C.A.A. Pipe Culvert, ___ " Thick | Linear Feet |
| ___ " x ___ " x ___ " C.A.A. Pipe Tees, ___ " Thick | Each |
| ___ " C.A.A. Pipe Elbows, ___ " Thick | Each |
| ___ " C.S. Pipe Culverts, ___ " Thick | Linear Feet |
| ___ " x ___ " C.S. Pipe Arch Culverts, ___ " Thick | Linear Feet |
| ___ x ___ " x ___ " C.S. Pipe Tees, ___ " Thick | Each |
| ___ " C.S. Pipe Elbows, ___ " Thick | Each |
| ___ " x ___ " C.S. Eccentric Reducers, ___ " Thick | Each |
| ___ " HDPE Pipe | Linear Feet |
| ___ " PVC Pipe | Linear Feet |
| ___ " Side Drain Pipe | Linear Foot |
| ___ " Pipe End Section | Each |

REINFORCED BRIDGE APPROACH FILL:

(3-18-03) (Rev 9-16-08)

SP4 R01 A

Description

This work consists of all work necessary to construct reinforced bridge approach fills in accordance with these provisions and the plans, and as directed by the Engineer.

Materials**(A) Geomembrane**

Provide geomembrane that is impermeable, composed of polyethylene polymers or polyvinyl chloride, and meets the following physical requirements:

| Property | Requirements | Test Method |
|----------------------------------|--|--------------------|
| Thickness | 25 mils Minimum | ASTM D1593 |
| Tensile Strength at Break | 100 lb/inch Minimum | ASTM D638 |
| Puncture Strength | 40 lbs Minimum | ASTM D 4833 |
| Moisture Vapor Transmission Rate | 0.018 oz/yd ² per Day Maximum | ASTM E96 |

(B) Fabric

Refer to Section 1056 for Type 2 Engineering Fabric and the following:

Use a woven fabric consisting of strong rot-proof synthetic fibers such as polypropylene, polyethylene, or polyester formed into a stable network such that the filaments or yarns retain their relative positions to each other.

| Fabric Property | Requirements | Test Method |
|------------------------|---------------------------|--------------------|
| Minimum Flow Rate | 2 gallons/min/square foot | ASTM D 4491 |

Lamination of fabric sheets to produce the physical requirements of a fabric layer will not be accepted. Furnish letters of certification from the manufacturer with each shipment of the fabric and geomembrane attesting that the material meets the requirements of this provision; however, the material is subject to inspection, test, or rejection by the Engineer at any time.

During all periods of shipment and storage, wrap the geomembrane and fabric in a heavy-duty protective covering to protect the material from ultraviolet rays. After the protective wrapping has been removed, do not leave the material uncovered under any circumstances for longer than 4 days.

(C) Select Material

Provide select material meeting the requirements of Class III, Type 1 or Type 2, or Class V select material of Section 1016 of the *2006 Standard Specifications*. When select material is required under water, use select material class V only, up to one foot above the existing water elevation.

(D) 4 inch Diameter Corrugated Drainage Pipe and Fittings

Provide pipe and fittings that meet all the applicable requirements of Section 815 or 816 of the *2006 Standard Specifications*.

Construction Methods

Place the geomembrane and fabric as shown on the plans or as directed by the Engineer. Perform the excavation for the fabric reinforced fill to the limits shown on the plans. Provide an excavated surface free of obstructions, debris, pockets, stumps, and cleared of all vegetation. The geomembrane or fabric will be rejected if it has defects, rips, holes, flaws, deterioration or damage incurred during manufacture, transportation, handling or storage. Lay all layers smooth, and free from tension, stress, folds, wrinkles or creases. Place all the fabric layers with the machine direction (roll direction) parallel to the centerline of the roadway. A minimum roll width of 10.0 feet for the fabric is required. Overlap geomembrane or fabric splices parallel to the centerline of the roadway a minimum of 18 inches. Geomembrane or fabric splices parallel to the backwall face will not be allowed.

Deposit and spread select material in successive, uniform, approximately horizontal layers of not more than 10 inches in depth, loose measurement, for the full width of the cross section, and keep each layer approximately level. Place and compact each layer of select material fill no more than 10 inches thick with low ground pressure equipment. Use hand operated equipment to compact the fill material within three feet of the backwall and wingwalls as directed by the Engineer. Compact select material to a density equal to at least 95% of that obtained by compacting a sample of the material in accordance with AASHTO T99 as modified by the Department. Compact the top eight inches of select material to a density to at least 100% of that obtained by compacting a sample of the material in accordance with AASHTO T99 as modified by the Department. Density requirements are not applicable to select material, class V; however compact the fill with at least four passes of low ground pressure equipment on the entire surface as directed by the Engineer. The compaction of each layer of select material shall be inspected and approved by the Department prior to the placement of the next fill layer. No equipment will be allowed to operate on the drainage pipe or any geomembrane/fabric layer until it is covered with at least six inches of fill material. Compaction shall not damage the drainage pipe, geomembrane, or fabric under the fill. Cover the geomembrane/fabric with a layer of fill material within four days after placement of the geomembrane/fabric. Geomembrane and fabric that are damaged as a result of installation will be replaced as directed by the Department at no additional cost.

Place the geomembrane on the ground, and attach and secure it tightly to the vertical face of the backwall and wingwalls with adhesives, duct-tape, nails or any other method approved by the Engineer. Place the first fabric layer on the surface of the geomembrane with the same dimensions of the geomembrane. No material or void is allowed between the geomembrane and the first fabric layer. Place and fold the remaining fabric layers on the edges as shown on the plans or as directed by the Engineer. Provide vertical separation between fabric layers as specified on the plans. The number of fabric layers will be shown in the plans.

Place four inch diameter perforated drainage pipe along the base of the backwall and sloped to drain as shown on the plans. Completely wrap perforated drainage pipe and #78M stone with Type 2 Engineering Fabric as shown on the plan detail. Install a pipe sleeve through the bottom of or under the wing wall prior to placing concrete for the wing wall. The pipe sleeve shall be of

adequate strength to withstand the wingwall load. Place the pipe sleeve in position to allow the drainage pipe to go through the wing wall with a proper slope. Connect four-inch diameter nonperforated (plain) drainage pipe with a coupling to the perforated pipe near the inside face of the wingwall. Place the nonperforated drainage pipe through the pipe sleeve, extend down to the toe of the slope and connect, to a ditch or other drainage systems as directed by the Engineer. For bridge approaches in cut sections where no side slope is available, direct the drainage pipe outlet to the end slope down to the toe using elbows as directed by the Engineer.

Measurement and Payment

Reinforced Bridge Approach Fill, Station _____ will be paid for at the contract lump sum price. Such price and payment will be full compensation for both approach fills at each bridge installation, including but not limited to furnishing, placing and compacting select material, furnishing and placing geomembrane and woven fabric, furnishing and placing pipe sleeve, drainage pipe, and stone, furnishing and installing concrete pads at the end of outlet pipes, excavation and any other items necessary to complete the work.

Payment will be made under:

| | |
|--|-----------------|
| Pay Item | Pay Unit |
| Reinforced Bridge Approach Fill, Station _____ | Lump Sum |

FINE GRADING SUBGRADE, SHOULDERS AND DITCHES:

(7-21-09)

SP5 R01

Revise the *Standard Specifications* as follows:

Page 5-1, Article 500-1 Description, replace the first sentence with the following:

Perform the work covered by this section including but not limited to preparing, grading, shaping, manipulating moisture content, and compacting either an unstabilized or stabilized roadbed to a condition suitable for placement of base course, pavement, and shoulders.

AGGREGATE BASE COURSE:

12-19-06

SP5 R03

Revise the *2006 Standard Specifications* as follows:

Page 5-11, Article 520-5 Hauling and Placing Aggregate Base Material, 6th paragraph, replace the first sentence with the following:

Base course that is in place on November 15 shall have been covered with a subsequent layer of pavement structure or with a sand seal. Base course that has been placed between November 16 and March 15 inclusive shall be covered within 7 calendar days with a subsequent layer of pavement structure or with a sand seal.

ASPHALT PAVEMENTS - SUPERPAVE:

(7-18-06)(Rev 4-20-10)

SP6 R01

Revise the *2006 Standard Specifications* as follows:

Page 6-2, Article 600-9 Measurement and Payment, delete the second paragraph.

Page 6-12, Subarticle 609-5(C)2, Required Sampling and Testing Frequencies, first partial paragraph at the top of the page, delete last sentence and add the following:

If the Engineer allows the mix to remain in place, payment will be made in accordance with Article 105-3.

Page 6-12, Subarticle 609-5(C)2, QUALITY CONTROL MINIMUM SAMPLING AND TESTING SCHEDULE

First paragraph, delete and replace with the following.

Sample and test the completed mixture from each mix design per plant per year at the following minimum frequency during mix production:

Second paragraph, delete the fourth sentence, and replace with the following

When daily production of each mix design exceeds 100 tons and a regularly scheduled full test series random sample location for that mix design does not occur during that day's production, perform at least one partial test series consisting of Items A and B in the schedule below.

Page 6-12, Subarticle 609-5(C)2(c) Maximum Specific Gravity, add after (AASHTO T 209):

or ASTM D 2041

Page 6-13, last line and on page and Page 6-14, Subarticle 609-5(C)(2)(e) Tensile Strength Ratio (TSR), add a heading before the first paragraph as follows:

(i) Option 1

Insert the following immediately after the first paragraph:

(ii) Option 2

Mix sampled from truck at plant with one set of specimens prepared by the Contractor and then tested jointly by QA and QC at a mutually agreed upon lab site within the first 7 calendar days after beginning production of each new mix design.

Second paragraph, delete and replace with the following:

Test all TSR specimens required by either option noted above on either a recording test press or a test press that maintains the peak load reading after the specimen has broken.

Subarticle 609-5(C)(3) Control Charts, delete the second sentence of the first paragraph and replace with the following:

For mix incorporated into the project, record full test series data from all regularly scheduled random samples or directed samples that replace regularly scheduled random samples, on control charts the same day the test results are obtained.

Page 6-15, Subarticle 609-5(C)(3) Control Charts, first paragraph on this page, delete the last sentence and substitute the following:

Denote the moving average control limits with a dash green line and the individual test limits with a dash red line.

Subarticle 609-5(C)(3)(a), (b) and (c), replace (a) (b) and (c) with the following:

- (a) A change in the binder percentage, aggregate blend, or G_{mm} is made on the JMF, or,
- (b) When the Contractor elects to stop or is required to stop production after one or two moving average values, respectively, fall outside the moving average limits as outlined in subarticle 609-5(C)6 or,
- (c) If failure to stop production after two consecutive moving averages exceed the moving average limits occurs, but production does stop at a subsequent time, re-establish a new moving average beginning at the actual production stop point.

Subarticle 609-5(C)(4) Control Limits, replace the first paragraph and the CONTROL LIMITS Table on page 6-16 with the following.

The following are established as control limits for mix production. Apply the individual limits to the individual test results. Control limits for the moving average limits are based on a moving average of the last 4 data points. Apply all control limits to the applicable target source.

CONTROL LIMITS

| Mix Control Criteria | Target Source | Moving Average Limit | Individual Limit |
|----------------------------|------------------|----------------------|------------------|
| 2.36 mm Sieve | JMF | ±4.0 % | ±8.0 % |
| 0.075mm Sieve | JMF | ±1.5 % | ±2.5 % |
| Binder Content | JMF | ±0.3 % | ±0.7 % |
| VTM @ N_{des} | JMF | ±1.0 % | ±2.0 % |
| VMA @ N_{des} | Min. Spec. Limit | Min Spec. Limit | -1.0% |
| $P_{0.075} / P_{be}$ Ratio | 1.0 | ±0.4 | ±0.8 |
| % G_{mm} @ N_{ini} | Max. Spec. Limit | N/A | +2.0% |
| TSR | Min. Spec. Limit | N/A | - 15% |

Page 6-16, Subarticle 609-5(C)(5) Warning Bands, delete this subarticle in its entirety.

Pages 6-16 through 6-19, Subarticle 609-5(C)(6), delete the word "warning" and substitute the words "moving average".

Page 6-16, Subarticle 609-5(C)(6) Corrective Actions, first paragraph, first sentence, delete and replace with the following:

Immediately notify the Engineer when moving averages exceed the moving average limits.

Page 6-17, third full paragraph, delete and replace with the following:

Failure to stop production when required due to an individual mix test not meeting the specified requirements will subject all mix from the stop point tonnage to the point when the next individual test is back on or within the moving average limits, or to the tonnage point when production is actually stopped, whichever occurs first, to being considered unacceptable.

Sixth full paragraph, delete the first, second, and third sentence and replace with the following:

Immediately notify the Engineer when any moving average value exceeds the moving average limit. If two consecutive moving average values for any one of the mix control criteria fall outside the moving average limits, cease production of that mix, immediately notify the Engineer of the stoppage, and make adjustments. The Contractor may elect to stop production after only one moving average value falls outside the moving average limits.

Page 6-18, Subarticle 609-5(C)(6) Corrective Actions second full paragraph, delete and replace with the following:

If the process adjustment improves the property in question such that the moving average after four additional tests is on or within the moving average limits, the Contractor may continue production with no reduction in payment

Page 6-18, delete the third and fourth full paragraphs, including the Table for Payment for Mix Produced in the Warning Bands and substitute the following:

If the adjustment does not improve the property in question such that the moving average after four additional individual tests is outside the moving average limits, the mix will be evaluated for acceptance in accordance with Article 105-3. Reduced payment for or removal of the mix in question will be applied starting from the plant sample tonnage at the stop point to the sample tonnage when the moving average is on or within the moving average limits. In addition, any mix that is obviously unacceptable will be rejected for use in the work.

Page 6-19, First paragraph, delete and replace with the following:

Failure to stop production and make adjustments when required due to two consecutive moving average values falling outside the moving average limits will subject all mix produced from the stop point tonnage to the tonnage point when the moving average is back on or within the moving average limits or to the tonnage point when production is actually stopped, whichever occurs first, to being considered unacceptable. Remove this material and replaced with materials that comply with the Specifications at no additional costs to the Department, unless otherwise approved. Payment will be made for the actual quantities of materials required to replace the removed quantities, not to exceed the original amounts.

Page 6-20, Subarticle 609-5(D)(1) General, delete the third full paragraph, and replace with the following:

Perform the sampling and testing at the minimum test frequencies as specified above. Should the density testing frequency fail to meet the minimum frequency as specified above, all mix without the required density test representation will be considered unsatisfactory. If the Engineer allows the mix to remain in place, payment will be made in accordance with Article 105-3.

Page 6-22, Subarticle 609-5(D)(4) Nuclear Gauge Density Procedures, third paragraph, insert the following as the second sentence:

Determine the Daily Standard Count in the presence of the QA Roadway Technician or QA Nuclear Gauge Technician on days when a control strip is being placed.

Page 6-23, Subarticle 609-5(D)(5) Limited Production Procedure, delete the first paragraph including (a), (b), (c) and substitute the following:

Proceed on limited production when, for the same mix type and on the same contract, one of the following conditions occur (except as noted in the first paragraph below).

- (a) Two consecutive failing lots, except on resurfacing*
- (b) Three consecutive failing lots on resurfacing*
- (c) Two consecutive failing nuclear control strips.

* Resurfacing is defined as the first new uniform layer placed on an existing pavement.

Page 6-25, Article 609-6 Quality Assurance, Density Quality Assurance, insert the following items after item (E):

- (F) By retesting Quality Control core samples from control strips (either core or nuclear) at a frequency of 100% of the frequency required of the Contractor;

- (G) By observing the Contractor perform all standard counts of the Quality Control nuclear gauge prior to usage each nuclear density testing day; or
- (H) By any combination of the above

Page 6-28, Subarticle 610-3(A) Mix Design-General, delete the fourth and fifth paragraphs and replace with the following:

Reclaimed Asphalt Pavement (RAP) or Reclaimed Asphalt Shingles (RAS) may be incorporated into asphalt plant mixes in accordance with Article 1012-1 and the following applicable requirements.

Reclaimed asphalt pavement (RAP) may constitute up to 50% of the total material used in recycled mixtures, except for mix Type S 12.5D, Type S 9.5D, and mixtures containing reclaimed asphalt shingle material (RAS). Reclaimed asphalt shingle (RAS) material may constitute up to 6% by weight of total mixture for any mix. When both RAP and RAS are used, do not use a combined percentage of RAS and RAP greater than 20% by weight of total mixture, unless otherwise approved. When the percent of binder contributed from RAS or a combination of RAS and RAP exceeds 20% but not more than 30% of the total binder in the completed mix, the virgin binder PG grade shall be one grade below (both high and low temperature grade) the binder grade specified in Table 610-2 for the mix type, unless otherwise approved. When the percent of binder contributed from RAS or a combination of RAS and RAP exceeds 30% of the total binder in the completed mix, the Engineer will establish and approve the virgin binder PG grade. Use approved methods to determine if any binder grade adjustments are necessary to achieve the performance grade for the specified mix type.

For Type S 12.5D and Type S 9.5D mixes, the maximum percentage of reclaimed asphalt material is limited to 20% and shall be produced using virgin asphalt binder grade PG 76-22. For all other recycled mix types, the virgin binder PG grade shall be as specified in Table 610-2A for the specified mix type.

When the percentage of RAP is greater than 20% but not more than 30% of the total mixture, use RAP meeting the requirements for processed or fractionated RAP in accordance with the requirements of Section 1012-1.

When the percentage of RAP is greater than 30% of the total mixture, use an approved stockpile of RAP in accordance with Section 1012-1(C). Use approved test methods to determine if any binder grade adjustments are necessary to achieve the performance grade for the specified mix type. The Engineer will establish and approve the virgin asphalt binder grade to be used.

Page 6-34, Insert the following immediately after Table 610-2:

**TABLE 610-2A
SUPERPAVE MIX DESIGN CRITERIA**

| Mix Type | Percentage of RAP in Mix | | |
|---|--------------------------|------------------------------------|----------------------------|
| | Category 1 % RAP ≤20% | Category 2 20.1% ≤ %RAP ≤ 30.0% | Category 3 %RAP > 30.0% |
| All A and B Level Mixes, I19.0C, B25.0C | PG 64 -22 | PG 64 -22 | TBD |
| S9.5C, S12.5C, I19.0D | PG 70 -22 | PG 64-22 | TBD |
| S 9.5D and S12.5D | PG 76-22 | N/A | N/A |

- Note: (1) Category 1 RAP has been processed to a maximum size of 2 inches.
 (2) Category 2 RAP has been processed to a maximum size of 1 inch by either crushing and or screening to reduce variability in the gradations.
 (3) Category 3 RAP has been processed to a maximum size of 1 inch, fractionating the RAP into 2 or more sized stockpiles

Page 6-35, Table 610-3 delete and replace with the following:

**TABLE 610-3
ASPHALT PLACEMENT- MINIMUM TEMPERATURE REQUIREMENTS**

| Asphalt Concrete Mix Type | Minimum Air Temperature | Minimum Surface Temperature |
|-------------------------------------|-------------------------|-----------------------------|
| ACBC, Type B 25.0B, C, B 37.5C | 35°F | 35°F |
| ACIC, Type I 19.0B, C, D | 35°F | 35°F |
| ACSC, Type S 4.75A, SF 9.5A, S 9.5B | 40°F | 50°F* |
| ACSC, Type S 9.5C, S 12.5C | 45°F | 50°F |
| ACSC, Type S 9.5D, S 12.5D | 50°F | 50°F |

* 35°F if surface is soil or aggregate base for secondary road construction.

Page 6-44, Article 610-8 Spreading and Finishing, third full paragraph, replace the first sentence with the following:

Use the 30 foot minimum length mobile grade reference system or the non-contacting laser or sonar type ski *with at least four referencing stations mounted on the paver at a minimum length of 24 feet* to control the longitudinal profile when placing the initial lanes and all adjacent lanes of all layers, including resurfacing and asphalt in-lays, unless otherwise specified or approved.

Page 6-50, Article 610-13 Density Acceptance, delete the second paragraph and replace with the following:

As an exception, when the first layer of mix is a surface course and is being placed directly on an unprimed aggregate or soil base, the layer will be included in the "Other" construction category.

Page 6-50, Article 610-13 Density Acceptance, delete the formula and description in the middle of the page and replace with the following:

where:

| | | |
|----|---|--|
| PF | = | $100 - 10(D)^{1.465}$ |
| PF | = | Pay Factor (computed to 0.1%) |
| D | = | the deficiency of the lot average density, not to exceed 2.0% |

Page 6-53, Article 620-4 Measurement and Payment:

Sixth paragraph, delete the last sentence.

Seventh paragraph, delete the paragraph and replace with the following:

The adjusted contract unit price will then be applied to the theoretical quantity of asphalt binder authorized for use in the plant mix placed during the partial payment period involved, except that where recycled plant mix is used, the adjusted unit price will be applied only to the theoretical number of tons of additional asphalt binder materials required by the job mix formula.

Page 6-54, Article 620-4 Measurement and Payment, add the following pay item:

| Pay Item | Pay Unit |
|--|----------|
| Asphalt Binder for Plant Mix, Grade PG 70-28 | Ton |

Page 6-69, Table 660-1 Material Application Rates and Temperatures, add the following:

| Type of Coat | Grade of Asphalt | Asphalt Rate gal/yd ² | Application Temperature °F | Aggregate Size | Aggregate Rate lb./sq. yd. Total |
|--------------|------------------|----------------------------------|----------------------------|----------------|----------------------------------|
| Sand Seal | CRS-2 or CRS-2P | 0.22-0.30 | 150-175 | Blotting Sand | 12-15 |

Page 6-75, Subarticle 660-9(B), add the following as sub-item (5)

(5) Sand Seal

Place the fully required amount of asphalt material in one application and immediately cover with the seal coat aggregate. Uniformly spread the fully required amount of aggregate in one application and correct all non-uniform areas prior to rolling.

Immediately after the aggregate has been uniformly spread, perform rolling.

When directed, broom excess aggregate material from the surface of the seal coat.

When the sand seal is to be constructed for temporary sealing purposes only and will not be used by traffic, other grades of asphalt material meeting the requirements of Articles 1020-6 and 1020-7 may be used in lieu of the grade of asphalt required by Table 660-1 when approved.

Page 6-76, Article 661-1 Description, add the following as the 2nd paragraph:

Provide and conduct the quality control and required testing for acceptance of the UBWC in accordance with *Quality Management System for Asphalt Pavements (OGAFC, PADL, and Ultra-Thin HMA Version)*, included in the contract.

Page 6-76, Article 661-2 Materials, add the following after Asphalt Binder, Grade 70-28:

| Item | Section |
|-----------------------------|---------|
| Asphalt Binder, Grade 76-22 | 1020 |
| Reclaimed Asphalt Shingles | 1012 |

Page 6-78, Subarticle 661-2(E), Asphalt Binder For Plant Mix, Grade PG 70-28, rename as ASPHALT BINDER FOR PLANT MIX and add the following as the first paragraph:

Use either PG 70-28 or PG 76-22 binder in the mix design. Where PG 76-22 is being used in the production of Ultra-thin, the grade of asphalt binder to be paid for will be PG 70-28, unless otherwise approved.

Page 6-79, Subarticle 661-2(G), Composition of Mix, add the following as the third sentence of the first paragraph.

The percent of asphalt binder contributed from the RAS shall not exceed 20% of the total binder in the completed mix.

Page 6-80, Article 661-2(G) Composition of Mix, replace Table 661-4 and associated notes with the following:

| Gradation Design Criteria (% Passing by Weight) | | | | |
|--|-----------|------------------------------|-----------------------|-----------------------|
| Standard Sieves | | 1/2 in. Type A | 3/8 in. Type B | 1/4 in. Type C |
| ASTM | mm | (% Passing by Weight) | | |
| 3/4 inch | 19.0 | 100 | | |
| 1/2 inch | 12.5 | 85 - 100 | 100 | |
| 3/8 inch | 9.5 | 60 - 80 | 85 - 100 | 100 |
| #4 | 4.75 | 28 - 38 | 28 - 44 | 40 - 55 |
| #8 | 2.36 | 19 - 32 | 17 - 34 | 22 - 32 |
| #16 | 1.18 | 15 - 23 | 13 - 23 | 15 - 25 |
| #30 | 0.600 | 10 - 18 | 8 - 18 | 10 - 18 |
| #50 | 0.300 | 8 - 13 | 6 - 13 | 8 - 13 |
| #100 | 0.150 | 6 - 10 | 4 - 10 | 6 - 10 |
| #200 | 0.075 | 4.0 - 7.0 | 3.0 - 7.0 | 4.0 - 7.0 |

| | 1/2 in. Type A | 3/8 in. Type B | 1/4 in. Type C |
|--|-------------------------|-------------------------|-------------------------|
| Asphalt Content, % | 4.6 - 5.6 | 4.6 - 5.8 | 5.0 - 5.8 |
| Draindown Test, AASHTO T 305 | 0.1% max. | | |
| Moisture Sensitivity, AASHTO T 283* | 80% min. | | |
| Application Rate, lb/ yd ² | 90 | 70 | 50 |
| Approximate Application Depth, in. | 3/4 | 5/8 | 1/2 |
| Asphalt PG Grade, AASHTO M 320 | PG 70-28 or PG 76-22 | PG 70-28 or PG 76-22 | PG 70-28 or PG 76-22 |

NOTE: *Specimens for T-283 testing are to be compacted using the SUPERPAVE gyratory compactor. The mixtures shall be compacted using 100 gyrations to achieve specimens approximately 95 mm in height. Use mixture and compaction temperatures recommended by the binder supplier.

Page 6-80, Subarticle 661-3(A) Equipment, add the following as the first paragraph:

Use asphalt mixing plants in accordance with Article 610-5 of the *Standard Specifications*.

Page 6-82, Subarticle 661-3(C), Application of Ultra-thin Bonded Wearing Course, delete the first paragraph and add the following as the first and second paragraphs.

Use only one asphalt binder PG grade for the entire project, unless the Engineer gives written approval.

Do not place Ultra-thin Bonded Wearing Course between October 31 and April 1, when the pavement surface temperature is less than 50°F or on a wet pavement. In addition, when PG 76-22 binder is used in the JMF, place the wearing course only when the road pavement surface temperature is 60°F or higher and the air temperature in the shade away from artificial heat is 60°F or higher.

Page 10-40, Subarticle 1012-1(A), add the following at the end of the last paragraph, last sentence:

or ultra-thin bonded wearing course.

Page 10-41, Table 1012-1, delete the entries for OGAFc and add new entries for OGAFc and a row for UBWC with entries:

| Mix Type | Coarse Aggregate Angularity ^(b) ASTM D5821 | Fine Aggregate Angularity % Minimum AASHTO T304 Method A | Sand Equivalent % Minimum AASHTO T176 | Flat & Elongated 5:1 Ratio % Maximum ASTM D4791 Section 8.4 |
|----------|--|---|--|--|
| S 9.5 D | 100/100 | 45 | 50 | 10 |
| OGAFc | 100/100 | N/A | N/A | 10 |
| UBWC | 100/85 | 40 | 45 | 10 |

Delete Note (c) under the Table 1012-1 and replace with the following:

(c) Does not apply to Mix Types SF 9.5A and S 9.5B.

Page 10-42, Subarticle 1012-1(B)(6), add as the last sentence:

The percentage loss for aggregate used in UBWC shall be no more than 35%.

Page 10-43, Subarticle 1012-1(F): Reclaimed Asphalt Shingle Material (RAS), insert the following immediately following the first paragraph:

(1) Mix Design RAS

Incorporate RAS from stockpiles that have been tested for uniformity of gradation and binder content prior to use in an asphalt mix design.

(2) Mix Production RAS

New Source RAS is defined as acceptable material which was not included in the stockpile when samples were taken for mix design purposes. Process new source RAS so that all materials will pass a 1/2" sieve prior to introduction into the plant mixer unit.

After a stockpile of processed RAS has been sampled and mix designs made from these samples, do not add new source RAS to the original stockpile without prior field testing to insure gradation and binder uniformity. Sample and test new source RAS before blending with the existing stockpile.

Store new source RAS in a separate stockpile until the material can be sampled and tested for comparison with the original recycled mix design data. New source RAS may also be placed against the existing stockpile in a linear manner provided it is sampled for mix design conformity prior to its use in the recycled mix.

RAS contamination including but not limited to excessive dirt, debris, clean stone, concrete will not be allowed.

Field approval of new source RAS will be based on the table below and volumetric mix properties on the mix with the new source RAS included. Provided these tolerances are met, volumetric properties of the new mix will then be performed. If all volumetric mix properties meet the mix design criteria for that mix type, the new source RAS may continue to be used.

If the gradation, binder content, or any of the volumetric mix properties are not within the allowable tolerances of the table below, do not use the new source RAS unless approved by the Engineer. The Contractor may elect to either not use the stockpile, to request an adjustment to the JMF, or to redesign the mix.

**NEW SOURCE RAS GRADATION and BINDER TOLERANCES
(Apply Tolerances to Mix Design Data)**

| 0-6% RAS | |
|------------------|-----------|
| P _b % | ±1.6% |
| Sieve Size (mm) | Tolerance |
| 9.5 | ±1 |
| 4.75 | ±5 |
| 2.36 | ±4 |
| 1.18 | ±4 |
| 0.300 | ±4 |
| 0.150 | ±4 |
| 0.075 | ±2.0 |

Page 10-43 through 10-45, Subarticle 1012-1(G), delete this in its entirety and replace with the following:

(G) Reclaimed Asphalt Pavement (RAP)

(1) Mix Design RAP

Incorporate RAP from stockpiles or other sources that have been tested for uniformity of gradation and binder content prior to use in an asphalt mix design. Use reclaimed asphalt pavement that meets all requirements specified for *one of* the following *two* classifications.

(a) Millings

Existing reclaimed asphalt pavement (RAP) that is removed from its original location by a milling process as specified in Section 607. Millings should be such that it has a uniform gradation and binder content and all materials will pass a 2" sieve prior to introduction into the plant mixer unit.

(b) Processed RAP

RAP that is processed in some manner (possibly by crushing and/or use of a blending method) to produce a uniform gradation and binder content in the RAP prior to use in a recycled mix. Process RAP so that all materials have a uniform gradation and binder content and will pass a 1" sieve prior to introduction into the plant mixer unit.

(c) Fractionated RAP

Fractionated RAP is defined as having two or more RAP stockpiles, where the RAP is divided into coarse and fine fractions. Grade RAP so that all materials will pass a 1" sieve. The coarse RAP stockpile shall only contain material retained on a 3/8" screen, unless otherwise approved. The fine RAP stockpile shall only contain material passing the 3/8" screen, unless otherwise approved. The Engineer may allow the Contractor to use an alternate to the 3/8" screen to fractionate the RAP. The maximum percentages of fractionated RAP may be comprised of coarse, fine, or the combination of both. Utilize a separate cold feed bin for each stockpile of fractionated RAP used.

(d) Approved Stockpiled RAP

Approved Stockpiled RAP is defined as fractionated RAP which has been isolated and tested for asphalt content, gradation, and asphalt binder characteristics with the intent to be used in mix designs with

greater than 30% RAP materials. Fractionate the RAP in accordance with Section 1012-1(G)(c). Utilize a separate cold feed bin for each approved stockpile of RAP used.

Perform extraction tests at a rate of 1 per 1000 tons of RAP, with a minimum of 5 tests per stockpile to determine the asphalt content and gradation. Separate stockpiles of RAP material by fine and coarse fractions. Erect and maintain a sign satisfactory to the Engineer on each stockpile to identify the material. Assure that no deleterious material is allowed in any stockpile. The Engineer may reject by visual inspection any stockpiles that are not kept clean, separated, and free of foreign materials.

Submit requests for RAP stockpile approval to the Engineer with the following information at the time of the request:

- (1) Approximate tons of materials in stockpile
- (2) Name or Identification number for the stockpile
- (3) Asphalt binder content and gradation test results
- (4) Asphalt characteristics of the Stockpile.

For the Stockpiled RAP to be considered for approval, the gradation and asphalt content shall be uniform. Individual test results, when compared to the target, will be accepted if within the tolerances listed below:

**APPROVED STOCKPILED RAP GRADATION and BINDER TOLERANCES
(Apply Tolerances to Mix Design Data)**

| P _b % | ±0.3% |
|------------------|-----------------|
| Sieve Size (mm) | Percent Passing |
| 25.0 | ±5% |
| 19.0 | ±5% |
| 12.5 | ±5% |
| 9.5 | ±5% |
| 4.75 | ±5% |
| 2.36 | ±4% |
| 1.18 | ±4% |
| 0.300 | ±4% |
| 0.150 | ±4% |
| 0.075 | ±1.5% |

Note: If more than 20% of the individual sieves are out of the gradation tolerances, or if more than 20% of the asphalt binder content test results fall outside the appropriate tolerances, the RAP shall not be used in HMA unless the RAP representing the failing tests is removed from the stockpile.

Do not add additional material to any approved RAP stockpile, unless otherwise approved by the Engineer.

Maintain at the plant site a record system for all approved RAP stockpiles. Include at a minimum the following: Stockpile identification and a sketch of all stockpile areas at the plant site; all RAP test results (including asphalt content, gradation, and asphalt binder characteristics).

(2) Mix Production RAP

During mix production, use RAP that meets the criteria for one of the following categories:

(a) Mix Design RAP

RAP contained in the mix design stockpiles as described above may be used in all applicable JMFs. These stockpiles have been pretested; however, they are subject to required QC/QA testing in accordance with Subarticle 609-5(C)(2).

(b) New Source RAP

New Source RAP is defined as any acceptable material that was not included in the stockpile or other source when samples were taken for mix design purposes. Process new source RAP so that all materials have a uniform gradation and binder content and will pass a 2" sieve prior to introduction into the plant mixer unit.

After a stockpile of millings, processed RAP, or fractionated RAP has been sampled and mix designs made from these samples, do not add new source RAP to the original stockpile without prior field testing to insure gradation and binder uniformity. Sample and test new source RAP before blending with the existing stockpile.

Store new source RAP in a separate stockpile until the material can be sampled and tested for comparison with the original recycled mix design data. New source RAP may also be placed against the existing stockpile in a linear manner provided it is sampled for mix design conformity prior to its use in the recycled mix.

Unprocessed RAP is asphalt material that was not milled and/or has not been processed to obtain a uniform gradation and binder content and is not representative of the RAP used during the applicable mix design. Unprocessed RAP shall not be incorporated into any JMFs prior to processing. Different sources of unprocessed RAP may be

stockpiled together provided it is generally free of contamination and will be processed prior to use in a recycled mix. RAP contamination in the form of excessive dirt, debris, clean stone, concrete, etc. will not be allowed. Incidental amounts of dirt, concrete, and clean stone may be acceptable. Unprocessed RAP may be processed and then classified as a new source RAP as described above.

Field approval of new source RAP will be based on Table 1012-2 below and volumetric mix properties on the mix with the new source RAP included. Provided the Table 1012-2 tolerances are met, volumetric properties of the new mix will then be performed. If all volumetric mix properties meet the mix design criteria for that mix type, the new source RAP may continue to be used.

If the gradation, binder content, or any of the volumetric mix properties are not within the allowable tolerances of Table 1012-2, do not use the new source RAP unless approved by the Engineer. The Contractor may elect to either not use the stockpile, to request an adjustment to the JMF, or to redesign the mix.

| Mix Type | 0-20% RAP | | | 20 ⁺ -30 % RAP | | | 30 ⁺ % RAP | | |
|------------------|-----------|--------|-------|---------------------------|--------|-------|-----------------------|--------|-------|
| | Base | Inter. | Surf. | Base | Inter. | Surf. | Base | Inter. | Surf. |
| P _b % | ± 0.7% | | | ± 0.4% | | | ± 0.3% | | |
| 25.0 | ±10 | - | - | ±7 | - | - | ±5 | - | - |
| 19.0 | ±10 | ±10 | - | ±7 | ±7 | - | ±5 | ±5 | - |
| 12.5 | - | ±10 | ±10 | - | ±7 | ±7 | - | ±5 | ±5 |
| 9.5 | - | - | ±10 | - | - | ±7 | - | - | ±5 |
| 4.75 | ±10 | - | ±10 | ±7 | - | ±7 | ±5 | - | ±5 |
| 2.36 | ±8 | ±8 | ±8 | ±5 | ±5 | ±5 | ±4 | ±4 | ±4 |
| 1.18 | ±8 | ±8 | ±8 | ±5 | ±5 | ±5 | ±4 | ±4 | ±4 |
| 0.300 | ±8 | ±8 | ±8 | ±5 | ±5 | ±5 | ±4 | ±4 | ±4 |
| 0.150 | - | - | ±8 | - | - | ±5 | - | - | ±4 |
| 0.075 | ±4 | ±4 | ±4 | ±2 | ±2 | ±2 | ±1.5 | ±1.5 | ±1.5 |

ASPHALT PAVEMENTS - WARM MIX ASPHALT SUPERPAVE:

(5-19-09) (Rev 10-20-09)

SP6 R02

Warm Mix Asphalt (WMA) is defined as additives or processes that allow a reduction in the temperature at which asphalt mixtures are produced and placed.

Notify the Engineer at least 2 weeks before producing the Warm Mix so the Engineer can arrange a preconstruction meeting. Discuss special testing requirements necessary for warm mix asphalt at the pre-pave meeting. Included at the pre-pave meeting the Contractor's QC manager, Paving Superintendent, and manufacturer's representative for the process or additive used for producing warm mix asphalt, the Department's Roadway Construction Engineer, Resident Engineer, State Pavement Construction, and Quality Assurance Supervisor.

Require a manufacturer's representative for the process or additive used to be present on site at the plant during the initial production and on the roadway during the laydown of the warm mix asphalt.

Revise the *2006 Standard Specifications* as follows:

Page 6-8, Article 609-1 Description, insert the following as the second paragraph.

Warm Mix Asphalt (WMA) is defined as additives or processes that allow a reduction in the temperature at which asphalt mixtures are produced and placed. WMA is allowed for use at the Contractor's option when shown in the contract documents.

Page 6-9, Article 609-4 Field Verification of Mixture and Job Mix Formula Adjustments,

Second paragraph, insert the following immediately after the first sentence.

When producing a WMA, field verification testing will also consist of performing a Tensile Strength Ratio (TSR) testing in accordance with AASHTO T283 as Modified by the Department.

Third paragraph, delete the third sentence and replace with the following:

Verification is considered satisfactory for HMA when all volumetric properties except $\%G_{mm}@N_{ini}$ are within the applicable mix design criteria, and the gradation, binder content, and $\%G_{mm}@N_{ini}$ are within the individual limits for the mix type being produced. Verification is considered satisfactory for WMA when all volumetric properties except $\%G_{mm}@N_{ini}$ are within the applicable mix design criteria, the TSR is equal to or above the minimum design criteria, and the gradation, binder content, and $\%G_{mm}@N_{ini}$ are within the individual limits for the mix type being produced.

Page 6-12, Subarticle 609-5(C)2(d) Bulk Specific Gravity of Compacted Specimens, add after (AASHTO T 312):

When producing Warm Mix Asphalt, gyrate specimens to specified N_{des} compaction effort without reheating mix other than to desired compaction temperature. Record time needed to reheat samples (if any).

Page 6-14, Subarticle 609-5(C)2(e) Tensile Strength Ratio, insert the following immediately after the third paragraph:

When producing WMA, perform TSR testing at

- i. Beginning of production for each JMF
- ii. Monthly thereafter

Page 6-27, Article 610-1 Description, insert the following as the third paragraph:

Warm Mix Asphalt (WMA) is defined as additives or processes that allow a reduction in the temperature at which asphalt mixtures are produced and placed. Use WMA at the Contractor's option unless otherwise shown on the plans.

Page 6-27, Article 610-2 Materials, insert the following at the end of this Article:

Use only WMA additives or processes listed on the Department's approved list maintained by the Materials and Tests Unit.

Page 6-31, Subarticle 610-3(B) Mix Design-Criteria, add the following as the fifth paragraph:

When WMA is used, submit the mix design without including the WMA additive.

Page 6-32, Subarticle 610-3(C) Job Mix Formula, Add the following as the second paragraph:

When WMA is used, document the additive or process used and recommended rate on the JMF submittal. Verify the JMF based on plant produced mixture from the trial batch.

Immediately following PG 76-22 335°F, add the following paragraph:

When WMA is used, produce an asphalt mixture within the temperature range of 225°F and 275 °F.

ASPHALT BINDER CONTENT OF ASPHALT PLANT MIXES:

(11-21-00)

SP6 R15

The approximate asphalt binder content of the asphalt concrete plant mixtures used on this project will be as follows:

| | | |
|--------------------------------------|--------------|------|
| Asphalt Concrete Base Course | Type B 25.0 | 4.3% |
| Asphalt Concrete Intermediate Course | Type I 19.0 | 4.7% |
| Asphalt Concrete Surface Course | Type S 4.75A | 7.0% |
| Asphalt Concrete Surface Course | Type SF 9.5A | 6.5% |
| Asphalt Concrete Surface Course | Type S 9.5 | 6.0% |
| Asphalt Concrete Surface Course | Type S 12.5 | 5.5% |

The actual asphalt binder content will be established during construction by the Engineer within the limits established in the *2006 Standard Specifications*.

ASPHALT PLANT MIXTURES:

(7-1-95)

SP6 R20

Place asphalt concrete base course material in trench sections with asphalt pavement spreaders made for the purpose or with other equipment approved by the Engineer.

PRICE ADJUSTMENT - ASPHALT BINDER FOR PLANT MIX:

(11-21-00)

SP6 R25

Price adjustments for asphalt binder for plant mix will be made in accordance with Section 620 of the *2006 Standard Specifications*.

The base price index for asphalt binder for plant mix is \$ **506.67** per ton.

This base price index represents an average of F.O.B. selling prices of asphalt binder at supplier's terminals on **May 1, 2010**.

BORROW EXCAVATION AND SHPO DOCUMENTATION FOR BORROW/WASTE**SITES:**

(12-18-07) (4-15-08)

SP8 R02

Revise the *2006 Standard Specifications* as follows:

Division 2 Earthwork

Page 2-16, Subarticle 230-1(D), add the words: *The Contractor specifically waives* as the first words of the sentence.

Page 2-17, Article 230-4(B) Contractor Furnished Sources, first paragraph, first sentence replace with the following:

Prior to the approval of any borrow sources developed for use on any project, obtain certification from the State Historic Preservation Officer of the State Department of Cultural

Resources certifying that the removal of the borrow material from the borrow sources(s) will have no effect on any known district, site building, structure, or object, architectural and/or archaeological that is included or eligible for inclusion in the National Register of Historic Places.

Division 8 Incidentals

Page 8-9, Article 802-2 General Requirements, add the following as the 1st paragraph:

Prior to the removal of any waste from any project, obtain certification from the State Historic Preservation Officer of the State Department of Cultural Resources certifying that the deposition of the waste material to the proposed waste area will have no effect on any known district, site building, structure, or object, architectural and/or archaeological that is included or eligible for inclusion in the National Register of Historic Places. Furnish a copy of this certification to the Engineer prior to performing any work in the proposed waste site.

Page 8-10, Article 802-2, General Requirements, 4th paragraph, add the following as the 2nd sentence:

The Department’s borrow and waste site reclamation procedures for contracted projects is available on the NCDOT website and shall be used for all borrow and waste sites on this project.

GUARDRAIL ANCHOR UNITS, TYPE 350:

(4-20-04)

SP8 R65

Description

Furnish and install guardrail anchor units in accordance with the details in the plans, the applicable requirements of Section 862 of the *2006 Standard Specifications*, and at locations shown in the plans.

Materials

The Contractor may at his option, furnish any one of the guardrail anchor units.

Guardrail anchor unit (ET-2000) as manufactured by:

Trinity Industries, Inc.
2525 N. Stemmons Freeway
Dallas, Texas 75207
Telephone: 800-644-7976

The guardrail anchor unit (SKT 350) as manufactured by:

Road Systems, Inc.
3616 Old Howard County Airport
Big Spring, Texas 79720
Telephone: 915-263-2435

Prior to installation the Contractor shall submit to the Engineer:

(A) FHWA acceptance letter for each guardrail anchor unit certifying it meets the requirements of NCHRP Report 350, Test Level 3, in accordance with Section 106-2 of the *2006 Standard Specifications*.

(B) Certified working drawings and assembling instructions from the manufacturer for each guardrail anchor unit in accordance with Section 105-2 of the *2006 Standard Specifications*.

No modifications shall be made to the guardrail anchor unit without the express written permission from the manufacturer. Perform installation in accordance with the details in the plans, and details and assembling instructions furnished by the manufacturer.

Construction Methods

Guardrail end delineation is required on all approach and trailing end sections for both temporary and permanent installations. Guardrail end delineation consists of yellow reflective sheeting applied to the entire end section of the guardrail in accordance with Section 1088-3 of the *2006 Standard Specifications* and is incidental to the cost of the guardrail anchor unit.

Measurement and Payment

Measurement and payment will be made in accordance with Articles 862-6 of the *2006 Standard Specifications*.

Payment will be made under:

| Pay Item | Pay Unit |
|----------------------------------|-----------------|
| Guardrail Anchor Units, Type 350 | Each |

PREFORMED SCOUR HOLE WITH LEVEL SPREADER APRON:

(10-15-02) (Rev 10-20-09)

SP8 R105

Description

Construct and maintain preformed scour holes with spreader aprons at the locations shown on the plans and in accordance with the details in the plans. Work includes excavation, shaping and maintaining the hole and apron, furnishing and placing filter fabric, rip rap (class as specified in the plans) and permanent soil reinforcement matting.

Materials

| Item | Section |
|---------------|----------------|
| Plain Rip Rap | 1042 |
| Filter Fabric | 1056 |

The permanent soil reinforcement matting shall be permanent erosion control reinforcement mat and shall be constructed of synthetic or a combination of coconut and synthetic fibers evenly distributed throughout the mat between a bottom UV stabilized netting and a heavy duty UV stabilized top net. The matting shall be stitched together with UV stabilized polypropylene thread to form a permanent three dimensional structure. The mat shall have the following minimum physical properties:

| <i>Property</i> | <i>Test Method</i> | <i>Value Unit</i> |
|--|------------------------|-------------------------|
| Light Penetration | ASTM D6567 | 9 % |
| Thickness | ASTM D6525 | 0.40 in |
| Mass Per Unit Area | ASTM D6566 | 0.55 lb/sy |
| Tensile Strength | ASTM D6818 | 385 lb/ft |
| Elongation (Maximum) | ASTM D6818 | 49 % |
| Resiliency | ASTM D1777 | >70 % |
| UV Stability * | ASTM 4355 | ≥80 % |
| Porosity (Permanent Net) | ECTC Guidelines | ≥85 % |
| Maximum Permissible Shear Stress (Vegetated) | Performance Bench Test | ≥8.0 lb/ft ² |
| Maximum Allowable Velocity (Vegetated) | Performance Bench Test | ≥16.0 ft/s |

*ASTM D1682 Tensile Strength and % strength retention of material after 1000 hours of exposure.

Submit a certification (Type 1, 2, or 3) from the manufacturer showing:

- (A) the chemical and physical properties of the mat used, and
- (B) conformance of the mat with this specification.

Construction Methods

All areas to be protected with the mat shall be brought to final grade and seeded in accordance with Section 1660 of the *Standard Specifications*. The surface of the soil shall be smooth, firm, stable and free of rocks, clods, roots or other obstructions that would prevent the mat from lying in direct contact with the soil surface. Areas where the mat is to be placed will not need to be mulched.

Measurement and Payment

Preformed Scour Holes with Level Spreader Aprons will be measured and paid as the actual number that has been incorporated into the completed and accepted work. Such price and payment will be full compensation for all work covered by this provision.

Payment will be made under:

| Pay Item | Pay Unit |
|---|-----------------|
| Preformed Scour Hole with Level Spreader Aprons | Each |

STEEL U-CHANNEL POSTS:

(7-18-06)

SP9 R02

Revise the *2006 Standard Specifications* as follows:

Page 9-15 Subarticle 903-3(D) first paragraph, last sentence, delete the last sentence and add the following:

Use posts of sufficient length to permit the appropriate sign mounting height. Spliced posts are not permitted on new construction.

GALVANIZED HIGH STRENGTH BOLTS, NUTS AND WASHERS:

(2-17-09)

SP10 R02

Revise the *Standard Specifications* as follows:

Page 10-126, Subarticle 1072-7(F)(3) Change the AASHTO reference to B 695 Class 55.

Page 10-247, Table 1092-2, Steel Sign Materials, Change High Strength Bolts, Nuts & Washers ASTM Specifications for Galvanizing to B695 Class 55.

Page 10-259, Subarticle 1094-1(A) Breakaway or Simple Steel Beam Sign Supports, replace the third paragraph with the following:

Fabricate high strength bolts, nuts, and washers required for breakaway supports from steel in accordance with ASTM A325 and galvanize in accordance with AASHTO B 695 Class 55.

Page 10-261, Article 1096-2 Steel Overhead Sign Structures, replace the last sentence with the following:

The galvanizing shall meet the requirement of AASHTO B 695 Class 55 for fasteners and of ASTM A123 for other structural steel.

AGGREGATE PRODUCTION:

(11-20-01)

SP10 R05

Provide aggregate from a producer who uses the current Aggregate Quality Control/Quality Assurance Program that is in effect at the time of shipment.

No price adjustment is allowed to contractors or producers who use the program. Participation in the program does not relieve the producer of the responsibility of complying with all requirements of the *2006 Standard Specifications*. Copies of this procedure are available upon request from the Materials and Test Unit.

CONCRETE BRICK AND BLOCK PRODUCTION:

(11-20-01)

SP10 R10

Provide concrete brick and block from a producer who uses the current Solid Concrete Masonry Brick/Unit Quality Control/Quality Assurance Program that is in effect on the date that material is received on the project.

No price adjustment is allowed to contractors or producers who use the program. Participation in the program does not relieve the producer of the responsibility of complying with all requirements of the *2006 Standard Specifications*. Copies of this procedure are available upon request from the Materials and Test Unit.

VOLUMETRIC CONCRETE BATCHING:

(5-18-10)

SP10 R13

Revise the *2006 Standard Specifications* as follows:

Page 10-19, after **Article 1000-12**, add the following as a new article:

1000-13 VOLUMETRIC MIXED CONCRETE

Upon written request by the contractor, the Department may approve the use of concrete proportioned by volume. The volumetric producer must submit and have approved a process control plan and product quality control plan by the Materials and Tests Unit. If concrete is proportioned by volume, the other requirements of these specifications with the following modifications will apply. Unless otherwise approved by the Department, use of concrete proportioned by volume shall be limited to Class B concrete and a maximum of 30 cubic yards per unit per day.

(A) Materials

Use materials that meet the requirements for the respective items in the *Standard Specifications* except that they will be measured by a calibrated volume-weight relationship.

Storage facilities for all material shall be designed to permit the Department to make necessary inspections prior to the batching operations. The facilities shall also permit identification of approved material at all times, and shall be designed to avoid mixing with or contaminating by unapproved material. Coarse and fine aggregate shall be furnished and handled so variations in the moisture content affecting the uniform consistency of the concrete will be avoided.

Moisture content of the coarse and fine aggregate will be made available onsite for the Engineer's review for each load. The frequency of moisture testing will be dependent on certain variables such as weather, season and source; however, moisture tests should be performed at least once at the beginning of the work day for each source material. Additional daily moisture tests for the coarse and fine aggregate shall be performed if requested by the Engineer.

Unused materials should be emptied from hopper daily. Concrete should not be mixed with materials that have been left in the hopper overnight.

(B) Equipment

Provide volumetric mixers with rating plates indicating that the performance of the mixer is in accordance with the Volumetric Mixer Manufacturer Bureau or equivalent. Mixers must comply with ASTM C685. Unless otherwise specified, all mixing operations must be in strict accordance with the manufacturer's recommended procedures. Such procedures shall be provided to the Department for review upon request.

The volumetric mixer shall be capable of carrying sufficient unmixed dry bulk cement, pozzolan (if required), fine aggregate, coarse aggregate, admixtures and water, in separate compartments and accurately proportioning the specified mix. Each batching or mixing unit (or both) shall carry in a prominent place a metal plate or plates on which are plainly marked the gross volume of the unit in terms of mixed concrete, discharge speed and the weight-calibrated constant of the machine in terms of a revolution counter or other output indicator.

The concrete mixing device shall be an auger-type continuous mixer used in conjunction with volumetric proportioning. The mixer shall produce concrete, uniform in color and appearance, with homogeneous distribution of the material throughout the mixture. Mixing time necessary to produce uniform concrete shall be established by the contractor and shall comply with other requirements of these specifications. Only equipment found acceptable in every respect and capable of producing uniform results will be permitted.

Each volumetric mixer shall be equipped with an onboard ticketing system that will electronically produce a record of all material used and their respective weights and the total volume of concrete placed. Alternate methods of recordation may be used if approved by the Engineer. Tickets should also identify the following information, at minimum:

- Contractor Name
- Contractor Phone Number
- NCDOT Project No. and TIP No.
- Date
- Truck No.
- Ticket No.
- Time Start/End of Pour
- Mix ID & Description (Strength)
- Aggregate Moisture Before Mixing

(C) Proportioning Devices

Volume proportioning devices, such as counters, calibrated gate openings or flow meters, shall be easily accessible for controlling and determining the quantities of the ingredients discharged. All indicating devices that affect the accuracy of proportioning and mixing of concrete shall be in full view of and near enough to be read by the operator and Engineer while concrete is being produced. In operation, the entire measuring and dispensing mechanism shall produce the specified proportions of each ingredient.

The volumetric mixer shall provide positive control of the flow of water and admixtures into the mixing chamber. Water flow shall be indicated by a flow meter and be readily adjustable to provide for slump control and/or minor variations in aggregate moisture. The mixer shall be capable of continuously circulating or mechanically agitating the admixtures.

Liquid admixtures shall be dispensed through a controlled, calibrated flow meter. A positive means to observe the continuous flow of material shall be provided. If an admixture requires diluting, the admixture shall be diluted and thoroughly mixed prior to introducing the admixture into the dispenser. When admixtures are diluted, the ratio of dilution and the mixing shall be approved by and performed in the presence of the Department.

The volumetric mixer shall be capable of measurement of cement, pozzolan (if required), liquids and aggregate being introduced into the mix.

(D) Calibration

Volume-weight relationships will be based on calibration. The proportioning devices shall be calibrated by the contractor prior to the start of each NCDOT job, and subsequently at intervals recommended by the equipment manufacturer. Calibrations will be performed in the presence of the Department and subject to approval from the Department. Calibration of the cement and aggregate proportioning devices shall be accomplished by weighing (determining the mass of) each component. Calibration of the admixture and water proportioning devices shall be accomplished by weight (mass) or volume. Tolerances in proportioning the individual components will be as follows:

**TABLE 1000-4
VOLUMETRIC MIXED CONCRETE CALIBRATION
PROPORTION TOLERANCES**

| Item | Tolerance |
|---|------------------|
| Cement, Weight (Mass) percent | 0 to +4 |
| Fine Aggregate, Weight (Mass) percent | ± 2 |
| Coarse Aggregate, Weight (Mass) percent | ± 2 |
| Admixtures, Weight (Mass) or Volume percent | ± 3 |
| Water, Weight (Mass) or Volume percent | ± 1 |

Each volumetric mixer must be accompanied at all times by completed calibration worksheets and they shall be made available to the Department upon request.

(E) Verification of Yield

Verification of the proportioning devices may be required at any time by the Department. Verification shall be accomplished by proportioning the rock and sand based on the cement meter count for each concrete mobile mixer. Once the count (revolutions) for 94 pounds of cement has been determined then delivery of the correct amount of rock and sand can be verified.

(F) Uniformity

When concrete is produced, have present during all batching operations a Certified Concrete Batch Technician. During batching and placement, the sole duty of this employee is to supervise the production and control of the concrete, perform moisture tests, adjust mix proportions of aggregates for free moisture, complete and sign approved delivery tickets, and assure quality control of the batching.

Two samples of sufficient size to make the required tests will be taken after discharge of approximately 15 and 85 percent of the load. Each of the 2 samples of concrete will be separately tested for the properties listed in Table 1000-3. Tests will be conducted in accordance with the test procedures specified in Table 1000-3 or procedures established by the Materials and Tests Unit. The Engineer may recheck mixer performance at any time when in his opinion satisfactory mixing is not being accomplished.

PORTLAND CEMENT CONCRETE (Alkali-Silica Reaction):

(2-20-07)

SP10 R16

Revise the *2006 Standard Specifications* as follows:

Article 1024-1(A), replace the 2nd paragraph with the following:

Certain combinations of cement and aggregate exhibit an adverse alkali-silica reaction. The alkalinity of any cement, expressed as sodium-oxide equivalent, shall not exceed 1.0 percent. For mix designs that contain non-reactive aggregates and cement with an alkali content less than 0.6%, straight cement or a combination of cement and fly ash, cement and ground granulated blast furnace slag or cement and microsilica may be used. The pozzolan quantity shall not exceed the amount shown in Table 1024-1. For mixes that contain cement with an alkali content between 0.6% and 1.0%, and for mixes that contain a reactive aggregate documented by the Department, regardless of the alkali content of the cement, use a pozzolan in the amount shown in Table 1024-1.

Obtain the list of reactive aggregates documented by the Department at:<http://www.ncdot.org/doh/operations/materials/pdf/quarryasrprob.pdf>

| Table 1024-1 | |
|--|--|
| Pozzolans for Use in Portland Cement Concrete | |
| <i>Pozzolan</i> | <i>Rate</i> |
| Class F Fly Ash | 20% by weight of required cement content, with 1.2 lbs Class F fly ash per lb of cement replaced |
| Ground Granulated Blast Furnace Slag | 35%-50% by weight of required cement content with 1 lb slag per lb of cement replaced |
| Microsilica | 4%-8% by weight of required cement content, with 1 lb microsilica per lb of cement replaced |

CULVERT PIPE:

(1-19-10)

SP10 R32

Revise the *Standard Specifications for Roads and Structures* as follows:

Page 10-67, Article 1032-1, replace (A), (B), (C), (D), (E) and (F) with the following:

- (A) Coated corrugated metal culvert pipe and pipe arches.
- (B) Coated corrugated metal end sections, coupling band, and other accessories
- (C) Corrugated aluminum alloy structural plate pipe and pipe arches
- (D) Corrugated aluminum alloy end sections, coupling band, and other accessories
- (E) Welded steel pipe

Page 10-69, Subarticle 1032-3(A)(5) Coating Repair, replace with the following:

Repair shall be in accordance with Section 1076-6 of the *Standard Specifications*.

Subarticle 1032-3(A)(7) Aluminized Pipe, replace with the following:

Aluminized pipe shall meet all requirements herein, except that the pipe and coupling bands shall be fabricated from aluminum coated steel sheet meeting the requirements of AASHTO M274.

Page 10-71, Article 1032-4 Coated Culvert Pipe, replace (A), (1), (2), (3), (4), (B), (C), (D), (E), (F) and (G) with the following:

- (A) Coatings for Steel Culvert Pipe or Pipe Arch

The below coating requirements apply for steel culvert pipe, pipe arch, end sections, tees, elbows, and eccentric reducers.

- (1) Steel Culvert pipe shall have an aluminized coating, meeting the requirement of AASHTO M274

- (2) When shown on the plans or as approved by the Engineer, a polymeric coating meeting the requirements of AASHTO M246 for Type B coating may be substituted for aluminized coating.

(B) Acceptance

Acceptance of coated steel culvert pipe, and its accessories will be based on, but not limited to, visual inspections, classification requirements, check samples taken from material delivered to the project, and conformance to the annual Brand Registration.

Page 10-73, Article 1032-5, sixth paragraph, third sentence, remove the word "spelter"

Page 10-74, 1032-7 Vitrified Clay Culvert Pipe, delete section in its entirety.

Page 10-75, Article 1032-8 Welded Steel Pipe, change title to WELDED STEEL PIPE FOR DRAINAGE

Subarticle 1032-9(B) Plain Concrete Culvert Pipe, delete section in its entirety.

Page 10-77, Article 1032-10 Corrugated Polyethylene Culvert Pipe, change title to CORRUGATED POLYETHYLENE (HDPE) CULVERT PIPE

Add the following: Article 1032-11 Polyvinyl Chloride (PVC) Pipe

Polyvinyl Chloride pipe shall conform to AASHTO M 304 or ASTM 949. When rubber gaskets are to be installed in the pipe joint, the gasket shall be the sole element relied on to maintain a tight joint. Test pipe joints at the plant hydrostatically using test methods in ASTM D 3212. Soil tight joints shall be watertight to 13.8 kPa. Watertight joints shall be watertight to 34.5 kPa unless a higher pressure rating is specified in the plans.

GLASS BEADS:

(7-18-06)

SP10 R35

Revise the *2006 Standard Specifications* as follows:

Page 10-223, 1087-4(C) Gradation & Roundness

Replace the second sentence of the first paragraph with the following:

All Drop-On and Intermixed Glass Beads shall be tested in accordance with ASTM D1155.

Delete the last paragraph.

ENGINEERING FABRICS TABLE 1056-1:

(7-18-06)

SP10 R40

Revise the *2006 Standard Specifications* as follows:

Page 10-100, Table 1056-1, replace the values for Trapezoidal Tear Strength with the following:

| Physical Property | ASTM Test Method | Type 1 | Type 2 | Type 3 | | Type 4 |
|---------------------------|------------------|----------------|--------------|----------------------|---------|--------------------|
| | | | | Class A | Class B | |
| Typical Applications | | Shoulder Drain | Under Riprap | Temporary Silt Fence | | Soil Stabilization |
| Trapezoidal Tear Strength | D4533 | 45 lb | 75 lb | -- | -- | 75 lb |

PRECAST DRAINAGE STRUCTURES - MACRO-SYNTHETIC FIBERS

(7-15-08)(Rev 11-18-08)

SP10 R42

Description

Substitute as an option, macro-synthetic fibers in lieu of 4” x 4” W1.4 x W1.4 welded wire fabric reinforcement for selected precast concrete products in accordance with the following requirements.

Materials

| Item | Section |
|--------------------------|---------|
| Portland Cement Concrete | 1077-5 |

(A) Substitute macro-synthetic fibers only for steel reinforcement with an area of steel of 0.12 in²/ft or less in the following items:

- (1) **Precast Drainage Structure** units in accordance with the requirements of *Standard Drawing 840.45*.
- (2) **Precast Manhole 4.0' Riser Sections** in accordance with the requirements of *Standard Drawing 840.52*.

All other requirements, including reinforcement for these precast concrete items will remain the same.

(B) **Submittal** Submit to the Department for approval by the precast producer and fiber manufacturer, independently performed test results certifying the macro-synthetic fibers and the precast concrete products meet the requirements listed herein:

(C) Macro-Synthetic Fibers

- (1) Manufacture from virgin polyolefins (polypropylene and polyethylene) and comply with ASTM C 1116.4.1.3.

Fibers manufactured from materials other than polyolefins Submit test results certifying resistance to long-term deterioration when in contact with the moisture and alkalis present in cement paste and/or the substances present in air-entraining and chemical admixtures.

- (2) Fiber length - no less than 1-1/2 inch.
- (3) Macro-synthetic fibers - aspect ratio (length divided by the equivalent diameter of the fiber) between 45 and 150.
- (4) Macro-synthetic fibers - Minimum tensile strength of 40 ksi when tested in accordance with ASTM D 3822.
- (5) Macro-synthetic fibers - minimum modulus of elasticity of 400 ksi when tested in accordance with ASTM D 3822.

(D) Fiber Reinforced Concrete

- (1) Approved structural fibers may be used as a replacement of steel reinforcement in allowable structures of NCDOT Standards 840.45 and 840.52. The dosage rate, in pounds of fibers per cubic yard, shall be as per recommended by the fiber manufacturer to provide a minimum average residual strength (in accordance with ASTM C 1399) of concrete of no less than that of the concrete with the steel reinforcement that is being replaced, but no less than 5 lbs. per cubic yard. Submit the recommendations of the manufacturer that correlate the toughness of steel-reinforced concrete with that of the recommended dosage rate for the fiber-reinforced concrete.
- (2) Fiber reinforced concrete - 4.5% air content, \pm 1.5% tolerance.
- (3) Fiber reinforced concrete - develop a minimum compressive strength 4000 psi in 28 days.
- (4) Workability of the concrete mix - determine in accordance with ASTM C995. The flow time - not be less than 7 seconds or greater than 25 seconds.
- (5) Assure the fibers are well dispersed and prevent fiber balling during production. After introduction of all other ingredients, add the plastic concrete and mix the plastic concrete for at least 4 minutes or for 50 revolutions at standard mixing speed.

Measurement and Payment

No separate payment will be made for substitution of macro-fiber synthetic reinforcement for the steel reinforcing. The price bid for the precast units will be full compensation for furnishing and incorporating the macro-fiber synthetic reinforcement.

QUALIFICATION OF WELDS AND PROCEDURES:

(7-21-09)

SP10 R43

Page 10-143, Subarticle 1072-20(D) Qualification of Welds and Procedures, replace the third sentence of the first paragraph with the following:

For all prequalified field welds, submit Welding Procedure Specifications (WPS) for each joint configuration for approval at least 30 days prior to performing any welding. In lieu of this, use the WPS provided and preapproved by the Department. These preapproved WPS are available from the Materials and Tests Unit or at:

http://www.ncdot.org/doh/operations/materials/structural/appr_proc.html. Use non-prequalified welds only if approved by the Engineer. Submit WPS for all non-prequalified welds to the Engineer for approval. At no cost to the Department, demonstrate their adequacy in accordance with the requirements of the Bridge Welding Code.

PORTABLE CONCRETE BARRIER:

(2-20-07)

SP10 R50

The *2006 Standard Specifications* is revised as follows:

Page 10-245, Article 1090-1(A) General, add the following after the first sentence:

The requirement for approved galvanized connectors will be waived if the barrier remains the property of the Contractor.

TEMPORARY SHORING:

(2-20-07) (Rev. 9-25-07)

SP11 R02

Description

Design and construct temporary shoring in accordance with the contract. Temporary shoring includes standard shoring, temporary mechanically stabilized earth (MSE) walls and non-anchored temporary shoring. Trench boxes are not considered temporary shoring. "Standard shoring" refers to *standard temporary shoring* and *standard temporary MSE walls*. Notes on plans may restrict the use of one or both types of standard shoring. Notes on plans may also require or prohibit temporary MSE walls.

Unless noted otherwise on the plans, temporary shoring is required as shown on the plans and to maintain traffic. Temporary shoring to maintain traffic is defined as shoring necessary to provide lateral support to the side of an excavation or embankment parallel to an open travelway when a theoretical 2:1 (H:V) slope from the bottom of the excavation or embankment intersects the existing ground line closer than 5 ft from the edge of pavement of the open travelway.

This provision is not applicable to anchored temporary shoring or the installation of pipes, drop inlets and utilities unless noted otherwise on the plans. Provide all shoring submittals before beginning work.

Materials

(A) Certifications, Storage and Handling

Provide Type 7 Contractor's Certifications in accordance with Article 106-3 of the *Standard Specifications* for all shoring materials used with the exception of reinforcing fabrics and geogrids. Furnish Type 2 Typical Certified Mill Test Reports in accordance with Article 106-3 of the *Standard Specifications* for all seam strengths and reinforcing fabric and geogrid properties. Provide minimum average roll values (MARV) in accordance with ASTM D4759 for test reports. For testing reinforcing fabric and geogrids, a lot is defined as a single day's production.

Load, transport, unload and store shoring materials such that they are kept clean and free of damage. Identify, store and handle all geogrids and geotextile fabrics in accordance with ASTM D4873. Geogrids and fabrics with defects, flaws, deterioration or damage will be rejected. Do not leave fabrics or geogrids uncovered for more than 7 days.

(B) Shoring Backfill

Use shoring backfill for the construction of all temporary shoring including backfilling behind non-anchored temporary shoring and in the reinforced zone for temporary MSE walls. Unless backfilling around culverts, use shoring backfill that meets the requirements of Class II Type I, Class III, Class V or Class VI select material in accordance with Section 1016 of the *Standard Specifications* or AASHTO M145 for soil classification A-2-4 with a maximum plasticity index (PI) of 6. For backfilling around culverts, use shoring backfill as defined herein except for A-2-4 soil.

(C) Non-anchored Temporary Shoring

Use steel shapes, plates and piles that meet the requirements of ASTM A36 and steel sheet piles that meet the requirements of Article 1084-2 of the *Standard Specifications*. Use timber lagging with a minimum allowable bending stress of 1000 psi that meets the requirements of Article 1082-1 of the *Standard Specifications*. For standard temporary shoring, use pile sections and lengths and lagging sizes as shown on the plans.

(D) Temporary MSE Walls

Use welded wire reinforcement forms, facings, mesh and mats that meet the requirements of AASHTO M55 or M221. Use connector bars and wires for welded wire wall components and support struts that meet the requirements of AASHTO M32. For standard temporary MSE walls, use wire gauges, strut sizes and welded wire components as shown on the plans.

(1) Geotextile Fabrics

Use geotextile fabrics that meet the requirements of Article 1056-1 of the *Standard Specifications*.

(a) Reinforcing Fabric

The reinforcement direction (RD) is defined as the direction perpendicular to the wall face and the cross-reinforcement direction (CRD) is defined as the direction parallel to the wall face.

Use woven polyester or polypropylene fabric that meets the following properties:

| Property | Test Method | Requirement (MARV) |
|--|-------------|------------------------|
| Wide Width Tensile Strength @ Ultimate (RD) | ASTM D4595 | Varies – 200 lb/in min |
| Wide Width Tensile Strength @ Ultimate (CRD) | ASTM D4595 | 100 lb/in min |
| Trapezoidal Tear Strength | ASTM D4533 | 100 lb min |
| CBR Puncture Strength | ASTM D6241 | 600 lb min |
| UV Resistance after 500 hrs | ASTM D4355 | 70 % |
| Apparent Opening Size (AOS), US Sieve | ASTM D4751 | 20 min – 70 max |
| Permittivity | ASTM D4491 | 0.20 sec ⁻¹ |

For standard temporary MSE walls (temporary fabric wall) use reinforcing fabric wide width tensile strengths and lengths in the RD as shown on the plans.

(b) Retention Fabric

Retain shoring backfill at the face of temporary MSE walls with retention fabric. Use fabric that meets the requirements of Class 3 and the UV resistance, AOS and permittivity for separation geotextile in accordance with AASHTO M288.

(2) SierraScape Temporary Wall

Use uniaxial (UX) geogrids composed of high-density polyethylene (HDPE) manufactured by Tensar Earth Technologies. Test geogrids in accordance with ASTM D6637. Use connection rods manufactured by Tensar Earth Technologies to transfer the load between the facings and geogrids.

For standard temporary MSE walls (SierraScape temporary wall) use geogrid types and lengths as shown on the plans.

(3) Terratrel Temporary Wall

Use ribbed reinforcing steel strips manufactured by The Reinforced Earth Company that meet the requirements of ASTM A572, Grade 65. Use connector rods that meet the requirements of AASHTO M31, Grade 60 and hair pin connectors that meet the requirements of ASTM A1011, Grade 50. Use bolts, nuts and washers that meet the requirements of AASHTO M164.

For standard temporary MSE walls (Terratrel temporary wall) use ribbed steel strip size and lengths, rod lengths and diameters, hairpin connectors, bolts, nuts and washers as shown on the plans.

Embedment

“Embedment” is defined as the depth of shoring below the bottom of the excavation or the grade in front of the shoring. For cantilever shoring, embedment is the depth of the piling below the grade in front of the shoring. For temporary MSE walls, embedment is the difference between the grade elevation in front of the wall and the elevation of the bottom of the reinforced zone.

Portable Concrete Barriers

Provide portable concrete barriers in accordance with the plans and if shoring is located within the clear zone as defined in the *AASHTO Roadside Design Guide*. Use NCDOT portable concrete barriers (PCBs) in accordance with Roadway Standard Drawing No. 1170.01 and Section 1170 of the *Standard Specifications*. Use Oregon Tall F-Shape Concrete Barriers in accordance with detail drawing and special provision obtained from:

<http://www.ncdot.org/doh/preconstruct/wztc/DesRes/English/DesResEng.html>

The clear distance is defined as the horizontal distance from the back face of the barrier to the edge of pavement and the minimum required clear distance is shown on the traffic control plans. At the Contractor’s option or if the minimum required clear distance is not available, set an unanchored PCB against the traffic side of the shoring and design shoring for traffic impact or use the “surcharge case with traffic impact” for the standard temporary shoring. An anchored PCB or Oregon barrier is required for barriers above and behind temporary MSE walls.

Contractor Designed Shoring

“Contractor designed shoring” is defined as non-anchored temporary shoring or temporary MSE walls designed by the Contractor. Unless prohibited or required, Contractor designed shoring is optional. Contractor designed shoring is required when notes on plans prohibit the use of standard shoring. Non-anchored Contractor designed shoring is prohibited when notes on plans require the use of temporary MSE walls and Contractor designed temporary MSE walls are prohibited when notes on plans prohibit the use of temporary MSE walls.

Before beginning design, survey the shoring location to determine existing elevations and actual design heights. Submit design calculations and drawings including typical sections for review and acceptance showing details of the proposed design and construction sequence in accordance with Article 105-2 of the *Standard Specifications*. Have shoring designed, detailed and sealed by a Professional Engineer registered in the State of North Carolina. Submit 3 hard copies of design calculations and 10 hard copies of drawings and an electronic copy (pdf or jpeg format on CD or DVD) of both the calculations and drawings.

Design non-anchored temporary shoring in accordance with the *AASHTO Guide Design Specifications for Bridge Temporary Works* and temporary MSE walls in accordance with the *AASHTO Allowable Stress Design Standard Specifications for Highway Bridges*. Use the following soil parameters for shoring backfill in the reinforced zone.

Total Unit Weight = 120 pcf
Friction Angle = 30 degrees
Cohesion = 0 psf

Design temporary shoring in accordance with the in-situ assumed soil parameters shown on the plans. Design shoring for a 3-year design service life and a traffic surcharge equal to 240 psf. This surcharge is not applicable for construction traffic. If a construction surcharge will be present within a horizontal distance equal to the height of the shoring, design the shoring for the required construction surcharge. If the edge of pavement or a structure to be protected is within a horizontal distance equal to the height of the shoring, design shoring for a maximum deflection of 3". Otherwise, design shoring for a maximum deflection of 6".

For non-anchored temporary shoring, the top of shoring elevation is defined as the elevation where the grade intersects the back face of the shoring. For traffic impact, apply 2 kips/ft to the shoring 1.5 ft above the top of shoring elevation. When designing for traffic impact, extend shoring at least 32" above the top of shoring elevation. Otherwise, extend shoring at least 6" above the top of shoring elevation.

Standard Shoring

Unless notes on plans prohibit the use of one or both types of standard shoring, standard shoring is optional. Submit a "Standard Temporary MSE Wall Selection Form" for each standard temporary MSE wall location and a "Standard Temporary Shoring Selection Form" for up to three standard temporary shoring locations. Submit selection forms at least 14 days before beginning shoring construction. Obtain standard shoring selection forms from:

<http://www.ncdot.org/doh/preconstruct/highway/geotech/formdet/standards.html>

(A) Standard Temporary Shoring

Determine the shoring height, traffic impact, groundwater condition and slope or surcharge case for each standard temporary shoring location. Determine the minimum required extension, embedment and sheet pile section modulus or H pile section from the plans for each location.

(B) Standard Temporary MSE Walls

Choose a standard temporary MSE wall from the multiple temporary MSE wall options shown in the plans. Do not use more than one option per wall location.

Step bottom of reinforced zone in increments equal to vertical reinforcement spacing for the wall option chosen. Determine the wall height and slope or surcharge case for each section of standard temporary MSE wall. With the exception of either the first or last section of wall, use horizontal section lengths in increments equal to the following for the wall option chosen.

| Standard Temporary MSE Wall Option | Increment |
|---|--------------------|
| Temporary Fabric Wall | 9 ft min (varies) |
| Hilfiker Temporary Wall | 10 ft min (varies) |
| SierraScape Temporary Wall | 18 ft – 7 1/4 in |
| Retained Earth Temporary Wall | 24 ft |
| Terratrel Temporary Wall | 19 ft – 8 in |

Determine the appropriate facings and/or forms and reinforcement length, spacing, strength, type, density and/or size from the plans for each wall section.

Construction Methods

When using an anchored PCB, anchor the barrier in accordance with Roadway Standard Drawing 1170.01 and Section 1170 of the *Standard Specifications*. Control drainage during construction in the vicinity of temporary shoring. Collect and direct run off away from temporary MSE walls, shoring and shoring backfill.

(A) Non-anchored Temporary Shoring

Install and interlock sheet piling or install piles as shown on the plans or accepted submittals with a tolerance of 1/2 inch per foot from vertical. Contact the Engineer if the design embedment is not achieved. If piles are placed in drilled holes, perform pile excavation to the required elevations and backfill excavations with concrete and lean sand grout.

Remove grout as necessary to install timber lagging. Install timber lagging with a minimum bearing distance of 3” on each pile flange. Backfill voids behind lagging with shoring backfill.

Perform welding in accordance with the accepted submittals and Article 1072-20 of the *Standard Specifications*.

(1) Pile Excavation

Excavate a hole with a diameter that will result in at least 3" of clearance around the entire pile. Use equipment of adequate capacity and capable of drilling through soil and non-soil including rock, boulders, debris, man-made objects and any other materials encountered. Blasting is not permitted to advance excavations. Blasting for core removal is permitted only when approved by the Engineer. Dispose of drilling spoils in accordance with Section 802 of the *Standard Specifications*. Drilling spoils consist of all excavated material including water removed from excavations by either pumping or drilling tools.

If unstable, caving or sloughing soils are encountered, stabilize excavations with clean watertight steel casing. Steel casings may be either sectional type or one continuous corrugated or non-corrugated piece. Provide casings of ample strength to withstand handling and driving stresses and the pressures imposed by concrete, earth or backfill. Use steel casings with an outside diameter equal to the hole size and a minimum wall thickness of 1/4 inch.

Before placing concrete, check the water inflow rate in the excavation after any pumps have been removed. If the inflow rate is less than 6" per half hour, remove any water and free fall the concrete into the excavation. Ensure that concrete flows completely around the pile. If the water inflow rate is greater than 6" per half hour, propose and obtain approval of the concrete placement procedure before placing concrete.

Center the pile in the excavation and fill the excavation with Class A concrete in accordance with Section 1000 of the *Standard Specifications* except as modified herein. Provide concrete with a slump of 6 to 8 inches. Use an approved high-range water reducer to achieve this slump. Place concrete in a continuous manner to the bottom of shoring or the elevations shown on the accepted submittals. Fill the remainder of the excavation with a lean sand grout and remove all casings.

(B) Temporary MSE Walls

The Engineer may require a wall preconstruction meeting to discuss the construction and inspection of the temporary MSE walls. If required, conduct the meeting with the Site Superintendent, the Resident or Bridge Maintenance Engineer, the Bridge Construction Engineer and the Geotechnical Operations Engineer before beginning wall construction.

Perform all necessary clearing and grubbing in accordance with Section 200 of the *Standard Specifications*. Excavate as necessary as shown on the plans or accepted submittals. Notify the Engineer when foundation excavation is complete. Do not place shoring backfill or first reinforcement layer until obtaining approval of the excavation depth and foundation material.

If applicable, install foundations located within the reinforced zone in accordance with the plans or accepted submittals.

Erect and maintain facings and forms as shown on the plans or accepted submittals. Stagger vertical joints of facings and forms to create a running bond when possible unless shown otherwise on the plans or accepted submittals.

Place facings and forms as near to vertical as possible with no negative batter. Construct temporary MSE walls with a vertical and horizontal tolerance of 3" when measured with a 10 ft straight edge and an overall vertical plumbness (batter) and horizontal alignment of less than 6".

Place reinforcement at locations and elevations shown on the plans or accepted submittals and in slight tension free of kinks, folds, wrinkles or creases. Repair or replace any damaged reinforcement. Contact the Engineer when existing or future structures such as foundations, pavements, pipes, inlets or utilities will interfere with reinforcement. To avoid structures, deflect, skew and modify reinforcement.

Do not splice reinforcement in the reinforcement direction (RD), i.e., parallel to the wall face. Seams are allowed in the cross-reinforcement direction (CRD). Bond or sew adjacent reinforcing fabric together or overlap fabric a minimum of 18" with seams oriented perpendicular to the wall face.

Place shoring backfill in 8 to 10 inch thick lifts and compact in accordance with Subarticle 235-4(C) of the *Standard Specifications*. Use only hand operated compaction equipment within 3 ft of the wall face. Do not damage reinforcement when placing and compacting shoring backfill. End dumping directly on the reinforcement is not permitted. Do not operate heavy equipment on reinforcement until it is covered with at least 10" of shoring backfill. Do not use sheepsfoot, grid rollers or other types of compaction equipment with feet.

Cover reinforcing and retention fabric with at least 3" of shoring backfill. Place top reinforcement layer between 4 and 24 inches below top of wall as shown on the plans or accepted submittals.

Bench temporary MSE walls into the sides of excavations where applicable. If the top of wall is within 5 ft of finished grade, remove top form or facing and incorporate the top reinforcement layer into the fill when placing fill in front of the wall. Temporary MSE walls remain in place permanently unless required otherwise.

Measurement and Payment

Temporary Shoring will be measured and paid for at the contract unit price per square foot of exposed face area at locations shown on the plans or required by the Engineer. For temporary MSE walls, the wall height will be measured as the difference between the top and bottom of

wall and does not include the embedded portions of the wall or any pavement thickness above the wall. For all other temporary shoring, the shoring height will be measured as the difference between the top and bottom of shoring elevation. The bottom of shoring elevation is defined as where the grade intersects the front face of the shoring. The top of shoring elevation is defined as where the grade intersects the back face of the shoring. No payment will be made for any extension of shoring above the top of shoring or any embedment below the bottom of shoring. Such price and payment will be full compensation for furnishing all labor, tools, equipment, materials and all incidentals necessary to design and install the temporary shoring and complete the work as described in this provision.

No payment will be made for temporary shoring not shown on the plans or required by the Engineer including shoring for OSHA reasons or the Contractor's convenience. No value engineering proposals will be accepted based solely on revising or eliminating the shoring locations shown on the plans or the estimated quantities shown in the bid item sheets as a result of actual field measurements or site conditions.

No additional payment will be made for anchoring PCBs or providing Oregon barriers in lieu of unanchored PCBs. Additional costs for anchoring PCBs or providing Oregon barriers will be considered incidental to *Temporary Shoring*.

Payment will be made under:

| | |
|-------------------|-----------------|
| Pay Item | Pay Unit |
| Temporary Shoring | Square Foot |

PAVEMENT MARKING LINES:

(11-21-06) (Rev. 9-18-07)

SP12 R01

Revise the *2006 Standard Specifications* as follows:

Page 12-2, 1205-3(D) Time Limitations for Replacement, add the following at the beginning of the chart:

| Facility Type | Marking Type | Replacement Deadline |
|--|--------------------------------|---|
| Full-control-of-access multi-lane roadway (4 or more total lanes) and ramps, including Interstates | All markings including symbols | By the end of each workday's operation if the lane is opened to traffic |

Page 12-14, Subarticle 1205-10, Measurement and Payment, delete the first sentence of the first paragraph and replace with the following:

Pavement Marking Lines will be measured and paid for as the actual number of linear feet of pavement marking lines per application that has been satisfactorily placed and accepted by the Engineer.

EXCAVATION, TRENCHING, PIPE LAYING, & BACKFILLING FOR UTILITIES:

(2-17-09)

SP15 R01

Revise the *2006 Standard Specifications* as follows:

Page 15-5, Article 1505-4 Repair of Pavements, Sidewalks and Driveways, first paragraph, add at the end of the first sentence

in accordance with Section 848.

Page 15-6, Article 1505-6 Measurement and Payment,

Second paragraph,

Delete (5) *Repair of Sidewalks and Driveways* in its entirety.

Add as the eighth paragraph:

 " *Concrete Sidewalk* and " *Concrete Driveways* will be measured and paid for in accordance with Article 848-4.

PERMANENT SEEDING AND MULCHING:

(7-1-95)

SP16 R01

The Department desires that permanent seeding and mulching be established on this project as soon as practical after slopes or portions of slopes have been graded. As an incentive to obtain an early stand of vegetation on this project, the Contractor's attention is called to the following:

For all permanent seeding and mulching that is satisfactorily completed in accordance with the requirements of Section 1660, Seeding and Mulching, and within the following percentages of elapsed contract times, an additional payment will be made to the Contractor as an incentive additive. The incentive additive will be determined by multiplying the number of acres of seeding and mulching satisfactorily completed times the contract unit bid price per acre for Seeding and Mulching times the appropriate percentage additive.

| Percentage of Elapsed Contract Time | Percentage Additive |
|--|----------------------------|
| 0% - 30% | 30% |
| 30.01% - 50% | 15% |

Percentage of elapsed contract time is defined as the number of calendar days from the date of availability of the contract to the date the permanent seeding and mulching is acceptably completed divided by the total original contract time.