

**PROJECT SPECIAL PROVISIONS**

**ROADWAY**

**CLEARING AND GRUBBING METHOD:**

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

M2 R01

Perform clearing on this project to the limits established by Method "II" shown on Standard No. 200.02 of the *2006 Metric Roadway Standard Drawings* at the following areas:

- Tank Trails
- Perimeter Roads
- Y2- (Smith Lake Road)

Perform clearing on this project to the limits established by Method "III" shown on Standard No. 200.03 of the *2006 Metric Roadway Standard Drawings* along the remainder of the project:

Revise the *2006 Metric 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 1 m back of the beginning extremity of the structure and ending at a station 1 m beyond the ending extremity of the structure.

**BURNING RESTRICTIONS:**

(7-1-95)

M2 R05

Open burning is not permitted on any portion of the right-of-way limits established for this project. Do not burn the clearing, grubbing or demolition debris designated for disposal and generated from the project at locations within the project limits, off the project limits or at any waste or borrow sites in this county. Dispose of the clearing, grubbing and demolition debris by means other than burning, according to state or local rules and regulations.

**BUILDING AND UNDERGROUND STORAGE TANK REMOVAL:**

(1-1-02) (Rev.6-21-05)

M2 R15

**Building Removal**

Remove the buildings and appurtenances listed below in accordance with Section 215 of the *2006 Metric Standard Specifications* and the following:

Prior to removal of any building, comply with the notification requirements of *Title 40 Code of Federal Regulations*, Part 61, Subpart M, which are applicable to asbestos. Give notification to the North Carolina Department of Health and Human Services, Division of Public Health Epidemiology Branch and/or the appropriate county agency when the county performs enforcement of the Federal Regulation. Submit a copy of the notification to the Engineer prior to the building removal.

Perform removal and disposal of asbestos in accordance with the requirements of *Title 40 Code of Federal Regulations*; comply with all Federal, State and local regulations when performing building removal and/or asbestos removal and disposal. Any fines resulting from violations of any regulation are the sole responsibility of the Contractor and the Contractor agrees to indemnify and hold harmless the Department against any assessment of such fines.

The Department has performed asbestos assessments for building items identified below. Copies of this report may be obtained through the Division Right-of-Way Agent. When asbestos is discovered after the opening of bids for the project, the Engineer may have the work performed by others or the cost of asbestos removal and disposal will be paid for in accordance with Article 104-7 of the *2006 Metric Standard Specifications*. When a building has had or will have asbestos removed and the Contractor elects to remove the building such that it becomes a public area, the Contractor is responsible for any additional costs incurred including final air monitoring.

### **Underground Storage Tank Removal**

Prior to removal of any Underground Storage Tank (UST), comply with the notification requirements of the *Title 40 Code of Federal Regulations*, Part 280.71(a). Give notification to the appropriate regional office of the North Carolina Department of Environment and Natural Resources, Division of Waste Management, UST Section. Submit a copy of the notification to the Engineer prior to the removal of the underground storage tank.

Permanently close UST systems by removal and disposal in compliance with the regulations set forth in *Title 40, Code of Federal Regulations*, Part 280.71 and *North Carolina Administrative Code (NCAC)* Title 15A, Chapter 2, Subchapter 2N and any applicable local regulations. Assess Underground Storage Tank sites at closure for the presence of contamination as required in *NCAC* Title 15A, Chapter 2, Subchapter 2N, Section .0803 and as directed by the appropriate Regional Office of the Division of Waste Management. Remove and dispose of UST systems and contents in a safe manner in conformance with requirements of *American Petroleum Institute Bulletin 1604*, Removal and Disposal of Used Underground Petroleum Storage Tanks, Chapters 3 through 6. (Note: As an exception to these requirements, the filling of the tank with water as a means of expelling vapors from the tank as described in Section 4.2.6.1 of *American Petroleum Institute Bulletin 1604*, will not be allowed. Comply with all Federal, State and local regulations when performing UST removal and contaminated material disposal. Any fines resulting from violations of any regulation are the sole responsibility of the Contractor and the Contractor agrees to indemnify and hold harmless the Department against any assessment of such fines.

Where underground storage tanks are indicated below, there will be no direct payment for the assessment or closure. When the contract does not indicate the presence of storage tanks and storage tanks are discovered after the opening of bids for the project, the Engineer may have the work performed by others or the cost of assessment, closure, and/or removal will be paid for in accordance with Article 104-7 of the *2006 Metric Standard Specifications*.

Disposition of any contaminated material associated with underground storage tanks will be made as provided in Article 107-26 of the *2006 Metric Standard Specifications*.

**For Project U-2519E**

Building Removal #1
Left of Survey Station 39+87, Line -COL1-
Parcel #012
Storage Shed

Building Removal #2
Left of Survey Station 19+00, Line -Y2
Parcel #019
One Story Block Business – Partially outside of Right of Way and/or construction line

Building Removal #3
Left of Survey Station 13+75, Line -RP2D-
Parcel #019
Storage Shed - Partially outside of Right of Way and/or construction line

Building Removal #4
Left of Survey Station 13+90, Line -RP2D-
Parcel #019
Storage Shed

Building Removal #5
Left of Survey Station 11+85, Line -Y4-
Parcel #019
Storage Shed - Partially outside of Right of Way and/or construction line

When the description of the work for an item indicates a building partially inside and partially outside the right of way and/or construction area, but does not require the building to be cut off, the entire building shall be removed. (This paragraph pertains to Item No.'s 2, 3, and 5.)

**For Project X-0002B**

Building Removal #1
Right of Survey Station 61+60, Line -L-
Parcel #918
Three Dilapidated Sheds

Building Removal #2
Right of Survey Station 61+60, Line -L-
Parcel #918
One Shed

Building Removal #3
Right of Survey Station 61+60, Line -L-
Parcel #918
One Story Frame Dwelling

Building Removal #4
Right of Survey Station 11+50, Line -RP C-
Parcel #005
One-Story Framed Dwelling

Building Removal #5
Left of Survey Station 11+50, Line -RP C-
Parcel #005
One-Story Framed Dwelling

Building Removal #6
Right of Survey Station 11+45, Line -RP C-
Parcel #005
Shed

Building Removal #7
Left of Survey Station 11+50, Line -RP C-
Parcel #005
Well House

Building Removal #8
Left of Survey Station 12+00, Line -RP C-
Parcel #009
One-Story Framed Dwelling

Building Removal #9
Left of Survey Station 12+30, Line -RP C-
Parcel #009
One-Story Framed Dwelling

Building Removal #10
Right of Survey Station 62+50, Line -L-
Parcel #919
Two-Story M Dwelling
Building Removal #11
Right of Survey Station 62+70, Line -L-
Parcel #919
House Trailer
Building Removal #12
Right of Survey Station 62+80, Line -L-
Parcel #919
House Trailer
Building Removal #13
Right of Survey Station 62+90, Line -L-
Parcel #919
House Trailer
Building Removal #14
Right of Survey Station 63+00, Line -L-
Parcel #919
Two-Story Brick Frame Dwelling
Building Removal #15
Right of Survey Station 62+70, Line -L-
Parcel #919
One-Story Frame Dwelling
Building Removal #16
Right of Survey Station 63+00, Line -L-
Parcel #919
House Trailer
Building Removal #17
Right of Survey Station 63+15, Line -L-
Parcel #919
House Trailer
Building Removal #18
Right of Survey Station 12+00,, Line -RP C-
Parcel #007
Bk Apartment Building

Building Removal #19
Left of Survey Station 12+40, Line -RP C-
Parcel #007
Bk Apartment Building
Building Removal #20
Right of Survey Station 12+40, Line -RP C-
Parcel #007
Bk Apartment Building
Building Removal #21
Right of Survey Station 12+40, Line -RP C-
Parcel #007
Bk Apartment Building
Building Removal #22
Right of Survey Station 12+40, Line -RP C-
Parcel #007
Bk Apartment Building
Building Removal #23
Left of Survey Station 12+80, Line -RP C-
Parcel #009
Bk Apartment Building
Building Removal #24
Left of Survey Station 13+00, Line -RP C-
Parcel #009
Bk Apartment Building
Building Removal #25
Center line of Survey Station 13+20, Line -RP C-
Parcel #009
Bk Apartment Building
Building Removal #26
Right of Survey Station 13+50, Line -RP C-
Parcel #009
Bk Apartment Building
Building Removal #27
Right of Survey Station 64+45, Line -L-
Parcel #916
Shed

Building Removal #28
Right of Survey Station 64+45, Line -L-
Parcel #916
Shed

Building Removal #29
Right of Survey Station 64+45, Line -L-
Parcel #916
Well House

Building Removal #30
Right of Survey Station 64+60, Line -L-
Parcel #916
One Story Frame Dwelling

Building Removal #31
Right of Survey Station 64+80, Line -L-
Parcel #020
House Trailer

Building Removal #32
Left of Survey Station 65+40, Line -L-
Parcel #022
One-Story Framed Dwelling

Building Removal #33
Left of Survey Station 65+40, Line -L-
Parcel #022
Shed

Building Removal #34
Left of Survey Station 65+80, Line -L-
Parcel #022
One-Story Blk Business

Building Removal #35
Right of Survey Station 65+55, Line -L-
Parcel #024
Shed

Building Removal #36
Right of Survey Station 65+80, Line -L-
Parcel #024
One-Story Frame/Bk Business (Church)

Building Removal #37
Right of Survey Station 28+35, Line -Y1-
Parcel #021
One-Story Bk Business

Building Removal #38
Right of Survey Station 28+55, Line -Y1-
Parcel #021
One-Story Bk Business

Building Removal #39
Right of Survey Station 30+70, Line -Y1-
Parcel #026
One-Story Metal Business

Building Removal #40
Right of Survey Station 31 +00, Line -Y1-
Parcel #026
Shed

**NOTE TO CONTRACTOR:**

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

**EMBANKMENTS:**  
(5-16-06)

M2 R18

Revise the 2006 Metric Standard Specifications as follows:

**Page 2-18, Article 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.

**SHALLOW UNDERCUT:**  
(9-18-07)

M2 R35 A

**Description**

Undercut to a depth of 150 to 600 mm and place fabric for soil stabilization and Class IV Subgrade Stabilization at locations shown on the plans or as directed by the Engineer.

**Materials**

Refer to Division 10 of the *2006 Metric Standard Specifications*.

<b>Item</b>	<b>Section</b>
Select Material, Class IV	1016
Fabric for Soil Stabilization, Type 4	1056

Use Class IV Select Material for Class IV Subgrade Stabilization. If Class IV Subgrade Stabilization does not meet the requirements of Article 1010-2 of the *2006 Metric Standard Specifications*, the Engineer, at his discretion, may consider the material reasonably acceptable in accordance with Article 105-3 of the *2006 Metric Standard Specifications*.

**Construction Methods**

Perform undercut excavation in accordance with Section 225 of the *2006 Metric Standard Specifications*. Place fabric for soil stabilization in accordance with Article 270-3 of the *2006 Metric Standard Specifications* before backfilling. Backfill with Class IV Subgrade Stabilization by end dumping subgrade stabilization material on the fabric. Do not operate heavy equipment on the fabric until it is covered with Class IV Subgrade Stabilization. Compact subgrade stabilization material to 92% of AASHTO T180 as modified by the Department or to the highest density that can be reasonably obtained.

Maintain Class IV Subgrade Stabilization in an acceptable condition and minimize the use of heavy equipment on subgrade stabilization material in order to avoid damaging the backfill. Provide and maintain drainage ditches and drains as required to prevent entrapment of water in backfill.

**Measurement and Payment**

*Class IV Subgrade Stabilization* will be measured and paid for at the contract unit price per metric ton. The quantity to be paid for will be the actual number of metric tons of subgrade stabilization material that has been incorporated into the completed and accepted work. The material will be measured by being weighed in trucks on certified platform scales or other certified weighing devices. This work includes but is not limited to furnishing, hauling, handling, placing, compacting and maintaining the subgrade stabilization material.

*Undercut Excavation* will be measured and paid for in accordance with Section 225 of the *2006 Metric Standard Specifications*.

*Fabric for Soil Stabilization* will be measured and paid for in accordance with Section 270 of the *2006 Metric Standard Specifications*.

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
Class IV Subgrade Stabilization	Metric Ton

**FALSE SUMPS:**

(7-1-95)

M2 R40

Construct false sumps in accordance with the details in the plans and at locations shown in the plans or at other locations as directed by the Engineer.

Payment for the work of construction of the false sumps will be made at the contract unit price per cubic meter for *Unclassified Excavation* or *Borrow Excavation* depending on the source of material, or included in *Grading-Lump Sum*.

**SHOULDER AND FILL SLOPE MATERIAL:**

(5-21-02)

M2 R45 C

**Description**

Perform the required shoulder and slope construction for this project in accordance with the applicable requirements of Section 560 and Section 235 of the *2006 Metric Standard Specifications* except as follows:

Construct the top 150 mm 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 50 mm 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.

**Compensation**

When the Contractor elects to obtain material from an area located beneath a proposed fill section which does not require excavation for any reason other than to generate acceptable shoulder and fill slope material, the work of performing the excavation will be considered incidental to the item of *Borrow Excavation* or *Shoulder Borrow*. If there is no pay item for *Borrow* or *Shoulder Excavation* in the contract, this work will be considered incidental to *Unclassified Excavation*. Stockpile the excavated material in a manner to facilitate measurement by the Engineer. Fill the void created by the excavation of the shoulder and fill slope material with suitable material. Payment for material used from the stockpile will be made at the contract unit price for *Borrow Excavation* or *Shoulder Borrow*. If there is no pay item for *Borrow Excavation* or *Shoulder Borrow*, then the material will be paid for at the contract unit price for *Unclassified Excavation*. The material used to fill the void created by the excavation of the shoulder and fill slope material will be made at the contract unit price for *Unclassified Excavation*, *Borrow Excavation*, or *Shoulder Borrow*, depending on the source of the material.

Material generated from undercut excavation, unclassified excavation or clearing and grubbing operations that is placed directly on shoulders or slope areas, will not be measured separately for payment, as payment for the work requiring the excavation will be considered adequate compensation for depositing and grading the material on the shoulders or slopes.

When undercut excavation is performed at the direction of the Engineer and the material excavated is found to be suitable for use as shoulder and fill slope material, and there is no area on the project currently prepared to receive the material generated by the undercut operation, the Contractor may construct a stockpile for use as borrow at a later date. Payment for the material used from the stockpile will be made at the contract unit price for *Borrow Excavation* or *Shoulder Borrow*.

When shoulder material is obtained from borrow sources or from stockpiled material, payment for the work of shoulder construction will be made at the contract unit price per cubic yard for *Borrow Excavation* or *Shoulder Borrow* in accordance with the applicable provisions of Section 230 or Section 560 of the *2006 Metric Standard Specifications*.

### **EMBANKMENT MONITORING:**

The instrumentation will consist of 12 settlement gauges. The settlement gauges shall be placed at the locations as shown in the plans or as directed by the Engineer.

<u>Line</u>	<u>Stations</u>	<u>Offsets</u>
-L-(-RP1BD-)	41+00 (41+00)	30 m & 45 m RT
-L-(-RP1BD-)	41+80 (41+80)	30 m & 45 m RT
-L-(-CDR-)	46+12 (45+80)	30 m & 45 m RT
-L-(-CDR-)	48+60 (48+30)	25 m & 40 m RT
-L-(-CDR-)	48+70 (48+40)	25 m & 40 m RT
-LP2D-	10+80	8 m RT & 8 m LT

### **Settlement Gauges**

Settlement Gauges as shown in the plans shall be furnished and installed by the Contractor. The base shall be placed on a level surface near the natural ground as shown in the plans. The 64 mm diameter metal pipe shall be extended by the Contractor by adding pipe sections at threaded couplings as the embankment progresses. The top of the extension section shall be no less than 305 mm above the embankment surface and no higher than 1.8 meters. The exposed length of pipe shall be made conspicuous to avoid chance of damage.

The Contractor shall conduct his operation in such a manner that the gauges are not damaged. Fill around the gauge pipes and plates shall be compacted to the same density as the surrounding material. Any settlement gauge pipe damaged or destroyed due to fault or negligence on the part of the Contractor shall be restored or replaced by the Contractor at no additional cost. No additional payment will be made for compaction of fill around and over the settlement gauges or for interference with the Contractor's operations resulting from settlement gauge installations. Care shall be taken that the 64 mm diameter pipe remains plumb.

The 64 mm diameter pipe shall be ASTM A53 type F, threaded with a black finish.

**Method of Measurement**

The quantity of settlement gauges to be paid for will be the actual number of each of these items which have been incorporated into the completed and accepted work.

**Basis of Payment**

The quantity of settlement gauges, measured as provided above, will be paid for at the contract unit price each for "Embankment Settlement Gauge". Such price and payment will be full compensation for all materials, labor, equipment and other necessary to complete the work satisfactorily.

Payment will be made under:

Embankment Settlement Gauge.....Each

**WAITING PERIOD BEFORE FINE GRADING OPERATIONS:**

Construct embankments to the finished grade elevations of the roadway sections listed below and observe a waiting period of six months before beginning fine grading operations. Maintain the embankments at the finished grade elevation of the roadway section during the waiting period.

Additional earth material required to maintain embankment at the finished grade will be paid for at the contract unit price per cubic meter for "Borrow Excavation" or "Unclassified Excavation" as the case may be.

<u>Line</u>	<u>Stations</u>
-RP1BD-	40+00 to 41+00
-RP1BD-	41+60 to 43+00
-CDR-	45+00 to 46+20
-CDR-	48+10 to 48+70
-LP2D-	10+00 to 11+40

**PHASE CONSTRUCTION:**

This work consists of conducting fill operations in phases during the embankment and MSE wall construction to provide resistance against the lateral spread type failure of slopes along a thin layer of soft to medium stiff clay. The construction at the following areas should be conducted in accordance with this provision:

<u>Line</u>	<u>Stations</u>
-CDR-	48+10 to 48+50

The Embankment monitoring should be also provided in accordance with the Embankment Monitoring Special Provision and details.

**Construction Methods**

Construct the embankment in accordance with Section 235 of NCDOT *Standard Specifications*. The embankment fills are placed to the proposed bottom elevation of wall as Phase I and observe a waiting period of 6 months. Phase I construction of placement of the embankment fill must extend to centerline of -L-. Do not begin construction of the wall and place backfill behind the wall within the phase construction stations listed above until after the completion of the waiting period of Phase I. With satisfactory completion of Phase I, construct the wall and complete the remaining embankment construction in Phase II.

**CONTAMINATED SOIL**

The Contractor's attention is directed to the possibility that soils containing petroleum hydrocarbon compounds may be encountered during earthwork activities on this project. The Department shall remove all known USTs, monitoring wells, and accessible contaminated soil from the project prior to letting.

Information relating to contaminated areas, sample locations and laboratory results are available at the following web address:

**[www.ncdot.org/doh/preconstruct/ps/contracts/letting.html](http://www.ncdot.org/doh/preconstruct/ps/contracts/letting.html)**

Impact to contaminated soil is possible during any earthwork activities on the project. The Contractor shall only excavate those soils which the Engineer designates necessary to complete a particular task. The Engineer shall determine if soil is contaminated based on petroleum odors and unusual soil staining. Contaminated soil not required to be excavated is to remain in place and undisturbed. The Contractor shall stockpile all contaminated soil excavated from the project in a location approved by the Engineer. The stockpile shall be constructed in accordance with DENR's *UST Section Guidelines for Ex Situ Petroleum Contaminated Soil Remediation*, Figure 2: Diagram for Temporary Containment and Treatment of Petroleum Contaminated Soil. The Engineer is to notify the Geotechnical Engineering Unit if petroleum contaminated soil is encountered and the Geotechnical Engineering Unit shall arrange for the sampling, loading, hauling, and disposal of the contaminated soil.

The Contractor is entirely responsible for compliance with all OSHA, EPA, DOT, DENR and local rules and regulations pertaining to excavation and stockpiling of the contaminated soil. Examples of such rules and regulations include, but are not limited to, 29 CFR 1910 and 1926, 40 CFR 260 - 265, 49 CFR 173 and 178, 15A NCAC 13A North Carolina Hazardous Waste Management Rules, NCGS 130A - 310 Inactive Hazardous Sites, the Federal Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the Federal Resource Conservation and Recovery Act (RCRA). It must be noted that inclusion of this paragraph is meant to highlight the Contractor's responsibility for regulatory compliance in all phases of work on this project.

**Measurement and Payment:**

The quantity of contaminated soil stockpiled shall be the actual number of tons of material, which has been acceptably excavated and stockpiled and shall be paid for at the contract unit price per ton for "Excavating and Stockpiling of Petroleum Contaminated Soil". The Geotechnical Engineering Unit shall arrange for the weighing of the stockpiled material on certified scales.

The above price and payment shall be full compensation for all work covered by this section, including, excavation, stockpile construction, equipment, decontamination of equipment, labor, and personal protective equipment.

Payment shall be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
Excavation and Stockpiling of Contaminated Soil	Metric Ton

**PIPE TESTING:**

4-17-07

M3 R33

Revise the *2006 Metric Standard Specifications* as follows:

**Page 3-2, 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.

**PIPE ALTERNATES:**

(7-18-06) (Rev 4-17-07)

M3 R36

**Description**

The Contractor may substitute Aluminized Corrugated Steel Pipe, Type IR or HDPE Pipe, Type S or Type D up to 1219 mm in diameter in lieu of concrete pipe in accordance with the following requirements.

**Material**

<b>Item</b>	<b>Section</b>
HDPE Pipe, Type S or D	1032-10
Aluminized Corrugated Steel Pipe, Type IR	1032-3(A)(7)

Aluminized Corrugated Steel Pipe will not be permitted in counties listed in Article 310-2 of the *2006 Metric Standard Specifications*.

**Construction Methods**

Aluminized Corrugated Steel Pipe Culverts and HDPE Pipe Culverts shall be installed in accordance with the requirements of Section 300 of the *2006 Metric Standard Specifications* for

Method A, except that the minimum cover shall be at least 300 mm. Aluminized Corrugated Steel Pipe Culvert and HDPE Pipe Culvert will not be permitted for use under travelways, including curb and gutter.

**Measurement and Payment**

\_\_\_\_\_ mm Aluminized Corrugated Steel Pipe Culvert to be paid for will be the actual number of linear meters installed and accepted. Measurement will be in accordance with Section 310-6 of the 2006 Metric Standard Specifications.

\_\_\_\_\_ mm HDPE Pipe Culvert to be paid for will be the actual number of linear meters installed and accepted. Measurement will be in accordance with Section 310-6 of the 2006 Metric Standard Specifications.

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
_____ mm Aluminized Corrugated Steel Pipe Culverts, _____ mm Thick	Linear Meter
_____ mm HDPE Pipe Culverts	Linear Meter

**REINFORCED BRIDGE APPROACH FILL:**

(3-18-03) (Rev.7-18-06)

M4 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:

<u>Property</u>	<u>Requirements</u>	<u>Test Method</u>
Thickness	0.6 mm Minimum	ASTM D1593
Tensile Strength at Break	18 kN/M Minimum	ASTM D638
Puncture Strength	0.2 kN Minimum	ASTM D 4833
Moisture Vapor Transmission Rate	0.667/gm/m <sup>2</sup> 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.

<u>Fabric Property</u>	<u>Requirements</u>	<u>Test Method</u>
Minimum Flow Rate	1358 cm <sup>3</sup> /sec/m <sup>2</sup>	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 Metric 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) 100 mm Diameter Corrugated Drainage Pipe and Fittings**

Provide pipe and fittings that meet all the applicable requirements of Section 815 or 816 of the *2006 Metric 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 3 m for the fabric is required. Overlap geomembrane or fabric splices parallel to the centerline of the roadway a minimum of 450 mm. 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 254 mm 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 254 mm thick with low ground pressure equipment. Use hand operated equipment to compact the fill material within 1 m 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 200 mm 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 150 mm 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 100 mm 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 100 mm 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:

<b>Pay Item</b>	<b>Pay Unit</b>
Reinforced Bridge Approach Fill, Station _____	Lump Sum

**AGGREGATE BASE COURSE:**

12-19-06

M5 R03

Revise the *2006 Metric Standard Specifications* as follows:

**Page 5-9, 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 5-19-09)

SP6R01

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 <sub>des</sub>	JMF	±1.0 %	±2.0 %
VMA @ N <sub>des</sub>	Min. Spec. Limit	-0.5%	-1.0%
P <sub>0.075</sub> / P <sub>be</sub> Ratio	1.0	±0.4	±0.8
%G <sub>mm</sub> @ N <sub>ini</sub>	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. 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 $\leq$ 20%	Category 2 20.1% $\leq$ %RAP $\leq$ 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 6-53, Article 620-4 Measurement and Payment, sixth paragraph, delete the last sentence.

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 <sup>2</sup>	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 6-80, Subarticle 661-3(A) Equipment, add the following as the first paragraph:**

Use asphalt mixing plants in accordance with Article 610-5.

**Page 6-53, Article 620-4 Measurement and Payment, seventh paragraph, delete the paragraph and substitute with the following:**

The adjustment 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 10-41, Table 1012-1, delete the last row of entries for OGAFC and add the following:**

Mix Type	Coarse Aggregate Angularity <sup>(b)</sup> 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 10-43, 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.

## 62

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

0-6% RAS	
P <sub>b</sub> %	±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 averages, will be accepted if within the tolerances listed below:

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

P <sub>b</sub> %	±0.3%
Sieve Size (mm)	Percent Passing
25.0	±5%
19.0	±5%
12.5	±2%
9.5	±2%
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.

**TABLE 1012-2**  
**NEW SOURCE RAP GRADATION and BINDER TOLERANCES**  
 (Apply Tolerances to Mix Design Data)

Mix Type	0-20% RAP			20 <sup>+</sup> -30 % RAP			30 <sup>+</sup> % RAP		
	Base	Inter.	Surf.	Base	Inter.	Surf.	Base	Inter.	Surf.
P <sub>b</sub> %	± 0.7%			± 0.4%			± 0.3%		
25.0	±10	-	-	±7	-	-	±5	-	-
19.0	±10	±10	-	±7	±7	-	±5	±5	-
12.5	-	±6	±6	-	±3	±3	-	±2	±2
9.5	-	-	±8	-	-	±5	-	-	±4
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 BINDER CONTENT OF ASPHALT PLANT MIXES:**

(11-21-00)

M6 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 Metric Standard Specifications*.

**ASPHALT PLANT MIXTURES:**

(7-1-95)

M6 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)

M6 R25

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

The base price index for asphalt binder for plant mix is **\$399.18** per metric ton.

This base price index represents an average of F.O.B. selling prices of asphalt binder at supplier's terminals on **April 1, 2009**.

**MASONRY DRAINAGE STRUCTURES:**

(10-16-07)

M8 R01

Revise the *2006 Standard Specifications* as follows:

**Page 8-25, Article 840-4 Measurement and Payment**, add the following at the end of the second paragraph:

For that portion of *Masonry Drainage Structure* measured above a height of 3 meters, payment will be made at 1.3 times the contract unit price per linear meter for *Masonry Drainage Structure*.

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

**SITES:**

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

M8 R02

Revise the *2006 Metric Standard Specifications* as follows:

**Division 2 Earthwork**

**Page 2-12, Subarticle 230-1(D)**, add the words: *The Contractor specifically waives* as the first words of the sentence.

**Page 2-13, 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 8-8, 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 8-8, Article 802-2, General Requirements, 7th 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.

**MODIFIED CONCRETE FLUME WITH CONCRETE OUTLET:**

(3-19-96) (Rev. 6-17-08)

M8 R10

At locations shown in the plans, construct concrete flumes, concrete curb, and apron in accordance with the details in the plans. Use materials meeting the requirements of Section 825 of the *2006 Metric Standard Specifications* except that the concrete must be Class "B" or of higher compressive strength.

Each concrete flume, concrete curb, and apron completed and accepted will be paid for at the contract unit price per each for *Modified Concrete Flume*. Such price and payment will be full compensation for all materials, labor, equipment, tools, removing and disposing of the temporary slope drains, and any other incidentals necessary to complete the work satisfactorily.

The concrete curb and ditch outside the pay limits of the apron will be measured and paid for in accordance with Section 846 and 850 of the *2006 Metric Standard Specifications*.

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
Modified Concrete Flume	Each

**ENDWALLS:**

(5-20-08)

M8 R25

Revise the *Standard Specifications* as follows:

**Page 8-23, Article 838-4 Replace the 1st and 2nd paragraph with the following:**

*Endwalls* will be measured and paid for in cubic meters of concrete or brick that have been completed and accepted. This quantity will be computed from the dimensions shown on the plans or from revised authorized dimensions. Where precast concrete units have been approved and are used in lieu of cast-in-place units the quantity to be paid for will be computed the same as if cast-in-place units were used, as no reduction in pay quantity will be made due to the use of precast in lieu of cast in place endwalls.

*Reinforced Endwalls* will be measured and paid for in cubic meters of concrete or brick that have been completed and accepted. This quantity will be computed from the dimensions shown on the plans or from revised authorized dimensions. Where precast concrete units have been approved and are used in lieu of cast-in-place units the quantity to be paid for will be computed the same as if cast-in-place units were used, as no reduction in pay quantity will be made due to the use of precast in lieu of reinforced cast in place endwalls.

**GUARDRAIL ANCHOR UNITS, TYPE 350:**

(4-20-04)

M8 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 Metric 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 Metric 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 Metric 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 Metric Standard Specifications*.

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
Guardrail Anchor Units, Type 350	Each

**PROTECTION OF FORT BRAGG PROPERTY:**

Ft. Bragg’s property shall always be protected. A breach of the perimeter shall not be allowed at any time. Proposed fence shall be installed prior to removing existing perimeter fence.

**EARLY FENCING**

SPI 8-18

The Contractor’s attention is directed to the fact that as a part of his first operations, he is required to install the permanent fence at the following parcels:

Number	Project	Parcel	Name
1.	X-0002B	28	Mattie Godbold

**FENCE:**

(3-6-06)

M8 R86

Revise the *2006 Metric Standard Specifications* as follows:

**Page 8-44, Subarticle 866-3(A), second sentence,**

Add *existing fencing* after stumps

**CHAIN LINK FENCING WITH BARBED WIRE ON EXTENSION ARMS:**

(7-1-95)

M8 R100 (Rev.)

**Description**

Provide 2100 mm chain link fencing and chain link gates with barbed wire on extension arms in accordance with the plans, Section 866 of the *2006 Metric Standard Specifications*, and the provisions herein.

**Construction Methods**

On all 2100 mm chain link fencing on this project and gates as directed by the Engineer, place three strands of barbed wire at the top of the fence fabric. Attach the barbed wire to extension arms that are to be fitted to the post tops.

Provide extension arms constructed to locate the top most strand of barbed wire approximately 300 mm above and approximately 300 mm out from the top rail. Space all strands of barbed wire at an approximately equal distance from each other. Make provisions for supporting the top rail. The arm shall make a 45 degree angle with the post, and be an item of standard manufacture. Have samples of extension arms to be used on the project approved prior to their installation.

Fabricate the extension arms from pressed steel or malleable wrought iron, or either of these materials in conjunction with a cast base. Provide a minimum weight of the arm material of 14 gauge. Provide a complete arm assembly of sufficient strength to support the barbed wire when stretched to proper tension. Galvanize all arms in accordance with ASTM A153.

Erect extension arms so as to point away from the pavement. Splicing of barbed wire between the arms will not be permitted. Use a method of attaching barbed wire to the arms acceptable to the Engineer.

### **Measurement and Payment**

No direct payment will be made for furnishing and installing the barbed wire and extension arms as such work will be considered incidental to other work being paid for by the various fencing items in the contract.

### **GATE, 2100 MM HIGH, 26800 MM OPENING:**

Furnish and erect chain link fence gate and gate posts at locations indicated on the plans.

The Contractor shall submit catalog cuts and/or shop drawings to Mr. Glenn Prillaman, Chief of Master Planning for Fort Bragg (910-396-6761) for approval prior to beginning construction of the gate. The gate shall be constructed in accordance with the approved catalog cuts and/or shop drawings.

*Gate, 2100 mm High, 26800 mm Opening*, will be measured and paid for in units of each for the number of gates, including metal gate posts, actually installed on the project. Double gates will be measured as one gate.

### **PREFORMED SCOUR HOLE WITH LEVEL SPREADER APRON:**

(10-15-02) (Rev 6-17-08)

M8 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**

<b>Item</b>	<b>Section</b>
Plain Rip Rap	1042
Filter Fabric	1056

The permanent soil reinforcement matting shall be permanent erosion control reinforcement mat and shall be constructed of 100% coconut fiber stitch bonded between a heavy duty UV stabilized cusped (crimped) netting overlaid with a heavy duty UV stabilized top net. The three nettings shall be stitched together on 38 mm centers UV stabilized polyester thread to form a permanent three dimensional structure. The mat shall have the following physical properties:

<i>Property</i>	<i>Test Method</i>	<i>Value Unit</i>
Light Penetration	ASTM D6567	15 %
Thickness	ASTM D6525	13 mm
Mass Per Unit Area	ASTM D6566	0.339 kg/m <sup>2</sup>
Tensile Strength	ASTM D6818	572 kg/m
Elongation (Maximum)	ASTM D6818	49 %
Resiliency	ASTM D6524	> 70 %
UV Stability*	ASTM D4355	≥80 %
Porosity (Permanent Net)	Calculated	≥85 %
Minimum Filament	Measured	0.76 mm
Maximum Permissible Shear Stress (Vegetated)	Performance Test	≥ 39.1 kg/m <sup>2</sup>
Maximum Allowable Velocity	Performance Test	≥ 4.9 m/s

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

Submit a certification from the manufacturer showing:

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

**Soil Preparation**

All areas to be protected with the mat shall be brought to final grade and seeded in accordance with Section 1660. 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**

*Performed 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

**STREET SIGNS AND MARKERS AND ROUTE MARKERS:**

(7-1-95)

M9 R01

Move any existing street signs, markers, and route markers out of the construction limits of the project and install the street signs and markers and route markers so that they will be visible to the traveling public if there is sufficient right of way for these signs and markers outside of the construction limits.

Near the completion of the project and when so directed by the Engineer, move the signs and markers and install them in their proper location in regard to the finished pavement of the project.

Stockpile any signs or markers that cannot be relocated due to lack of right of way, or any signs and markers that will no longer be applicable after the construction of the project, at locations directed by the Engineer for removal by others.

The Contractor shall be responsible to the owners for any damage to any street signs and markers or route markers during the above described operations.

No direct payment will be made for relocating, reinstalling, and/or stockpiling the street signs and markers and route markers as such work shall be considered incidental to other work being paid for by the various items in the contract.

**STEEL U-CHANNEL POSTS:**

(7-18-06)

M9 R02

Revise the *2006 Metric Standard Specifications* as follows:

**Page 9-12 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.

**HIGH STRENGTH CONCRETE FOR DRIVEWAYS:**

(11-21-00) (7-18-06)

M10 R01

Use high early strength concrete for all driveways shown in the plans and as directed by the Engineer. Provide high early strength concrete that meets the requirements of Article 1000-6 of the *2006 Metric Standard Specifications*.

Measurement and payment will be in accordance with Section 848 of the *2006 Metric Standard Specifications*.

**GALVANIZED HIGH STRENGTH BOLTS, NUTS AND WASHERS:**

(2-17-09)

M10R02

Revise the *Metric Standard Specifications* as follows:

**Page 10-101, Subarticle 1072-7(F)(3)** Change the AASHTO reference to B 695 Class 55

**Page 10-201, Table 1092-2, Steel Sign Materials,** Change High Strength Bolts, Nuts & Washers ASTM Specifications for Galvanizing to B695 Class 55.

**Page 10-211, Subarticle 1094-1(A) Breakaway or Simple Steel Beam Sign Supports,** replace the first full 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 10-212, Article 1096-2 Steel Overhead Sign Structures,** replace the last sentence with the following:

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

**AGGREGATE PRODUCTION:**

(11-20-01)

M10 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 Metric Standard Specifications*. Copies of this procedure are available upon request from the Materials and Test Unit.

**CONCRETE BRICK AND BLOCK PRODUCTION:**

(11-20-01)

M10 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 Metric Standard Specifications*. Copies of this procedure are available upon request from the Materials and Test Unit.

**PORTLAND CEMENT CONCRETE (Alkali-Silica Reaction):**

(2-20-07)

M10 R16

Revise the *2006 Metric 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>

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

**GLASS BEADS:**

(7-18-06)

M10 R35

Revise the *2006 Metric Standard Specifications* as follows:

**Page 10-182, 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)

M10 R40

Revise the 2006 Metric Standard Specifications as follows:

Page 10-80, 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	200 N	334 N	--	--	334 N

**PRECAST DRAINAGE STRUCTURES - MACRO-SYNTHETIC FIBERS**

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

SP 10 R42

**Description**

Substitute as an option, macro-synthetic fibers in lieu of 100 mm x 100 mm 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 254 mm<sup>2</sup>/m or less in the following items:
  - (1) **Precast Drainage Structure** units in accordance with the requirements of *Standard Drawing 840.45*.
  - (2) **Precast Manhole 1.2 Meter' 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 38 mm.
- (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 2812 kg/cm<sup>2</sup> when tested in accordance with ASTM D 3822.
- (5) Macro-synthetic fibers - minimum modulus of elasticity of 28,123 kg/cm<sup>2</sup> 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 2.97 kg/m<sup>3</sup>. 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, ± 1.5% tolerance.
- (3) Fiber reinforced concrete - develop a minimum compressive strength 2.97 kg/m<sup>3</sup> 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.

**PAINT SAMPLING AND TESTING:**

(8-15-06)

M10 R45

Revise the *2006 Metric Standard Specifications* as follows:

**Page 10-155, Article 1080-4,** Delete the first paragraph and replace with the following:

All paint will be sampled, either at the point of manufacture or at the point of destination. Inspection and sampling will be performed at the point of manufacture wherever possible. The Contractor shall not begin painting until the analysis of the paint has been performed, and the paint has been accepted.

**PORTABLE CONCRETE BARRIER**

(2-20-07)

M10 R50

The *2006 Metric Standard Specifications* is revised as follows:

**Page 10-200, 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)

M11 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 1.5 m 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 *2006 Metric 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 *2006 Metric 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 *2006 Metric 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 *2006 Metric Standard Specifications*. Use timber lagging with a minimum allowable bending stress of 6.9 MPa that meets the requirements of Article 1082-1 of the *2006 Metric 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 2006 Metric 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 – 35 kN/m min
Wide Width Tensile Strength @ Ultimate (CRD)	ASTM D4595	18 kN/m min
Trapezoidal Tear Strength	ASTM D4533	0.44 kN min
CBR Puncture Strength	ASTM D6241	2.67 kN min
UV Resistance after 500 hrs	ASTM D4355	70 %
Apparent Opening Size (AOS), US Sieve	ASTM D4751	0.212 mm min – 0.850 mm max
Permittivity	ASTM D4491	0.20 sec <sup>-1</sup>

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 450. Use connector rods that meet the requirements of AASHTO M31, Grade 415 and hair pin connectors that meet the requirements of ASTM A1011, Grade 345. 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 Metric Standard Drawing No. 1170.01 and Section 1170 of the *2006 Metric 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 *2006 Metric 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 = 18.8 kN/m<sup>3</sup>  
Friction Angle = 30 degrees  
Cohesion = 0 kPa

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 11.5 kPa. 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 75 mm. Otherwise, design shoring for a maximum deflection of 150 mm.

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 29.2 kN/m to the shoring 450 mm above the top of shoring elevation. When designing for traffic impact, extend shoring at least 800 mm above the top of shoring elevation. Otherwise, extend shoring at least 150 mm 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/>

#### **(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.

<b>Standard Temporary MSE Wall Option</b>	<b>Increment</b>
Temporary Fabric Wall	2.7 m min (varies)
Hilfiker Temporary Wall	3.0 m min (varies)
SierraScape Temporary Wall	5.7 m
Retained Earth Temporary Wall	7.3 m
Terratrel Temporary Wall	6.0 m

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 Metric Standard Drawing 1170.01 and Section 1170 of the *2006 Metric 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 42 mm per meter 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 75 mm 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 *2006 Metric Standard Specifications*.

**84****(1) Pile Excavation**

Excavate a hole with a diameter that will result in at least 75 mm 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 *2006 Metric 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 6 mm.

Before placing concrete, check the water inflow rate in the excavation after any pumps have been removed. If the inflow rate is less than 150 mm 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 150 mm 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 *2006 Metric Standard Specifications* except as modified herein. Provide concrete with a slump of 150 to 200 mm. 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 *2006 Metric 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 75 mm when measured with a 3 m straight edge and an overall vertical plumbness (batter) and horizontal alignment of less than 150 mm.

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 450 mm with seams oriented perpendicular to the wall face.

Place shoring backfill in 200 to 250 mm thick lifts and compact in accordance with Subarticle 235-4(C) of the *2006 Metric Standard Specifications*. Use only hand operated compaction equipment within 1 m 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 250 mm 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 75 mm of shoring backfill. Place top reinforcement layer between 100 to 600 mm 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 1.5 m 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 meter 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:

<b>Pay Item</b> Temporary Shoring	<b>Pay Unit</b> Square Meter
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**ANCHORED TEMPORARY SHORING:** **(SPECIAL)**

**Description**

Anchored temporary shoring consists of sheet piling or H piles with timber lagging anchored with ground or helical anchors. At the Contractor’s option, use anchored temporary shoring in lieu of temporary shoring. Design and construct anchored temporary shoring based on actual elevations and dimensions in accordance with the contract and accepted submittals. For this provision, “anchored shoring” refers to anchored temporary shoring and “Anchored Shoring Contractor” refers to the contractor installing the anchors. Use an Anchored Shoring Contractor prequalified by the NCDOT Construction Unit for anchored retaining walls work (work code 3020).

**Materials**

Provide Type 7 Contractor’s Certifications in accordance with Article 106-3 of the *Standard Specifications* for all anchored shoring materials. Store steel materials on blocking a minimum of 12” (300 mm) above the ground and protect it at all times from damage; and when placing in the work make sure it is free from dirt, dust, loose mill scale, loose rust, paint, oil or other foreign materials. Damaged, bent or twisted materials will be rejected.

Use steel shapes, plates and piles meeting the requirements of ASTM A36 and steel sheet piles meeting the requirements of Article 1084-2 of the *Standard Specifications*. Use timber lagging with a minimum allowable bending stress of 1000 psi (6.9 MPa) that meets the requirements of Article 1082-1 of the *Standard Specifications*.

**(A) Ground Anchors**

A ground anchor consists of a grouted steel bar or strands. Use high-strength steel bars meeting the requirements of AASHTO M275 or seven-wire strands meeting the requirements of ASTM A886 or Article 1070-5 of the *Standard Specifications*. Splice bars in accordance with Article 1070-10 of the *Standard Specifications*. Do not splice strands.

Fabricate centralizers from schedule 40 polyvinyl chloride (PVC) plastic pipe or tube, steel or other material not detrimental to bars or strands (no wood). Size centralizers to position the bar or strands within 1 inch (25 mm) of the drill hole center and allow a tremie to be inserted to the bottom of the hole. Use centralizers that do not interfere with grout placement or flow around bars or strands.

Use grout in accordance with the contract.

**(B) Helical Anchors**

A helical anchor consists of a lead section with a central steel shaft and at least one helix steel plate followed by extensions with only central shafts (no helixes). Use helical anchors with an ICC Evaluation Service, Inc. (ICC-ES) report. Helical anchors without an ICC-ES report may be approved at the discretion of the Engineer. Provide couplers, thread bar adapters and bolts for connecting anchors together and to piling in accordance with the anchor manufacturer's recommendations.

**(C) Anchor Heads**

Anchor heads consist of bearing plates with hex nuts and washers for bars and wedge plates and wedges for strands. Provide bearing plates meeting the requirements of ASTM A36 and hex nuts, washers, wedge plates and wedges in accordance with the anchor manufacturer's recommendations.

**(D) Shoring Backfill**

Use shoring backfill meeting 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.

**88****Design**

Before beginning design, survey Contractor designed shoring locations to determine existing elevations and actual design heights. Design anchored shoring in accordance with the plans and the *FHWA Geotechnical Engineering Circular No. 4 "Ground Anchors and Anchored Systems"* (Publication No. FHWA-IF-99-015).

Provide portable concrete barriers in accordance with the contract for barriers for temporary shoring. The top of shoring elevation is defined as the elevation where the grade intersects the back face of the anchored shoring. For traffic impact, apply 2 kips/ft (29.2 kN/m) to the anchored shoring 1.5 ft (5 m) above the top of shoring elevation. When designing for traffic impact, extend anchored shoring at least 32" (800 mm) above the top of shoring elevation. Otherwise, extend anchored shoring at least 6" (150 mm) above the top of shoring elevation.

Design anchored shoring for a 3-year design service life and a traffic surcharge equal to 240 psf (11.5 kPa). 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 anchored shoring for the required construction surcharge.

Do not extend anchors beyond right-of-way or easement lines. Extend the unbonded length for ground anchors or the shallowest helix for helical anchors at least 5 ft (1.5 m) behind the critical failure surface. If existing or future obstructions such as foundations, guardrail posts, pavements, pipes, inlets or utilities will interfere with anchors, maintain a minimum clearance of 6" (150 mm) between the obstruction and the anchors.

Determine anchor loads for ground and helical anchors in accordance with Geotechnical Engineering Circular No. 4. Size anchors such that design loads do not exceed 60% of bar, strand or central shaft tensile strengths. Also, size anchors such that maximum test loads do not exceed 80% of bar, strand or central shaft tensile strengths and lock-off loads do not exceed 70% of tensile strengths.

Submit anchored shoring designs including unit grout/ground bond strengths for ground anchors and installation torque requirements for helical anchors for review and acceptance in accordance with Article 105-2 of the *Standard Specifications*. Submit working drawings showing plan views, shoring profiles with anchor locations and typical sections with anchor, piling and shoring details. If necessary, include details on working drawings for obstructions interfering with anchors or extending through shoring. Submit design calculations for each anchored shoring section with different surcharge loads, shoring geometry or material parameters. A minimum of one analysis is required for each shoring section with different anchor lengths. 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. Have anchored shoring designed, detailed and sealed by a Professional Engineer registered in North Carolina.

**88-A****Construction Methods**

When using an anchored NCDOT portable concrete barrier (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 anchored shoring. Collect and direct run off away from anchored shoring and areas above and behind shoring.

Before starting anchored shoring construction, conduct a preconstruction meeting to discuss the construction, inspection and testing of the anchored shoring. Schedule this meeting after all anchored shoring submittals have been accepted. The Resident or Bridge Maintenance Engineer, Bridge Construction Engineer, Geotechnical Operations Engineer, Contractor and Anchored Shoring Contractor Superintendent and Project Manager will attend this preconstruction meeting.

Notify the Engineer before blasting in the vicinity of anchored shoring. Perform blasting in accordance with the contract. Install foundations located behind anchored shoring and within a horizontal distance equal to the longest anchor length before beginning anchored shoring construction.

Install and interlock sheet piling or install H piles as shown on the plans or accepted submittals with a tolerance of 1/2 inch per foot (42 mm per meter) 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. Ensure at least 3" (75 mm) of contact in the horizontal direction between the lagging and pile flanges.

Backfill voids and fill sections behind lagging and piling with shoring backfill. Perform welding in accordance with the accepted submittals and Article 1072-20 of the *Standard Specifications*.

**(A) Pile Excavation**

Excavate a hole with a diameter that will result in at least 3" (75 mm) 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 (6 mm).

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" (150 mm) 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" (150 mm) 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 (150 to 200 mm). 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) Anchor Installation**

Install anchors within 3 degrees and 12" (300 mm) of the inclination and location, respectively, shown in the accepted submittals. Install ground anchors in accordance with the accepted submittals and Section 6.5 of the *AASHTO LRFD Bridge Construction Specifications* with the exception of corrosion protection requirements.

Install helical anchors in accordance with the accepted submittals and the anchor manufacturer's instructions. Measure the torque during installation and do not exceed the torsion strength rating of the helical anchors. Satisfy the minimum installation torque and length requirements before terminating anchor installation. When replacing helical anchors, embed the last helix of the replacement anchor at least 3 helix plate diameters past where the first helix of the previous anchor was located.

**(C) Anchor Testing**

Proof test all anchors in accordance with the accepted submittals and Section 6.5.5 of the *AASHTO LRFD Bridge Construction Specifications* with the exception of the acceptance criteria in Section 6.5.5.5. For this provision and these AASHTO specifications, "ground anchor" refers to a ground or helical anchor and "tendon" refers to a bar or strand for a ground anchor and a central shaft for a helical anchor.

**(D) Anchor Acceptance**

Anchor acceptance is based on the following criteria.

1. For ground and helical anchors, total movement is less than 0.04" (1 mm) between the 1 and 10 minute readings or less than 0.08" (2 mm) between the 6 and 60 minute readings.

2. For ground anchors, total movement at maximum test load exceeds 80 percent of the theoretical elastic elongation of the unbonded length.

**(E) Anchor Test Results**

Submit 2 original hard copies of anchor test records including load versus movement curves within 24 hours of completing each test. The Engineer will review the test records to determine if the anchor is acceptable.

If the Engineer determines an anchor is unacceptable, revise the anchored shoring design. Submit a revised anchored shoring design for review and acceptance and provide an acceptable anchor with the revised design and/or installation methods at no additional cost to the Department. If required, replace anchors and/or provide additional anchors with the revised design and/or installation methods at no additional cost to the Department.

After completing all anchor testing for each anchored shoring, submit electronic copies (pdf or jpg format on CD or DVD) of all corresponding test records.

**Measurement and Payment**

Anchored temporary shoring will be measured as the exposed face area and the anchored 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 anchored shoring. The top of shoring elevation is defined as where the grade intersects the back face of the anchored shoring. No payment will be made for any extension of anchored shoring above the top of shoring or any embedment below the bottom of shoring.

If the Contractor elects to use anchored temporary shoring in lieu of temporary shoring, the anchored shoring will be paid for at the contract unit price bid for *Temporary Shoring*. Such price and payment will be full compensation for design, submittals, furnishing labor, tools, equipment and materials, excavating lifts, installing piling and anchors, grouting, providing timber lagging, backfill and any incidentals necessary to design and construct anchored shoring in accordance with this provision.

**CHANGEABLE MESSAGE SIGNS**

(11-21-06)

M11 R11

Revise the *2006 Metric Standard Specifications* as follows:

**Page 11-7, Article 1120-3, Replace the 3rd sentence with the following:**

Sign operator will adjust flash rate so that no more than two messages will be displayed and be legible to a driver when approaching the sign at the posted speed.

**PAVEMENT MARKING LINES:**

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

M12 R01

Revise the *2006 Metric Standard Specifications* as follows:

**Page 12-11, 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 meters of pavement marking lines per application that has been satisfactorily placed and accepted by the Engineer.

**EXCAVATION, TRENCHING, PIPE LAYING AND BACKFILLING FOR UTILITIES:**

(2-17-09)

M15R01

Revise the *2006 Metric Standard Specifications* as follows:

**Page 15-4, 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 15-5, Article 1505-6**

**Second paragraph,**

**Delete (E) 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)

M16 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.

<b>Percentage of Elapsed Contract Time</b>	<b>Percentage Additive</b>
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.

**PREPARATION OF SUBGRADE AND BASE:**

(1-16-96)

M5 R05

On mainline portions and ramps of this project, prepare the subgrade and base beneath the pavement structure in accordance with the applicable sections of the *2006 Metric Standard Specifications* except use an automatically controlled fine grading machine utilizing string lines, laser controls, or other approved methods to produce final subgrade and base surfaces meeting the lines, grades, and cross sections required by the plans or established by the Engineer.

No direct payment will be made for the work required by this provision as it will be considered incidental to other work being paid for by the various items in the contract.

**DRY DETENTION BASIN:**

SPI

**Description**

This work consists of the construction and maintenance of a basin at locations designated on the plans. This work includes placement of riser/drawdown structures.

The size of the detention basin and drawdown structure may be affected by site conditions during construction of the project. The quantity of materials may be increased, decreased, or eliminated entirely at the direction of the Engineer. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

**Materials**

Per Division 8 and 10 of *Standard Specifications*

<b>Item</b>	<b>Section</b>
Minor Drainage Structure	840
Drainage Ditch Excavation	240

**Construction Methods**

Dry detention basin is to be excavated and drawdown structure constructed as specified in the plans or as directed.

**Measurement and Payment**

*Drainage Structures* will be measured and paid for in accordance with Article 840-4 of the *Standard Specifications*.

*Drainage ditch excavation* will be measured and paid for in accordance with *Standard Specifications*.

Such price and payment will be full compensation for all work covered by this section, including, but not limited to furnishing all materials, labor, equipment, and incidentals necessary to construct the dry detention basin.

Payment will be made under:

**Pay Item**

Masonry Drainage Structure  
Masonry Drainage Structure  
Drainage Ditch Excavation

**Pay Unit**

Linear Meter  
Cubic Meter  
Cubic Meter