

**PROJECT SPECIAL PROVISIONS**

Roadway

7-1-95

SP1R01

**CLEARING AND GRUBBING:**

9-17-02

Perform clearing on this project to the limits established by Method "III" shown on Standard No. 200.03 of the Roadway Standards.

The 2002 Standard Specifications shall be revised as follows:

Page 2-3, Article 200-5

Delete the first sentence of this article and insert the following:

The property owner will have no right to use or reserve for his use any timber on the project. All timber cut during the clearing operations is to become the property of the Contractor, and shall be either removed from the project by him, or else shall be satisfactorily disposed of as hereinafter provided.

SP2R01

**PEA GRAVEL:**

**DESCRIPTION**

The work covered by this provision consists of furnishing and placing pea gravel in truck escape ramps in accordance with the details in the plans. as directed by the Engineer and the following provision.

**MATERIALS**

The pea gravel shall be rounded, uncrushed stone, free draining, and contaminant resistant. The pea gravel shall meet the gradation requirements of Table 1005-1 of the Standard Specifications for 78M aggregate. The pea gravel shall be composed of hard, durable rock and free from adherent coatings. The pea gravel shall be of such character that it will not readily bind together but will remain in a relatively non-cohesive state.

All pea gravel will be approved by the Engineer prior to use.

**CONSTRUCTION METHOD**

The pea gravel shall be placed and spread in one uncompacted layer. Any machine, combination of machines, or equipment which will handle the material without unduly binding the pea gravel together may be used when approved by the Engineer.

**BASIS OF PAYMENT**

The quantity of pea gravel to be paid for will be the actual number of cubic yards for pea gravel which has been incorporated into the completed and accepted work.

The quantity of pea gravel, measured as provided for above will be paid for at the contract unit price per cubic yards for "Pea Gravel". Such price and payment will be full compensation for furnishing, hauling, placing and shaping, and all incidentals necessary to complete the work.

**WEEP HOLES:**

**1.0 GENERAL**

Install weep holes as specified in these special provisions and as directed by the Engineer.

**2.0 CONSTRUCTION**

Install weep holes as shown on the plans. The locations of weep holes shown on the plans are approximate only and the exact location and sequence of placing weep holes is as directed by the Engineer.

Drill weep holes a minimum of 40 feet with equipment capable of drilling 2 to 3 inch diameter holes to designated lines and grades through rock formations to depths as shown on the plans.

**3.0 METHOD OF MEASUREMENT**

The quantity of weep holes to be paid for will be the actual linear feet of hole drilled. Measurement of horizontal drilling will be made by counting the number of drilling rod joints extended into the ground at each drill hole and multiplying by the length of the joint. Where the last joint extends partially into the ground, measurement will be made to the nearest foot. The length of the drilling bit used shall be measured to the nearest foot and be added to the length of drill rod to obtain the total quantity of drilling for each hole.

**4.0 BASIS OF PAYMENT**

The quantity of weep hole, measured as provided above, will be paid for at the contract unit price per linear foot for Weep Holes.

The above prices and payments will be considered full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in drilling the weep holes complete in place and accepted.

Payment will be made under:

Weep Holes.....Linear Feet

**WIRE MESH & ROCK ANCHORS FOR WIRE MESH:****1.0 DESCRIPTION**

Install wire mesh, rock anchors and random rock bolts for the wire mesh in accordance with details shown on the plans, at locations determined by and as directed by the Engineer. The wire mesh is suspended from rock anchors and wire ropes along the top of a slope and draped down the face so as to restrain and channel rockfall. The wire mesh is attached to the wire ropes using tie wire and "Tiger Tite" locking clips.

**2.0 MATERIALS**

Furnish and install wire mesh as detailed in the plans and as directed by the Engineer. The wire mesh must be a galvanized hexagonal double twisted steel wire mesh, maximum 3.25 x 4.50 inch mesh opening, with a minimum diameter of 0.118 inches (gauge 11) from a minimum 60,000 psi steel, or an approved equal. All wire used in the fabrication of the wire mesh and in the wiring operations during construction must have a 95% zinc and 5% aluminum coating and tensile strength in accordance with the requirements of ASTM A641-92.

Secure rigidly the wire mesh with rock anchors located 5 feet down from the bench elevation spaced at 10-foot maximum centers. Install rock bolts at random locations as directed by the Engineer. Install each rock anchor or bolt such that a 6" x 6" x 1/2" steel plate is placed on each anchor or bolt and the anchor or bolt is placed through the wire mesh to position the wire mesh between the rock and the steel plate. All rock anchors and bolts must be one inch in diameter deformed or continuously threaded Grade 60 ksi steel and meet the requirements of ASTM A615-80. Equip each anchor and bolt with 2 plastic centering sleeves on four-foot centers to achieve concentric spacing of the entire anchor or bolt.

Use a pre-mixed, unsanded, non-metallic, non-shrink grout, which can be mixed to a flowable consistency with a minimum 7-day compressive strength 3000 psi and a minimum 28-day compressive strength of 5500 psi. Produce cylinders at such frequencies as determined by the Engineer and conduct testing in accordance with Section 1054-6 of the Standard Specifications. Each rock anchor and bolt must be a minimum of 12 feet long and each rock anchor capacity of 20 tons must be verified with a pull out test.

Place the wire ropes on top of the wire mesh. The wire rope must be 3/4 inch diameter, class 6x19 (IWRC) galvanized, with nominal strength of 25.6 tons and according to the Federal Specification for wire rope and strands, RR-W-410D.

All the tie wires and "Tiger Tite" locking clips must be composed of galvanized steel, approximately 0.148 inch diameter (gauge 9). Alternative fasteners may be approved by the engineer provided they provide at least 900 pounds of resistance while still remaining locked and closed. Galvanize all accessories including clips, clamps, wires, rings and all incidentals necessary for installation, to the requirements of ASTM A-153-80.

### 3.0 CONSTRUCTION METHOD

Attach the top of the wire mesh to the top wire rope and located 10 feet below the bench elevation or as directed by the Engineer. Cut and wrap the wire mesh such that the mesh hangs straight down the slope as the detail shown on the plans and that a minimum overlap of 12 inches is maintained. The top wire rope is then attached by vertical wire ropes to anchors located 5 feet below the bench elevation spaced at maximum of 10 foot intervals or as directed by the Engineer. Wire mesh is then draped over the slope to within 10 feet of grade such that a 1-foot overlap is achieved. The wire mesh overlap is connected with locking clips on staggered 12-inch centers as the detail shown on the plans. Intermediate horizontal and vertical wire ropes are spaced and sized as the detail shown on the plans. The wire mesh is to be attached to the horizontal and vertical wire ropes (except the bottom and top wire ropes) by continuously weaving tie wire and attaching locking clips on 24-inch centers. Attach wire mesh to the top and bottom wire rope with locking clips on 12-inch centers and continuously weaved tie wire through a 12 inch overlap. All intersections of vertical and horizontal wire ropes that do not require 4 1/2" diameter ring connections must be connected with a U-Bolt as the detail shown on the plans.

The required rock anchors and bolts will be as the detail shown in the plans. Paint the plate, nut and full length of rock anchors and bolts with two coats of zinc-rich paint; the zinc-rich paint must meet the requirements of Article 1080-9 of the Standard Specifications. The rock anchors and bolts will not be post-tensioned, but the full length of the anchors and bolts must be grouted and modified based upon the result of pull out tests as specified by the Engineer.

### 4.0 METHOD OF MEASUREMENT

The quantity of wire mesh to be paid for will be the number of square yards, measured along the surface over which mesh has been accepted and completed in place.

The quantity of rock anchors and bolts to be paid for will be the actual number of linear feet installed in the completed work. The anchor or bolt is measured from the lower end of the threaded bar to the surface of the rock.

### 5.0 BASIS OF PAYMENT

The quantity of wire mesh, measured as provided for above, will be paid for at the contract unit price per square yard for "Wire Mesh". Such price and payment will be full compensation for all work covered by this provision, including but not limited to furnishing all wire mesh, ties, locking clips, clamps, rings, wire, cable; placing and securing the wire mesh, and for all incidentals necessary to complete the work satisfactorily.

The quantity of rock anchors and bolts, measured as provided for above, will be paid for at the contract unit price per linear foot for "Rock Anchor for Wire Mesh". Such price and payment will be full compensation for furnishing all labor, materials, equipment, and supervision necessary for the actual installation of the rock anchors and rock bolts and the performance of pull out tests as specified by the Engineer.

Payment will be made under:

Wire Mesh.....Square Yard  
Rock Anchors for Wire Mesh.....Linear Feet

**HORIZONTAL DRAINS:**

**1.0 GENERAL**

Furnish and install horizontal drains as shown on the plans, as specified in these special provisions and as directed by the Engineer. Horizontal drains must be a minimum of 40 feet unless directed otherwise by the Engineer.

**2.0 MATERIALS**

Construct horizontal drains of polyvinyl chloride pipe meeting the following requirements: a nominal size of 1½ inch, Schedule 80 Type II PVC 2110 plastic pipe conforming to the specifications of ASTM Designation: D1785. Use slotted pipe in lengths of 10 and 20 ft.

Slotted pipe must have 2 rows of slots cut circumferentially in the pipe on 2 of the third points (120 degrees apart). The average configuration must be 46 slots using a 0.010 inch opening, plus or minus one slot per row per foot, unless otherwise determined by the Engineer.

Include a minimum of 1.00 square inch of opening per linear foot of slotted pipe. Other suitable perforations or slots, equal to the above requirements, may be substituted upon written approval by the Engineer.

Extend ten (10) feet of unslotted 1½ inch Diameter Schedule 80, Type II PVC 2110 pipe or approved equivalent through the existing ground as shown on the plans.

**3.0 CONSTRUCTION**

Install drains as shown on the plans at locations as directed by the Engineer. Holes may be terminated and the drain installed if the drill penetrates 10 feet of rock before reaching the desired length.

Drill holes for horizontal drains with Hydraulic Rotary Drilling equipment capable of drilling 3-inch to 6-inch diameter holes to designated lines and grades through soil and rock formations to depths as shown on the plans.

Install plastic pipe by inserting the pipe inside the drill rod with the openings on the top and then retracting the drill rod so that the plastic pipe extends for the full length of the drilled hole. Tightly plug the entrance end of the plastic pipe with a rounded or pointed extension that must not extend more than 0.5 foot beyond the end of the pipe.

Install horizontal drain so to cement the plastic pipe together where necessary to form a continuous tube and not be telescoped or damaged to the extent that its drainage efficiency will be impaired when completed.

Fill completely the annular space between the Horizontal Drainage Borehole and the unslotted pipe with Non Shrink Cement Grout consisting of two parts sand and one part cement or as approved by the Engineer.

During the drilling operations, determine the elevation of the drilled hole at the upper end of the completed drain hole. The measurements may be made by inserting tubes or pipes and measuring liquid levels, or by other means acceptable to the Engineer. Furnish all labor, materials, tools, equipment, and incidentals necessary for determining the elevations.

To prevent erosion in the Borehole the driller should adjust to the geological situation of each Horizontal Drain Borehole to determine amounts of air, water, and soap or combinations thereof. Use of any drilling additives must be approved by the Engineer.

Dispose water used for drilling and water developed during drilling operations by the Contractor in such a manner that no damage will result to the work.

Identify each drain by placement of a permanent sign on a steel post at the outlet of the horizontal drain as directed by the Engineer with some permanent marking as designated by him.

#### **4.0 METHOD OF MEASUREMENT**

The quantity of PVC pipe used for horizontal drains to be paid for will be the actual number of linear feet of pipe, which has been incorporated into the completed and accepted work. Pipe measurement will be made by counting the number of joints used and multiplying by the length of the joint. When partial joints are used for horizontal drain pipes, measurement will be made to the nearest foot.

The quantity of horizontal drain borehole to be paid for will be the actual length of hole drilled. Measurement of horizontal drilling will be made by counting the number of drilling rod joints extended into the ground at each drill hole and multiplying by the length of the joint. Where the last joint extends partially into the ground, measurement will be made to the nearest foot. Measure the length of the drilling bit used to the nearest foot and be added to the length of drill rod to obtain the total quantity of drilling for each hole.

**5.0 BASIS OF PAYMENT**

The quantities of PVC plastic pipe, measured as provided above, will be paid for at the contract unit price per linear foot for "1½ Inch Slotted PVC 2110 Pipe, Type II" or "1½ Inch Unslotted PVC 2110 Pipe, Type II", as the case may be.

The quantity of horizontal drain bore hole, measured as provided above, will be paid for at the contract unit price per linear foot for "Horizontal Drain Bore Hole".

No separate payment will be made for the concrete grouting around the 1½ Inch Unslotted PVC pipe as this work is considered incidental to the various items being paid for in the contract.

The above prices and payments will be considered full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing the horizontal drainage complete in place and accepted.

Payment will be made under:

Horizontal Drain Borehole.....	Linear Feet
1½ Inch Slotted PVC 2110 Pipe, Type II .....	Linear Feet
1½ Inch Unslotted PVC 2110 Pipe, Type II.....	Linear Feet

**TENSIONED ROCK BOLTS - TYPE II:**

**1.0 DESCRIPTION**

Furnish, install and test 1-1/4 inch diameter, 20 ft. long steel bar Type II rock anchors at locations as determined by the Engineer. The installation pattern, location and length of rock bolts are to be determined by the Engineer during excavation of the cut slopes. Conditions encountered may require the Engineer to change the pattern and length of rock bolts from those indicated by these Special Provisions.

The Contractor is cautioned to the fact that the location of Type II Rock Bolts may require the Contractor to work from cranes or other specialized methods.

Unless otherwise specified herein, install anchors according to the anchor manufacturer procedures and recommendations or as directed by the Engineer.

**2.0 SUBMITTALS**

Supply the following information:

A. Shop Drawings: Not less than 30 days prior to fabrication and include:

Type II, 1-1/4 inch diameter rock anchor design details, including bond length, method of corrosion protection for permanent anchors, the head assembly, and reinforced concrete reaction block complete with doweling and reinforcing details.

Detail drawings including specific method and procedure for drilling, installing, grouting and testing Type II rock anchors.

- B. Calibration Certificates: Not less than 10 days prior to commencing drilling and include:

Tensioning jack calibration certificate(s) of test which have been performed not more than 30 days prior to commencing drilling. Provide certificate showing the relationship between gauge pressure and applied load.

- C. Product Data and Manufacturers Instructions: Not less than 30 days prior to commencing drilling and include:

1. Pre-mixed, non-shrink anchoring grout type.
2. Anti-corrosion compound for inside of anchor head.
3. Mill test reported for each heat or lot of prestressing components used to fabricate the anchors showing ultimate load, yield, percent elongation at yield and modulus of elasticity.

- D. Daily Records: Within 5 days after completion of each anchor installation in each area. Submit records of each Type II rock anchor, but are not necessarily limited to all information where applicable, on the Contractors anchor report form and test log. Include drilling conditions, bolt location, length, and grout volume.

### 3.0 MATERIALS

- A. 1-1/4 Inch Diameter Rock Anchors

1. General: Use anchor assembly 1-1/4 inch diameter, 20 ft. long Grade 60 ksi deformed or continuously threaded steel bar conforming to ASTM 615 complete with corrosion protection system for permanent installations, centralizers on 4 ft. centers in bond zone, couplings where required, grout tubes, and anchor head assembly consisting of reinforced concrete reaction block, anchor plate, hardened washers, nut, and steel cover. The anchor head assembly must be capable of developing 100 percent of the guaranteed minimum ultimate tensile strength of the bar without cracking or deformation. Do not exceed a bearing pressure on the reaction block concrete of 1500 psi.
2. Manufacturer: Use all prestressing components from the product of a manufacturer regularly engaged in the fabrication of permanent rock anchor systems. The fabrication procedure must be in strict accordance with the manufacturer details.



3. Assembly: Use anchor assembly consisting of a bond length to be determined by the Contractor, and a variable free stressing length to suit any changes to the hole lengths. The assembly must be accordance to the manufacturers approved details.
4. Corrosion Protection: Include a corrosion protection system for the permanent rock anchor to protect the full length of the bar and comprise a continuous plastic sheath grouted on to the bar, or approved equivalent system. Apply corrosion protection system to the bars prior to their installation in the drill holes. Protect anchor head and the exposed bar under the anchor plate against corrosion, including an arrangement for pumping an anti-corrosion compound under the reaction plate to form a continuous seal of the unprotected portion of the bar.

Paint the exposed sealing cap and anchor plate with two coats of zinc-rich paint; the zinc-rich paint must meet the requirements of Article 1080-9 of the Standard Specifications.

5. Cover head of the anchor with a steel cap to protect the head from corrosion and damage. Fabricate cap from 1/4 inch thick steel plate bolted to the reaction plate, and fill with anti-corrosion compound.

B. Anchoring Grout

1. The grout must be a pre-mixed, unsanded, non-metallic, non-shrink grout, which can be mixed to a flowable consistency with a minimum 7-day compressive strength of 3000 psi. and a minimum 28 day compressive strength of 5500 psi. Cylinders will be made at such frequencies as determined by the Engineer and conduct testing in accordance to Section 1054-6 of the Standard Specifications.
2. Use pre-mixed grout from the product of a manufacturer regularly engaged in the manufacture of cementitious grouts for rock anchoring.

a. Water

Use water in Portland cement grouts that is clear, fresh water, free from injurious amounts of oil, acid, alkali, organic matter, sediment or any other deleterious substance.

b. Reinforced Concrete Reaction Blocks

Reinforced concrete reaction blocks, where required, to level or wedge the rock surface must be doweled to the rock face and adequately reinforced to withstand the pressure of the reaction plate. All materials must meet the requirements for incidental concrete in Section 825 of the Standard Specifications.

### 3.0 CONSTRUCTION METHODS

#### A. General

Prior to installation, all anchor corrosion protection components and the anchor assembly must be handled and stored to avoid corrosion and damage such as abrasion, cuts, cracks, nicks, pits, welds or weld splatters. Furthermore, once the corrosion protection sheath has been grouted, use special handling procedures to prevent bending of the bar that could crack the grout in the sheath. Any such damage of the anchor components of the anchor assembly may be rejected as determined by the Engineer.

#### B. Installation Sequence

Sequence rock anchor installation and blasting operations such that no blasting is carried out within a distance of 200 feet from any bolt until the grout anchorage has set for a time not less than six days.

#### C. Site Preparation

Prior to starting drilling anchor holes the bearing area, scale of all soil and loose and broken rock.

#### D. Drilling

##### 1. General:

- a. Equipment: Drill holes with a rotary-percussion drill.
- b. Drill Logs: Driller must keep an accurate log noting depth from surface of any changes in rock hardness, rate of drilling, presence of water, fracture zones and voids.
- c. Cleaning: Clean holes thoroughly of all cuttings and rock fragments by flushing with high pressure air.
- d. Sequence: Drilling must precede reaction block construction.

##### 2. Anchor Holes:

- a. Dimensions: Drill anchor holes a minimum diameter of 4 inch or as specified by the anchor manufacturer and 2 ft. deeper than the anchor length.

- b. Orientation: Drill anchor holes at the dip angle of about 15 degrees below horizontal and aligned in plan at angles determined by the Engineer which will depend partly on the particular geological conditions at each anchor location.
- c. Deviation: The lower end of the anchor holes must not have deviate more than one foot from the specified location determined by the collar location and the required alignment of the anchor. The Engineer may require that drill hole orientation surveys be carried out, at the Contractors expense, where there is evidence of excessive deviation.

E. Water Test

1. Test Procedure: After cleaning the hole, fill drill hole with water, and the flow of water into the rock surrounding the hole must be observed for a period of 5 minutes.
2. Acceptance Criteria: The flow of water must not exceed 0.001 gals/inch diameter/foot depth/minute.
3. Grout and Re-drill: If the water flow exceeds the acceptance criteria, grout the hole with a cementitious sealing grout. Within 24 hours after grouting, re-drill and re-test the hole. Perform the grouting and re-drilling procedure until the hole has passed the acceptance criteria. Conduct procedure at the Contractors expense.

F. Anchor Insertion:

1. Following acceptance of a drill hole, install the rock anchor assembly comprising steel bar, corrosion protection, centralizers and grout tubes in the hole. Do not bend anchors during handling and anchor must slide freely into the hole without hammering or pushing.
2. The anchor head assembly must be firmly supported at its final location during grouting and for the curing period.

G. Grouting

1. General: Place grout only at the temperature range recommended by the grout manufacturer.

Do not use grout with an expired date in the work and dispose of at an authorized location.

Do not use grout that has any hardened lumps in the work and dispose of at an authorized location.

2. Mixing: Mix grout in a colloidal or high shear grout mixer in accordance with the grout manufacturers published instructions. Use only enough mixing water to produce a grout with the required consistency for the placing method proposed. Place grout immediately after mixing.
3. Placing Grout:
  - a. General: Place grout quickly and continuously to avoid overworking, segregation, bleeding and disturbance of initial set.  
  
Do not use grout which has stiffened due to delay in the work and dispose of at an authorized location.  
  
Do not re-tempered grout after initial mixing.
  - b. Pump grout into the annular space between the rock and the anchor using a grout tube extending to the lower end of the drill hole to fill the hole to the collar.

#### H. Concrete Reaction Blocks

1. General: Construct a concrete reaction block or a suitable quick set mix approved by the Engineer at each anchor location, where the rock has inadequate bearing capacity to support the load under the reaction plate, or where the rock surface is irregular or is not aligned at right angles to the axis of the anchor. The reaction block must form a uniform bearing surface for the steel reaction plate such that the bearing plate is aligned at right angles to the anchor, with its center coincident with the axis of the bar assembly.
2. Rock Surface Preparation: Prior to pouring concrete on the rock surface, clean with air/water jets and stiff brooming to produce a clean, sound rock surface.
3. Anchor Block Construction: Attach securely each reaction block to the rock face with pins grouted into holes drilled into the rock around the anchor. The concrete reaction block or quick set mix must be sized and reinforced as necessary to provide a bearing surface that can sustain the applied stress under the reaction block without bending or cracking.

#### I. Testing

1. Setting Time: The grout in the bond zone and concrete in the reaction block must meet the strength specified by the anchor manufacturer prior to testing the anchors.
2. Notification: Notify the Engineer notification of testing 48 hours prior to commencing testing.

3. Testing Equipment: Supply all testing, measuring and ancillary equipment.
4. Test Procedure: Set up a stable system to support the dial gauge used to make absolute measurements of the deflection of the head of the anchor. The system must be acceptable to the Engineer who will record and process all load/deflection measurements.
5. Hydraulic Jack: Tension all anchors using a calibrated hydraulic jack as specified by the anchor manufacturer.
6. Test Loads: Tension the anchors to the following loads:

Alignment Load (AL)	-	10 kips
Test Load (1.25P)	-	75 kips
Transfer Load (P)	-	60 kips
7. Performance Tests: Conduct performance tests on the first three (3) anchors in each Area, and up to thirty (30) other anchors in the project as selected by the Engineer. The Performance Test consists of a cyclic loading program according to the following procedure, with deflection of the head measured relative to a stable reference point to an accuracy of .001 inch at each load interval:
  - i. AL, 0.25P, AL,
  - ii. 0.25P, 0.5P, AL,
  - iii. 0.25P, 0.5P, 0.75P, AL,
  - iv. 0.25P, 0.5P, 0.75P, 1.0P, AL,
  - v. 0.25P, 0.5P, 0.75P, 1.0P, 1.25P
  - vi. Hold for Creep Test
  - vii. Lock off at 1.0P
8. Proof Test: Proof test all anchors not performance tested according to the following procedure, with deflection of the head measured relative to a stable reference point to an accuracy of .001 inch at each load interval:
  - i. AL, 0.25P, 0.5P, 0.75P, 1.0P, 1.25P,
  - ii. Hold for Creep Test,
  - iii. Lock off at 1.0P.
9. Creep Test: At the Test Load on each anchor, perform a creep test by holding the load constant and recording the deflection of the head at the following time intervals:
  - i. 0, 0.5, 2, 5, 10, 30, 50 minutes for Performance Test,
  - ii. 0, 0.5, 2, 5 minutes for Proof Test.

10. Lift-off Test: After locking off the anchor at the Transfer Load, re-apply the load to determine the lift-off load. The lift-off load is the load at which the head of the anchor just starts to move as the load is applied.

J. Acceptance Criteria

1. Criteria: Accept an anchor if the following criteria are met:

The total elastic movement at the anchor head must be more than 80% of the theoretical elastic elongation of the free stressing length, and less than 100% of the theoretical elastic elongation of the free stressing length plus 50% of the bond length.

The creep movement at the anchor head does not exceed 0.08 inch during the Creep Test.

The lift-off load is within 10% of the Transfer Load.

2. Anchor Failure: If any anchor fails to meet the acceptance criteria, the Contractor, at his expense, must perform all of the following:
  - a. Re-test the failed anchor using Performance Test procedures to as high a load as possible and determine the maximum load that will satisfy acceptance criteria I, II and III. Install an additional anchor in accordance with this specification at a location selected by the Engineer. The two anchors combined tension must not be less than 100 percent of the Test Load (P).
  - b. Submit any method for improving the capacity of the anchor and obtain the Engineers authorization to proceed.
  - c. For each failed anchor, test or re-test using Performance Test procedures, one additional anchor as selected by the Engineer.

## 5.0 METHOD OF MEASUREMENT

The quantity of 1¼ inch diameter Type II rock bolts to be paid for will be measured by the linear feet from the lower end of the bar to the upper surface of the anchor plate to the nearest foot.

## 6.0 BASIS OF PAYMENT

The quantity of Type II rock bolts, measured as provided above will be paid for at the contract unit price per linear foot for Type II Rock Bolts.

Such price and payment will be considered full compensation for quality control, supply, drilling, alignment measurements, water testing, grouting/redrilling as required, anchor grouting, testing and meeting all acceptance criteria of the anchors, as well as construction of the reaction blocks and removal of all formwork.

Payment will be made under:

Type II Tensioned Rock Bolt.....Linear Feet

**NONTENSIONED ROCK BOLTS - TYPE I:**

**1.0 DESCRIPTION**

- A. Install Type I rock bolts, fully encapsulated in grout and nontensioned, as directed and at locations determined by the Engineer. The total number of Type I rock bolts that are installed may vary from that shown on the drawing depending on actual geological conditions encountered during the course of work.
- B. Prior to performing pre-splitting or cushion blasting along the excavation slope line on each excavation lift, install single row of rock bolts at an angle of 1H:1V below the horizontal at the toe of the previously excavated cut face (see Arrangement of Bolts and Weep Holes in the plans). Provide Type I rock bolts a minimum of ten feet in length and at spacing as determined by the Engineer during the progress of the work. It may be necessary to utilize rock bolts with lengths greater than ten feet, and to vary the bolt spacing as necessary to suit varying geological conditions, as directed by the Engineer.
- C. Do not blast within a distance of 200 feet from any bolt until the grout anchorage has set for a time not less than three days.

**2.0 MATERIALS**

- A. Use one-inch diameter rock bolts, deformed or continuously threaded Grade 60 ksi steel bars conforming to ASTM A 615. Equip each bolt with plastic centering sleeves on four foot centers. Nuts and bearing plates are NOT required.
- B. Where couplings are required to extend the anchor to the required length, use couplings with corrosion protection according to the manufacturer recommendations, and have strength not less than that of the rock bolt.
- C. Protect rock bolts from corrosion by an epoxy coating over the full length of the bar. Bolts with epoxy coating that is cracked or chipped or are covered by deleterious material such as grease or mud are not acceptable. The epoxy coating must meet the requirements of Section 1070-8 of the Standard Specifications.

- D. Use grout with non-sanded, non-metallic, non-shrink, cementitious grout as approved by the Engineer. The water/cement ratio for the grout mix must not more than 3 U.S. gals. per 66 lb. bag of grout as required to produce a pumpable mix with minimum water bleed.

### 3.0 CONSTRUCTION METHOD

- A. Use a minimum of 2-inch diameter holes for the rock bolts, drilled with percussion drill and one foot longer than the bolt length. At the completion of drilling, do not use compressed air to clean all cuttings, mud and other deleterious materials from the hole.
- B. Install bolt, complete with centering sleeves and a grout tube extending to the lower end of the bolt, in the hole so that it extends to the face of the rock cut. Use a grout tube to completely fill the drill hole with grout until grout return is obtained at the surface and the bolt is encapsulated in grout. Pull grout tube from the hole as the grout is injected.
- C. If grout loss from the drilled hole exceeds three times the volume of the annular space between the drilled hole and rock anchor, then discontinue rock anchor installation and remove tendon from the hole and clean. Pressure grout the drilled hole with a cementitious sealing grout at a pressure of at least 5 psi above hydrostatic pressure, redrill the hole 24 hours after the grout sets, and install rock anchors as described herein above. Any grout volume that now exceeds three times the theoretical volume of the empty hole must be approved by the Engineer and will be paid for under the unit price for additional grout volume.
- D. Use water in cement grouts that is clear, fresh water, free from injurious amounts of oil, acid, alkali, organic matter, sediment or any other deleterious substance.
- E. Collect grout samples from the Contractor at the first anchor and every 25 anchors thereafter. Samples will be submitted to an accredited laboratory for testing in conformance to ASTM C109. Provide grout with a minimum 7 day compressive strength of 3000 p.s.i., and a minimum 28 day strength of 5500 p.s.i.
- F. Pull test a minimum of 2 percent of the installed bolts, as selected by the Engineer. Supply a minimum of 4 percent of the total number of bolts, with threaded ends on which pull tests can be carried out. Install bolts selected for testing, designated test bolts, so that the upper end extends far enough past the rock face of the extension rod to be attached to the end of the bolt.
- G. Use equipment for conducting pull tests with a coupling that will attach to the end of the test bolt, an extension rod, a plate and nut and a hollow core hydraulic jack with a minimum capacity of 70 kips. Supply hydraulic jack with a calibration certificate relating hydraulic pressure to jack load; conduct calibration not more than 30 days prior to the start of work, and at any other time during the course of the work as required by the Engineer.



- H. Perform pull tests by applying a load of 44 kips to the bolt and maintaining this constant load for a minimum time of two minutes, or longer time as directed by the Engineer. The Engineer will evaluate the load capacity of the bolt and reject the bolt if it is considered that a constant test load of 44 kips cannot be maintained.
- I. Conduct pull testing after the grout has cured for a minimum of 5 days.
- J. For each test bolt rejected by the Engineer, install an additional test bolt within five feet of the rejected bolt, and conduct additional two pull tests at locations determined by the Engineer. All additional bolts and testing are considered incidental to the contract and no additional payment will be made.

**4.0 METHOD OF MEASUREMENT**

- A. The quantity of Type I rock bolts to be paid for will be measured by the linear feet of rock bolts installed in the completed work.
- B. The volume of additional grout that is placed, as directed by the Engineer, in excess of the theoretical maximum volume of grout must be measured by the gallon of mixed grout. Measure grout by an approved metering device or other approved method. The unit price paid for the additional grout is inclusive of all materials, labor, equipment and supervision necessary for the actual placement of grout.

**5.0 BASIS OF PAYMENT**

- A. Payment of these rock bolts will be made at the contract unit price per linear foot for Type I Rock Bolt. Payment for Pull Tests will be made at the contract unit price per each for Type I Rock Bolt Pull Test. Payment for grout in excess of the theoretical maximum volume will be made at the contract unit price per gallon for Additional Grout. Such prices and payments will be full compensation of furnishing all labor, materials, equipment and supervision necessary for the actual installation of the rock bolts, the performance for pull tests and grouting at the locations and in the manner specified by the Engineer.

Payment will be made under:

Type I Rock Bolt.....	Linear Feet
Type I Rock Bolt Pull Test.....	Each
Additional Grout for Rock Bolts.....	Gallon

**RESCALING SLOPES:**

**1.0 GENERAL**

Rescale the cut slopes for loose material during the construction phase of the project at locations as directed by the Engineer. This is a separate process from the initial excavation and scaling operation. Rescale and dress the slopes by mechanical means to a safe stable condition. Remove all loose spalls and rocks not firmly keyed into the rock slope and soil failures above the rock slope. Proceed from the top of slope downward to the roadway ditch or catchment area in the rescaling operation. The final stage of the rescaling operation will require the slope to be traversed by laborers using hand tools to ensure that all potentially hazardous protrusions have been successfully removed to the satisfaction of the Engineer.

The Contractor is advised that since the rescaling operation will entail considerable hazards due to falling rock and debris, adequately protect personnel and the completed roadway grade from falling rocks and debris by the use of back stops or other devices as approved by the Engineer.

**2.0 MEASUREMENT**

The quantity of rescaled slopes to be paid for will be the exposed face area in square yards of slopes rescaled to the satisfaction of the Engineer. The quantity will be determined by actual surface measurement of the completed slope after the rescaling has been performed.

**3.0 BASIS OF PAYMENT**

The quantity of rescaling slopes, measured as provided for above, will be paid for at the contract unit price per square yard for "Rescaling Slopes". Such price and payment will be full compensation for all labor, tools, equipment, and all incidentals necessary to complete the work satisfactorily. This includes remobilization of equipment onto the slope for the rescaling operation.

This pay item does not cover major slope failures or major landslides that require slope redesign.

Payment will be made under:

Rescaling Slopes.....Square Yard

**REMOVAL AND DISPOSAL OF RESCALED AND SLIDE MATERIAL:**

**1.0 GENERAL**

Remove and dispose of material resulting from the rescaling operations and material resulting from earth and rock slides which reaches roadway elevation or as directed by the Engineer.

The Contractor will be required to remove and dispose of slide material, which constitutes a hazard to the traveling public immediately upon occurrence of slide as directed by the Engineer.

Dispose removed material in the designated waste areas furnished by the Department of Transportation or in waste areas furnished by the Contractor and in accordance with the requirements of Section 802 of the Standard Specifications, or used as directed by the Engineer.

**2.0 MEASUREMENT**

The quantity of rescaled and slide material to be paid for will be the actual number of tons of material satisfactorily removed from the roadway and disposed. The material will be measured by being weighed in trucks on approved platform scales or other approved weighing device to be furnished by the Contractor.

**3.0 BASIS OF PAYMENT**

The quantity of rescaled and slide material, measured as provided for above, will be paid for at the contract unit price per ton for "Removal and Disposal of Rescaled and Slide Material". Such price and payment will be full compensation furnishing all labor, materials, weighing scales, and equipment necessary to complete the work, including any drilling and blasting required to break down large blocks or rock to facilitate disposal of the material.

This pay item does not cover major slope failures or major landslides that require slope redesign.

Payment will be made under:

Removal and Disposal of Rescaled and Slide Material.....Ton

**ROCK EMBANKMENT CONSTRUCTION USING CLASS VII SELECT MATERIAL:****1.0 GENERAL**

Construct rock embankments using Class VII Select Material in accordance with Section 235 of the Standard Specifications, the detail shown on the plans and the following provisions:

Drain rock embankments in accordance with the detail in the plans and as directed by the Engineer.

**2.0 MATERIALS**

Use earth material and Class VII stone derived from the project.

Use blasted rock and aggregate base course material to construct the rock embankments using Class VII select material as detailed in the plans and located at the following stations:

<b>From Station</b>	<b>To Station</b>	<b>Side</b>	<b>Slope</b>	
25+00	27+50	LT	1.75:1	FILL
30+00	30+50	LT	1.75:1	FILL
33+50	41+50	LT	1.75:1	FILL
42+00	49+50	LT	1.5:1	FILL
49+50	54+00	LT	1.75:1	FILL
54+50	58+50	LT	1.5:1	FILL
57+50	58+00	RT	1.75:1	FILL
61+50	64+00	LT	1.5:1	FILL
63+50	64+50	RT	1.75:1	FILL
90+00	94+00	LT	1.75:1	FILL
92+00	94+00	RT	1.75:1	FILL
102+50	103+00	RT	1.75:1	FILL
104+50	106+00	LT	1.75:1	FILL
114+50	117+00	LT	1.75:1	FILL
120+50	124+00	LT	1.75:1	FILL
121+00	124+00	RT	1.75:1	FILL
127+00	129+00	LT	1.75:1	FILL
131+00	132+00	LT	1.75:1	FILL
135+00	139+50	LT	1.75:1	FILL
136+00	136+50	RT	1.75:1	FILL
144+00	144+50	RT	1.75:1	FILL
149+00	153+50	LT	1.75:1	FILL
165+00	168+00	RT	1.75:1	FILL
165+00	170+50	LT	1.75:1	FILL

<b>From Station</b>	<b>To Station</b>	<b>Side</b>	<b>Slope</b>	
181+50	188+50	RT	1.75:1	FILL
199+00	202+50	LT	1.75:1	FILL
206+50	207+50	LT	1.75:1	FILL
223+50	225+00	LT	1.5:1	FILL
224+00	236+00	RT	1.75:1	FILL
225+50	231+50	LT	1.75:1	FILL
242+50	249+00	LT	1.75:1	FILL
252+50	255+50	LT	1.75:1	FILL
258+00	262+50	RT	1.75:1	FILL
261+00	265+50	LT	1.75:1	FILL
269+00	296+00	LT	1.75:1	FILL
302+50	306+00	LT	1.5:1	FILL
323+00	328+50	LT	1.75:1	FILL
323+50	328+00	RT	1.75:1	FILL
334+00	338+50	LT	1.75:1	FILL
341+50	344+50	LT	1.75:1	FILL
349+00	356+00	RT	1.75:1	FILL

The rock shall meet the following requirements:

- a. Class VII in accordance with Article 1016-3 of the Standard Specifications.
- b. No rippable rock will be permitted in the embankments.
- c. Density requirements will not apply to roadway embankment at the above locations, but the formation of roadway embankments shall be as outlined above.

The aggregate base course shall meet the requirements of Section 1016-3, Class IV; or material meeting gradation requirements of Table 520-1, Column C.

**3.0 COMPENSATION**

No additional compensation will be made for any requirements for furnishing and placing Class VII or earth materials as the cost of such work shall be included in the contract unit price per cubic yard for "Unclassified Excavation".

Measurement and payment for Aggregate Base Course will be in accordance with Article 520-12 and 520-13 of the Standard Specifications.

**ROCK BLASTING AND OVERBREAK CONTROL:****1.0 DESCRIPTION**

Use controlled blasting techniques, as covered herein, for forming highway rock cut slopes at all locations where the rock cuts are 1:1 or steeper as shown on the plans. The purpose of controlled blasting is to minimize damage to the rock backslope and enhance long-term stability.

**A. Controlled Blasting**

Controlled blasting refers to the controlled use of explosives and blasting accessories in carefully spaced and aligned drill holes to produce a free surface or shear plane in the rock along the specified excavation backslope. Controlled blasting technique covered by this specification is pre-splitting blasting. When pre-splitting, the detonation of the pre-split line is before the detonation of any production holes.

**B. Production Blasting**

Production blasting, as covered herein, refers to the main fragmentation blasting resulting from more widely spaced production holes drilled throughout the main excavation area adjacent to the controlled blast line. Detonate production holes in a controlled delay sequence.

**2.0 GENERAL REQUIREMENTS****A. Use of Explosives**

Obtain all necessary permits for, and comply fully with the laws, rules and regulations of local, State and Federal agencies in connection with the use, transport, storage and safe handling of all explosives. Perform all blasting operations in accordance with Section 107-11 of the Standard Specifications.

Use explosives of such character and in such amount as is permitted by the State and local laws and ordinances and all respective agencies having jurisdiction over them.

Supply all products and materials used for any Blasting Operation from a recognized supplier and products of a company regularly engaged in the manufacture of explosives and related products.

Do not use explosives with an expired shelf life.

**B. Blasting Plan Submittal**

Submit a "Pre-Blast Plan" to the Engineer for review not less than 3 weeks prior to commencing drilling and blasting operations, or at any time the Contractor proposed to change the drilling and blasting methods. Include in the pre-blast plan the full details of the drilling and blasting patterns the Contractor proposes to use for both the controlled and production blasting. Submit the pre-blast plan with the following minimum information.

- 1) Station limits of proposed blasting.
- 2) Plan and section view of proposed drill pattern including free face, burden, blasthole spacing, blasthole diameters, blasthole angles, lift height, and subdrill depth.
- 3) Loading diagram showing type and amount of explosives, primers, initiators, and location and depth of stemming.
- 4) Initiation sequences of blast holes including delay times and delay system.
- 5) Manufacturer data sheets for all explosives, primers, and initiators to be employed.
- 6) Details of measures such as stemming, matting and padding, and estimates of Peak Particle Velocities at the closest structures, if applicable.

The pre-blast plan submittal is for quality control and record keeping purposes. Review of the blast plan by the Engineer shall not relieve the Contractor of his responsibility for ensuring that the blasting operation is conducted in a satisfactory manner and in accordance with these specifications.

Submit a blasting plan to the Engineer within 24 hours after each shot. The blasting plan must contain the full details of the drilling and blasting in accordance with Section 107-11 of the standard specifications.

**C. Blasting Test Section(s)**

1. Test blasts will be conducted at the commencement of blasting operations at each rock cut and at any other time the Contractor proposes to change blast designs.
2. Prior to commencing full-scale blasting operations, demonstrate the adequacy of the proposed blast plan by drilling, blasting, and excavating short test sections, up to 100 feet in length, to determine which combination of pattern, charge, detonation sequence and controlled blasting method works best. When field conditions warrant, as determined by the Engineer, the Contractor may be ordered to use test section lengths less than 100 feet.

3. Unless otherwise allowed by the Engineer, begin the tests with the blast holes along the final line spaced 30 inches apart, then adjust if needed, until the Engineer approves the spacing to be used for full-scale blasting operations.
4. Apply the requirements for controlled and production blasting operations covered elsewhere in this specification to the blasting carried out in conjunction with the test shots.
5. Do not drill ahead of the test shot area until the test section has been excavated and the results evaluated by the Engineer. If the results of the test shot(s), in the opinion of the Engineer, are unsatisfactory, then, notwithstanding the Engineer's prior review of such methods, adopt such revised methods as are necessary to achieve the required results. Unsatisfactory test shot results include an excessive amount of fragmentation beyond the indicated lines and grade, excessive flyrock, or violation of other requirements within these specifications. All costs incurred by the Contractor in adopting revised blasting methods necessary to produce an acceptable test shot will be incidental to the contract unit prices for roadway excavation and controlled blasting.
6. If at any time during the progress of the work, the methods of drilling and blasting do not produce the desired result of a uniform slope and shear face, within the tolerances specified, the Contractor will be required to drill, blast and excavate in short sections, not exceeding 100 feet in length, until a technique is arrived that will produce the desired results. Extra cost resulting from this requirement will be borne by the Contractor.

D. Scaling and Stabilization

1. Install Non-tensioned rock bolts (Type I ) at locations as determined and directed by the Engineer.
2. Install Tensioned rock bolts (Type II) at locations as determined and as directed by the Engineer.
3. Comply with specifications for Type I and II bolts in the sequencing for blasting and bolting operations. Do not blast within 250 feet of Type I rock anchors for a period of 3 days following grouting, and within 250 feet of any Type II anchors for a period of 6 days following grouting.
4. Remove or stabilize all rock on the cut face that is loose, hanging, or which creates a potentially dangerous situation to the satisfaction of the Engineer, during or upon completion of the excavation in each lift. Drilling of the next lift will not be allowed until this work has been completed.



5. Scale slopes as required to remove all hazardous loose rock or overhangs. Scale slopes by hand using a suitable standard steel mine scaling rod. Subject to the Engineer's approval, other methods such as machine scaling, hydraulic splitters, or light blasting may be used in lieu of or to supplement hand scaling. Payment for scaling is considered incidental to the contract unit price for unclassified excavation.
6. Stabilization necessitated, by the rock geology, will be paid for at the appropriate unit price for Type I rock bolts, Type II rock bolts, or wire mesh. Stabilization necessitated, in the opinion of the Engineer, by the Contractor's failure to use proper and approved blasting operations, will be performed at the Contractor's expense.

E. Safety

1. Observe the entire blast area for a minimum of 5 minutes following a blast to guard against rock fall before commencing work in the cut.
2. Prohibit or halt the blasting operations if it is apparent that through the methods being employed, the required slopes are not being obtained in a stable condition or the safety and convenience of the traveling public is being jeopardized at the discretion of the Engineer.

### 3.0 CONTROLLED BLASTING METHODS

A. GENERAL

Use controlled blasting to create final slopes with the overall angles as shown on the plans. Between each lift along the final line, holes may be drilled at an angle of not steeper than 50 degrees for a final slope of 1:1 or 70 degrees for a final slope of 0.5:1, with an appropriate step-out to maintain the overall slope angle.

Pre-splitting is required along the final line of all slopes 1:1 or steeper as shown on the plans. Careful hole layout and depth control will be required in order to maintain the overall slope angle. The amount of subdrilling will be the minimum required to excavate the slope to the final line, and will be determined during the test blasting.

B. PRE-SPLITTING

1. Perform all pre-splitting, including that carried out in conjunction with the blasting test section requirements of Section 2.3 in accordance with the following requirements.
2. Unless otherwise permitted by the Engineer, completely remove all overburden soil and loose or decomposed rock along the top of the excavation for a distance of at least 30 feet beyond the end of the production hole drilling limits, or to the end of the cut, before drilling the final line holes.

3. Remove potentially dangerous boulders or other material located beyond the excavation limits as ordered by the Engineer. Payment for removal of the material located beyond the excavation limits shall be by force account, as outlined in section 109-3 of the Standard Specifications.
4. The final line drill holes must not be less than 2 inches and not more than 3 inches in diameter.
5. Control drilling operations by the use of proper equipment and technique so that no hole shall deviate from the plane of the planned slope by more than 6 inches either parallel or normal to slope. Final line holes exceeding these limits shall not be paid for unless, in the Engineer's opinion, satisfactory slopes are being obtained.
6. Drill final line holes within 3 inches of the staked collar location. Holes drilled outside the 3-inch tolerance will be rejected and will not be measured for payment.
7. Affix mechanical devices to all drilling equipment used to drill final line holes to accurately determine the angle at which the drill steel enters the rock in both perpendicular directions. Final line hole drilling will not be permitted if these devices are either missing or inoperative.
8. Extend pre-split holes a minimum of 30 feet beyond the limits of the production holes to be detonated, or to the end of the cut as applicable.
9. The final line holes for any individual lift must not exceed 25 vertical feet, with allowances for subdrill. Under certain circumstances, such as at the ends of cuts, and following the approval of the Engineer, the height of the lift may be increased to a maximum of 40 feet. This will be for localized areas only. For general conditions, lift heights are not to exceed 25 feet.
10. Along the final lines, the amount of subdrill will be equal to the width of the offset between lifts.
11. When the cut height will require more than one lift, offset as shown in the detail sheets between lifts will be permitted to allow for drill equipment clearances. Begin the control blast hole drilling at a point which will allow for necessary offsets and shall adjust, at the start of lower lifts, to compensate for any drift, which may have occurred in the upper lifts. Additional excavation volume outside the design overall cut slope angle resulting from the offsets shall be incidental to the contract bid price for roadway excavation, and no additional payment shall be made.
12. Drilling 2 feet below ditch bottom will be allowed to facilitate removal of the toe berm.

13. Before placing charges, determine that the hole is free of obstructions for its entire depth. Exercise all necessary precautions so the placement of the charges will not cause caving of material from the walls of the holes.
14. Drill hole conditions may vary from dry to filled with water. Use whatever type(s) of explosives and/or blasting accessories necessary to accomplish the specified results.
15. The maximum effective diameter of explosives used in final line holes must not be greater than 1/2 the diameter of the final line hole.
16. Do not use bulk ammonium nitrate and fuel oil (ANFO) or any other bulk loaded product to be loaded in the final line holes.
17. Use only standard explosives manufactured especially for pre-splitting in the final line holes, unless otherwise approved by the Engineer.
18. If fractional portions of standard explosive cartridges are used, then firmly affix to the detonating cord in such a manner that the cartridges will not slip down the detonating cord nor bridge across the hole.  
Do not exceed 30 inches center to center the spacing of fractional cartridges along the length of the detonating cord and adjust to give the desired results.
19. Where a continuous column cartridge type of explosives used with detonating cord is to be used, assemble and affix to the detonating cord in accordance with the explosive manufacturer's instructions. Provide a copy of the explosive manufacturer's instructions to the Engineer.
20. The bottom charge of final line holes may be larger than the line charges but not be large enough to cause overbreak. Place the top charge of a final line hole far enough below the collar, and reduce sufficiently, to avoid overbreaking and heaving.
21. Stem the upper portion of all pre-split holes, from the top most charge to the hole collar. Use sand or other dry angular granular material, all of which passes a 3/8 inch sieve, for stemming materials.
22. As long as equally satisfactory pre-split slopes are obtained, the Contractor, at his option, may either pre-split the slope face before drilling for product blasting or may pre-split the slope face and production blast at the same time, provided that the pre-splitting drill holes are fired first. If required to reduce ground vibrations or noise, pre-split holes may be delayed, providing the hole to hole delay is no more than 25 milliseconds.

23. Do not deviate the final slope face more than one foot from a plane passing through adjacent drill holes, except where the character of the rock is such that, as determined by the Engineer, irregularities are unavoidable. Measure the one-foot tolerance perpendicular to the plane of the slope. No portion of the slope must encroach on the roadbed.
24. Unloaded and unstemmed guide holes, if used between pre-split holes, must be of the same diameter and drilled in the same plane and to the same tolerance as the pre-split holes.

#### 4.0 PRODUCTION BLASTING

##### A. Production Blasting

Perform all production blasting, including that carried out in conjunction with the blasting test section requirements of Section 2.0 (C) of these special provisions, performed in accordance with the following general requirements.

1. Production blast holes shall not be drilled closer than 6 feet to the controlled blast line, unless approved by the Engineer. The bottom of the production holes shall not be lower than the bottom of the controlled blast holes.
2. Production holes shall not exceed 6 inches in diameter, unless approved by the Engineer.
3. Detonation of production holes shall be on a delay sequence toward a free face.
4. Stemming material used in production holes shall be sand or other dry angular granular material, all of which passes 3/8 inch sieve.
5. It is the Contractor's responsibility to take all necessary precautions in the production blasting so as to minimize blast damage to the final face.
6. Payment for production blasting shall be incidental to the contract unit price for unclassified excavation.
7. Where appropriate to minimize damage beyond the final lines, a line of buffer holes shall be drilled on a parallel plane adjacent to the pre-split holes. Buffer hole diameters shall be between 2 1/2 and 3 inches. The line of buffer holes shall be drilled an appropriate distance out from the final line and spaced 3 to 6 feet center to center. The explosive loads in these holes shall not exceed fifty (50) percent of the full explosive load that could be placed in a 3 inch production hole. Detonation of the buffer holes shall be on a delay sequence toward a free face.

**5.0 SPECIAL REQUIREMENTS****A. Pre-Blast Condition Survey**

1. Arrange for a pre-blast survey of any nearby buildings, structures, wells, or utilities, which may potentially be at risk from blasting damage. Use the survey method acceptable to the Contractor's insurance company. Provide survey records to the Engineer for review. Notify occupants of local buildings prior to the commencement of blasting.
2. Pre-blast surveys are considered incidental to the contract, and no additional payment shall be made.

**B. Vibration Control and Monitoring**

1. When blasting near buildings, structures, or utilities which may be subject to damage from blast induced ground vibrations, control ground vibrations by the use of properly designed delay sequences and allowable charge weights per delay. Use allowable charge weights per delay based on vibration levels which will not cause damage. Carry out trial blasts and measure vibration levels to establish the allowable charge weights per delay. Conduct trial blasts in conformance with the blasting test section requirements of Section 2.0 (C) of these special provisions and modified as required to limit ground vibrations to a level which will not cause damage.
2. Whenever vibration damage to adjacent structures is possible, monitor each blast with an approved seismograph located, as approved, between the blast area and the closest structure subject to blast damage. Use seismograph capable of recording particle velocity for three mutually perpendicular components of vibration in the range generally found with controlled blasting.
3. Peak particle velocity of each component must not exceed the safe limits of the nearest structure subject to vibration damage. Employ a qualified vibration specialist to establish the safe vibration limits. The vibration specialist must also interpret the seismograph records to insure that the seismograph data shall be effectively utilized in the control of the blasting operations with respect to the existing structures. Use a vibration specialist subject to the Engineer's approval.
4. Furnish data recorded for each shot in an organized format to the Engineer within 24 hours after each blast and include the following:
  - (1) Identification of instrument used.
  - (2) Name of qualified observer and interpreter.
  - (3) Distance and direction of recording station from blast area
  - (4) Type of ground at recording station and material on which the instrument is sitting.

- (5) Maximum particle velocity in each component.
  - (6) A dated and signed copy of photographic records of seismograph readings.
5. The Engineer will, as necessary, monitor blasting operations with an engineering seismograph. In order to facilitate such work, give the Engineer seven days advance notice before the initial blasting is performed and 24 hours notice of subsequent blasting operations.

Cooperate with the Engineer in establishing a signal system which will allow vibrations to be effectively monitored.

The monitoring of blast vibrations by the Engineer or the submission of blast reports by the Contractor will not relieve the Contractor of his responsibilities as defined in Article 107-11.

C. Air-blast and Noise Control

1. Where appropriate, install an air-blast monitoring system between the main blasting area and the nearest structure subject to blast damage or annoyance. Use specifically manufactured equipment for the purpose of taking the air-blast measurements. Retain peak overpressure below 0.05 psi at the nearest structure or other designated location. Use appropriate blasthole patterns, detonation systems, and stemming to prevent venting of blasts and to minimize air-blast and noise levels produced by the blasting operations. Decrease the overpressure limits if it proves too high based on damage or complaints. Furnish a permanent signed and dated record of the peak overpressure measurements to the Engineer immediately after each shot.
2. Airblast monitoring is considered incidental to the contract, and no additional payment will be made.

D. Flyrock Control

Before the firing of any blast in areas where flying rock may result in personal injury or unacceptable damage to property or the work, the Contractor must take all necessary precautions to prevent flyrock.

## 6.0 METHOD OF MEASUREMENT

The quantity of Pre-Splitting of Rock to be paid for will be the actual number of square yards of rock face measured along the design lines of the cut from the bottom of the ditch or rock catchment area to the crest of the final line cut which has been pre-split. No additional payment will be made for additional area around irregularities on the face, or resulting from overbreaks, or from faces produced by offsets between lifts.

**7.0 BASIS OF PAYMENT**

Payment for production blasting shall be incidental to the contract unit price for unclassified excavation.

Payment for scaling is considered incidental to the contract unit price for unclassified excavation.

The quantity of pre-splitting, measured as provided in Section 6.0 will be paid for at the contract unit price per square yard for "Pre-Splitting of Rock".

Such price and payment will be full compensation for all materials, explosive, labor, tools, and equipment needed. Quantities shown on the plans and in the contract documents are based on the anticipated heights of the cuts from limited field investigations. Actual quantities may vary and will depend on actual field conditions.

Pre-splitting of Rock.....Square Yard

**SOIL PLATING OF ROCK EMBANKMENTS:**

Plate all embankments constructed of Class VII select material with soil as shown on the details in the plans and as directed by the Engineer.

The soil material shall be earth material derived from the project. The soil plating shall contain no rocks greater than 2 inches in diameter.

No additional compensation will be made for any requirements for furnishing and placing soil material as the cost of such work shall be included in the contract unit price per cubic yard for "Unclassified Excavation".

**TOE BENCHING EXCAVATION:**

**1.0 DESCRIPTION**

Excavate material necessary for the formation of benches in the existing ground beneath proposed embankments in order to increase the bond between the existing ground and the proposed embankment.

**2.0 CONSTRUCTION METHODS**

When embankments are to be placed and compacted on hillsides, or when new embankments are to be compacted against existing embankment, or when embankment is built in part widths, or at other locations designated by the Engineer, excavate benches in the existing ground in accordance with the detail shown on the plans and as directed by the Engineer.

Use where practical all material removed in the excavation in the formation of embankments. No excavation shall be wasted except as permitted by the Engineer. Disposed of waste material in a manner, which will not cause damage to adjacent property, nor mar the appearance of the completed roadway.

**3.0 METHOD OF MEASUREMENT**

The quantity of excavation to be paid for will be the actual number of cubic yards of materials, measured in their original position and computed by the average end area method, which have been acceptably excavated in accordance with the plans and specifications or as directed by the Engineer. Original cross-sections for the determination of excavation quantities will be taken before any grading begins. Final cross-sections will be the sections required by the plans or directed by the Engineer.

The upper bound of the benching excavation is the point at which the 5' by 5' typical benches as shown on the plans intersect the existing ground line.

No measurement will be made of any materials excavated outside of authorized excavation limits, or of any materials excavated before stakes have been set.

**4.0 BASIS OF PAYMENT**

The quantity of excavation, measured as provided for above, will be paid for at the contract unit price per cubic yard for "Toe Benching Excavation". The above prices and payments will be full compensation for all work covered by this section, including but not limited to excavation, blasting, and hauling; disposal of materials; removal and disposal of stumps and the formation and compaction of embankments.

Payment will be made under:

Toe Benching Excavation.....Cubic Yard

**LAUNCHED SOIL NAILS FOR SLOPE REPAIR:**

**1.0 GENERAL**

The work under this provision consists of design, plan preparation, and construction of launched soil nails for slope repairs at the locations indicated in these provisions and as directed by the Engineer.

Do no disturb the terrain or vegetation adjacent to the repaired slopes.

The approximate beginning and the end of the stations for slope repairs are listed below and may be adjusted in the field as directed by the Engineer.

Station: From 170+50 -L- to 172+50 -L-



Submit 5 copies of design plans and calculations to the Engineer for review and approval in accordance with Section 105-2 of the Standard Specifications. Prepare and seal the plans and calculations using a North Carolina Registered Professional Engineer. Notification of the acceptance or rejection of the design will be within 40 calendar days of the Engineer's receipt of the design submittal.

Schedule a preconstruction conference with the Contractor, the launched soil nails Subcontractor, the Resident Engineer, the DOT Inspector, the Division Construction Engineer, the Division Maintenance Engineer, the Area Bridge Construction Engineer and the representative from the Geotechnical Engineering Unit to discuss construction and inspection of the launched soil nails.

## **2.0 LAUNCHED SOIL NAILS APPLICATION LIMIT**

The application of the launched soil nails for roadway embankment slope repair is limited to 1:1 (H:V) or flatter slopes.

## **3.0 QUALITY ASSURANCE**

The superintendent of this work is required to have a minimum of three years experience and the soil nail launcher operators and on-site supervisors are required to have a minimum of one year experience installing launched soil nails. Submit a list identifying the superintendent, soil nail launcher operators, and on-site supervisors assigned to the project before starting the work. Summarize each individual's experience sufficiently for the Engineer to evaluate the individual's qualifications.

All nozzlemen are required to have at least one year of continuous experience in similar shotcrete application work and demonstrate ability to satisfactorily place the material in accordance with the recommendations of ACI 506.3R Guide to Certification of Shotcrete Nozzlemen. Submit resume, copy of certificate and work experience, within the last five years, of proposed Nozzlemen for approval.

Do not start work or order materials until the Engineer approves the personnel qualifications. The Engineer may suspend the work if non-approved personnel are substituted for approved personnel. No adjustments in the contract time or costs resulting from the work suspension will be allowed.

## **4.0 DESIGN CRITERIA**

Review all available subsurface information and conduct additional investigations, as needed before beginning design.

Design the launched soil nails for slope repair in accordance with the following references.

- Application Guide for Launched Soil Nails, USDA Forest Service, EM 7170-12A, FHWA-FPL-93-003, July 1994

- Project Report for Launched Soil Nails – 1992 Demonstration Project, USDA Forest Service, EM 7170-12B, FHWA-FPL-93-004, July 1994
- Manual for Design and Construction Monitoring of Soil Nail Walls, FHWA, Report No. FHWA-SA-96-096
- John E. Steward and J. Mauricio Ribera, Launched Soil Nails: New Method for Rapid Low-Impact Slope Repairs, *Proceeding, Sixth International Conference on Low-Volume Roads*, National Academy Press, Volume 2, 1995, pp 240-251.

Nails extending beyond the Right of Way or easement line are not allowed.

Shotcrete facing must have a minimum of **4 inches** in thickness and must be reinforced with welded wire mesh. Geocomposite drainage strips at a maximum 10 foot spacing are required behind the shotcrete.

Prepare plans to include but not limited to the following:

- Elevation views showing all nail locations, existing ground line elevations and stations.
- Plan views.
- Typical section views showing shotcrete, nail locations, nail inclinations and drainage details, etc.
- Details of drainage strips.
- Verification test nail locations and test apparatus details.
- Construction sequence.

## 5.0 CONSTRUCTION SUBMITTALS

Provide the following submittals for the Engineer's review and approval. Resubmit all changes or deviations from the reviewed submittals for approval by the Engineer. Slope repair construction will not be allowed to begin until all submittal requirements are satisfied and found acceptable to the Engineer. No adjustments in contract time will be allowed due to incomplete submittals. Items listed below that have been included on the prepared plans and have been found acceptable need not be resubmitted.

Submit the following to the Engineer at least **21** calendar days before initiating the work:

- A. Proposed schedule and detailed construction sequences.
- B. Launched soil nail testing methods and equipment including:
  - Details of the jacking frame and appurtenant bracing.
  - Details showing methods of isolating test nails during shotcrete application (i.e., methods to prevent bonding of the launched soil nail and the shotcrete).
  - Equipment list.
- C. Provide the identification number and certified calibration records for each load cell, test jack pressure gauge, and jack master pressure gauge to be used. Include the date tested, device identification number and certified calibration test results for an

accuracy of at least two percent of the applied certification loads by a qualified independent testing laboratory no earlier than 30 days prior to submittal.

- D. Certified mill test results for nails together with properly marked samples from each heat specifying the ultimate strength, yield strength, elongation and composition.
- E. Shotcrete Placement (if needed):
- Written documentation of the nozzle men's qualifications. Resubmit at any subsequent time for new or additional nozzle men.
  - Location and thickness of shotcrete.
  - Proposed methods of shotcrete placement and of controlling and maintaining facing alignment.
  - Shotcrete mix design including:
    - a. Type of Portland cement.
    - b. Aggregate source and gradation.
    - c. Proportions of mix by weight and water-cement ratio.
    - d. Proposed admixtures, manufacturer, dosage, technical literature.
  - Compressive strength test results verifying the 3-day and 28-day compressive strengths.
  - Previous strength test results for the proposed shotcrete mix completed within one year of the start of shotcreting may be submitted for initial verification of the required compressive strengths at start of production work.
- F. Complete engineering data for the drainage geotextile and geocomposite drain strip including a one (1) ft square sample, manufacturers' certificate of compliance, and installation instructions (if used).
- G. Certifications of Compliance for weep hole drainage pipes and curing compounds (if used).
- H. Specification and data on equipment including shotcreting and compressed air equipment, proposed access arrangements, and capacities.

## 6.0 MATERIALS

All materials shall conform to the requirements of the applicable sections of the Standard Specifications for Roads and Bridges of the North Carolina Department of Transportation and the following provisions.

### A. Launched Soil Nails

Furnish launched soil nails that are either solid or hollow steel bars with a nominal outer diameter up to 1.5 inches and up to 25 feet or longer in length. The minimum wall thickness of hollow steel nails is 0.120 inches. Use AASHTO M31, Grade 60, 75 or higher, threaded or un-threaded steel bars without splices or welds. Use only new, straight, undamaged, and galvanized or epoxy coated nails. Do not use cutoffs from previously driven nails.

## B. Shotcrete

Furnish shotcrete complying with the requirements of ACI 506.2, "Specifications for Materials, Proportioning and Application of Shotcrete", unless otherwise specified herein. Shotcreting consists of applying one or more layers of concrete conveyed through a hose pneumatically projected at a high velocity against a prepared surface, which is trimmed and cleaned.

Produce shotcrete by either a wet-mix or a dry-mix process. The wet-mix process consists of thoroughly mixing all the ingredients except accelerating admixtures, but including the mixing water, introducing the mixture into the delivery equipment and delivering it, by positive displacement, to the nozzle. Air jet the wet-mix shotcrete from the nozzle at high velocity onto the surface. The dry-mix process consists of producing shotcrete by delivering the dry ingredients conveyed through hose pneumatically with the mixing water introduced at the nozzle. For additional descriptive information, refer to the American Concrete Institute ACI 506R "Guide to Shotcrete."

Use materials for shotcrete conforming to the following requirements:

Cement	AASHTO M85/ ASTM C150, Type I, II, III or V.
Fine Aggregate	AASHTO M6/ASTM C33 clean, natural.
Coarse Aggregate	AASHTO M80, Class B for quality
Water	Clean and Potable. AASHTO M157/ASTM C94
Chemical Admixtures	<p>Accelerator: Fluid type, applied at nozzle, meeting requirements of AASHTO M194/ASTM C494/ASTM C1141.</p> <p>Water-reducer and Superplasticizer: AASHTO M194/ASTM C494 Type A, C, D, E, F, or G</p> <p>Retarders: AASHTO M194/ ASTM C494 Type B or D.</p>
Mineral Admixtures	<p>Fly Ash: AASHTO M295/ASTM C618 Type F or C, cement replacement up to 35 percent by weight of cement.</p> <p>Silica Fume: ASTM C1240, 90 percent minimum silicon dioxide solids content, not to exceed 12 percent by weight of cement.</p>

Welded Wire Mesh                    AASHTO M55/ASTM A185 or A497.

Prepackaged Shotcrete            ASTM C928.

Deliver, store, and handle materials to prevent contamination, segregation, corrosion or damage. Store liquid admixtures to prevent evaporation and freezing.

Obtain Engineer's approval for the proposed mix design and method of placement before beginning shotcrete placement.

Use aggregate for shotcrete meeting the strength and durability requirements of AASHTO, as applicable, and the following gradation requirements:

Sieve Size	Percent Passing by Weight
1/2"	100
3/8"	90-100
No. 4	70-85
No. 8	50-70
No. 16	35-55
No. 30	20-35
No. 50	8-20
No. 100	2-10

Proportion the shotcrete to be pumpable with the concrete pump furnished for the work, with a cementing materials content of at least 24.3 pounds per cubic foot and water/cement ratio not greater than 0.50. Do not use admixtures unless approved by the Engineer. Thoroughly mix admixtures into the shotcrete at the rate specified by the manufacturer. Use only accelerators compatible with the cement used, non-corrosive to steel, and not promoting other detrimental effects such as cracking or excessive shrinkage. The maximum allowable chloride ion content of all ingredients is 0.10% when tested to AASHTO T260.

Provide shotcrete with a design compressive strength of 2000 psi in 3 days and 4000 psi in 28 days.

Batch aggregate and cement by weight or by volume in accordance with the requirements of ASTM C94 or AASHTO M241/ASTM C685. Use mixing equipment that thoroughly blends the materials in sufficient quantity to maintain placing continuity. Produce ready mix shotcrete complying with AASHTO M157. Batch, deliver, and place shotcrete within 90 minutes of mixing. The use of retarding admixtures may extend application time beyond 90 minutes if approved by the Engineer.

Premixed and packaged shotcrete mix may be provided for on-site mixing. Use packages containing materials conforming to the Material section of this provision. Placing time limit after mixing is per the manufacturers' recommendations.

C. Geocomposite Drain, Weepholes and Drainage Pipe

Geocomposite Drain Miradrain 6200 or Equal.

Weep Hole ASTM 1785 Schedule 40 PVC, solid and perforated wall.

Drainage Pipe Cell classification 12454-B or 12354-C, wall thickness SDR 35, with solvent weld or elastomeric gasket joints.

## 7.0 HANDLING AND STORAGE

Carefully handle all steel reinforcement items and nail steel and store on supports to prevent contact with the ground. Damage to the nail steel as a result of abrasion, cuts or nicks, welds and weld spatter will be the cause for rejection. Grounding of welding leads to the nail steel will not be allowed. Protect nail steel from dirt, rust, and other deleterious substances at all times. Corrosion or pitting of the nails will be cause for rejection.

Provide drainage geotextile and geocomposite drains in rolls wrapped with a protective covering and stored in a manner which protects the fabric from mud, dust, dirt, debris, and shotcrete rebound. Do not remove protective wrapping until the geotextile or drain strip is installed. Avoid extended exposure to ultra-violet light. Label each roll of geotextile or drain strip in the shipment to identify that production run.

Store cement adequately to prevent moisture degradation and partial hydration. Do not use cement that is caked or lumpy.

## 8.0 CONSTRUCTION

A. Launched Soil Nails

Furnish launched soil nails, equipment and incidentals necessary to complete the work. Insert launched soil nails with a single stroke.

Install launched soil nails at the locations and to the lengths as shown in the plans or designated by the Engineer. Nails may be added, eliminated, or relocated as determined by the Engineer to accommodate actual field conditions.

Do not leave more than 4 feet of soil nail exposed after driving unless the Engineer directs otherwise. Cut off the exposed portion of installed nails flush with ground level or as directed by the Engineer. Dispose of the cut-off portions of the launch soil nails off the right of way at sites obtained by the Contractor at no additional cost to the Department. Do not use remaining lengths from cut nails for launch soil nails.

B. Shotcrete

Construct shotcrete with a minimum thickness of **4 inches** with welded-wire mesh **2 inches** from the surface. Do not begin shotcrete construction or incorporate materials into the work until the submittal requirements are satisfied and accepted by the Engineer. Any changes or deviations from the accepted submittals or re-submittals before proceeding with work are not allowed. No adjustments in contract time will be allowed due to incomplete submittals.

Ensure the minimum thickness of shotcrete using shooting wires, thickness control pins, or other devices acceptable to the Engineer. Install thickness control devices normal to the surface such that they protrude the required shotcrete thickness outside the surface. Ensure that the front face of the shotcrete does not extend beyond the limits established by the Engineer.

Clean the face of the excavation and other proposed shotcrete of loose materials, mud, rebound, over spray or other foreign matter that could prevent or reduce shotcrete bond. Protect adjacent surfaces from overspray during shooting. Avoid loosening, cracking, or shattering the ground during excavation and cleaning. Remove any surface material that is so loosened or damaged, to a sufficient depth to provide a base that is suitable to receive the shotcrete. Remove material that loosens as the shotcrete is applied. The cost of additional shotcrete is incidental to the work. Divert water flow and remove standing water so that shotcrete placement will not be detrimentally affected by standing water. Do not place shotcrete on frozen surfaces.

Maintain a clean, dry, oil-free supply of compressed air sufficient for maintaining adequate nozzle velocity at all times. Use equipment capable of delivering the premixed material accurately, uniformly, and continuously through the delivery hose. Control shotcrete application thickness, nozzle technique, air pressure, and rate of shotcrete placement to prevent sagging or sloughing of freshly-applied shotcrete.

Begin shotcrete production work only upon initial approval of the design mix and nozzlemen's qualifications and continue if the specified strengths are obtained. Suspend the shotcrete work if the test results of the work do not satisfy the strength requirements and change all or some of the following: the mix, the crew, the equipment, or the procedures. Before resuming work, submit additional test panels using the new crew, materials and/or methods that demonstrate to the satisfaction of the Engineer that the shotcrete in the panels satisfies the specified strength requirements. Provide all work required to obtain satisfactory strength tests at no additional cost to the Department.

Apply the shotcrete from the lower part of the area upward to prevent accumulation of rebound. Orient nozzle at a distance and approximately perpendicular to the working face so that rebound will be minimal and compaction will be maximized. Pay special attention to encapsulating reinforcement. Do not work rebound back into the construction. Where shotcrete is used to complete the zone of the nail near the face, position the nozzle to completely fill any voids.

A clearly defined pattern of continuous horizontal or vertical ridges or depressions at the reinforcing elements after they are covered with shotcrete will be considered an indication of insufficient reinforcement cover or poor nozzle techniques. In this case immediately suspend the application of shotcrete and implement corrective measures before resuming the shotcrete operations. Correct the shotcreting procedure by adjusting the nozzle distance and orientation, by insuring adequate cover over the reinforcement, by adjusting the water content of the shotcrete mix or other means. Adjustment in water content of wet-mix will require additional submittal and review of the shotcrete mix.

Repair shotcrete surface defects as soon as possible after placement. Remove and replace shotcrete that exhibits segregation, honeycombing, lamination, voids, or sand pockets. In-place shotcrete not meeting the specified strength requirement will be subject to remediation. Possible remediation options include placement of additional shotcrete thickness or removal and replacement, at no additional cost to the Department.

Taper construction joints uniformly toward the excavation face over a minimum distance equal to the thickness of the shotcrete layer. Provide a minimum reinforcement overlap at reinforcement splice joints as shown in the Construction Plans. Clean and wet the surface of a joint before adjacent shotcrete is applied. Where shotcrete is used to complete the top ungrouted zone of the nail drill hole near the face, to the maximum extent practical, clean and dampen the upper grout surface to receive shotcrete, similar to a construction joint.

Use either an undisturbed gun finish as applied from the nozzle or a rough screeded finish. Remove shotcrete extending into the CIP finish face section beyond the tolerances specified herein.



Do not place shotcrete if the ambient air or ground temperature is below 40° F. Maintain cold weather protection if the temperature after place is below 40° F until the in-place compressive strength of the shotcrete is greater than 725 psi. Cold weather protection includes blankets, heating under tents, or other means acceptable to the Engineer. Deposit the shotcrete mix at a temperature of not less than 50° F or more than 100° F.

Suspend shotcrete application during high winds and heavy rains unless suitable protective covers, enclosures or wind breaks are installed. Remove and replace newly placed shotcrete exposed to rain that washes out cement or otherwise makes the shotcrete unacceptable. Provide a polyethylene film or equivalent to protect the work from exposure to adverse weather.

Meet all Federal, State, and Local safety code requirements.

### C. Drainage Network

The drainage network consists of installing prefabricated geocomposite drainage strips and weep hole drain pipes as shown in the plans or as directed by the Engineer. Install all elements of the drainage network before installing shotcrete.

#### 1. Geocomposite Drain Strips

Install geocomposite drain strips as shown in the plans. Place drain strips at construction joints such that the joint is aligned as close as practical along the middle of the longitudinal axis of the drain strip.

Secure at least 12 inches wide geocomposite drain strips to the cut face with the geotextile side against the ground before shotcreting. Use at least 8 inches long securing pins with a 1.5 inch diameter head and installed on a minimum grid pattern of 24 inches on center. Use only continuous drain strips. Use splices with a 12 inch minimum overlap such that the flow is not impeded.

When the drain strips cannot be secured tight against the slope face, place polyethylene film over the drain edges to prevent excess shotcrete from entering the sides of the drain. Alternatively, the drains may be installed in 16 inch wide strips and the film omitted.

#### 2. Weep Hole Drainage Pipes

Install weep hole drainage pipes at locations shown in the plans or as directed by the Engineer. Use no more than 10 feet between weep holes. Use pipe lengths of solid PVC pipe installed to direct water from the geocomposite drain strips to the outside of the shotcrete facing. Connect pipes to the drain strips by installing prefabricated drain grates in accordance with the drain strip manufacturer's recommendations. Seal

joints between the drain grate, the drain strips and the drainage pipe to prevent shotcrete intrusion. Installation of additional weep holes will be required, for any geocomposite drainage boards that are damaged and may cause interruption in flow as determined by the Engineer. The Department will make no additional payment for this work or additional materials.

## 9.0 NAIL TESTING

Proof testing of 5% of the nails is required. Supply all material, equipment, and labor to perform the tests. Collect all required proof test data in the presence of the Engineer.

Testing equipment includes two dial or vernier gauges, a dial gauge support, jack, pressure gauge, master pressure gauge and a reaction frame.

Provide a minimum of two dial or vernier gauges capable of measuring to 0.001 inch (0.025 mm) at the site to measure the nail movement. The dial gauges must have a minimum stroke of 3 inches (75 mm). The dial gauges must be aligned within five degrees from the axis of the nail and supported independent of the jacking set-up and the wall. Use a hydraulic jack and pump to apply the test load.

The jack and pressure gauge must be calibrated as a unit by an independent testing laboratory. The pressure gauge must be graduated in 100-psi (700 kPa) increments or less and have a range not exceeding twice the anticipated maximum pressure during testing unless otherwise approved by the Engineer. Use the pressure gauge to measure the applied load. The minimum ram travel of the jack must not be less than 4 inches (100 mm). The jack must be capable of applying each load in less than one minute.

Independently support and center the jack over the nail so that the nail does not carry the weight of the jack. A calibrated master pressure gauge must also be kept at the site. Calibrate the master gauge with the test jack and pressure gauge as a unit. Use the load cell to maintain constant load hold throughout the creep test. Provide recent calibration curves in accordance with Section 2. Place the stressing equipment over the nail in such a manner that the jack, bearing plates, load cell and stressing anchorage are in alignment. Position the jack at the beginning of the test such that unloading and repositioning of the jack during the test will not be required.

Provide a reaction frame sufficiently rigid and of adequate dimension such that excessive deformation of the test apparatus requiring repositioning of any components does not occur. No part of the reaction frame must bear within 6 inches (150 mm) of the edge of the test nail unless otherwise approved by the Engineer.

The design load during testing will be determined by the following equation:

$$DTL = L_B \times A_D$$

Where: DTL = Design Test Load  
 L<sub>B</sub> = As-Built Test Length (ft or m)  
 A<sub>D</sub> = Design Adhesion (lb/ft or kN/m)

Proof testing is required on at least five percent of the production nails in each excavation lift to verify the Contractor’s methods and the assumed design nail capacity. No less than one nail will be tested in each lift. The locations and number of these tests will be determined by the Engineer.

Perform proof tests by incrementally loading the nail to 150 percent of the design test load. The nail movement at each load will be measured and recorded by the Engineer. At load increments other than maximum test load, hold the load long enough to obtain a stable reading. Incrementally load for proof tests in accordance with the following schedule.

<u>LOADING</u>	<u>HOLD TIME</u>
<u>LOAD</u>	
AL	Until Stable
0.25DTL	Until Stable
0.50DTL	Until Stable
0.75DTL	Until Stable
1.00DTL	Until Stable
1.25DTL	Until Stable
1.50DTL	10 or 60 minutes

The alignment load (AL) should be the minimum load required to align the testing apparatus and should not exceed five percent of the design load (DTL). Dial gauges should be “zeroed” after the alignment load has been applied.

Maintain all load increments within five percent of the intended load. Depending on performance, perform either 10 minute or 60 minute creep tests at the maximum test load (1.50 DTL). Start the creep period starts as soon as the maximum test load is applied and measure and record the nail movement at 1, 2, 3, 5, 6 and 10 minutes. Where nail movement between one minute and 10 minutes exceeds 0.04 inches (1 mm), the maximum test load must be maintained an additional 50 minutes and movements recorded at 20, 30, 50 and 60 minutes.

Extended creep testing time may be required for borderline plastic soils as noted on the plans or directed by the Engineer.

A test nail will be considered acceptable when:

1. (a) a total creep less than 0.04 inches (1 mm) is observed between the one and 10 minute readings creep test, or a creep rate less than 0.08 inches (2 mm) per log cycle of time is observed during the 60 minute creep test between six and 60 minute readings and; (b) the creep rate is linear or decreasing throughout the creep test load hold period.
2. A pullout failure does not occur at the maximum test load. Pullout failure load is defined as the load at which attempts to increase the test load simply result in continued excessive pullout movement of the test nail. The pullout failure load must be recorded as part of the test data.

Nails which fail must be abandoned and replaced with new proof test nails. Also, the Engineer may require that additional proof testing be conducted to verify that adjacent nails have sufficient load carrying capacity. Modifications may be required including installing additional test or production nails, or installing longer production nails.

## 9.0 SAMPLING

Acceptance of the launch soil nails will be by proof testing, by Manufacturer's and/or Vendor's certification to the Engineer stating the material composition conforms to this provision and by visual inspection of the in place nails by the Engineer.

Acceptance of shotcrete will be by visual inspection by the Engineer of the work, preconstruction test panels (for nozzle men without previous ACI certification), and production test panels from the wall facing. Perform shotcreting of test panels using qualified personnel in the presence of the Engineer. Furnish at least one production test panel during the first production application of shotcrete. Construct the production test panels simultaneously with the shotcrete facing installation at times designated by the Engineer. Make production test panels with minimum dimensions of 18"x18" square and at least 4" thick.

Materials found not in compliance with the requirements of this Contract may be rejected, removed and replaced at the Vendor's expense, or accepted at a reduction in Contract price determined by the Engineer.

## 10.0 METHOD OF MEASUREMENT AND BASIS OF PAYMENT

### A. Launched Soil Nails

The Engineer will measure the Launched Soil Nails in individual nails, each. Upon receipt of proper invoices, the Department will pay for the materials delivered and accepted at the Contractor's unit bid price per Launched Soil Nail. The Department will not make payment for partial deliveries. Payment at the Contract unit price each will be full compensation for all labor, materials, equipment, and incidentals to furnish and place Launched Soil Nails.

Payment will be made under:

“Launched Soil Nail” .....Each

B. Shotcrete

The Engineer will measure the surface area of the shotcrete in square feet. Upon receipt of proper invoices, the Department will pay for the materials delivered and accepted at the Contractor’s unit bid price per Launched Soil Nail. The Department will not make payment for partial deliveries.

Payment at the contract unit price per square foot will be full compensation for all materials, labor, equipment, geocomposite drainage strips, weep holes, reinforcing steel, shotcrete, any preparatory trimming and cleaning of soil/rock surfaces, shotcrete cold joints and all incidentals for placing shotcrete around the launched soil nails and the repaired slopes.

Payment will be made under:

“Shotcrete for Launched Soil Nail”.....Square Feet

**ROCKFALL CONTROL FENCE:**

**1.0 DESCRIPTION**

Design, prepare plans, furnish, and install energy absorbing Rockfall Control Fence system at approximate locations listed in these Special Provisions and at exact locations as directed by the Engineer. Work includes all barrier components, ring nets, steel posts, concrete foundations, anchors, and all other materials, labor, tools, equipment, and incidentals to complete the work.

STATION	TO	STATION	SIDE	SLOPE
28+50		40+50	RT	1.0:1
41+50		47+00	RT	0.5:1
71+00		74+50	RT	1.0:1
76+00		78+50	RT	1.0:1
301+50		305+00	RT	1.0:1
305+50		322+50	RT	0.5:1
318+00		322+50	LT	1.0:1
330+00		333+50	RT	0.5:1

## 2.0 GENERAL

Provide a rockfall control fence system with a minimum height of 10 feet and of sufficient structural capacity to absorb impact design loads of 92 foot-tons (250 kJ) of kinetic energy without the passage of particles larger than 4 inches (100 mm) in diameter through the barrier and with little or no maintenance required. Provide a system that is a free standing structure in which all supports and anchors lie within the plane of the barrier, not extending back towards the slopes, unless otherwise directed by the Engineer, to preserve access to the catchment area between rock barrier and rock slopes.

Provide the manufacturer test data for the system design demonstrating satisfactory performance in a similar application and capacity. Select a manufacturer engaged in designing and manufacturing rockfall protection systems, having a minimum of five (5) years of documented experience with manufacturing of such systems used in a similar application and capacity. Supply written evidence from manufacturer demonstrating certification of a quality assurance program, as well as proof and validity of seller's liability insurance.

Submit eight sets of complete working drawings/shop plans, erection plans and design calculations, sealed by a North Carolina Registered Professional Engineer, for review and approval prior to beginning rockfall control fence system work. Allow 40 calendar days for review and approval from the date they are received by the Engineer until they are returned to the Contractor.

The Resident Engineer will schedule a Preconstruction Conference with representatives from the Contractor, the Rockfall control fence system Supplier, and the Geotechnical Engineering Unit to discuss construction details and inspection of the rockfall control fence system.

Provide all necessary materials from the Supplier chosen.

Obtain from the Supplier technical instruction and guidance in preconstruction activities, including the Preconstruction Conference, and on-site technical assistance during construction. Follow any instructions from the Supplier closely unless otherwise directed by the Engineer.

## 3.0 MATERIALS

### A. Ring Nets

Construct nets from interlocking steel rings, each ring with a diameter of 12 inches (300 mm). Rings must be composed of steel wire coiled into a loop. Fasten three steel clips around each ring to hold the ring together. Connect each ring to the four adjoining rings by passing through them.

Use wire with high tensile strength carbon steel wire with a nominal 0.118-inch (3 mm) diameter and the minimum breaking strength of the wire must be 256,000 psi (1,770 N/mm<sup>2</sup>).

Galvanize wire with a zinc/aluminum super coating and the minimum weight of the coating must be 0.655 oz/ft<sup>2</sup> (200 g/m<sup>2</sup>).

B. Wire Mesh

Cover nets with chain link mesh material, which must be attached to the wire rope netting and fastened with galvanized hog rings and/or galvanized tie wire on 2-foot centers horizontally and vertically. The chain link fabric must meet the requirements of Section 1050 of the NCDOT Standard Specifications. Chain link material must be 2 inch; 9-gauge minimum and in accordance with AASHTO M181-90, and be zinc coated in accordance with A392-84, Class 1 Standards.

C. Net Support Columns

Fabricate columns from WF 10x60 or better wide flange structural members meeting ASTM A36 or better for preformed steel shapes.

Weld cable guides to the columns (top and bottom), fabricate from extra strong pipe meeting ASTM A53, Grade B, or A106 requirements and have a removable cover plate for ease of maintenance.

Fabricate columns with a detachable foundation base plate with breakaway shear assembly unless a direct bury column foundation is designed.

All steel shapes must comply with ASTM A36-84 and bolts, nuts and washers to ASTM A325-86.

D. Net Support Ropes

Top and bottom net support ropes must each incorporate a factory swedged eye at one end and braking elements throughout, and be manufactured from ¾" diameter wire rope, 6x19 construction (or equivalent), IWRC and have a minimum breaking strength of 52,920 lbs. Verify braking element design through testing to ensure satisfactory performance and a minimum of required maintenance.

E. Lateral Support Ropes

Lateral support ropes must incorporate a factory swedged eye on one end and be manufactured from ¾" diameter rope. The lateral support ropes must be of 6x19 construction (or equivalent), IWRC and have a minimum breaking strength of 52,920 lbs.

F. Retaining Ropes (as directed by the Engineer)

Retaining ropes must incorporate a factory swaged eye on one end and a braking element and be constructed of ¾" diameter rope. The retaining ropes must be of 6x19 construction (or equivalent), IWRC and have a minimum breaking strength of 52,920 lbs.

G. Rock and Soil Anchors

Wire Rope Anchors must incorporate a factory swaged eye on one end and be manufactured from ¾" diameter rope. The wire rope anchors must be of 6x19 construction (or equivalent), IWRC and have a minimum breaking strength of 52,920 lbs.

Anchors must have minimum pullout strength of 20 tons and be verified by the Contractor in the field. Pullout testing is required on a minimum of 20% of the production anchors. If more than 25% of the tested anchors fail, all anchors must be tested. Replace failed anchors at no additional cost to the Department. Perform testing against a temporary yoke or load frame. No part of the yoke or load frame may bear within 3 feet of the anchor.

H. Miscellaneous Materials

Supply all miscellaneous hardware such as wire rope clips, thimbles, bolts, etc. with the system.

I. Shackles

Use shackles to fasten the ring nets to each other and to the net support ropes. Use 5/8" shackles or better along the top and bottom of each net. Use ½" shackles or better along the sides of each net.

J. Wire Rope Specifications

All wire rope for the support ropes, lateral support ropes and wire rope anchors must conform to requirements of Federal Specifications RR-W-410D or equivalent.

K. Corrosion Protection

All wire ropes must conform to requirements of Federal Specification RR-W-410D for wire rope. Hog rings or tie wire must be supplied with zinc coating meeting the requirements of ASTM A641-92.

Hot dip galvanize all miscellaneous material associated with the rockfall system such as wire rope clips, bolts, nuts, thimbles, etc.



Where the system is exposed to corrosive elements such as salt spray or where the owner determines it necessary, coat all ropes and nets with a wire rope protectant by the Manufacturer.

#### 4.0 CONSTRUCTION METHODS

Perform the foundation work for the columns and rock and soil anchors in accordance with the typical cross sections shown on the approved working drawings. The distance from centerline to centerline of the columns must be kept as close as possible to that shown on the approved working drawings. The spacing cannot exceed  $\pm 3$  inches of the distance as indicated on the approved working drawings.

Prior to placing foundation concrete all loose soil or rocks must be removed from the holes. The minimum concrete strength is to be 4500 psi. The concrete must meet the requirements of Section 825 of the NCDOT Standard Specifications. Prior to attaching any cables or netting to the column, cure the foundation concrete a minimum of 7 days or as directed by the Engineer.

##### Rockfall System Installation

- Step 1: Locate and install foundations, columns and anchors in accordance with the approved working drawings. The columns must not vary from the indicated pitch or from vertical by more than 2 inches from the top to bottom of the column and must not deviate more than  $\pm 3$  inches from centerline to centerline of the columns.
- Step 2: After the columns are properly set, install the lateral ropes, retaining ropes and support ropes through the cable guide assemblies on the columns as indicated on the working drawings. Using the supplied wire rope clips, tension the lateral ropes, retaining ropes and support ropes and fasten the ropes as shown on the approved working drawings. The distance from the column to the braking elements must not exceed 5 feet. Tension the lateral ropes before tensioning the support ropes. Tension all ropes as necessary to eliminate slack, and tension the support ropes until there is no sag in the ropes.
- Step 3: Position the top row of rings on each net to the top support rope connecting each ring to the support rope with 5/8" shackles or better. Attach the bottom of the nets to the bottom support rope in a similar manner. Use 5/8" shackles or better to attach the nets to the side vertical support rope (at end posts). Using 1/2" shackles or better, attach the sides of each net to the adjacent net (ring to ring). The first of these side shackles should be used to hold the top corners of each two adjacent nets together. Finally, remove any temporary fasteners that have been used.

- Notes: a. Do not attach the nets to the cable guide assemblies or to the columns.
- b. Bottom support rope braking elements should be oriented vertically and tied to the ring nets using tie wire or plastic ties. Do not use shackles or wire rope clips! This is done for maintenance and/or aesthetic reasons.

Step 4: Position and attach the chain link mesh to the ring nets as indicated on the working drawings. As an option, position the chain link against the ring nets and seam it to the support ropes when the nets are seamed. Using hog rings or tie wire fasteners or other approved fastener, attach the chain link to the nets on two-foot center, horizontally and vertically.

Step 5: Make sure that the system is properly tightened and the installation appearance looks aesthetically pleasing to the surrounding area to the satisfaction of the Engineer.

## **5.0 SPARE PARTS**

Supply the following spare parts are to be for the system:

- (12) Braking Element Replacement Kits
- (12) 10-ft x 20-ft Sections or as directed by Engineer of Replacement Ring Nets
- (20) Wire Rope Anchors
- (10) Structural Steel Column

Spare parts are to become the property of the Department. Provide spare parts to NCDOT Division 11 Maintenance personnel or as directed by the Engineer. Cost of spare parts to be included in the unit price bid for Rockfall Control Fence.

## **6.0 METHOD OF MEASUREMENT**

The quantity of Rockfall Control Fence to be paid for will be the actual number of linear feet of fence, measured in place from center of end support column to center of end support column at each fence location, which has been completed and accepted.

## **7.0 BASIS OF PAYMENT**

The quantity of Rockfall Control Fence measured as provided for above, will be paid for at the contract unit price per linear foot for "Rockfall Control Fence."

The above price and payment will be full compensation for all work covered by this provision including but not limited to furnishing and installing all wire rope netting, wire support rope, clips and other hardware, support columns, drilling, concrete, wire rope

anchors, cable guide assemblies, spare parts, and any other materials necessary to install a complete system ready to use.

Payment will be made under:

Rockfall Control Fence.....Linear Foot

**BUILDING REMOVAL:**

**01-01-02**

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

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 Epidemiology, Asbestos Hazard Management Branch and/or the appropriate county agency when enforcement of the Federal Regulation is performed by the county. Submit a copy of the notification to the Engineer prior to the building removal.

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 cost of asbestos removal and disposal will be paid for in accordance with Article 104-7 of the Standard Specifications. Perform removal and disposal of asbestos in accordance with the requirements of Title 40 Code of Federal Regulations.

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.

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.

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 Environmental Management, Groundwater 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 dispose of in compliance with the regulations set forth in Title 40, Code of Federal Regulations, Part 280.71 and North Carolina Administrative Code 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 Environmental 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 API Bulletin 1604, will not be allowed. Where underground storage tanks are indicated below, there will be no direct payment for the closure or assessment. 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 cost of closure, assessment and/or removal will be paid for in accordance with Article 104-7 of the Standard Specifications.

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

**Building Removal (Item #1)**

Parcel #014. - Right of Approximate Survey Station 26+10, Survey Line L  
Billboard

**Building Removal (Item #2)**

Parcel #020 - Right of Approximate Survey Station 80+00, Survey Line L  
Billboard

**Building Removal (Item #3)**

Parcel #022 - Right of Approximate Survey Station 85+20, Survey Line L  
Metal Canopy

**Building Removal (Item #4)**

Parcel #022 - Right of Approximate Survey Station 86+82, Survey Line L  
Billboard

**Building Removal (Item #5)**

Parcel #023 - Right of Approximate Survey Station 90+35, Survey Line L  
One-Story Frame Dwelling

**Building Removal (Item #6)**

Parcel #025 - Right of Approximate Survey Station 101+70, Survey Line L  
One-Story Frame Dwelling

**Building Removal (Item #7)**

Parcel #032 - Left of Approximate Survey Station 116+48, Survey Line L  
Monopole Billboard

**Building Removal (Item #8)**

Parcel #032 - Left of Approximate Survey Station 117+20, Survey Line L  
Frame Shed

**Building Removal (Item #9)**

Parcel #032 - Left of Approximate Survey Station 117+35, Survey Line L  
Frame Shed

Building Removal (Item #10)

Parcel #032 - Left of Approximate Survey Station 117+70,. Survey Line L  
One Story Frame Building

Building Removal (Item #11)

Parcel #032 - Left of Approximate Survey Station 118+25, Survey Line L  
Quonset

Building Removal (Item #12)

Parcel #032 - Left of Approximate Survey Station 118+80, Survey Line L  
One-Story Frame Business

Building Removal (Item #15)

Parcel #036 - Right of Approximate Survey Station 127+50, Survey Line L  
One-Story Frame Dwelling

Building Removal (Item #16)

Parcel #039 - Left of Approximate Survey Station 138+60, Survey Line L  
Church Sign with Brick Foundation

Building Removal (Item #17)

Parcel #040 - Left of Approximate Survey Station 133+40, Survey Line L  
One-Story Brick Dwelling -- Located Partially Outside of the R/W and Construction Line

Building Removal (Item #18)

Parcel #039, - Right of Approximate Survey Station 138+30, Survey Line L  
One-Story Frame Dwelling - Located Partially Outside of the R/W & Construction Line

Building Removal (Item #19)

Parcel #044 - Right of Approximate Survey Station 140+40, Survey Line L  
One-Story Frame Dwelling

Building Removal (Item #20)

Parcel #048 - Right of Approximate Survey Station 154+25, Survey Line L  
One Story Brick Dwelling

Building Removal (Item #21)

Parcel #048 - Center Line of Approximate Survey Station 154+30, Survey Line L  
One-Story Frame Shed

Building Removal (Item #22)

Parcel #051 - Right of Approximate Survey Station 162+40, Survey Line L  
Mobile Home

Building Removal (Item #23)

Parcel #051 - Right of Approximate Survey Station 163+50, Survey Line L  
One-Story Frame Business - - Located Partially Outside of the R/W and Construction Line

Building Removal (Item #24)

Parcel #051 - Right of Approximate Survey Station 166+05, Survey Line L  
Billboard

Building Removal (Item #25)

Parcel #056 - Right of Approximate Survey Station 173+40, Survey Line L  
Billboard

Building Removal (Item #26)

Parcel #056 - Right of Approximate Survey Station 191+35, Survey Line L  
Billboard

Building Removal (Item #27)

Parcel #056 - Right of Approximate Survey Station 202+10, Survey Line L  
Billboard

Building Removal (Item #28)

Parcel #064 - Right of Approximate Survey Station 217+15, Survey Line L  
Billboard

Building Removal (Item #29)

Parcel #068 - Right of Approximate Survey Station 222+60, Survey Line L  
One-Story Block Dwelling

Building Removal (Item #30)

Parcel #074. - Right of Approximate Survey Station 227+30, Survey Line L  
Mobile Home

Building Removal (Item #31)

Parcel #074 - Right of Approximate Survey Station 228+40, Survey Line L  
One-Story Block/Frame Dwelling

Building Removal (Item #32)

Parcel #075 - Left of Approximate Survey Station 234+30  
One-Story Log Cabin - Located Partially Outside of the R/W and Construction Line

Building Removal (Item #33)

Parcel #077 - Right of Approximate Survey Station 237+30, Survey Line L  
Monopole Billboard

Building Removal (Item #34)

Parcel #082 - Right of Approximate Survey Station 255+35, Survey Line L  
Billboard

Building Removal (Item #35)

Parcel #082 - Right of Approximate Survey Station 256+45, Survey Line L  
Two-Story Frame Dwelling

**Building Removal (Item #36)**

Parcel #082 - Right of Approximate Survey Station 256+95, Survey Line L  
Shed

**Building Removal (Item #37)**

Parcel #082 - Right of Approximate Survey Station 257+32, Survey Line L  
Shed - Located Partially Outside of the R/W and Construction Line

**Building Removal (Item #38)**

Parcel #082 - Right of Approximate Survey Station 257+35, Survey Line L  
Shed

**Building Removal (Item #39)**

Parcel #082 - Right of Approximate Survey Station 265+85, Survey Line L  
Billboards - Located Partially Outside of the R/W and Construction Line

**Building Removal (Item #40)**

Parcel #086 - Right of Approximate Survey Station 268+00, Survey Line L  
One Story Brick Dwelling

**Building Removal (Item #41)**

Parcel #102 - Left of Approximate Survey Station 11+10, Survey Line Y-4  
One Story Brick Business

**Building Removal (Item #42)**

Parcel #102 - Left of Approximate Survey Station 11+30, Survey Line Y-4  
Brick Spring House

**Building Removal (Item #43)**

Parcel #118 - Left of Approximate Survey Station 347+70, Survey Line L  
One Story Brick Dwelling

**Building Removal (Item #44)**

Parcel #121 - Left of Approximate Survey Station 349+45, Survey Line L  
1 ½-Story Frame Dwelling

**Building Removal (Item #45)**

Parcel #121 - Left of Approximate Survey Station 350+10, Survey Line L  
One-Story Frame Garage

**Building Removal (Item #46)**

Parcel #125 - Left of Approximate Survey Station 354+50, Survey Line L  
One-Story Frame Dwelling

**Building Removal (Item #47)**

Parcel #125 - Left of Approximate Survey Station 355+85, Survey Line L  
Shed

When the description of the work of 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 Items No(s) 17, 18, 23, 34, 39 & 41.

The deletion of any sign item where a portion of same has been removed by other, the concrete or similar type base will then be removed by the contractor and the payment will be covered either under clearing and grubbing or unclassified excavation as appropriate.

SP2R15

**EXCAVATION OF ROCK BY USE OF EXPLOSIVES:**

1-01-02

The Contractor's attention is directed to Article 107-11 of the Standard Specifications.

In addition to the requirements of this Article, submit to the Engineer a written report after each blast that gives complete details of the blast procedure. Submit the blast report on forms provided by the Engineer within 24 hours after each blast.

The Engineer will, as necessary, monitor blasting operations with an engineering seismograph. In order to facilitate such work, provide to the Engineer seven days advance notice before the initial blasting is performed and 24 hours notice of subsequent blasting operations.

Cooperate with the Engineer in establishing a signal system that will allow vibrations to be effectively monitored.

The monitoring blast vibrations by the Engineer or the submission of blast reports by the Contractor in no way relieves the Contractor of his responsibilities as defined in Article 107-11.

SP2R20

**TEMPORARY DETOURS:**

7-1-95

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

Payment for the construction of the detours will be made at the contract unit prices for the various items involved. After the detours have served their purpose, remove the portions deemed unsuitable for use as a permanent part of the project as directed by the Engineer. Salvage within the right of way, as directed by the Engineer, for removal by State Forces. Pipe culverts and stockpile the aggregate base course removed from the detours at locations removed from the detours remain the property of the Contractor. Remove pipe culverts from the project when they are no longer needed. Place pavement and earth material removed from the detour in embankments or dispose of in waste areas furnished by the Contractor. Aggregate base course and earth material that is removed will be measured and will be paid for at the contract unit price per cubic yard (cubic meter) for "Unclassified Excavation". Pavement that is removed will be measured and will be paid for at the contract unit price per square yard (square meter) for "Removal of Existing Pavement". Pipe culverts that are removed will be measured and will be paid for at the contract unit price per linear foot (meter) for "Pipe Removal". Such prices and payments will be full compensation for the work of removing, salvaging, and stockpiling



The monitoring blast vibrations by the Engineer or the submission of blast reports by the Contractor in no way relieves the Contractor of his responsibilities as defined in Article 107-11. SP2R20

**TEMPORARY DETOURS:**

**7-1-95**

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

Payment for the construction of the detours will be made at the contract unit prices for the various items involved. After the detours have served their purpose, remove the portions deemed unsuitable for use as a permanent part of the project as directed by the Engineer. Salvage within the right of way, as directed by the Engineer, for removal by State Forces. Pipe culverts and stockpile the aggregate base course removed from the detours at locations removed from the detours remain the property of the Contractor. Remove pipe culverts from the project when they are no longer needed. Place pavement and earth material removed from the detour in embankments or dispose of in waste areas furnished by the Contractor. Aggregate base course and earth material that is removed will be measured and will be paid for at the contract unit price per cubic yard (cubic meter) for "Unclassified Excavation". Pavement that is removed will be measured and will be paid for at the contract unit price per square yard (square meter) for "Removal of Existing Pavement". Pipe culverts that are removed will be measured and will be paid for at the contract unit price per linear foot (meter) for "Pipe Removal". Such prices and payments will be full compensation for the work of removing, salvaging, and stockpiling aggregate base course; placing and removing pipe culverts; and for placing earth material and pavement in embankments or disposing of earth material and pavement in waste areas.

SP2R30

**SHALLOW UNDERCUT:**

**2-19-02<sub>R</sub>**

Perform undercut excavation and place a combination of fabric for soil stabilization and Class IV Subgrade Stabilization at locations as directed by the Engineer. Work includes performing undercut excavation, disposing of unsuitable material, furnishing and placing fabric for soil stabilization; and furnishing, placing and compacting Class IV Subgrade Stabilization.

**MATERIALS**

Fabric for Soil Stabilization.....	Section 270
Class IV Subgrade Stabilization.....	Section 1016-3, Class IV; or
	Material meeting gradation
	requirements of Table 520-1,
	Column C

**FALSE SUMPS:**

7-1-95c

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 yard (cubic meter) for "Unclassified Excavation or "Borrow Excavation" depending on the source of material, or included in "Grading-Lump Sum"

SP2R40

**SHOULDER AND FILL SLOPE MATERIAL:**

5-21-02

**General:**

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

Construct the top 6 inches (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 2 inches (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 sections 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 (cubic meter) for "Borrow Excavation" or "Shoulder Borrow" in accordance with the applicable provisions of Section 230 or Section 560 of the Standard Specifications. SP2R50

**REMOVE AND RESET EXISTING FENCE:** **7-1-95**

Description:

The Contractor shall remove and reset existing fence at locations shown in the plans and as directed by the Engineer.

Construction:

The fence, after resetting, shall be in a condition that is equal to or better than before the guardrail is removed. The Contractor shall replace any of the fencing components which have been unnecessarily damaged by him.

Method of Measurement:

The quantity of remove and reset existing guardrail to be paid for will be the actual number of linear feet of fence that has been removed, reset, and accepted. Measurement will be made after the fence has been reset, as provided in Section 866 of the Standard Specifications.

Basis of Payment:

The quantity of remove and reset existing fence, measured as provided above, will be paid for at the contract unit price per linear foot for "Remove and Reset Existing Fence". Such price and payment will be full compensation for removing and resetting the guardrail, and for furnishing all equipment, labor, and incidentals necessary to complete the work.

D8R12

Payment will be made under:

Remove and Reset Existing Fence.....Linear Foot

**PVC PIPE FOR SPRING BOX:**

**10-19-04**

Furnish and install PVC pipe in accordance with the Specifications, plans or as otherwise directed by the Engineer.

PVC pipe for spring box shall conform to the requirements of Section 1044-5 of the *Standard Specifications* and shall be installed in accordance with Section 815 of the *Standard Specifications*.

Method of Measurement:

**PVC pipe** for spring box will be measured in accordance with Section 815-4 of the *Standard Specifications*.

Basis of Payment:

**PVC pipe** for spring box will be paid for in accordance with Section 815-5 of the *Standard Specifications*.

Payment will be made under:

6" PVC for Spring Box .....Linear Feet SPI

**" (mm) WELDED STEEL PIPE:**

**1-15-02**

Use \_\_\_ " (mm) welded steel pipe as shown on the plans that conforms to Section 330 of the *Standard Specifications*.

Install the pipe by dry boring and jacking. Carefully dry bore the pipe true to the line and grade given. Hold the bore to a minimum to insure that there is no settlement. Remove and replace any pipe that has been damaged due to the Contractor's operation at no cost to the Department. Completely fill all voids around the outside of the pipe to the satisfaction of the Engineer.

Measurement will be made in accordance with Article 330-4 of the *Standard Specifications*.

The quantity of pipe as measured above will be paid for at the contract unit price per linear foot (meter) for "\_\_\_" (mm) Welded Steel Pipe, \_\_\_ " (mm) Thick, Grade B (By Boring and Jacking)". Such price and payment will be full compensation for all work described herein including dry boring, jacking, tools, materials, labor, workmanship, and all other incidentals necessary to complete the work.

SP3R25

Payment will be under:

\_\_\_ " (mm) Welded Steel Pipe, \_\_\_ " (mm) Thick, Grade B  
(By Boring and Jacking) .....Linear Foot (Meter)

**FLOWABLE FILL:**

**9-17-02**

Provide and install flowable fill material in accordance with Articles 340-2 of the Standard Specifications.

Discharge flowable fill material directly from the truck into the space to be filled, or by other approved methods. The mix may be placed full depth or in lifts as site conditions dictate. The Contractor shall provide a method to plug the ends of the existing pipe in order to contain the flowable fill.

At locations where flowable fill is called for on the plans and a pay item for flowable fill is included in the contract, the quantity of flowable fill to be paid for will be the actual number of cubic yards (cubic meters) of flowable fill that have been satisfactorily placed and accepted.

The quantity of flowable fill, measured as provided above, will be paid for at the contract unit price per cubic yard (cubic meter) for "Flowable Fill". Such price and payment will be full compensation for all work covered by this provision including but not limited to the mix design, furnishing, hauling, placing and containing the flowable fill.

SP3R30

Payment will be made under:

Flowable Fill .....Cubic Yard (Cubic Meter)

**PREPARATION OF SUBGRADE AND BASE:**

**1-16-96**

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 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.

SP5R05

**AGGREGATE FOR SOIL-CEMENT BASE:**

**1-01-02R**

Revise the 2002 Standard Specifications as follows:

Page 5-27, Article 542-1. Delete the first sentence and substitute the following:

"The work covered by this section consists of constructing and curing a soil-cement base by treating the subgrade, existing subbase, or existing base, or any combination of these materials, by pulverizing, adding portland cement, adding aggregate when required, mixing, wetting, and compacting the mixture to the required density."

Page 5-27, Article 542-2. Add the following after line 3:

"Aggregate, Std. Size ABC.....Section 1005"

Page 5-28, Article 542-7. Add the following paragraph after the first paragraph:

"Prior to spreading cement, aggregate shall be spread at the rate shown in the plans.

Page 5-30, Article 542-16. Add the following paragraph after the first paragraph:

"The quantity of aggregate to be paid for will be the number of tons (metric tons) of aggregate that have been incorporated into the completed and accepted work. The aggregate will be measured by weighing in trucks on certified platform scales or other certified weighing devices. No deductions will be made for any moisture contained in the aggregate at the time of weighing."

Page 5-31, Article 542-17. Add the following paragraph after the first paragraph:

"The quantity of aggregate, measured as provided in Article 542-16, will be paid for at the contract unit price per ton (metric ton) for "Aggregate for Soil-Cement Base"."

Add the following at the end of the last paragraph:

"Aggregate for Soil-Cement Base.....Ton (Metric Ton)"

SP5R15

**LIME AND CEMENT TREATED SOIL**

**11-18-03**

Revise the 2002 Standard Specifications as follows:

Page 5-4, Article 501-8. In the second sentence of the first paragraph, **change 40 days to 24 days.**

Page 5-28, Article 542-7. In the second sentence of the first paragraph, **change 45 days to 24 days.**

SP5R20

**ASPHALT PAVEMENTS - SUPERPAVE**

**02-17-04**

Revise the 2002 Standard Specifications as follows:

**PRIME COAT**

Page 6-2, Article 600-9

Delete the first paragraph under this Article and substitute the following:

The quantity of prime coat to be paid will be the number of gallons (liters) of prime coat material that has been satisfactorily placed on the roadway. Each distributor load of prime coat material delivered and utilized on the project will be measured.

**ASPHALT TACK COAT**

Page 6-4, Article 605-8

Insert the following after paragraph one in this Article:

Take necessary precautions to limit the tracking and/or accumulation of tack coat material on either existing or newly constructed pavements. Excessive accumulation of tack may require corrective measures.

**FIELD VERIFICATION AND JOB MIX FORMULA ADJUSTMENTS**

Page 6-7, Article 609-4

Delete the first paragraph under this Article and substitute the following:

Conduct field verification of the mix at each plant within 30 calendar days prior to initial production of each mix design, when required by the Allowable Mix Adjustment Policy and when directed as deemed necessary.

Page 6-8, Article 609-4

Delete the first paragraph on this page and substitute the following:

Retain records of these calibrations and mix verification tests, including Superpave Gyratory Compactor (SGC) printouts, at the QC laboratory. In addition, furnish copies, including SGC printouts, to the Engineer for review and approval within one working day after beginning production of the mix.

Page 6-8, Article 609-4

Add the following sentence to the end of the last paragraph in this Article:

Any mix produced that is not verified may be assessed a price reduction at the Engineer's discretion in addition to any reduction in pay due to mix and/or density deficiencies.

Quality control minimum sampling and testing schedule:

Page 6-9, Subarticle 609-5(C)1

Delete the second sentence in the second paragraph of this Article and substitute the following:

Retain the QC compacted volumetric test specimens for 5 calendar days, commencing the day the specimens are prepared.

Page 6-9, Subarticle 609-5(C)2

At the bottom of this page, delete the sentence directly above the Accumulative Production Increment and substitute the following:

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

Page 6-10, Subarticle 609-5(C)2

Revise Items B, C, D and E on this page as follows:

- B. Gradation on Recovered Blended Aggregate from Mix Sample (AASHTO T 30 Modified) Grade on all sieves specified on JMF
- C. Maximum Specific Gravity (AASHTO T 209 or ASTM D 2041), optional (ASTM D 6857)
- D. Bulk Specific Gravity of Compacted Specimens (AASHTO T166), optional (ASTM D 6752), Average of 3 specimens at  $N_{des}$  gyrations (AASHTO T 312)
- E. Air Voids (VTM) (AASHTO T 269), Average of 3 specimens at  $N_{des}$  gyrations

Page 6-11, Subarticle 609-5(C)2

At the top of this page, delete Item B., "Reclaimed Asphalt Pavement..." and substitute the following:

- B. Reclaimed Asphalt Pavement (RAP) Binder Content and Gradation (AASHTO T 308 Modified or T 164 and AASHTO T 30 Modified) (sampled from stockpiles or cold feed system at beginning of production and weekly thereafter). Have RAP approved for use in accordance with Article 1012-1(G). (Split Sample Required)



Page 6-11, Subarticle 609-5(C)2

Insert the following sampling and testing at the end of this Subarticle

- F. Uncompacted Void Content of Fine Aggregate, AASHTO T 304, Method A (natural sand only). Performed at Mix Design and when directed as deemed necessary. (Split Sample Required)
- G. Reclaimed Asphalt Shingle Material (RAS) Binder Content and Gradation (AASHTO T 308 Modified or T 164 and AASHTO T 30 Modified) (sampled from stockpiles or cold feed system at beginning of production and weekly thereafter). Have RAS approved for use in accordance with Article 1012-1(F). (Split Sample Required)

#### CONTROL CHARTS

Page 6-11, Subarticle 609-5(C)3

Delete the second sentence of the first paragraph in this Subarticle and substitute the following:

Record all regularly scheduled random sample or directed sample full test series results for mix incorporated into the project on control charts the same day the test results are obtained.

Page 6-12, Subarticle 609-5(C)3

Delete item 3 in the list below the second full paragraph on this page.

#### CONTROL LIMITS

Page 6-12, Subarticle 609-5(C) 4

At the bottom of this page, delete the table and substitute the following:

#### CONTROL LIMITS

Mix Control Criteria	Target Source	Warning Limit	Moving Average Limit	Individual Limit
2.36mm Sieve	JMF	±4.0 %	±5.0 %	±8.0 %
0.075mm Sieve	JMF	±1.5 %	±2.0 %	±2.5 %
Binder Content	JMF	±0.3 %	±0.5 %	±0.7 %
VTM @ N <sub>des</sub>	JMF	±1.0 %	±1.5 %	±2.0 %
VMA @ N <sub>des</sub>	Min. Spec. Limit	-0.5%	-0.8%	-1.0%
P <sub>0.075</sub> / P <sub>be</sub> Ratio	Max. Spec. Limit	0.0	N/A	+0.4%
%G <sub>mm</sub> @ N <sub>ini</sub>	Max. Spec. Limit	N/A	N/A	+2.0%
TSR	Min. Spec. Limit	N/A	N/A	-15.0%

## FIELD COMPACTION QUALITY CONTROL

Page 6-15, Subarticle 609-5(D)1

Delete the first and second sentences in the fourth paragraph on this page and substitute the following:

Base and intermediate mix types (surface mixes not included) utilized for pavement widening of less than 4.0 feet and all mix types used in tapers, irregular areas and intersections (excluding full width travel lanes of uniform thickness), will not be subject to the sampling and testing frequency specified above provided the pavement is compacted using approved equipment and procedures. However, the Engineer may require occasional density sampling and testing to evaluate the compaction process.

Page 6-16, Subarticle 609-5(D)1

Delete item number 2 at the top of this page. Item number 3 should be re-numbered as 2 after the specified deletion.

## LIMITED PRODUCTION PROCEDURE

Page 6-17, Subarticle 609-5(D) 5

Delete the first paragraph in this Subarticle and substitute the following:

Proceed on limited production when, for the same mix type, one of the following items occur:

- (1) Two consecutive failing lots, excluding lots representing an individual resurfacing map or portion thereof.
- (2) Three consecutive failing lots, with each lot representing an individual resurfacing map or portion thereof.
- (3) Two consecutive failing nuclear control strips.

Pavement within each construction category (New and Other), as defined in Article 610-13, and pavement placed simultaneously by multiple paving crews will be evaluated independently for limited production purposes.

Delete the first sentence in the last paragraph in this Subarticle and substitute the following:

If the Contractor does not operate by the limited production procedures as specified above, the two consecutive failing density lots, three consecutive failing lots with each lot representing an individual resurfacing map or portion thereof, or two consecutive failing nuclear control strips, whichever is applicable, and all mix produced thereafter will be considered unacceptable.

## DOCUMENTATION (RECORDS)

Page 6-18, Subarticle 609-5(E)

Delete the third and fourth sentence in the first full paragraph on this page and substitute the following:

Maintain all QC records, forms and equipment calibrations for a minimum of 3 years from their completion date.

Delete the second full paragraph on this page and substitute the following:

Falsification of test results, documentation of observations, records of inspection, adjustments to the process, discarding of samples and/or test results, or any other deliberate misrepresentation of the facts will result in the revocation of the applicable person's QMS certification. The Engineer will determine acceptability of the mix and/or pavement represented by the falsified results or documentation. If the mix and/or pavement in question is determined to be acceptable, the Engineer may allow the mix to remain in place at no pay for the mix, asphalt binder and other mix components. If the mix and/or pavement represented by the falsified results is determined not to be acceptable, remove and replace with mix, which complies with the Specifications. Payment will be made for the actual quantities of materials required to replace the falsified quantities, not to exceed the original amounts.

## QUALITY ASSURANCE

Page 6-18, Article 609-6

In Item 5 under Plant Mix Quality Assurance, add "at a frequency equal to or greater than 5% of the QC sample frequency".

In the first sentence within the paragraph below Plant Mix Quality Assurance, delete the words "of mix".

In Item 1 under Density Quality Assurance, delete the wording at the end of the sentence "at a frequency equal to or greater than 10% of the frequency required of the Contractor".

Page 6-19, Article 609-6

In Item 4 under Density Quality Assurance, add "at a frequency equal to or greater than 5% of the QC sample frequency."

Insert the following after Item 4 under Density Quality Assurance:

6. By periodically directing the recalculation of random numbers for the Quality Control core or nuclear density test locations. The original QC test locations may be tested by QA and evaluated as verification tests.

## LIMITS OF PRECISION

Page 6-19, Article 609-6

In the limits of precision table, delete the last three rows and substitute the following:

QA retest of prepared QC Gyrotory Compacted

Volumetric Specimens	± 0.015
Retest of QC Core Sample	± 1.2% (% Compaction)
Comparison of QA Core Sample	± 2.0% (% Compaction)
QA Verification Core Sample	± 2.0% (% Compaction)
Nuclear Comparison of QC Test	± 2.0% (% Compaction)
QA Nuclear Verification Test	± 2.0% (% Compaction)

## ASPHALT CONCRETE PLANT MIX PAVEMENTS – DESCRIPTION

Page 6-20, Article 610-1

Insert the following after the last paragraph in this Article:

A high frequency of asphalt plant mix, density, or mix and density deficiencies occurring over an extended duration of time may result in future asphalt, which is represented by mix and/or density test results not in compliance with minimum specification requirements, being excluded from acceptance at an adjusted contract unit price in accordance with Article 105-3. This acceptance process may apply to all asphalt produced and /or placed and may continue until the Engineer determines a history of quality asphalt production and placement is reestablished.

## MATERIALS

Page 6-21, Article 610-2

Delete reference of Anti-strip additive (chemical) to Article 1020-2 and substitute Article 1020-8.

## COMPOSITION OF MIXTURES (MIX DESIGN AND JOB MIX FORMULA)

Page 6-21, Subarticle 610-3(A)

At the end of the second paragraph under this Subarticle, add the following sentence:

In addition, submit Superpave gyrotory compactor printouts for all specimens compacted at  $N_{des}$  and  $N_{max}$  during the mix design process.

Insert the following paragraph after the second paragraph under this Subarticle:

For the final surface layer of the specified mix type, use a mix design with an aggregate blend gradation above the maximum density line on the 2.36 mm and larger sieves.

Insert the following at the end of the third paragraph under this Article:

When the percent of binder contributed from RAS or a combination of RAS and RAP exceeds 20 percent of the total binder in the completed mix, the virgin binder PG grade must be one grade below (both high and low temperature grade) the binder grade specified in Table 610-2 for the mix type.

Delete the fourth paragraph in this Subarticle and substitute the following:

For Type S 12.5D mixes, the maximum percentage of reclaimed asphalt material is limited to 15% and must be produced using virgin asphalt binder grade PG 76-22. For all other recycled mix types, when the percentage of RAP is 15 percent or less of the total mixture, the virgin binder PG grade must be as specified in Table 610-2 for the specified mix type. When the percentage of RAP is greater than 15 but not more than 25 percent of the total mixture, the virgin binder PG grade must be one grade below (both high and low temperature grade) the specified grade for the mix type. When the percentage of RAP is greater than 25 percent of the total mixture, the Engineer will establish and approve the asphalt binder grade.

Page 6-22, Subarticle 610-3(A)

Insert the following sentence at the end of the Item 4:

If natural sand is utilized in the proposed mix design, determine and report the Uncompacted Void Content of the natural sand in accordance with AASHTO T-304, Method A.

Page 6-23, Subarticle 610-3(A)

Under the quantities of mix components insert the following sentence:

When requested by the Engineer, submit to the Department's Materials and Tests Unit, in Raleigh, six (6) Superpave Gyrotory Compactor specimens compacted to a height of 75 mm and to a void content (VTM) of 4.0% +/- 0.5% for performance rut testing with the Asphalt Pavement Analyzer.

JOB MIX FORMULA

Page 6-24, Subarticle 610-3(C)

Delete Table 610-1 and associated notes. Substitute the following:

**TABLE 610-1  
SUPERPAVE AGGREGATE GRADATION DESIGN CRITERIA**

Standard Sieves (mm)	Percent Passing Criteria (Control Points)											
	Mix Type (Nominal Maximum Aggregate Size)											
	4.75 mm (a)		9.5 mm (c)		12.5 mm (c)		19.0 mm		25.0 mm		37.5 mm	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
50.0												100.0
37.5										100.0	90.0	100.0
25.0								100.0	90.0	100.0		90.0
19.0						100.0	90.0	100.0		90.0		
12.5				100.0	90.0	100.0		90.0				
9.5		100.0	90.0	100.0		90.0						
4.75	90.0	100.0		90.0								
2.36	65.0	90.0	32.0 <b>(b)</b>	67.0 <b>(b)</b>	28.0	58.0	23.0	49.0	19.0	45.0	15.0	41.0
1.18												
0.600												
0.300												
0.150												
0.075	4.0	8.0	4.0	8.0	4.0	8.0	3.0	8.0	3.0	7.0	3.0	6.0

- (a) For Type S 4.75A, a minimum of 50% of the aggregate components shall be manufactured material from the crushing of stone.
- (b) For Type SF 9.5A, the percent passing the 2.36mm sieve shall be a minimum of 60% and a maximum of 70%.
- (c) For the final surface layer of the specified mix type, use a mix design with an aggregate blend gradation above the maximum density line on the 2.36 mm and larger sieves.

Delete Table 610-2 and associated notes. Substitute the following:

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

Mix Type (f)	Design ESALs millions (a)	Binder PG Grade (b)	Compaction Levels			Volumetric Properties (c)			
			No. Gyration @ N <sub>ini</sub>	N <sub>des</sub>	N <sub>max</sub>	VMA % Min.	VTM %	VFA Min. - Max.	%G <sub>mm</sub> @ N <sub>ini</sub>
S-4.75A	<0.3	64 -22	6	50	75	20.0	7.0-15.0		
SF-9.5A	<0.3	64 -22	6	50	75	16.0	3.0 - 5.0	70 - 80	≤ 91.5
S-9.5B	0.3 - 3	64 -22	7	75	115	15.0	3.0 - 5.0	65 - 80	≤ 90.5
S-9.5C	3 - 30	70 -22	8	100	160	15.0	3.0 - 5.0	65 - 76	≤ 90.0
S-12.5C	3 - 30	70 -22	8	100	160	14.0	3.0 - 5.0	65 - 75	≤ 90.0
S-12.5D	> 30	76 -22	9	125	205	14.0	3.0 - 5.0	65 - 75	≤ 90.0
I-19.0B	< 3	64 -22	7	75	115	13.0	3.0 - 5.0	65 - 78	≤90.5
I-19.0C	3 - 30	64 -22	8	100	160	13.0	3.0 - 5.0	65 - 75	≤ 90.0
I-19.0D	> 30	70 -22	9	125	205	13.0	3.0 - 5.0	65 - 75	≤ 90.0
B-25.0B	< 3	64 -22	7	75	115	12.0	3.0 - 5.0	65 - 78	≤ 90.5
B-25.0C	> 3	64 -22	8	100	160	12.0	3.0 - 5.0	65 - 75	≤ 90.0
B-37.5C	> 3	64 -22	8	100	160	11.0	3.0 - 5.0	63 - 75	≤ 90.0
	<b>Design Parameter</b>				<b>Design Criteria</b>				
All	1. %G <sub>mm</sub> @ N <sub>max</sub>				≤ 98.0% (d)				
Mix	2. Dust to Binder Ratio (P <sub>0.075</sub> / P <sub>be</sub> )				0.6 - 1.4				
Types	3. Retained Tensile Strength (TSR) (AASHTO T 283 Modified)				85 % Min. (e)				

- Notes:**
- (a) Based on 20 year design traffic.
  - (b) When Recycled Mixes are used, select the binder grade to be added in accordance with Subarticle 610-3(A).
  - (c) Volumetric Properties based on specimens compacted to N<sub>des</sub> as modified by the Department.
  - (d) Based on specimens compacted to N<sub>max</sub> at selected optimum asphalt content.
  - (e) AASHTO T 283 Modified (No Freeze-Thaw cycle required). TSR for Type S 4.75A, Type B 25.0 and Type B 37.5 mixes is 80% minimum.
  - (f) Mix Design Criteria for Type S 4.75A may be modified subject to the approval of the Engineer

WEATHER, TEMPERATURE, AND SEASONAL LIMITATIONS FOR PRODUCING AND PLACING ASPHALT MIXTURES

Page 6-26, Article 610-4, Table 610-3

Delete the title of Table 610-3 and substitute the following title:

**ASPHALT PLACEMENT- MINIMUM TEMPERATURE REQUIREMENTS**

In the first column, third row; delete reference to the ACSC Types S 9.5A and S 12.5B mix.

Add the following minimum placing temperatures for mix types S 4.75A and SF 9.5A.

<b>Asphalt Concrete Mix Type</b>	<b>Minimum Air Temperature</b>	<b>Minimum Road Surface Temperature</b>
ACSC, Type S 4.75A, SF 9.5A	40°F (5°C)	50°F (10°C)

SPREADING AND FINISHING

Page 6-32, Article 610-8

Insert the following after the second sentence within the sixth paragraph in this Article,

Take necessary precautions during production, loading of trucks, transportation, truck exchanges with paver, folding of the paver hopper wings, and conveying material in front of the screed to prevent segregation of the asphalt mixtures.

Page 6-33, Article 610-8

At the end of the third full paragraph on this page, add the following sentence:

Waiver of the use of automatic screed controls does not relieve the Contractor of achieving plan grades and cross-slopes.



DENSITY REQUIREMENTS

Page 6-34, Article 610-10,

Delete Table 610-4 and substitute the following table and associated notes:

**Table 610-4  
MINIMUM DENSITY REQUIREMENTS**

<b>MIX TYPE</b>	<b>MINIMUM % of <math>G_{mm}</math></b>
<b>SUPERPAVE MIXES</b>	<b>(Maximum Specific Gravity)</b>
S 4.75A	85.0 <sup>(a,b)</sup>
SF 9.5A	90.0
S 9.5X, S 12.5X, I 19.0X, B 25.0X, B 37.5X	92.0

(a) All S 4.75A pavement will be accepted for density in accordance with Article 105-3

(b) Compaction to the above specified density will be required when the S 4.75 A mix is applied at a rate of 100 lbs/sy (55 kg/m<sup>2</sup>)

Page 6-34, Article 610-10

Delete the second paragraph in this Article and substitute the following:

Compact base and intermediate mix types (surface mixes not included) utilized for pavement widening of less than 4.0 feet (1.2 meters) and all mix types used in tapers, irregular areas and intersections (excluding full width travel lanes of uniform thickness), using equipment and procedures appropriate for the pavement area width and/or shape. Compaction with equipment other than conventional steel drum rollers may be necessary to achieve adequate compaction. Occasional density sampling and testing to evaluate the compaction process may be required. Densities lower than that specified in Table 610-4 will be accepted, in accordance with Article 105-3, for the specific mix types and areas listed directly above.

**SURFACE REQUIREMENTS AND ACCEPTANCE**

Page 6-35, Article 610-12

Delete the first paragraph in this Article and substitute the following:

Construct pavements using quality paving practices as detailed herein. Construct the pavement surface smooth and true to the plan grade and cross slope. Immediately correct any defective areas with satisfactory material compacted to conform with the surrounding area. Pavement imperfections resulting from unsatisfactory workmanship such as segregation, improper longitudinal joint placement or alignment, non-uniform edge alignment and excessive pavement repairs will be considered unsatisfactory and if allowed to remain in place will be accepted in accordance with Article 105-3.

When directed due to unsatisfactory laydown or workmanship, operate under the limited production procedures. Limited production for unsatisfactory laydown is defined as being restricted to the production, placement, compaction, and final surface testing (if applicable) of a sufficient quantity of mix necessary to construct only 2500 feet (750 meter) of pavement at the laydown width.

Remain on limited production until such time as satisfactory laydown results are obtained or until three consecutive 2500 foot (750 meter) sections have been attempted without achieving satisfactory laydown results. If the Contractor fails to achieve satisfactory laydown results after three consecutive 2500 foot (750 meter) sections have been attempted, cease production of that mix type until such time as the cause of the unsatisfactory laydown results can be determined. As an exception, the Engineer may grant approval to produce a different mix design of the same mix type if the cause is related to mix problem(s) rather than laydown procedures.

Mix placed under the limited production procedures for unsatisfactory laydown or workmanship will be evaluated for acceptance in accordance with Article 105-3.

#### DENSITY ACCEPTANCE

Page 6-36, Article 610-13

Delete the second paragraph on this page and substitute the following:

The pavement will be accepted for density on a lot by lot basis. A lot will consist of one day's production of a given job mix formula on a contract. As an exception, separate lots will be established when the one of the following occurs:

- (6) Portions of pavement are placed in both "New" and "Other" construction categories as defined below. A lot will be established for the portion of the pavement in the "New" construction category and a separate lot for the portion of pavement in the "Other" construction category.
- (7) Pavement is placed on multiple resurfacing maps, unless otherwise approved prior to paving. A lot will be established for each individual resurfacing map or portion thereof.
- (8) Pavement is placed simultaneously by multiple paving crews. A lot will be established for the pavement placed by each paving crew.
- (9) Pavement is placed in different layers. A lot will be established for each layer.
- (10) Control strips are placed during limited production.

The Engineer will determine the final category and quantity of each lot for acceptance purposes.

Page 6-36, Article 610-13

Delete the first sentence in the third paragraph on this page and insert the following:

The “New” construction category will be defined as pavements of uniform thickness, exclusive of irregular areas, meeting all three of the following criteria:

Delete the sixth paragraph in this Article and substitute the following:

A failing lot for density acceptance purposes is defined as a lot for which the average of all test sections, and portions thereof, fails to meet the minimum specification requirement. If additional density sampling and testing, beyond the minimum requirement, is performed and additional test sections are thereby created, then all test results shall be included in the lot average. In addition, any lot or portion of a lot that is obviously unacceptable will be rejected for use in the work.

Page 6-36, Article 610-13

Delete the last paragraph on this page and substitute the following:

Any density lot not meeting minimum density requirements detailed in Table 610-4 will be evaluated for acceptance by the Engineer. If the lot is determined to be reasonably acceptable, the mix will be paid at an adjusted contract price in accordance with Article 105-3. If the lot is determined not to be acceptable, the mix will be removed and replaced with mix meeting and compacted to the requirement of these specifications.

**BASIS OF PAYMENT, ASPHALT PAVEMENTS**

Page 6-37, Article 610-16

Add the following to the second paragraph:

The quantity of hot mix asphalt pavement, measured as provided in Article 610-15, will be paid for at the contract unit prices per ton (metric ton) for “Asphalt Concrete Surface Course, Type S 4.75A, and SF 9.5A”.

Add the following to the payment item description:

Asphalt Concrete Surface Course, Type S 4.75A.....	Ton (Metric Ton)
Asphalt Concrete Surface Course, Type SF 9.5A.....	Ton (Metric Ton)

Delete reference to the Asphalt Concrete Surface Course, Types S 9.5A and S 12.5B in both the second paragraph and in the payment description.

## ASPHALT BINDER FOR PLANT MIX - METHOD OF MEASUREMENT

Page 6-39, Article 620-4

Delete the first sentence of the second paragraph on this page and substitute the following:

Where recycled plant mix is being produced, the grade of asphalt binder to be paid for will be the grade for the specified mix type as required in Table 610-2 unless otherwise approved.

## CONSTRUCTION REQUIREMENTS

Page 6-43, Article 650-5

Add the following paragraph after the first paragraph under this Article:

Do not place open-graded asphalt friction course between October 31 and April 1 of the next year, unless otherwise approved. Place friction course, Type FC-1 mixes, only when the road surface temperature is 50°F (10°C) or higher and the air temperature is 50°F (10°C) or higher. The minimum air temperature for Type FC-1 Modified and FC-2 Modified mixes will be 60°F (15°C).

## AGGREGATES FOR ASPHALT PLANT MIXES

Page 10-34, Subarticle 1012-1(B)4

Delete this Subarticle and substitute the following:

(4) Flat and Elongated Pieces:

Use coarse aggregate meeting the requirements of Table 1012-1 for flat and elongated pieces when tested in accordance with ASTM D 4791 (Section 8.4) on the No. 4 (4.75 mm) sieve and larger with a 5:1 aspect ratio (maximum to minimum) for all pavement types, except there is no requirement for Types S 4.75A, SF 9.5A, and S 9.5B.

Delete Table 1012-1 and substitute the following:

**Table 1012-1  
AGGREGATE CONSENSUS PROPERTIES<sup>(a)</sup>**

Mix Type	Course	Fine	Sand	Flat &
	Aggregate	Aggregate	Equivalent	Elongated
	Angularities <sup>(b)</sup>	Angularity		5 : 1 Ratio
		% Minimum	% Minimum	% Maximum
	ASTM D 5821	AASHTO T 304 Method A	AASHTO T 176	ASTM D 4791 Section 8.4
S 4.75 A		40	40	
SF 9.5 A S 9.5 B I 19.0 B B 25.0 B	75 / -	40	40	10 <sup>(c)</sup>
S 9.5 C S 12.5 C I 19.0 C B 25.0 C B 37.5 C	95 / 90	45	45	10
S 12.5 D I 19.0 D	100 / 100	45	50	10
OGAFC	100 / 100	N/A	N/A	10

- (a) Requirements apply to the course aggregate blend and/or fine aggregate blend
- (b) 95/90 denotes that 95% of the course aggregate (+No.4 or + 4.75mm sieve) has one fractured face and 90% has two or more fractured faces.
- (c) Does not apply to Mix Types SF 9.5 A or S 9.5 B

Page 10-36, Subarticle 1012-1(C)1

Insert the following after the fourth paragraph on this page:

When natural sand is utilized in “C” or “D” level asphalt mixes, do not exceed the maximum natural sand percentage in the mix design and/or production aggregate blend detailed in Table 1012-1A.

**Table 1012-1A**

<b>Uncompacted Void Content of Fine Aggregate AASHTO T 304 Method A</b>	<b>Maximum Percent Natural Sand Included in Mix Design and/or Production*</b>
Less than 42.0	10
Equal to 42.0 to 44.9	15
Equal to 45.0 and greater	20

\*Maximum percent natural sand may be exceeded with approval from Pavement Construction Engineer upon satisfactory evaluation of pavement performance testing

**FINE AGGREGATE ANGULARITY**

Page 10-36, Subarticle 1012-1(C)6

Delete reference to AASHTO TP 33 Method A and substitute AASHTO T 304, Method A.

Page 10-37, Subarticle 1012-1(H)

Delete this Subarticle. It is a duplicate of Subarticle 1012-1(F) located on Page 10-36.

**ASPHALT BINDER**

Page 10-46, Article 1020-2

Delete the first paragraph under this Article and substitute the following:

Use Performance Graded Asphalt Binder meeting the requirements of AASHTO M 320. See Article 610-3 for the specified grades. Submit a Quality Control Plan for asphalt binder production in conformance with the requirements of AASHTO R 26 to the Materials and Tests Unit.

SP6R01

**ASPHALT BINDER CONTENT OF ASPHALT PLANT MIXES: 11-21-00<sub>R</sub>**

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 Standard Specifications or Project Special Provisions.

SP6R15

**ASPHALT PLANT MIXTURES: 7-1-95<sub>c</sub>**

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.

SP6R20

**PRICE ADJUSTMENT - ASPHALT BINDER FOR PLANT MIX: 11-21-00**

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

The base price index for asphalt binder for plant mix is \$219.17 per ton (metric ton).

This base price index represents an average of F.O.B. selling prices of asphalt binder at supplier's terminals on October 1, 2004.

SP6R25

**FINAL SURFACE TESTING - ASPHALT PAVEMENTS (RIDEABILITY) 05-18-04**

Perform acceptance testing of the longitudinal profile of the finished pavement surface in accordance with these provisions using a North Carolina Hearne Straightedge (Model No. 1). Furnish and operate the straightedge to determine and record the longitudinal profile of the pavement on a continuous graph. Final surface testing is an integral part of the paving operation and is subject to observation and inspection by the Engineer as deemed necessary.

Push the straightedge manually over the pavement at a speed not exceeding 2 miles per hour (3 kilometers per hour). For all lanes, take profiles in the right wheel path approximately 3 ft (1 m) from the right edge of pavement in the same direction as the paving operation, unless otherwise approved due to traffic control or safety considerations. Make one pass of the straightedge in each full width travel lane. The full lane width should be comparable in ride quality to the area evaluated with the Hearne Straightedge. If deviations exist at other locations across the lane width, utilize a 10 foot non-mobile straightedge or the Hearne Straightedge to

evaluate which areas may require corrective action. Take profiles as soon as practical after the pavement has been rolled and compacted but in no event later than 24 hours following placement of the pavement, unless otherwise authorized by the Engineer. Take profiles over the entire length of final surface travel lane pavement exclusive of -Y- line travel lanes less than or equal to 300 feet (90 meters) in length, turn lanes less than or equal to 300 feet (90 meters) in length, structures, approach slabs, paved shoulders, loops, and tapers or other irregular shaped areas of pavement, unless otherwise approved by the Engineer. Test in accordance with this provision all mainline travel lanes, full width acceleration or deceleration lanes, -Y- line travel lanes greater than 300 feet (90 meters) in length, ramps, full width turn lanes greater than 300 feet (90 meters) in length, and collector lanes.

At the beginning and end of each day's testing operations, and at such other times as determined necessary by the Engineer, operate the straightedge over a calibration strip so that the Engineer can verify correct operation of the straightedge. The calibration strip must be a 100 ft (30 m) section of pavement that is reasonably level and smooth. Submit each day's calibration graphs with that day's test section graphs to the Engineer. Calibrate the straightedge in accordance with the current NCDOT procedure titled "North Carolina Hearne Straightedge - Calibration and Determination of Cumulative Straightedge Index". Copies of this procedure may be obtained from the Department's Pavement Construction Section.

Plot the straightedge graph at a horizontal scale of approximately 25 ft per inch (3 m per cm) with the vertical scale plotted at a true scale. Record station numbers and references (bridges, approach slabs, culverts, etc.) on the graphs, and distances between references/stations must not exceed 100 ft (30 m). Have the operator record the Date, Project No., Lane Location, Wheel Path Location, Type Mix, and Operator's Name on the graph.

Upon completion of each day's testing, evaluate the graph, calculate the Cumulative Straightedge Index (CSI), and determine which lots, if any, require corrective action. Document the evaluation of each lot on a QA/QC-7 form. Submit the graphs along with the completed QA/QC-7 forms to the Engineer, within 24 hours after profiles are completed, for verification of the results. The Engineer will furnish results of their acceptance evaluation to the Contractor within 48 hours of receiving the graphs. In the event of discrepancies, the Engineer's evaluation of the graphs will prevail for acceptance purposes. The Engineer will retain all graphs and forms.

Use blanking bands of 0.2 inches, 0.3 inches, and 0.4 inches (5 mm, 7.5 mm, and 10 mm) to evaluate the graph for acceptance. The 0.2 inch and 0.3 inch (5 mm and 7.5 mm) blanking bands are used to determine the Straightedge Index (SEI), which is a number that indicates the deviations that exceed each of the 0.2 inch and 0.3 inch (5 mm and 7.5 mm) bands within a 100 ft (30 m) test section. The Cumulative Straightedge Index (CSI) is a number representing the total of the SEIs for one lot, which consist of not more than 25 consecutive test sections. In addition, the 0.4 inch (10 mm) blanking band is used to further evaluate deviations on an individual basis. The Cumulative Straightedge Index (CSI) will be determined by the Engineer in accordance with the current procedure titled "North Carolina Hearne Straightedge - Calibration and Determination of Cumulative Straightedge Index".



The pavement will be accepted for surface smoothness on a lot by lot basis. A test section represents pavement one travel lane wide not more than 100 ft (30 m) in length. A lot will consist of 25 consecutive test sections, except that separate lots will be established for each travel lane, unless otherwise approved by the Engineer. In addition, full width acceleration or deceleration lanes, ramps, turn lanes, and collector lanes, will be evaluated as separate lots. For any lot which is less than 2500 feet (750 m) in length, the applicable pay adjustment incentive will be prorated on the basis of the actual lot length. For any lot which is less than 2500 feet (750 m) in length, the applicable pay adjustment disincentive will be the full amount for a lot, regardless of the lot length.

If during the evaluation of the graphs, more than 5 lots within the contract limits (mainline travel lanes and full width -Y- line travel lanes greater than 300 feet in length only) require corrective action, then proceed on limited production for unsatisfactory laydown in accordance with Article 610-12. Proceeding on limited production is based upon the Contractor's initial evaluation of the straightedge test results and must begin immediately upon obtaining those results. Additionally, the Engineer may direct the Contractor to proceed on limited production in accordance with Article 610-12 due to unsatisfactory laydown or workmanship.

Limited production for unsatisfactory laydown is defined as being restricted to the production, placement, compaction, and final surface testing of a sufficient quantity of mix necessary to construct only 2500 feet (750 meter) of pavement at the laydown width. Once this lot is complete, the final surface testing graphs will be evaluated jointly by the Contractor and the Engineer. Remain on limited production until such time as satisfactory laydown results are obtained or until three consecutive 2500 foot (750 meter) sections have been attempted without achieving satisfactory laydown results. The Engineer will determine if normal production may resume based upon the CSI for the limited production lot and any adjustments to the equipment, placement methods, and/or personnel performing the work. Once on limited production, the Engineer may require the Contractor to evaluate the smoothness of the previous asphalt layer and take appropriate action to reduce and/or eliminate corrective measures on the final surface course. Additionally, the Contractor may be required to demonstrate acceptable laydown techniques off the project limits prior to proceeding on the project.

If the Contractor fails to achieve satisfactory laydown results after three consecutive 2500 foot (750 meter) sections have been attempted, cease production of that mix type until such time as the cause of the unsatisfactory laydown results can be determined.

As an exception, the Engineer may grant approval to produce a different mix design of the same mix type if the cause is related to mix problem(s) rather than laydown procedures. If production of a new mix design is allowed, proceed under the limited production procedures detailed above.

If the Contractor does not operate by the limited production procedures as specified above, the 5 lots, which require corrective action, will be considered unacceptable and may be subject to removal and replacement. Mix placed under the limited production procedures for unsatisfactory laydown will be evaluated for acceptance in accordance with Article 105-3.

After initially proceeding under limited production, the Contractor shall immediately notify the Engineer if any additional lot on the project requires corrective action. The Engineer will determine if limited production procedures are warranted for continued production.

The pay adjustment schedule for the Cumulative Straightedge Index (CSI) test results per lot is as follows:

<b>Pay Adjustment Schedule for Cumulative Straightedge Index (CSI)</b> (Obtained by adding SE Index of up to 25 consecutive 100 ft. (30m) sections)				
*CSI	<u>ACCEPTANCE</u>  <u>CATEGORY</u>	<u>CORRECTIVE</u>  <u>ACTION</u>	<u>PAY ADJUSTMENT</u>	
			<u>Before</u> <u>Corrective</u> <u>Action</u>	<u>After</u> <u>Corrective</u> <u>Action</u>
0-0	Acceptable	None	\$300 incentive	None
1-0 or 2-0	Acceptable	None	\$100 incentive	None
3-0 or 4-0	Acceptable	None	No Adjustment	No Adjustment
1-1, 2-1, 5-0 or 6-0	Acceptable	Allowed	\$300 disincentive	\$300 disincentive
3-1, 4-1, 5-1 or 6-1	Acceptable	Allowed	\$600 disincentive	\$600 disincentive
Any other Number	Unacceptable	Required	Per CSI after Correction(s) (not to exceed 100% Pay)	

**\*Either Before or After Corrective Actions**

Correct any deviation that exceeds a 0.4 inch (10 mm) blanking band such that the deviation is reduced to 0.3 inches (7.5 mm) or less.

Corrective actions shall be performed at the Contractor's expense and shall be presented for evaluation and approval by the Engineer prior to proceeding. Any corrective action performed shall not reduce the integrity or durability of the pavement which is to remain in place. Corrective action for deviation repair may consist of overlaying, removing and replacing, indirect heating and rerolling. Scraping of the pavement with any blade type device will not be allowed as a corrective action. Provide overlays of the same type mix, full roadway width, and to the length and depth established by the Engineer. Tapering of the longitudinal edges of the overlay will not be allowed.

Corrective actions will not be allowed for lots having a CSI of 40 or better. If the CSI indicates "Allowed" corrective action, the Contractor may elect to take necessary measures to reduce the CSI in lieu of accepting the disincentive. Take corrective actions as specified if the CSI indicates "Required" corrective action. The CSI after corrective action should meet or exceed "Acceptable" requirements.

Where corrective action is allowed or required, the test section(s) requiring corrective action will be retested, unless the Engineer directs the retesting of the of the entire lot. No disincentive will apply after corrective action if the CSI is 40 or better. If the retested lot after corrective action has a CSI indicating a disincentive, the appropriate disincentive will be applied.

Incentive pay adjustments will be based only on the initially measured CSI, as determined by the Engineer, prior to any corrective work. Where corrective actions have been taken, payment will be based on the CSI determined after correction, not to exceed 100 percent payment.

Areas excluded from testing by the N.C. Hearne Straightedge will be tested by using a non-mobile 10-foot (3 m) straightedge. Assure that the variation of the surface from the testing edge of the straightedge between any two contact points with the surface is not more than 1/8 inch (3 mm). Correct deviations exceeding the allowable tolerance in accordance with the corrective actions specified above, unless the Engineer permits other corrective actions.

Furnish the North Carolina Hearne Straightedge(s) necessary to perform this work. Maintain responsibility for all costs relating to the procurement, handling, and maintenance of these devices. The Department has entered into a license agreement with a manufacturer to fabricate, sell, and distribute the N.C. Hearne Straightedge. The Department's Pavement Construction Section may be contacted for the name of the current manufacturer and the approximate price of the straightedge.

No direct payment will be made for the work covered by this section. Payment at the contract unit prices for the various items covered by those sections of the specifications directly applicable to the work constructed will be full compensation for all work covered by this section including, but not limited to, performing testing in accordance with this specification, any corrective work required as a result of this testing and any additional traffic control as may be necessary.

SP6R45

**CONSTRUCTION SURVEYING:**

**01-20-04**

Add the following after the first sentence of Section 801-1 of the January 2002 Standard Specifications:

Provide a stakeout of areas where an environmental permit is required prior to performing any construction in or adjacent to these areas. Stake out limits of the permitted work areas according to the approved permit drawings. Provide clear delineation by use of pink or other highly visible flagging. Insure construction limits do not exceed approved permitted work areas. Immediately notify the Resident Engineer of any variations of the stakeout limits when compared to the approved permit drawings.

Replace the fifth paragraph of Section 801-4 of the January 2002 Standard Specifications with the following:

Partial payments for the item of "Construction Surveying" will be made on each particular payment estimate based upon the percentage complete of the item of "Construction Surveying" as determined by the Engineer. The Contractor is required to submit a certified statement each month indicating the percentage of "Construction Surveying" work completed. The Resident Engineer will determine if the amount indicated is reasonably correct and the Resident Engineer will pay accordingly on the next partial pay estimate.

SP8R02

**DISPOSAL OF WASTE AND DEBRIS:**

2-19-02

Revise the 2002 Standard Specifications as follows:

**Page 8-9, Subarticle 802-2(7. Buffer Zones:)**

At the end of the last sentence in this subarticle, add the words "unless superseded by an environmental permit."

SP8R03

**ENDWALLS:**

6-18-02

Revise the 2002 Standard Specifications as follows:

Page 8-24, Article 838-2

Delete the last two paragraphs of this article and insert the following:

"Use either portland concrete, brick masonry, or precast concrete for the endwall unless otherwise specified on the Drainage Summary Sheet of the Plans."

SP8R27

**GUARDRAIL POSTS AND OFFSET BLOCKS:**

06-22-04

Revise the *2002 Standard Specifications* as follows:

Page 10-69, Subarticle 1046-3

Delete this sub-article in its entirety and replace with the following:

**1046-3 POSTS AND OFFSET BLOCKS.**

**(A) General:**

The Contractor may at his option furnish either of the following types of steel guardrail posts. Only one type of post will be permitted at any one continuous installation. Use structural steel posts throughout the project, unless otherwise directed or detailed in the plans.

1. Steel W6 x 8.5 or W6 x 9.0 posts
2. Steel 4.5" x 6.0" "C" shape posts (C150 x 12.2 kg/m)

The Contractor may at his option furnish either of the following types of treated timber posts if specifically directed or detailed in the plans. Only one type of post will be permitted at any one continuous installation.

1. Timber 6" x 8" (152 mm x 203 mm) posts.
2. Timber 8" x 8" (203 mm x 203 mm) posts.

**(B) Structural Steel Posts:**

Fabricate steel posts for guardrail of the size and weight shown on the plans from structural steel complying with the requirements of Section 1072. Metal from which C shape posts are fabricated shall meet the requirements of ASTM A570 for any grade of steel, except that mechanical requirements shall meet the requirements of ASTM A36. Punch or drill the holes for connecting bolts. Burning will not be permitted. After fabrication, the posts shall be galvanized in accordance with Section 1076.

**(C) Treated Timber Posts:**

Timber guardrail posts shall be of treated southern pine meeting the requirements of Article 1082-2 and 1082-3.

Bore bolt holes to a driving fit for the bolts. A minus tolerance of 1 percent will be allowed in the length of the post. Perform all framing and boring before the posts receive preservative treatment.

**(D) Offset Blocks:**

Provide 8-inch deep recycled plastic or composite offset blocks that have been approved for use with the guardrail shown in the standard drawings and/or plans. Only one type of offset block will be permitted at any one continuous installation. Prior to beginning the installation of recycled offset block, submit the FHWA acceptance letter for each type of block to the Engineer for approval.

Treated timber offset blocks with steel beam guardrail will not be allowed unless required by Specifications, directed by the Engineer or detailed in the plans. Steel offset blocks with steel beam guardrail will not be allowed.

Recycled plastic or composite offset blocks shall be made from no less than 50% recycled plastic or composite, and shall meet the following minimum requirements:

- Specific Gravity: .....0.950
- Compressive Strength in Lateral Direction: .....1600 psi (11 MPa)
- Maximum Water Absorption: .....10% by weight
- Maximum Termite and Ant Infestation: .....10%
- Testing.....Shall pass NCHRP Report 350,

Revise the *2002 Standard Roadway Drawings* as follows:

Sheet 4 of 6, Standard 862.03, delete the note and substitute the following:

Note: The midpost and offset block of the WTR section will require special bolt hole drilling in the thrie beam offset block and line post.

SP8R57

**GUARDRAIL ANCHOR UNITS, TYPE 350:**

**04-20-04**

**DESCRIPTION**

Furnish and install guardrail anchor units in accordance with the details in the plans, the applicable requirements of Section 862 of the 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: 1-800-644-7976

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:

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

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 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 862.5 and 862-6 of the Standard Specifications.

Payment will be made under:

Guardrail Anchor Units, Type 350 .....Each

SP8R65

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

**7-1-95**

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 will 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 will be considered incidental to other work being paid for by the various items in the contract.

SP9R01

**AGGREGATE PRODUCTION:****11-20-01**

Provide aggregate from a producer who utilizes the new 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 utilize the new program. Participation in the new program does not relieve the producer of the responsibility of complying with all requirements of the Standard Specifications. Copies of this procedure are available upon request from the Materials and Test Unit.

SP10R05

**CONCRETE BRICK AND BLOCK PRODUCTION:****11-20-01**

Provide concrete brick and block from a producer who utilizes the new 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 utilize the new program. Participation in the new program does not relieve the producer of the responsibility of complying with all requirements of the Standard Specifications. Copies of this procedure are available upon request from the Materials and Test Unit.

SP10R10

**FINE AGGREGATE:****11-19-02**

Revise the 2002 Standard Specifications as follows:

Page 10-17, Table 1005-2

Make the following change to the table:

For Standard Size 2MS the following gradation change applies.

The minimum percent shown for material passing the No. 8 (2.36mm) sieve has been changed from 84 to **80**.

SP10R15

**BORROW MATERIAL****02-17-04**

Revise the 2002 Standard Specifications as follows:

Page 10-44

Section 1018-2 II (b) Delete the last sentence in its entirety.

SP10R17



**METAL POSTS AND RAILS:**01-21-03<sub>R</sub>

Revise the 2002 Standard Specifications as follows:

**1050-3 METAL POSTS AND RAILS.**

**Page 10-72, (A) Chain Link Fence: Delete paragraphs 2 and 3, and replace with the following:**

Steel H posts must have a minimum yield strength of 45,000 pi (310 MPa) and weigh 3.26 pounds per foot (4.85 kg/m). Galvanize steel H posts in accordance with ASTM F 1043 with a Type A coating. Aluminum H posts must weigh 1.25 pounds per foot (1.86 kg/m).

Roll formed steel line posts must be a 1.625" x 1.875" (41.3 mm x 47.6 mm) section weighing 2.40 lb/lf (3.57 kg/m) after galvanizing and be formed from 0.121" (3.1 mm) thick sheet having a minimum yield strength of 45,000 psi (310 MPa). Roll formed steel brace rails and top rails must be a 1.250" x 1.625" (31.8 mm x 41.3 mm) section weighing 1.35 lb./lf (2.01 kg/m) after galvanizing and be formed from 0.080" (2.0 mm) thick sheet steel having a minimum yield strength of 45,000 pi (310 Map). Galvanize all roll formed members after fabrication in accordance with ASTM F 1043 with a Type A coating.

**Page 10-73, (A) Chain Link Fence: Delete sentence one of paragraph four and replace with the following:**

Vinyl coated posts must be pipe posts meeting the requirements of AASHTO M 181, and have a fusion bonded vinyl coating of at least 6 mils (0.15 mm) thick.

Add the following as the penultimate paragraph:

For pipe 1.90" OD and under, the outside diameter at any point shall not vary more than 1/64" (0.4 mm) over nor more than 1/32" (0.8 mm) under the standard specified. For pipe 2.375" OD and over, the outside diameter shall not vary more than  $\pm 1\%$  from the standard specified nor shall the minimum wall thickness at any point be more than 12.5% under the nominal wall thickness specified.

**Page 10-73 (B) Woven Wire Fence: Add the following as the penultimate paragraph:**

For pipe 1.90" OD and under, the outside diameter at any point shall not vary more than 1/64" (0.4 mm) over nor more than 1/32" (0.8 mm) under the standard specified. For pipe 2.375" OD and over, the outside diameter shall not vary more than  $\pm 1\%$  from the standard specified nor shall the minimum wall thickness at any point be more than 12.5% under the nominal wall thickness specified.

**1050-7 FITTINGS AND ACCESSORIES**

Page 10-75, delete the last sentence of the last paragraph and replace with the following:  
The vinyl coating must be at least 6 mils (0.15 mm) thick, except that the coating on tension wire, hog rings, and tie wires must be at least 20 mils (0.50 mm) thick.

SP10R20

**COATED, PAVED AND LINED CORRUGATED STEEL CULVERT PIPE:** 10-21-03

Revise the 2002 Standard Specifications as follows:

**Section 1032-4(E) Optional Coatings for Bituminous Coated Pipe and Pipe Arch:**

Page 10-58. Delete Numbers 2. and 3., and substitute the following;

2. Type B: In lieu of Type B, Half Bituminous Coated and Partially Paved galvanized pipe, aluminized pipe or polymeric coated pipe without bituminous coating and paving may be used.
3. Type C: In lieu of Type C, Fully Bituminous Coated and Partially Paved galvanized pipe, aluminized pipe or polymeric coated pipe without a bituminous coating and paving may be used.

SP10R25

**TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC:** 1-15-02<sub>R</sub>

Revise the 2002 Standard Specifications as follows:

Delete Section 1175 and insert the following:

**Description**

Furnish, install, and remove sheeting, shoring, and bracing necessary to maintain traffic at locations shown on the Traffic Control Plans, and other locations determined during construction. Shoring required 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 or steeper slope from the bottom of the excavation or embankment intersects the existing ground line closer than five (5) feet (1.5 m) from the edge of pavement of the open travelway. Contractor has option of submitting their own shoring design or using the Standard shoring design, unless otherwise noted in the plans.

Materials

Sheet piling must be hot rolled and conform to the requirements of ASTM A328.

Steel piles must conform to the requirements of ASTM A36.

Timber and lumber must conform to the requirements of Article 1082-1 in Standard Specifications.

Include all materials proposed for use in temporary shoring in the shoring design submittal described below.

Provide a Type 7 Contractor's Certification for all shoring materials used.

Contractor Shoring Design

Submit shoring design for review and approval by the Engineer prior to beginning construction.

Submit calculations and detail drawings in accordance with section 410-4 of the Standard Specifications.

Design all temporary shoring in accordance with the latest edition of AASHTO's Guide Design Specifications for Bridge Temporary Works.

If temporary concrete barrier is to be located within three (3) feet (1 m) of the top of the shoring, measured to the back face of the barrier, then design the temporary shoring to resist the lateral movement of the barrier when struck by a vehicle and extend the shoring out of the ground at least to the top elevation of the temporary concrete barrier. Design the temporary shoring to resist an impact load of two (2) kips/foot (29 kN/m) applied at one and half (1.5) feet (0.5 m) above ground. This shoring will be paid for as "Temporary Shoring - Barrier Supported". Temporary concrete barrier is paid for separately.

Standard Shoring Design

Select the appropriate shoring design from the "Standard Temporary Shoring for Maintenance of Traffic" detail drawing as shown in the plans.

Submit a "Standard Shoring Selection Form" to Engineer a minimum of fourteen (14) days prior to beginning construction of shoring.

Find Standard Shoring Selection Form as follows:

1. Go to NCDOT webpage ([www.doh.dot.state.nc.us](http://www.doh.dot.state.nc.us))
2. Click on Doing Business with NCDOT link
3. Scroll down and click on Soils and Foundation Design Section Forms link
4. Click on Standard Shoring Selection Form

### Criteria for the Standard Shoring Designs

- Maximum height of shoring excavation is eleven (11) feet (3.35 meters).
- Groundwater table is not above bottom of shoring excavation.
- Traffic surcharge equal to 240 psf (11 kPa).
- Soldier pile spacing is six (6) feet (1.8 meters).
- Soldier pile embedment depths are for driven piles.
- Timber lagging must have minimum thickness of three (3) inches (76 mm).
- Timber must have a minimum allowable bending stress of 1000 psi (6895 kPa).

If conditions at the shoring location do not meet the criteria of the Standard shoring design as outlined above and in the plans, then Contractor must submit a shoring design to the Engineer for approval.

### Construction Methods

Install and interlock steel sheet piles to a tolerance of not more than 3/8 inch per foot (30mm per meter) from vertical.

If soldier piles are used, then install piles to a tolerance of not more than 1/4 inch per foot (20mm per meter) from vertical.

If soldier piles are to be installed in drilled holes, then set piles in drilled holes and fill the holes as soon as practical after installing the piles.

Excavate or auger the soil and rock in two (2) foot (610 mm) diameter holes to the required embedment depth as shown on the approved design. Maintain holes, if required, by casing or other means. Set soldier piles to bottom of the hole prior to backfilling. Backfill holes with Class A concrete to the bottom of excavation. Fill remainder of hole with a lean sand-grout mixture to the ground surface. Remove mixture as necessary to install timber lagging.

Use timber lagging with a minimum three (3) inch (76mm) thickness perpendicular to the pile flange. Install timber lagging with a minimum bearing distance of three (3) inches (76 mm) on each pile flange. Backfill voids behind lagging with granular material or compacted excavated material to the satisfaction of the Engineer.

Backfill and compact fill for shoring excavation prior to removal of shoring.

If the design embedment depth is not achieved, then notify the Engineer immediately.

### Method of Measurement

The quantity of temporary shoring to be paid for will be the actual number of square feet (square meter) of exposed face of the shoring measured from the bottom of the shoring excavation or embankment to the top of the shoring, with the upper limit for pay purposes not to exceed one (1) foot (0.3 m) above the retained ground elevation.

The quantity of temporary shoring - barrier supported to be paid for will be the actual number of square feet (square meter) of exposed face of the shoring measured from the bottom of the excavation or embankment to the top of the shoring, with the upper limit for pay purposes not to exceed one (1) foot (0.3 m) above the retained ground elevation.

Basis of Payment

Payment for temporary shoring will only be made at locations where it is required in order to maintain traffic. Trench boxes are not considered temporary shoring for the maintenance of traffic and will not be paid for under this special provision. Such payment will include, but not limited to, furnishing all labor, tools, equipment, and all incidentals necessary to install shoring and complete the work as described in this special provision.

The quantity of shoring necessary for the maintenance of traffic, measured as provided above, will be paid for at the contract unit price per square foot (square meter) of "Temporary Shoring".

The quantity of shoring with temporary concrete barrier located within three (3) feet (1.0 meter) of the shoring will be paid for at the contract unit price per square foot (square meter) of "Temporary Shoring - Barrier Supported".

Payment will be made under:

Temporary Shoring.....	Square Feet (Square Meter)	
Temporary Shoring - Barrier Supported.....	Square Feet (Square Meter)	SP11R01

**DRUMS:** **07-16-02**

Revise the 2002 Standard Specifications as follows:

Page 10-195, Subarticle 1089-5(C)

Delete the first (1<sup>st</sup>) sentence of the first (1<sup>st</sup>) paragraph and insert the following:

"Provide a minimum of three orange and two white alternating horizontal circumferential stripes covering the entire outside with each drum."

SP11R05

**PORTABLE CONCRETE BARRIER:** **11-19-02**

Portable Concrete Barrier used on this project must meet one of the following:

- NC Approved NCHRP 350 Portable Concrete Barrier (design can be found at <http://www.doh.dot.state.nc.us/preconstruct/traffic/congestion/TC/> or can be obtained by calling the Traffic Control Section at (919) 250-4159)
- Other NCHRP 350 Portable Concrete Barrier as approved by the Engineer and the Traffic Control Section

- NC Approved NCHRP 230 Portable Concrete Barrier in Roadway Standard Drawing 1170.01 manufactured before October 1, 2002

SP11R10

**PAVEMENT MARKING GENERAL REQUIREMENTS:**

**07-16-02**

Revise the 2002 Standard Specifications as follows:

Page 12-10, Subarticle 1205-3(J)

Delete the first (1<sup>st</sup>) sentence of the first (1<sup>st</sup>) paragraph and insert the following:

“Have at least one member of every pavement marking crew working on a project certified through the NCDOT Pavement Marking Technician Certification Process. For more information contact the Traffic Control, Marking and Delineation Section of the North Carolina Department of Transportation at 919-250-4151 or

<http://www.doh.dot.state.nc.us/preconstruct/traffic/congestion/TC/>”

SP12R01

**PERMANENT SEEDING AND MULCHING:**

**07-01-95**

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.

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

SP16R01