February 19, 2008

FULL DEPTH RECLAMATION WITH EMULSIFIED ASPHALT

1.1 Description

Full Depth Reclamation with Emulsified Asphalt consists of pulverizing and mixing the existing asphalt pavement, base, subbase, and subgrade (if necessary) materials with Emulsified Asphalt to produce a uniform mixture. Water and other supplemental materials may be added to produce a suitable mixture. The mixture will be compacted to serve as a base course for pavement in accordance with the plans and these specifications. This specification applies to a road that has had a site selection and material evaluation performed by SCDOT.

1.2 Materials

Ensure that emulsified asphalt meets the requirements given in **SC-T-99**, "Full Depth Reclamation Using Emulsified Asphalt – Job Mix Formula Preparation" and is from a source listed on Qualified Product Listing 38. Ensure that water meets the requirements of **Subsection 701.2.11.2** and prime coat meet the requirements of **Subsection 401.4.18**. Ensure that any add-rock used in this work conforms to the gradation requirements of **Section 305**, excluding Recycled Portland Cement Base Course, or to the gradation specified for Aggregate No. CR-14 given in the Appendix of the Standard Specifications.

1.3 Construction Requirements

(a) JOB MIX FORMULA AND SUBMITTAL

1. PURPOSE OF THE JOB MIX FORMULA

Determine the composition of the full depth reclamation mixture by developing a Job Mix Formula (JMF).

2. DEVELOPMENT OF THE JOB MIX FORMULA

Prepare a JMF in accordance with the requirements given in **SC-T-99**.

3. SUBMITTAL OF JOB MIX FORMULA

Submit the proposed JMF to the Materials and Research Engineer for review and acceptance. Submit the JMF no less than 28 calendar days prior to beginning the full depth reclamation. Show a description of reclaimed materials and proportions of emulsified asphalt proposed for the production of the full depth reclamation in the submittal. Ensure that supplemental materials required for the reclamation (cement, lime, etc.) are also completely described in the submittal. Include the laboratory results from **SC-T-99** in the submittal. Do not begin construction until the accepted JMF has been provided to the Resident Construction Engineer (RCE).

4. SUBMITTAL OF SAMPLES OF EXISTING ROADBED MATERIALS AND EMULSIFIED ASPHALT

Along with the proposed JMF, submit to the Materials and Research Engineer 3 gallons of the emulsified asphalt proposed for the full depth reclamation mixture and approximately 100 pounds of a composite representative sample of the existing roadbed materials. This composite sample is to consist of material obtained approximately every 1/4-mile along the roadbed that is then combined as a single 100 pound (approximately) sample of representative material.

(b) QUALITY CONTROL

Provide and maintain a quality control system to provide assurance that the full depth reclamation is constructed in accordance with the contract requirements. Submit a "Quality Control Plan for Full Depth Reclamation" to the RCE for review prior to the preconstruction conference. Ensure that this plan includes:

- procedure, equipment, and frequency proposed for monitoring the amount of emulsified asphalt placement;
- procedure, equipment, and frequency proposed for monitoring the material characteristics of the reclaimed material;
- procedure, equipment, and frequency proposed for monitoring the amount of water, and depth of pulverization of the reclaimed material during mixing;
- procedure, equipment and frequency for monitoring the reclaimed material moisture requirements during production;
- procedure, equipment and frequency for monitoring the density and moisture content of the full depth reclamation in-place;
- any other information requested by the RCE.

Present weekly documentation to the RCE verifying that the work is being monitored in accordance with the requirements given in the quality control plan. The RCE will not *approve* the Quality Control Plan but will review it to determine if the information in the plan is complete and acceptable. An incomplete plan will be returned for completion.

Do not begin construction until the RCE returns one copy of the plan and informs in writing that no further information will be required. The RCE will stop the production if work is not being performed in compliance with the plan.

(c) LENGTH, WIDTH AND DEPTH OF RECLAMATION

1. LENGTH OF RECLAMATION

Except by written permission of the RCE, the length of roadbed pulverized at any time is not to exceed the length that can be completely pulverized, mixed and compacted in the same working day.

2. WIDTH AND DEPTH OF RECLAMATION

The width and depth of the required pulverizing and mixing will be shown on the plans. Control the depth of pulverizing to ensure that the finished thickness is within the required tolerance limits.

3. REPEATED PASSES OF THE RECLAMATION EQUIPMENT

Complete the entire operation of reclaiming the existing road, adding water, asphalt emulsion, and supplemental materials (if required) in one pass of the reclamation equipment. If the entire reclamation operation cannot be completed in one pass reclaim the roadbed to the depth shown on the plans during a subsequent pass of the reclamation equipment and the addition of the remaining amount of emulsified asphalt and supplemental materials that may not have been placed in the first pass.

(d) EQUIPMENT

1. SUBMITTAL OF DESCRIPTION OF EQUIPMENT

Submit a description of all of the equipment that will be used for the construction of the full depth reclamation. Submit this information to the RCE with the submittal of the Quality Control Plan. Do not begin construction until the RCE informs that the proposed equipment and method of monitoring the rate of placement of emulsified asphalt and supplemental materials is adequately described.

2. MECHANICAL MIXER

Use a mechanical mixer that is capable of pulverizing and mixing the existing pavement, base and sub-grade to the required depth. Ensure that the mechanical mixer is capable of pulverizing the existing asphalt pavement so that 98%-100 % passes a 2-inch sieve. Ensure that the mixer has a system for adding emulsified asphalt directly into the mixing chamber. Do not apply emulsified asphalt from equipment that is not a part of the mixer. Ensure that the mixing chamber has a full width spray bar consisting of a positive displacement pump interlocked to the machine speed so that the amount of emulsion being added is automatically adjusted with changes in machine speed. Ensure that the additive system is capable of incorporating up to 7 gallons per square yard of emulsion and that individual valves on the spray bar are capable of being turned off as necessary to minimize emulsion overlap on subsequent passes.

3. RECLAMATION MACHINE

Ensure that the reclamation machine has the capacity of mixing the pulverized pavement, base and sub-grade to the required depth. Ensure that the reclamation machine also has the capacity of distributing the emulsified asphalt and supplemental materials directly into the reclaimed materials during mixing. Distribute the emulsified asphalt through the reclamation machine so that that it is placed uniformly across the reclaimed roadbed at the required rate in one pass.

4. ROLLERS

Various types of rollers (padfoot, sheepsfoot, vibratory, pneumatic tire) rollers may be required to provide the compactive effort that is necessary to achieve the required compaction.

(e) WEATHER LIMITATIONS

Do not perform reclamation in the rain. Reclamation will not be performed when the temperature is expected to be below freezing during the reclamation work and for a period of 7 days after the completion of the reclamation.

(f) GRADATION, MOISTURE AND EMULSIFIED ASPHALT CONTENT DURING RECLAMATION

Ensure that the initial pulverizing and mixing breaks up the existing roadbed into the required gradation. Add additional material if it is necessary to achieve the required gradation. Take samples of the reclaimed (initial) material before the addition and mixing of emulsified asphalt and supplemental materials. Analyze the samples to determine if the material meets the required gradation. Take corrective measures to provide the required gradation. The RCE will check the gradation at least once for each 2000 linear feet of each lane.

(g) MOISTURE CONTENT BEFORE FINAL MIXING AND COMPACTION

Check the moisture content of the in-situ reclaimed (and possibly pre-pulverized) material prior to the addition and mixing of the asphalt emulsion and supplemental materials. Check the moisture content in accordance with the requirements given in **AASHTO T255** or an approved equivalent procedure. Check the moisture content at least once each day that the reclamation work is performed. If the moisture content is not within 1 % of the JMF, adjust it by the addition of water or by aeration. Recheck the moisture content prior to the addition and mixing of the asphalt emulsion.

(h) APPLICATION AND MIXING OF EMULSIFIED ASPHALT AND SUPPLEMENTAL MATERIALS

Monitor the rate of application of emulsified asphalt and supplemental materials during the mixing of the reclaimed materials. Ensure that the rate of addition of asphalt emulsion and supplemental materials is in accordance with the JMF. Do not change the application rates of the emulsified asphalt and supplemental materials from that shown in the JMF without written permission of the RCE. Ensure that the mixture of the water, pulverized roadbed materials, emulsified asphalt and supplemental materials is done within the tolerance limits of theoretical optimum moisture content so that the mixture is suitable for immediate compaction without further mixing or grading.

When the mixer will handle only a part of the roadbed width within a single lane, limit the operation so that the full width of the lane being constructed of treated material is promptly mixed, compacted, and finished before starting the next section.

(i) COMPACTION AND FINISHING

Ensure that the pulverizing, mixing, and compaction is a continuous operation. Ensure that the compaction of the mixture of roadbed materials, water and emulsified asphalt begins within 30 minutes after the final mixing. The breakdown roller shall follow closely and shall not be behind the reclaimer by more than 500 feet. Complete the compaction and finishing each day that the reclamation work is done. Compact the mixture to 97.0 % of theoretical maximum density shown in the JMF. Monitor the in-place density as indicated in the Quality Control Plan.

The in-place density will be measured by the RCE in accordance with the requirements given in **AASHTO T310**, Direct Transmission Method only. The in-place density will be measured at least once for each 1000 linear feet of each lane.

Scraping and blading of the compacted mixture is not allowed. Perform repeated reclamation if the shape of the roadbed is not within the construction tolerances. At the end of each day's construction, form a clean, straight, vertical, transverse construction joint by cutting back the reclaimed roadbed to the full width and thickness of completed work.

(j) CURING OF FULL DEPTH RECLAMATION

Allow the full depth reclamation to cure after compaction until the moisture content is reduced to either less than 50 % of the optimum moisture content shown in the JMF or less than or equal to 2.5 %. Perform repeated reclamation if the reclaimed roadbed is damaged by traffic or equipment prior to the curing of the reclaimed roadbed.

(k) APPLICATION OF ASPHALT PRIME COAT AFTER CURING

Apply a prime coat of Emulsified Asphalt Prime (EA-P Special) to the surface of the full depth reclamation after the completion of the curing. Finish and place the prime coat in accordance with the material and construction requirements given in **Subsection 401.4.18**. The cost of the prime coat is considered to be included in the unit price for full depth reclamation and no additional payment will be made for this material or its application.

(l) TESTING, TOLERANCE, AND DEFICIENCY CORRECTION

1. GENERAL

Reconstruct areas of the full depth reclamation that are not within the required tolerances of thickness, density, and surface finish as directed by the RCE without additional compensation. The amount of asphalt emulsion required for reconstruction will be in accordance with the approved JMF.

2. THICKNESS

The RCE will verify the thickness of the reconstructed roadbed at intervals of one test per 200 feet of lane, or more often if necessary. Ensure that the thickness of the entire reconstructed layer or layers does not vary more than 1 inch, plus or minus, from that shown on the plans. Immediately reconstruct any section deficient by more than 1 inch in accordance with all of the requirements given in this Section for full depth reclamation. For any section exceeding the 1 inch tolerance, add additional asphalt emulsion to correct the composition of the full depth reclamation mixture and remix and re-compact to the required depth, width and density.

3. SURFACE FINISH

Ensure responsibility for roadbed grade controls. Ensure that the cross slope does not vary by more than 0.50 % from the required slope as shown on the plans. (If, for example a 2.0 % cross slope is required, the measured slope will not be greater than 2.5 % or less than 1.5 %). High spots in the finished surface may be corrected by motor grader or planer without additional compensation, provided the resulting thickness is within the allowable tolerances.

1.4 Method of Measurement

Measure Full Depth Reclamation in units of square yards. Measure the length of a lane along the center of the lane. The width of a lane is the width shown on the plans. Additional areas required for crossovers, turnouts, etc., are determined by the measurement of the length and width along the surface of the reclaimed area. Emulsified asphalt is measured in gallons. Add-rock is measured in tons placed.

1.5 Basis of Payment

(a) UNIT PRICE COVERAGE

The contract unit price for Full Depth Reclamation is full compensation for furnishing all materials (except Emulsified Asphalt and Add-Rock) equipment, tools, labor, and incidentals necessary to complete the work.

The contract unit price for Emulsified Asphalt for Full Depth Reclamation is full compensation for furnishing and applying the emulsified asphalt to complete the work of Full Depth Reclamation. Payment is only made for the actual amount of emulsified asphalt applied to the reclaimed roadbed.

Additional soil or aggregate material required to construct the roadbed to the required plan grade and section, and any unsuitable material excavated, is measured and paid for under the appropriate item of Unclassified Excavation, Borrow, or Add-Rock and is full compensation for furnishing all materials, tools, labor, and incidentals necessary to complete the work.

(b) PAYMENT WILL BE MADE UNDER:

Item No.	Description	Units
3063320	Full Depth Reclamation, 4 inches Thick	SY
3063321	Full Depth Reclamation, 5 inches Thick	SY
3063322	Full Depth Reclamation, 6 inches Thick	SY
3063323	Full Depth Reclamation, 8 inches Thick	SY
3063324	Full Depth Reclamation, 10 inches Thick	SY
3063325	Full Depth Reclamation, 12 inches Thick	SY
3064005	Emulsified Asphalt for Full Depth Reclamation	GAL
3059001	Additional Rock for Full Depth Reclamation	TON