

STATE OF TENNESSEE

(Rev. 6/27/16)

January 1, 2015

SPECIAL PROVISION

REGARDING

FULL DEPTH RECLAMATION OF FLEXIBLE PAVEMENT

Description of Work: Reclaim existing flexible pavement by pulverizing the bituminous asphalt layers, mixing the pulverized material with the existing base and subgrade layers and adding a specified amount of cement and water to achieve a homogeneous mixture of reclaimed base material. The reclaimed base shall be constructed to the lines and grades as specified in the plans and/or as directed by the Engineer.

Materials: Provide materials as specified in:

Portland Cement, Type I.....	901.01
Portland-Pozzolan Cement, Type IP.....	901.01
Portland-Limestone Cement, Type IL	901.01
Bituminous Curing Seal, Emulsified Asphalt, Types allowed for Tack Coat in 403.....	904.03
Water.....	302.03.B

Provide and place emulsified asphalt, of a type allowed for Tack Coat in **403**, meeting the test requirements specified in Table **904.03-1**. The Contractor may select the kind of bituminous material to use for curing.

Equipment: All equipment necessary for the satisfactory performance of this work shall be fully operational and approved before work will be permitted to begin.

Provide a mechanical cement spreader of a type that has a controllable adjustable rate of flow and will uniformly distribute the cement in all directions at the required rate. Provide a mechanical mixer capable of pulverizing and mixing the existing pavement, base, sub-grade, and cement uniformly to the specified depth. Mixers shall be capable of sizing the material to a point that 100% passes a 2 inch sieve. Provide a mixer that is equipped with a metered water additive system capable of adding moisture uniformly into the mixture. Equipment that requires the application of water separate of the mixing operation is not acceptable.

Provide rollers whose capacity is capable of compacting the mixed material to 95% dry density as determined in accordance with AASHTO T99. Provide suitable compaction equipment as follows:

- For reclamation greater than 8 inch depth, use a vibratory pad-foot roller for breakdown compaction of the lower lift.
- For reclamation of 8 inch depth or less use a Pneumatic Tire Roller for breakdown compaction, or following the pad-foot roller when reclamation exceeds 8 inch depth.

Perform finish rolling using a single or tandem steel drum static roller.

Provide a motor grader with an electronic grade/slope control system or provide other means to control the roadway profile and slope. Alternate methods shall be approved by the Engineer.

Limitations: Only apply cement to reclaimed material that is unfrozen and when the air temperature in the shade is at least 45°F and rising. Unless otherwise approved by the Engineer, construction of FDR work shall not proceed during periods of high wind, on a forecasted rain date greater than 30%, in the rain, or if the projected weather forecasts freezing temperatures within 5 days of the planned date of application.

Limit the application of cement to an area that will allow for continuous operations and for the completion of the FDR process through clipping, final compaction, and finishing within 3 hours from the time the cement is applied. Do not leave any uncompacted mixture undisturbed for more than 30 minutes.

If the uncompacted mixture is wetted by rain so that the average moisture content exceeds the specified tolerance, reconstruct the entire section as specified here-in.

Test Strip. In the presence of the Engineer, construct a 300 foot test strip during initial reclamation to assure the process and equipment will produce the desired outcome. Demonstrate the full reclamation process including pulverization, application of cement and water, final compaction, and shaping.

Establish roller patterns and verify that density can be achieved. Perform compaction in a continuous and uniform manner over the entire test strip. The Department will take nuclear density readings after each pass of each roller. Continue compaction with each roller until additional roller passes produce no appreciable increase in density. Upon completion of compaction, the Department will take a minimum of 5 tests at random locations to determine the average in-place density of the control strip. Use the roller pattern established for the remainder of the project.

Establish the target speed and/or RPM of the mixing and spreading equipment to assure that the moisture content and cement spread rates will be acceptable. Verify time constraints can be achieved.

Have the equipment on hand to verify the reclaimed material particle size after pulverizing, to calibrate the water meter of the mechanical mixer, and to verify the spread rate of cement distribution of the cement spreader. Identify and adjust any aspects of the work not conforming to the intent of the contract requirements before proceeding with full production work. If processes of the work are not found to be adequately controlled to produce the desired reclaimed roadway, construct additional test sections until the necessary control is established. In the event the specified particle size is unachievable, cold planing the pavement prior to pulverization may be deemed necessary by the Engineer to establish proper control.

Pulverizing: Pulverize the existing pavement structure and uniformly mix with existing base, and subgrade to the depth and width specified in the plans, such that 100% passes a 2 inch sieve prior to the application of cement. The contractor is to verify particle size in the presence of the Engineer initially and periodically as identified here-in during the progress of work to ensure control.

Cement Application, Spreading and Mixing: Uniformly spread the required quantity of cement on the pulverized base and immediately blend the cement until evenly distributed. Maintain the moisture content at or below the optimum moisture during application of cement.

The percentage of cement to be used, depth of cut, proctor, and optimum moisture will be

established by the Materials Engineer based on tests of the existing flexible surface, base and subgrade layers. The amount of cement to be used will be based on laboratory specimens achieving a compressive strength of 300 to 500psi within 7 days, in accordance with ASTM D1633. Actual strength and target cement spread rates will be dependent on the depth of cut and material collected from project samples before work is started.

Thoroughly mix water, cement, and the pulverized materials until the water and cement are uniformly distributed throughout the base mixture. Maintain the moisture content within a range of minus 1.0% of optimum moisture to plus 3.0% of optimum moisture during final mixing and initial compaction. Moisture content shall be determined by a nuclear gauge using the direct transmission method in accordance with AASHTO T310.

Compaction: Begin compaction immediately after cement and water has been incorporated and thoroughly blended with the reclaimed base mixture. Compact the reclaimed base materials using approved self-propelled rollers to a minimum dry density of 95%. The moisture content prior to breakdown rolling shall not vary more than 3% above or 2% below the specified optimum moisture content, and shall be less than the quantity that will cause the soil-cement mixture to become unstable during compaction and finishing.

The Department will measure density and moisture by using the direct transmission mode of a nuclear density and moisture content gauge, in accordance with AASHTO T310. Compact the entire reclaimed area using uniform passes of compaction equipment as determined from the test strip, ensuring that uniform density is achieved.

Complete final compaction and finishing of the reclaimed base mixture within 3 hours after cement has been added to the mixture. Do not leave any cement treated reclaimed base mixture undisturbed for more than 30 minutes in areas that not been compacted and finished to grade.

Finishing: After compaction, shape the surface of the reclaimed base material to the required lines, grades, and cross-sections. If no lines or grades are provided, the contractor shall maintain the existing profile and provide correction to noticeable imperfections and cross slopes as instructed by the Engineer. Sprinkle the surface until it is damp, but not wet, and clip with a motor grader as directed by the Engineer. Dispose of the material removed by clipping. Following clipping, seal the surface with a roller.

Construction Joints: At the beginning of each day's construction, form a straight transverse construction joint by cutting back into the previously completed work to form a true vertical face free of loose or shattered material. Straightedge the traverse joints during final grading.

If longitudinal joints between adjacent stabilization passes are necessary, they shall be overlapped 2 to 4 inches in a neat straight line. Gouging in excess of 2.0 inches into the adjacent previous stabilized reclaimed lane is not permissible and means shall be provided for immediate correction. Pre-determined cut lines shall be marked in a manner visible to the operator. Steer the mixer so as to accurately follow the marking. The overlap cut width should be confirmed before starting a new cut sequence. The longitudinal joint shall be offset at least 6 inches with the next succeeding layer of HMA or surface treatment.

Surface Tolerances: After final finishing and compaction of the reclaimed base, test the surface with a 12 foot straightedge applied parallel to the centerline of the pavement. The deviation of the surface from

the testing edge of the straightedge shall not exceed 1/2 inch.

Curing: The Contractor is required to proof roll the compacted material and correct yielding areas prior to applying a curing material. After the reclaimed base material has been finished, protect it against drying by applying one of the bituminous materials specified here-in. Apply the curing material in accordance with Standard Specification Section **403** at the rate shown on the Plans. Perform this work as soon as possible after completing the base construction, but in no case later than 24 hours after completing finishing operations. Maintain the finished reclaimed base material in a continuously moist condition until the curing material is placed.

If construction equipment or other local traffic must use the bituminous-covered surface before it has dried sufficiently, apply sufficient granular cover consisting of clean sand, 100% passing a 3/8 inch sieve and 10% maximum passing the #200 sieve, or provide other approved material to prevent pickup. Maintain the bituminous curing material for 7 days to ensure that all of the reclaimed base material remains effectively sealed and covered. Protect finished portions of reclaimed base material that are traveled on by equipment used in constructing an adjoining section so as to prevent equipment from marring or damaging completed work.

Subsequent asphalt-based layers or surface treatment identified in the plans can be used as a curing material and can be placed any time after finishing, as long as the FDR is sufficiently able to support the required construction equipment without marring or permanent distortion of the surface. Do not operate construction equipment on the new reclaimed base except as necessary to discharge into the asphalt spreader during pavement operations.

Sufficiently protect the reclaimed base material from freezing for 7 days after its construction.

Traffic: Completed sections of the reclaimed base may be opened when necessary to lightweight local traffic, provided the base has received a bituminous coating as stipulated above and has hardened sufficiently to prevent marring or distortion of the surface, and provided the curing is not impaired. Appropriate traffic signs must be posted to prevent heavy traffic on the constructed base. Finished sections can be opened, with Departmental approval, to all traffic after the FDR base has received subsequent asphalt-based layers or surface treatment identified in the plans and is sufficiently stable to withstand marring or permanent deformation. The contractor is responsible for repairing any failed areas. If the failed areas are not due to workmanship, the Department will participate in the reconstruction of any such areas previously approved. Ingress and egress shall be provided for property owners, public entrances, and side roads during the curing period.

QA/QC and Acceptance Testing: The Department will divide the project into lots of approximately 10,000 square yards for density and moisture testing purposes, and will perform five tests on each lot. Density tests shall be performed as soon as practical after final compaction. The average dry density of each lot shall be not less than 95% of maximum density as determined in accordance to AASHTO T99, and no individual test shall be less than 92%. Moisture content shall be checked just prior to initial compaction. Each moisture content test shall be within a range of minus 2.0% to plus 3.0% of optimum moisture. Moisture content and density shall be determined by a nuclear gauge using the direct transmission mode in accordance with AASHTO T310.

The Department will collect samples prior to initial compaction to verify the mix design. The

Contractor shall test, in the presence of the Engineer, pulverization and mixing depths and the size of reclaimed material at representative locations of each density or moisture test selected by the Department. The measured thickness shall not deviate from that shown on the Plans by more than 1 inch.

Cement spread rates shall be checked as instructed by the Engineer. The contractor shall have available appropriate scales and square canvas tarps measuring 1.0 square yard. The contractor shall have on hand the equipment to verify the reclaimed material particle size after pulverizing, to calibrate the water meter of the mechanical mixer, and to verify the spread rate of cement.

Reconstruction and Replacement: If reconstruction becomes necessary, repeat all construction procedures and adhere to the time limitations specified as stated herein; however, the Engineer will determine the amount of cement to be used in the reconstructed reclaimed base material. Replace faulty work for the full depth of treatment. Correct low areas by replacing the material for the full depth of treatment rather than by adding a thin layer of reclaimed base material to the completed work.

Maintenance: Maintain the reclaimed base material in good condition until all work has been completed and accepted. Immediately repair defects that may occur at no additional cost to the Department.

Method of Measurement: The Department will measure:

1. Processing by the square yards of completed reclaimed base material, as determined using the actual length measured along the center-line of the roadbed and the width shown on the Plans or designated by the Engineer.
2. Cement incorporated in the work by the ton in accordance with **109**.
3. Bituminous Material used for a curing seal by the ton in accordance with **109**.
4. Water used in mixing and finishing operations by the M.G. (1,000 gallons) using calibrated tanks or distributors, or accurate meters.

The Department will not measure or pay for water added to emulsified asphalt or aggregate cover material used during the curing process.

Basis of Payment: The Department will pay for accepted quantities at the contract process as follows:

<i>Item Number</i>	<i>Item</i>	<i>Pay Unit</i>
304-01.04	Processing (reclaimed base material)	Square Yard
304-01.08	Portland Cement (reclaimed base material)	Ton
309-10.02	Bituminous Material	Ton
203-06	Water	MG

The Department will not pay for reconstructive work, including additional cement and processing, required due to the Contractor’s negligence.

The Department will not pay for the furnishing and spreading of granular cover used for protection, in

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accordance with the curing requirements for areas opened to equipment and other traffic before the curing material has sufficiently dried.

