

Section 2116. Full Depth Reclamation

2116.01 DESCRIPTION.

Reclaim existing asphalt pavement to the width and depth specified in the contract documents. Mix the reclaimed material in-place with an asphalt stabilizing agent, additional materials (when specified), and water (if required). Compact this mixture.

2116.02 MATERIALS.

A. Asphalt Stabilizing Agent.

1. Unless specified otherwise in the contract documents, the asphalt stabilizing agent may, at the Contractor's option, be either of the following:
 - a. Emulsified Asphalt (HFMS-2s) meeting the requirements of [Section 4140](#).
 - b. Foamed Asphalt using PG 52 -34 or PG 46 -34 asphalt binder meeting the requirements of [Section 4137](#).
2. Unless stated otherwise in the contract documents, use the residual asphalt application rate of 3.0%, by dry mass to determine the estimated plan quantity of asphalt stabilizing agent.

B. Pulverized Bituminous Material.

Ensure the reclaimed paving material conforms to the following gradation. The gradation may be revised with the Engineer's approval, but ensure the top size of the material does not exceed 25% of the depth of the compacted recycled mat.

Sieve Size	% Passing
1 1/2 inch (37.5 mm)	98 to 100
1 inch (25 mm)	90 to 100

C. Mineral Stabilizing Agents.

A mineral stabilizing agent may be required by the mix design. When specified, the agent may be from any locally available commercial source meeting the following criteria:

1. Portland cement meeting ASTM C 150, Type I.
2. Fly ash may come from any available source.
3. Hydrated lime meeting the requirements of [Article 4193](#).
4. Limestone fines from limestone crushing operations.

D. Mix Design.

The contract documents will specify the mix design for the reclaimed mixture. The mix design establishes the depth of milling, the amount of added material, and the amount of residual asphalt to incorporate into the milled material and the optimum laboratory compaction moisture.

2116.03 CONSTRUCTION.

A. General.

1. Perform full depth reclamation between April 1 and November 1 unless otherwise specified in the contract documents.
2. Do not perform reclaiming operations when the weather conditions are such that proper mixing, shaping, and compacting the reclaiming material cannot be accomplished.

B. Equipment.

1. Furnish a self-propelled machine capable of reclaiming the existing paving material to the width and depth shown in the contract documents. Ensure the machine meets the following:
 - a. Equipped with automatic depth control and maintain a constant cutting depth and width.
 - b. Capable of pulverizing bituminous material to the required gradation.
 - c. Capable of mixing the reclaimed material and asphalt stabilizing agent into a homogeneous mixture.
 - d. Provides a positive means for accurately controlling the rate of flow and total delivery of the asphalt stabilizing agent into the mixture in relation to the speed and quantity of material being recycled.
 - e. A delivery system meeting the requirements of [Article 2001.22, F](#).
2. When foamed asphalt is used, use an asphalt foaming system that accurately and uniformly adds the specified percent of water to the hot asphalt binder. Use equipment fitted with a test nozzle to provide field samples of foamed asphalt. Equip tankers supplying the hot asphalt binder with a thermometer to continuously measure the temperature of the asphalt in the bottom third of the tank.
3. Use rollers meeting the requirements of [Article 2001.05](#) for compacting the reclaimed material. As a minimum, have the following rollers available for use:
 - a. Sheepsfoot roller.
 - b. Double drum steel roller (may be used in the static or vibratory mode).
 - c. 25 ton (22.5 Mg) or greater pneumatic tire roller.

C. Preparation.

Prior to initiating the reclaiming operation, clear all vegetation and debris within the width of pavement to be reclaimed. Remove of this vegetation and debris from the project according to [Article 1104.08](#).

D. Reclaiming the Existing Pavement.

1. During reclaiming operations, apply the asphalt stabilizing agent to the pulverized material at a rate that will achieve the residual asphalt content established by the mix design. The Engineer may vary the application rate of asphalt stabilizing agent as required by existing pavement conditions.
2. Determine the amount of additional water needed to facilitate uniform mixing with the asphalt stabilizing agent and achieve a stable reclaimed layer above the minimum specified density. The water may be added prior to or concurrently with the asphalt stabilizing agent. Ensure adding water to facilitate uniform mixing does not adversely affect the asphalt stabilizing agent.
3. The mineral stabilizing agent may be added dry or in slurry form.
4. If multiple passes of the equipment are required to reclaim the pavement material to the desired width, use a minimum 6 inch (150 mm) overlap. Use an asphalt stabilizer application system capable of being adjusted for the width of reclaiming so that overlapped mixture maintains the designed residual asphalt content.

E. Compaction and Shaping.

1. Ensure the following:
 - Field density for the reclaimed mat on Interstate and Primary roads is a minimum of 94% of laboratory density based on the dry weight of compacted material according to [Materials I.M. 504](#).
 - Field density for the reclaimed mat on shoulders and all other roads is a minimum of 92%.
 - The surface density, based on the 2 inch depth nuclear probe density, is a minimum of 97% of the nuclear probe density measured at 75% of the reclaimed mat depth.
2. Perform initial rolling with a sheepsfoot roller until the roller pads walk out of the reclaimed mix. Shaping to achieve planned profile and cross slope should cut deep enough to remove the sheepsfoot roller marks.
3. Repeated reclaiming and rolling may be required within 2 calendar days after the initial processing and rolling to achieve the target density on the completed in-place recycled surface. Discontinue rolling that results in cracking, movement, or other types of distress until such time that the problem can be resolved. If there is a significant change in mix proportions, weather conditions, or other controlling factors, the Engineer may require construction of test strips to check target density.

F. Quality Control.

1. Control the residual asphalt content to be within $\pm 0.5\%$ of the target established by the design.
2. Control the mineral stabilizing agent to be within $\pm 0.5\%$ of the target established by the design.
3. For foamed asphalt, ensure the asphalt binder is maintained at a temperature within $\pm 20^\circ\text{F}$ (10°C) of the optimum temperature established by the design. The Engineer may verify the foaming characteristics of each new tanker load, by measuring a sample from the equipment's test nozzle.
4. Ensure the crown of the compacted reclaimed mat is within 6 inches (150 mm) of the centerline reestablished by construction survey, unless specified otherwise in the contract documents. Measure the profile along the center of each lane of the compacted reclaimed mat with a profilograph. Correct bumps and dips greater than 1 inch (25 mm). Ensure the cross-slope of the compacted reclaimed mat is within 1 inch (25 mm) of the designated slope.
5. Unless specified otherwise in the contract documents, perform nuclear gauge moisture and density tests every 500 feet (150 m) per lane at locations determined by the Engineer, according to [Materials I.M. 504](#). The Quality Index for density will not apply. Remix and compact sections of reclaimed mat that do not achieve minimum density criteria.

2116.04 METHOD OF MEASUREMENT.

Measurement will be as follows:

A. Full Depth Reclamation.

Square yards (square meters) satisfactorily completed computed from the measured longitudinal length of pavement reclaimed to the nearest 0.1 foot (0.1 meter) and the width of pavement specified in the contract documents.

B. Asphalt Stabilizing Agent.

Tons (megagrams) or gallons (liters) measured through a calibrated pump used for metering the total delivery of the agent or by delivery tanker quantity.

C. Mineral Stabilizing Agent.

Dry tons (megagrams) by delivery tanker quantity.

2116.05 BASIS OF PAYMENT.

Payment will be the contract unit price as follows:

A. Full Depth Reclamation.

1. Per square yard (square meter).

2. Payment is full compensation for all labor, equipment, and materials necessary for preparation, reclaiming, shaping, and compaction of the reclaimed material.

B. Asphalt Stabilizing Agent.

1. Per ton (megagram) or gallon (liter).
2. Payment is full compensation for all labor, equipment, and materials necessary for furnishing the agent and application of the agent into the reclaimed material.

C. Mineral Stabilizing Agent.

1. Per dry ton (megagram).
2. Payment is full compensation for all labor, equipment, and material necessary for furnishing the agent and application of the agent into the reclaimed material.