

FULL DEPTH RECLAMATION**PART 1 - GENERAL****1.01 SECTION INCLUDES**

Full depth reclamation of asphalt roadways

1.02 DESCRIPTION OF WORK

Includes pulverizing and mixing of existing asphalt and underlying materials; addition of stabilizing agents and additives if required; compaction of the reclaimed materials and curing of the compacted street.

1.03 SUBMITTALS

Comply with Division 1 - General Provisions and Covenants as well as the following:

- A. Prepare and submit the job mix formula to the Engineer for approval prior to initiating full reclaiming operations.
- B. Provide quality control test results.

1.04 SUBSTITUTIONS

Comply with Division 1 - General Provisions and Covenants.

1.05 DELIVERY, STORAGE, AND HANDLING

Comply with Division 1 - General Provisions and Covenants.

1.06 SCHEDULING AND CONFLICTS

Comply with Division 1 - General Provisions and Covenants.

1.07 SPECIAL REQUIREMENTS

None.

1.08 MEASUREMENT AND PAYMENT**A. Full Depth Reclamation:**

1. **Measurement:** Measurement will be in square yards for the area of roadway reclaimed.
2. **Payment:** Payment will be at the unit price per square yard of roadway reclaimed.
3. **Includes:** Unit price includes, but is not limited to, pulverizing and sizing of existing asphalt layers; incorporating and mixing of existing underlying materials; protecting street fixtures; development of a job mix formula; adding and mixing stabilizing agents and additives, if required; compacting the reclaimed mix; shaping of the mix; removing any loose or excess material; curing; and final clean up.

1.08 MEASUREMENT AND PAYMENT (Continued)**B. Mechanical Stabilization Agents:**

1. **Measurement:** Measurement will be in tons of aggregate.
2. **Payment:** Payment will be at the unit price per ton of aggregate.
3. **Includes:** Unit price includes, but is not limited to, furnishing and placing of aggregate and blending of the aggregates.

C. Bituminous Stabilization Agents:

1. **Measurement:** Measurement will be in gallons of asphalt emulsion or foamed asphalt furnished and incorporated.
2. **Payment:** Payment will be at the unit price per gallon of asphalt emulsion or foamed asphalt furnished and incorporated.
3. **Includes:** Unit price includes, but is not limited to, furnishing and placing of materials and mixing the agent into the reclaimed mix.

D. Chemical Stabilization Agents:

1. **Measurement:** Measurement will be in tons of chemical stabilization agents.
2. **Payment:** Payment will be at the unit price per ton of chemical stabilization agents.
3. **Includes:** Unit price includes, but is not limited to, furnishing and placing of materials and mixing the agent into the reclaimed mix.

E. Microcracking

1. **Measurement:** Measurement will be in square yards for the area of roadway microcracked.
2. **Payment:** Payment will be at the unit price per square yard of roadway microcracked.

F. Interlayer for Cement Stabilized Base

1. **Measurement:** Measurement will be in square yards for each type and thickness of interlayer.
2. **Payment:** Payment will be at the unit price per square yard for each type and thickness of interlayer.
3. **Includes:** Unit price includes, but is not limited to, surface cleaning, furnishing, and placing of the interlayer (if specified).

G. Fixture Adjustment: Comply with Section 6010 for adjustment of manholes and intakes and Section 5020 for adjustment of water valves and fire hydrants.

PART 2 - PRODUCTS**2.01 MATERIALS**

- A. Mechanical Stabilizing Agents:** Use virgin crushed aggregates, RAP, or crushed PCC in the gradation called for in the job mix formula.
- B. Bituminous Stabilizing Agent:** Use asphalt emulsion (HFMS-2s) meeting the requirements of Iowa DOT Section 4140, or foamed asphalt using PG 52-34S asphalt binder meeting the requirements of Iowa DOT Section 4137.
- C. Chemical Stabilizing Agent:**
1. Cement complying with Iowa DOT Article 4101.01, A.
 2. Class C or Class F Fly Ash complying with Iowa DOT Section 4108.
 3. Hydrated Lime complying with AASHTO M 216.
 4. Calcium Chloride complying with Iowa DOT Section 4194.
 5. If approved by the Engineer, use proprietary products according to the manufacturer's requirements.
- D. Fog Seal Cure:** Comply with Iowa DOT Section 2306.
- E. Water:** Comply with Iowa DOT Section 4102. Potable water obtained from an approved supply does not need to be tested.
- F. Interlayer**
1. Class A crushed stone complying with Iowa DOT Article 4120.04.
 2. HMA interlayer complying with Section 7021, 2.04, B.

2.02 JOB MIX FORMULA

Compile a job mix formula using an analysis of the existing asphalt pavement layers and the subbase/subgrade and the required strength of the reclaimed pavement section as specified in the contract documents. The job mix formula will identify the stabilizing agent and any additives; the rates for the stabilizing agent and additive, if needed; and the rate of water to reach the optimum moisture content. Allowable tolerances should be included to allow the Contractor to adjust the mixture so that it is placed successfully.

PART 3 - EXECUTION**3.01 EQUIPMENT****A. General:**

1. Perform full depth reclamation between April 1 and November 1.
2. Perform reclaiming operations when weather conditions are such that proper mixing, shaping, and compacting the reclaimed mix can be accomplished.

B. Equipment:

1. Furnish a self-propelled machine capable of reclaiming the existing paving material to the width and depth specified in the contract documents. Ensure the equipment meets the following:
 - a. Equipped with automatic depth control to maintain a constant depth and width.
 - b. Capable of pulverizing the existing roadway to the required gradation.
 - c. Accurately controls the rate of flow and total delivery of the stabilizing agent and additives, if needed, into the reclaimed mixture in relation to the speed and quantity of the material being recycled.
 - d. Capable of mixing the reclaimed material and any stabilizing agent and additive required by the job mix formula into a homogeneous mixture.
2. If specified in the contract documents, use an asphalt foaming system that accurately and uniformly adds the required percent of water to the hot asphalt binder. Use equipment fitted with a test nozzle to provide field samples of the foamed asphalt. Equip tankers supplying the hot asphalt binder with a thermometer to continuously monitor the temperature of the asphalt in the bottom third of the tank.
3. Have the following rollers available for use:
 - a. Sheepsfoot roller
 - b. Double drum steel roller (static and vibratory)
 - c. Pneumatic tire roller (25 ton or greater)
4. Provide a motor grader with grade and cross-slope control.

3.02 PREPARATION

Prior to initiating the reclaiming process, undertake the following tasks:

- A. Identify and protect all affected utilities.
- B. Remove excess dirt, vegetation, raised pavement markings, standing water, and any other objectionable materials.

3.03 UTILITIES

All utilities within the project limits should be protected prior to the pulverization. Locate and lower manholes, water valve boxes, and other fixtures a minimum of 4 inches below the bottom of the reclaimed section. Re-set manhole castings, water valves, and other fixtures to the proper elevations following completion of the compaction of the reclaimed mixture. If lowering of fixtures is not practical, excavate material from around the fixture to a location where it can be pulverized by the reclaimer. Move the pulverized material back around the fixture after mixing and compact with smaller compaction equipment to the required densities. Protect stormwater intakes by preventing reclaimed material from entering the drainage system.

3.04 CONTROL STRIP

Construct a control strip during the first day of production to verify that the equipment, construction methodology, and workmanship meet the specifications. Adequately size the control strip to verify that the optimal rates of water, stabilizing agent, and additives can be achieved. Establish a rolling pattern that will result in optimum compaction. The Engineer may waive the control strip provided the Contractor provides proof that the work will meet the specifications based on previous experience using the same equipment, personnel, and materials.

3.05 PULVERIZING

Pulverize the existing asphalt pavement and underlying areas to initiate the reclaiming process.

- A. Pulverize the full depth of the asphalt layers and the underlying materials in a single pass, unless multiple passes are specified in the contract documents.
- B. If multiple passes are specified, leave a minimum of 1 inch of the underlying layer intact with the initial pulverizing pass.
- C. Prior to the second pulverizing/mixing pass, complete light compaction and reshaping to establish a solid working base.
- D. Verify the gradation of the pulverized material meets the job mix formula.
- E. Provide a 6 inch overlap of the longitudinal joint and 24 inches between transverse joints when multiple passes are required.

3.06 REMOVAL OF EXCESS MATERIAL

Following the initial pulverization pass and prior to the mixing pass, if required, remove any excess reclaimed material from the project area to a site designated by the Engineer as a means to meet final design elevations.

3.07 STABILIZING AGENT APPLICATION

- A. **Mechanical:** Spread aggregate in a uniform layer ahead of the pulverizer. Placement can be completed during the initial pulverizing pass or as a part of a mixing pass.
- B. **Chemical:** Spread dry chemical stabilizers onto the reclaimed material between the pulverizing pass and the mixing pass. Take corrective measures if dust is a problem. Apply chemical stabilizers in slurry form through the reclaimer's on-board liquid additive system, if so equipped, or directly on the reclaimed material in advance of the mixing pass. Disburse slurry uniformly over the entire reclaimed roadway. Do not exceed 30 minutes from the time the slurry is applied until the mixing begins. Ensure chemical stabilizer application rate is $\pm 0.5\%$ as required by the job mix formula.
- C. **Bituminous:** Inject the asphalt emulsion or foamed asphalt at the required rate through the reclaimer's on-board liquid additive system. Ensure residual asphalt content is $\pm 0.5\%$ of the target established in the job mix formula. Maintain foamed asphalt binder $\pm 20^{\circ}\text{F}$ of the optimum temperature established by the job mix formula.

3.08 STABILIZING ADDITIVES

Add chemical stabilizing agents as additives to applications that use bituminous stabilizers at the rates required by the job mix formula. Apply the chemical additive in dry form, slurry form, or through the reclaimer's liquid injection system after the pulverizing pass.

3.09 COMPACTION

Ensure reclaimed material is within 2% of the optimum moisture content.

- A. Timing:** Compact the mixed reclaimed roadway materials based on the type of stabilizing agent used as follows:
1. **Mechanical:** Upon completion of all mixing passes.
 2. **Chemical:**
 - a. **Cement:** Do not exceed two hours between mixing and final compaction.
 - b. **Hydrated Lime and Kiln Dust:** Initiate compaction 4 hours after mixing. Maintain moisture content above the optimum level during that time.
 3. **Bituminous:**
 - a. **Asphalt Emulsion:** Complete compaction at or just after the emulsion breaks.
 - b. **Foamed Asphalt:** Initiate immediately after mixing and complete prior to the mixture drying out.
- B. Process:** Follow the rolling pattern established with construction of the control strip with respect to type and size of roller. Perform initial rolling with sheepsfoot roller until the roller pads walk out of the reclaimed mix. Set the vibratory amplitude/frequency, tire pressure for pneumatic, and static weight of all rollers based on the depth of the reclaimed mixture to be compacted. Uniformly compact the mixture to a minimum of 98% of maximum dry density according to AASHTO T 134 on a moving average of five consecutive tests with no individual test below 96%.
- C. Shaping:** Following sheepsfoot roller walk out, cut the reclaimed road bed and shape to required grade and cross-section to remove roller marks. Complete rolling to achieve the required density. Ensure the crown of the compacted reclaimed roadway is within 6 inches of the established centerline, unless otherwise specified in the contract documents. If grade control is required, stake according to Section 11,010, 3.03, A.

3.10 CURING

- A. Moisture:** Following final finishing, maintain the surface moisture by completing regular applications of a light spray of water. Continue moisture cure for a minimum of 7 days. Apply water spray such that the surface is not eroded.
- B. Bituminous:** Apply bituminous fog seal within 24 hours of finishing operations. Maintain moisture cure until bituminous cure is placed. Prior to application of fog seal, clean all loose and extraneous materials from the surface. Complete fog seal cure according to Iowa DOT Section 2306. If traffic is allowed on the roadway prior to the fog seal drying so that material is picked up on tires, add a sand blotter to the entire roadway width.

3.11 MICROCRACKING

If specified in the contract documents, complete microcracking of the cement stabilized reclaimed roadway starting within 24 to 48 hours after moisture curing was initiated. Use a 10 to 12 ton vibratory steel drum roller with vibration set at maximum amplitude and speed limited to 2 mph. Use 3 to 4 passes over the entire roadway except the outside 1 foot on uncurbed sections. Continue moisture curing or apply fog seal cure following completion of microcracking.

3.12 INTERLAYER

If specified in the contract documents, complete placement of the HMA interlayer according to Section 7021. Complete placement of the Class A crushed stone interlayer by complying with Iowa DOT Section 2312.

END OF SECTION