



STATE OF MAINE  
DEPARTMENT OF TRANSPORTATION  
16 STATE HOUSE STATION  
AUGUSTA, MAINE 04333-0016

Janet T. Mills  
GOVERNOR

Bruce A. Van Note  
COMMISSIONER

April 30, 2024  
Subject: Full Depth Reclamation  
State WIN: 026872.30  
Location: Deblois, Beddington &  
T22 MD BPP  
**Amendment No. 2**

Dear Sir/Ms.:

In the Bid Book:

**Add** the attached Special Provision, Section 309, Full Depth Recycled Pavement (With Foamed Asphalt), 8 pages, dated September 10, 2013.

**Add** the attached Special Provision, Section 309, Full Depth Recycled Pavement (With Foamed Asphalt) Mix Design, 1 page, dated April 29, 2024.

**Add** the attached Special Provision, Section 311, Cold In-Place Recycled Asphalt Pavement (Travelling Pugmill with Emulsion or Foamed Asphalt), 8 pages, dated March 26, 2024.

The following questions have been received:

**Question:** Special Provision Section 105 pg 45 Note 1 States that millings for cross slope correction will be done at the same time as reclaim operations. Will the paving crew continue to be paid under item 631.161 Paving crew in the event that they are waiting for the FDR operation to be completed in the same area/workzone?

**Response:** Item 631.161 Paving crew will be paid for the actual hours the crew is placing and compacting RAP materials ahead of FDR operations. The Department would compensate for up to 8 hours for approved delays not associated with planned FDR operations. The Contractor may propose to perform work in additional work zones but the Department would not be responsible for additional costs associated with maintaining the RAP to suitable conditions required for the traveling public.

**Question:** With reference to Item 307.332 Full Depth Recycled Pavement (w/ Emulsified Asphalt Stabilizer) 5 inch depth.

- a. Is the reclaimed asphalt to be treated with an Emulsified Asphalt Stabilizer & Cement?
- b. If required is the Emulsified Asphalt Stabilizer required to be injected through the reclaimer during the mixing process?
- c. Is Foamed Asphalt FDR and option? If so can the Department provide the specification?

**Response:**

A. As indicated in the recycled mix design included in the contract, Portland cement and emulsion are required unless an alternative product is proposed and accepted.

B. As indicated in the 307 Special Provision under section 307.04 emulsion is required to be injected through the reclaimer.

C. FDR using foamed asphalt is an option if requested by the contractor. Equipment and processes shall meet the requirements outlined in the attached 309 Foamed Asphalt special provision, or as outlined in the 311 Cold In-Place Recycle special provision if a CIPR would be utilized. A foamed asphalt mix design has been provided for bidding purposes.

**Question:** Within Supplemental Special Provision Section 307 Full Depth Recycling it references Section 311 – Cold In-Place Recycled Pavement. Is the CIPR process an option on this contract?

**Response:** The use of CIPR equipment to perform the initial full depth reclamation (FDR) and the emulsion treated layer as long as all sizing, depth, cross slope and profile requirements are met.

**Question:** If utilizing the equipment specified in Section 311 – Cold In-Place Recycled Pavement is an initial pass with a reclaimer required prior to using the CIPR equipment?

**Response:** This project requires cross slope correction that may exceed the ability of single pass CIPR equipment which is why the Department selected a Full Depth Recycle treatment not CIPR. The contractor may elect to use CIPR equipment for the initial “FDR” operations, but all sizing requirements to create material that pass a 2 inch sieve must be met.

**Question:** If Cold in Place Recycled is an option will it be allowed to pave at 12' width to accommodate the width of the machine?

**Response:** The treated layer will applied to the travelway and shoulder widths areas indicated in the construction notes. Should a twelve foot machine be proposed the Department would allow its use but would not be responsible for any additional costs associated with its use.

**Question:** Special Provision Section 204 Add Shoulder Aggregate states that "The Contractor shall be responsible for loading, hauling, and placement of the material". Under Section 631 Equipment Rental (Paving Crew) 631.031 Loading and Hauling Equipment it states that "Trucks will be loaded using Department supplied equipment". How will the contractor be paid to load trucks for item 411.101?

**Response:** As stated in the Special Provision 204, Item 204.211, the Contractor shall be responsible for loading, hauling, placing and compacting the material for shoulder aggregate. The intent of Item 411.101 is to provide the basis of payment for loading and trucking of the processed millings and shall be the responsibility of the Contractor. The intent of Item 631.161 Paving Crew and 631.162 Paving Crew (overtime) is to provide the basis of payment for the placement and compaction of the processed millings.

**Question:** Could you confirm the initial grind depth? Are there boring logs available?

**Response:** The existing pavement depth ranges from 4 to 11 inches according to the Department's GPR data. There are isolated areas that could range from 11 to 16 inches after HMA millings are added for cross slope correction. The Department may share the GPR data with the low bidder upon award of the Contract.

Consider these changes and information prior to submitting your bid on **May 1, 2024**.

Sincerely,



George M. A. Macdougall P.E.  
Contracts & Specifications Engineer

**SECTION 309**  
**FULL DEPTH RECYCLED PAVEMENT**  
**(With Foamed Asphalt)**

309.01 Description This work shall consist of pulverizing a portion of the existing roadway structure into a homogenous mass, treating the pulverized material with the foamed asphalt process, and placing and compacting this material to the lines, grades, and dimensions shown on the plans or established by the Resident.

**MATERIALS**

309.020 Pulverized Material Pulverized material shall consist of the existing asphalt pavement and one inch or more as specified of the underlying gravel, pulverized and blended into a homogenous mass. Pulverized material will be processed to 100 percent passing a 2 in square mesh sieve.

309.021 New Aggregate and Additional Recycled Material New aggregate, if required by the contract, shall meet the requirements of Section 703.10 - Aggregate for Untreated Surface Course and Leveling Course, Type A. Aggregate Subbase Course Gravel Type D processed to 100 percent passing a 2 inch square mesh sieve and meeting the requirements of 703.06 – Aggregate for Base and Subbase may be used in areas requiring depths greater than 2 inches. New aggregate required to restore grade and/or cross-slope shall be measured and paid for under the appropriate item. Crusher dust required as part of the job mix shall be considered part of the 309 item and will not be measured for payment.

Recycled material, if required, shall consist of salvaged asphalt material from the project or from off-site stockpiles that has been processed, prior to use to 100 percent passing a 2 in square mesh sieve. Recycled material shall be conditionally accepted at the source by the Resident. It shall be free of winter sand, granular fill, construction debris, and other materials not generally considered asphalt pavement.

Recycled material generated and salvaged from the project shall be used within the roadway limits to the extent it is available as described in 309.06. No additional payment will be made for material salvaged from the project.

Recycled material supplied from off-site stockpiles shall be paid for as described in the contract, or by contract modification.

309.022 Asphalt Binder The asphalt binder used in the foamed asphalt process shall be Performance Grade 64-28 or 58-28 meeting the requirements of AASHTO M320.

309.023 Portland Cement The Portland Cement shall be Type I or II meeting the requirements of AASHTO M85.

309.024 Hydrated Lime Hydrated Lime shall meet the requirements of AASHTO M216.

309.025 Crusher Dust Crusher dust, if required by the mix design, shall be free from friable or deleterious material, including excessive mica, and shall meet the following gradation requirements:

Sieve Size	Percent Passing
12.5 mm [½ in]	100
0.075 mm [No. 200]	10 - 20

309.026 Water Water shall be clean and free from deleterious concentrations of acids, alkalis, salts or other organic or chemical substances.

## EQUIPMENT

309.030 Pulverizer The modified milling or recycling machine shall, as a minimum, have the following features:

- a. A minimum power capability of 600 horsepower.
- b. Two microprocessor-controlled systems, complete with 2 independent pumping systems and spraybars, to regulate the application of foamed asphalt stabilizing agent, separate from water (for increasing the moisture content of the recycled material), in relation to the forward speed and mass of the material being recycled.
- c. Two spray bars shall each be fitted with self-cleaning nozzles at a maximum spacing of one nozzle for each 6 in width of the chamber.
- d. The foamed asphalt shall be produced at the spraybar in individual expansion chambers into which both hot asphalt and water are injected under pressure through individual and separate small orifices that promote atomization. The rate of addition of water into hot asphalt shall be kept at a constant (percentage by mass of asphalt) by the same microprocessor.
- e. An inspection (or test) nozzle shall be fitted at one end of the spraybar that produces a representative sample of foamed asphalt.
- f. An electrical heating system capable of maintaining the temperature of all asphalt flow components above 300°F.
- g. A single asphalt feed pipe installed between the modified milling or recycling machine and the supply tanker. Circulating systems that incorporate a return pipe to the supply tanker shall not be used.
- h. The recycler shall be fitted with a front breaker bar system to ensure that the reclaimed material is broken down to the sizing outlined in 309.020.

309.031 Liquid Mixer Unit or Distributor Only tankers with a capacity exceeding 2500 gal shall be used to supply the recycling machine with asphalt. Each tanker shall be fitted with two recessed pin-type tow hitches, one in front and the other behind, thereby allowing the tanker to be pushed from behind by the recycling machine, and to push a water tanker in front. No leaking tanker will be permitted on the job site. In addition, each tanker shall be equipped with the following:

- a. A thermometer to show the temperature of the contents in the bottom third of the tank.
- b. A rear feed valve, with a minimum internal diameter of 3 in, capable of draining the contents of the tank when fully opened.
- c. Insulation to retain heat.
- d. A calibrated dipstick marked at intervals of no more than 25 gal, for measuring the contents of the tank.

309.032 Cement or Lime Spreader Spreading of the Portland Cement or Hydrated Lime shall be done with a spreader truck designed to spread dry particulate (such as Portland Cement or Lime) or other approved means to insure a uniform distribution across the roadway and minimize fugitive dust. Pneumatic application, including through a slotted pipe, will not be permitted. Other systems that have been developed include fog systems, vacuum systems, etc. Slurry applications may also be accepted. The Department reserves the right to accept or reject the method of spreading cement. The Contractor shall provide a method for verifying that the correct amount of cement is being applied.

309.033 Placement Equipment Placement of the full depth recycled material to the required slope and grade shall be done with an approved highway grader or by another method approved by the Resident.

309.034 Rollers The full depth recycled material shall be rolled with a vibratory pad foot roller, a vibratory steel drum soil compactor and a pneumatic tire roller. The pad foot roller drum shall have a minimum of 112 tamping feet 3 inches in height, a minimum contact area per foot of 17 in<sup>2</sup>, and a minimum width of 84 inches. The vibratory steel drum roller shall have a minimum 84 inches width single drum. The pneumatic tire roller shall meet the requirements of Section 401.10 and the minimum allowable tire pressure shall be 85 psi.

## MIX DESIGN

The Department will supply a mix design for the foamed asphalt based on test results from pavement and soil analysis taken to the design depth. The Department will provide the following information prior to construction:

1. Percent of asphalt to be used.
2. Percent of water to be used in the foaming process.
3. Quantity (if any) of crusher dust to be used.
4. Quantity of lime or cement to be added.
5. Optimum moisture content for proper compaction and dispersion of foamed asphalt.
6. Additional aggregate (if required).

After a test strip has been completed or as the work progresses, it may be necessary for the Resident to make necessary adjustments to the mix design. Changes to compensation will be in accordance with the Mix Design Special Provision.

## CONSTRUCTION REQUIREMENTS

308.04 Pulverizing The entire depth of existing pavement shall be pulverized together with approximately 1 inch or more of the underlying gravel into a homogenous mass. All pulverizing shall be done with equipment that will provide a homogenous mass of pulverized material, processed in-place, which will pass a 2 in square mesh sieve.

309.05 Weather Limitations When foamed asphalt is used, full depth recycled work shall be performed when;

- a. Foaming operations will be allowed between May 15<sup>th</sup> and September 15<sup>th</sup> inclusive in Zone 1 - Areas north of US Route 2 from Gilead to Bangor and north of Route 9 from Bangor to Calais. Foaming operations will be allowed between May 1<sup>st</sup> and September 30<sup>th</sup> inclusive in Zone 2 - Areas south of Zone 1 including the US Route 2 and Route 9 boundaries.

- b. The atmospheric temperature, as determined by an approved thermometer placed in the shade at the recycling location, is 50°F and rising.
- c. When there is no standing water on the surface.
- d. During generally dry conditions, or when weather conditions are such that proper pulverizing, adding, mixing, and curing can be obtained using proper procedures, and when compaction can be accomplished as determined by the Resident.
- e. When the surface is not frozen and when overnight temperatures are expected to be above 32°F.
- f. Wind conditions as such that the spreading of lime or cement on the roadway ahead of the recycling machine will not adversely affect the operation.

309.06 Full Depth Recycling Procedure New aggregate or recycled material meeting the requirements of Section 309.021 - New Aggregate, and Recycled Material shall be added as necessary to restore cross-slope and/or grade before initial pulverizing. Locations will be shown on the plans or described in the construction notes; the Resident may add other locations while construction of the project is in progress. The Contractor will use recycled material to the extent it is available, in lieu of new aggregate. The material shall then be pulverized, processed, and blended into a homogeneous mass passing a 2 in square mesh sieve. Material found not pulverized down to a 2 in size will be required to be reprocessed by the recycler with successive passes until approved by the Resident.

Should the Contractor be required to add new aggregate or recycled material to restore cross-slope and/or grade after the initial pulverizing process, those areas will require re-processing to blend into a homogenous mass passing a 2 in square mesh sieve.

The resultant material from the initial pulverizing processes shall be graded and compacted to the cross-slope and profile shown on the plans or as directed by the Resident. The Contractor will also be responsible for re-establishing the existing profile grade. The completed surface of the full depth recycled course shall be shaped and maintained to a tolerance, above or below the required cross sectional shape, of  $\frac{3}{8}$  inch. The initial pulverizing process density requirements will be the same as Section 309.08 unless otherwise directed by the Resident.

Following completion of the initial pulverizing and blending process the dry stabilizing agents (lime or cement) shall be spread uniformly over the full width of roadway to be recycled prior to each pass of the foaming operation, and in a continuous process by means of a mechanical spreader. Dry stabilizing agents shall be spread at the prescribed rate of application provided by the Department.

If required by the mix design, a uniform layer of crusher dust or other aggregate specified shall be spread over the full width of the roadway just prior to the foaming procedure. Foamed asphalt shall be incorporated into the material to a depth determined by the pavement design. These additives shall then be uniformly blended into a homogeneous mass until an apparent uniform distribution has occurred. The Resident may adjust the rate of application as necessary.

Asphalt binder shall be added to the milling or recycling process by pumping from a mobile bulk tanker that is pushed from behind by the recycling machine. Tankers shall be equipped with a built-in thermometer to ensure that the bituminous stabilizing agent is maintained at  $375^{\circ}\text{F} \pm 10^{\circ}\text{F}$ . The system employed to add the foamed asphalt to the recycling process shall conform to the equipment requirements specified in this Section.

Sufficient water shall be added through the recycler head during the recycling process to ensure thorough

blending to meet the optimum moisture for compaction as specified. Water shall be added only by means of a controlled system on the recycling machine. Care shall be taken to prevent excessive wetting. A second water truck may be required during recycling operations to assist in the compaction and water control efforts. The rate of water supplied shall be kept constant unless changed due to project material changes.

The resultant material shall be graded and compacted to the cross-slope and profile shown on the plans or as directed by the Resident. The Contractor will also be responsible for re-establishing the existing profile grade. The completed surface of the full depth recycled course shall be shaped and maintained to a tolerance, above or below the required cross sectional shape, of  $\frac{3}{8}$  in. Areas not meeting this tolerance will be repaired as described in Section 309.061.

After compaction, the roadway surface shall be treated with a light application of water, and rolled with pneumatic-tired rollers to create a close-knit texture. The finished layer shall be free from:

- a. Surface laminations.
- b. Segregation of fine and coarse aggregate.
- c. Corrugations, centerline differential, potholes, or any other defects that may adversely affect the performance of the layer.

The Contractor shall protect and maintain the recycled layer until a lift of pavement is applied. Frequent light watering shall be performed to prevent the surface from drying out. Any damage or defects in the layer shall be repaired immediately. An even and uniform surface shall be maintained. The recycled surface shall be swept prior to hot mix asphalt placement.

309.061 Repairs Repairs and maintenance of the recycled layers, during and after the curing period, resulting from damage caused by traffic, weather or environmental conditions, or resulting from damage caused by the Contractor's operations or equipment, shall be completed at no additional cost to the Department.

Low areas will be repaired using a hot mix asphalt shim. Areas up to 1 in high can be repaired by milling or shimming with hot mix asphalt. Areas greater than 1 in high will be repaired using a hot mix asphalt shim. All repair work will be done with the Resident's approval at the Contractor's expense.

## TESTING REQUIREMENTS

309.07 Quality Control The Contractor shall operate in accordance with the approved Quality Control Plan (QCP) to assure a product meeting the contract requirements. The QCP shall meet the requirements of Section 106.4 - Quality Control and this Section. The Contractor shall not begin recycling operations until the Department approves the QCP in writing.

Prior to performing any recycling process, the Department and the Contractor shall hold a Pre-recycle conference to discuss the recycling schedule, type and amount of equipment to be used, sequence of operations, and traffic control. A copy of the QC random numbers to be used on the project shall be provided to the Resident. All field and plant supervisors including the responsible onsite recycling process supervisor shall attend this meeting.



The QCP shall address any items that affect the quality of the Recycling Process including, but not limited to, the following:

- a. Sources for all materials, including New Aggregate and Additional Recycled Material.
- b. Make and type of rollers including weight, weight per inch of steel wheels, and average contact pressure for pneumatic tired rollers.
- c. Testing Plan.
- d. Recycling operations including recycling speed, yield monitoring, procedures for avoiding recycling and curing in inclement weather, methods to ensure that segregation is minimized, procedures for mix design modification, grading and compacting operations, and cement and lime application procedure.
- e. Methods for protecting the finished product from damage and procedures for any necessary corrective action.
- f. Method of grade checks.
- g. Examples of Quality Control forms.
- h. Name, responsibilities, and qualifications of the Responsible onsite Recycling Supervisor experienced and knowledgeable with the process.
- i. A note that all testing will be done in accordance with AASHTO and MDOT/ACM procedures.

The Project Superintendent shall be named in the QCP, and the responsibilities for successful implementation of the QCP shall be outlined.

The Contractor shall sample, test, and evaluate the full depth reclamation process in accordance with the following minimum frequencies:

#### MINIMUM QUALITY CONTROL FREQUENCIES

Test or Action	Frequency	Test Method
Density	1 per 1000 ft / lane	AASHTO T 310
Air Temperature	4 per day at even intervals	
Surface Temperature	At the beginning and end of each days operation	
Yield of all materials (The daily yield, yield since last test, and total project yield.)	1 per 1000 ft / lane	

The Department may view any QC test and request a QC test at any time.

The Contractor shall submit all QC test reports and summaries in writing, signed by the appropriate technician, the Department's onsite representative by 1:00 P.M. on the next working day, except when otherwise noted in the QCP due to local restrictions. The Contractor shall make all test results, including randomly sampled densities, available to the Department onsite.

Penalties for QCP non-compliance will be in accordance with Standard Specification 106.4.6

The Contractor shall cease recycling operations whenever one of the following occurs:

- a. The computed yield differs from the mix design by 10percent or more.
- b. The Contractor fails to follow the approved QCP.
- c. The Contractor fails to achieve 98-percent density after corrective action has been taken.
- d. The finished product is visually defective, as determined by the Resident.

Recycling operations shall not resume until the Department approves the corrective action to be taken.

**309.08 Test Strip** The contractor shall assemble all items of equipment for the recycling operation on the first day of the foamed asphalt work. The Contractor shall construct a test strip for the project at a location approved by the Resident. The Responsible onsite Recycling Supervisor will work with Department personnel to determine the suitability of the mixed material, bitumen dispersion within the mixed material, moisture control within the mixed material, and compaction and surface finish. The test strip section is required to:

- A. Demonstrate that the equipment and processes can produce recycled layers to meet the requirements specified in these special provisions.
- B. Determine the effect on the gradation of the recycled material by varying the forward speed of the recycling machine and the rotation rate of the milling drum.
- C. Determine the sequence and manner of rolling necessary to obtain the compaction requirements and establish a target density. The Contractor and the Department will calibrate their respective gauges at this time.

The test strip shall be at least 300 ft in length of a full lane-width (or a half-road width). Full recycling production will not start until a passing test strip has been accomplished. If a test strip fails to meet the requirements of this specification, the Contractor will be required to repair or replace the test strip to the satisfaction of the Resident. Any repairs, replacement, or duplication of the test strip will be at the Contractor's expense.

After the test strip has been pulverized, and the roadway brought to proper shape, the Contractor shall add water until it is determined that optimum moisture has been obtained. The test strip shall then be rolled using the specified compaction equipment as directed until the density readings show an increase in dry density of less than 1 pcf for the final four roller passes of each roller. The Contractor and Department will each determine a target density using their respective gauges by performing several additional density tests and averaging them. The average of these tests will be used as the target density of the recycled material for QC and Acceptance purposes.

Following completion of the test strip, compaction of the material shall continue until a density of not less than 98 percent of the test strip target density has been achieved for the full width and depth of the layer. During the construction and compaction of the Full Depth Recycled base, should three consecutive Acceptance test results for density fail to meet a minimum of 95 percent of the target density, or exceed 102 percent of target density, a new test strip shall be constructed.

#### ACCEPTANCE TEST FREQUENCY

Property	Frequency	Test Method
In-place Density	1 per 2000 ft / lane	AASHTO T 310

**309.09 Miscellaneous** No new pavement shall be placed on the full depth recycled pavement until a curing period of 48 hours has elapsed. If inclement weather occurs, the Department reserves the right to extend the curing period.

**309.10 Method of Measurement** Full Depth recycled material (with Foamed Asphalt) will be measured by the yd<sup>2</sup>.

309.11 Basis of Payment The accepted quantity of Full Depth Recycled Pavement with Foamed Asphalt shall be paid for at the contract unit price per yd<sup>2</sup>, complete in-place to the specified limits, which price shall be full compensation for furnishing all equipment and labor for pulverizing, blending, placing, grading, compacting and for all incidentals necessary to complete the work including asphalt binder, water, Portland Cement, lime, and crusher dust.

The addition of materials to restore profile grade and/or cross-slope in areas shown on the plans or described in the construction notes will be paid separately under designated pay items within the contract. No additional payment will be made for materials salvaged from the project.

Payments will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
309.35 Full Depth Recycled Pavement with Foamed Asphalt 5 in depth	yd <sup>2</sup>
309.36 Full Depth Recycled Pavement with Foamed Asphalt 6 in depth	yd <sup>2</sup>

SPECIAL PROVISION  
SECTION 309  
FULL DEPTH RECYCLED ASPHALT PAVEMENT  
(with Foamed Asphalt)

**Mix Design**

**The JMF targets represented in this Special Provision are intended to provide a basis for bidding purposes only. The Department will develop a job mix formula for the FDR using the bituminous material salvaged from the project and provided to the Department by the Contractor. A minimum of two weeks shall be allowed from the time of sample delivery to mix design completion.**

The Full Depth Recycled Pavement on this project will be treated with the following material proportions:

PG 58-28 asphalt binder	2.8%
Water needed to ensure proper foaming	2.8 %
Portland cement (Type I or II)	1.0 %

**The approximate unit weight of the in-place recycled material shall be 125 pcf. This information shall be used for bidding purposes only.**

The optimum moisture content for compaction as determined by the Department using samples obtained from the pulverized material prior to addition of the foamed asphalt, by means of AASHTO T 180, Method D, is 7.0%.

After the test strip has been completed, or as work progresses, it may be necessary to make adjustments to the mix design. A contract modification will be executed if percentages change from the requirements above for PG asphalt binder or Portland cement by more than 0.10%. Positive and negative price adjustments will be made. The price adjustment will be based upon receipted bills for materials delivered the project site. If a price adjustment is warranted, the contractor will supply the Department with all receipted bills for PG asphalt binder, Portland cement for the entire project. Adjustments in water content exceeding the initial targets shall not be paid for directly, but shall be considered incidental to the item.

## SECTION 311

### **Cold In-Place Recycled Asphalt Pavement (Traveling Pugmill with Emulsion or Foamed Asphalt Technology)**

311.01 Description The Contractor shall construct a Cold In-place Recycled Pavement base course in accordance with the Contract documents and in reasonably close conformity with the lines, grades, thicknesses, and typical cross sections shown on the plans or as established by the Department. This work will consist of milling 3 to 6 inches of existing bituminous pavement as indicated in the contract, pulverizing and sizing the millings, the addition of Foamed Asphalt or Emulsified Asphalt with Portland Cement or hydrated lime to the proportions specified, the mixing and placement of the mixture full width as required in the contract, (including shoulders as indicated ) and compacting the mixture to a uniform layer in one continuous operation to the lines, grades and thicknesses indicated on the plans or as established by the Resident. Excess recycled material not used in the CIPR process will become the property of the Contractor.

Equipment, materials and methods outlined in this specification may be used to treat Full Depth Recycled (FDR) pulverized pavement sections processed to a size that will pass a 2 inch square mesh sieve.

Treatment of the pulverized pavement layers (if required) to the required depth and width may be accomplished by means and equipment described in this specification, up to 5 inches in treatment depth.

Should the contractor elect to use the Cold In-place Recycled Pavement equipment to add Portland cement, emulsion, or foamed asphalt treatments to FDR layers, the equipment requirements of section 311.043 - Screening and Sizing Unit may be modified to eliminate the screening unit if it can be demonstrated that the material has been processed to 2 inch minus and no oversize exists in the FDR layer being treated.

## **MIX DESIGN**

(Emulsion or Foaming technologies)

311.02 Composition of Mixture / Mix Design The Recycled Pavement on this project will be treated with either a Foamed Asphalt or Asphalt Emulsion additive at the Contractors option.

The Department may take samples prior to project advertise and provide a mix design for the project, establishing targets for Foamed Asphalt or Emulsion, with Portland cement or lime for bidding purposes.

If the Department does not provide a mix design for the project, the Contractor will be responsible to obtain samples from the project and provide the Resident with a proposed mix design a minimum of two weeks prior to commencing work.

The Contractor provided mix design shall include the Foamed Asphalt or Asphalt Emulsion binder application percentage, type and supplier, the percentage of Portland Cement or hydrated lime to be added, water percentage, and the percentage of any supplemental aggregates to be added.

- a. The aim for air voids in the final product is 8 to 11%.
- b. The Contractor may add water as needed to the sized material to facilitate uniform mixing and compaction.
- c. Included in the mix design will be the product information from the supplier of the asphalt or emulsion binder and any product information regarding the Portland cement or hydrated lime.
- d. The Contractor will be responsible for deciding and conducting investigative work to determine the properties of the existing in place bituminous mixes which the Contract documents do not describe. Any cores or laboratory testing the contractor performs to establish a recycled mix design will be incidental to the Cold In-Place Recycle pay item and not paid for separately. A copy of all test results on the pavement samples shall be included with the mix design.

The addition of Portland Cement or hydrated lime at 1.0% by weight is required and will be included in the mix design criteria. Asphalt, Emulsion, water, aggregate, cement shall be added in percentage by weight and verified by tank checks according to the Quality Control Plan. Cement or lime may be added in dry form or in a slurry.

### MATERIALS (Emulsion or Foaming technologies)

311.030 Pulverized Material Recycled bituminous pavement, after milling and sizing, will meet the following gradation requirements:

<u>Sieve Size</u>	<u>% Passing Limits</u>
2 in	100
1 in	95-100

311.031 Asphalts If an emulsion technology is proposed, the emulsified asphalt binder shall be a cationic slow-set grade CSS-1, CSS-1H, or CMS-2 medium set grades. Emulsions may be modified with polymer to improve coating and mixture strength for higher trafficked projects. All emulsions shall meet the requirements of Section 702.04. Cationic emulsions shall retain a 63% minimal asphalt residual value.

The Department may allow the use of a high float asphalt emulsion grade HFMS-2 in low traffic locations, if it can be demonstrated that the HFMS-2 results in a better coating and higher cured strength values than CSS or CMS grade emulsions when mixed with the available aggregates during the mix design process.

The Department will allow the use of foamed asphalt technology as an alternative to an emulsified asphalt additive if it can be demonstrated that the process can be successfully achieved, and the final treated product is of equal or higher quality.

If a foaming technology is proposed, the asphalt binder used in the foamed asphalt process shall be Performance Grade of 58-28 meeting the requirements of AASHTO M320, and the Contractor will supply a mix design and provide the following information prior to construction:

1. Percent of asphalt to be used.
2. Percent of water to be used in the foaming process.
3. Quantity of cement to be added.
4. Optimum moisture content for proper compaction and dispersion of foamed asphalt.
5. Additional aggregate (if required).

The Department will evaluate and approve the foamed asphalt mix design once submitted. Should the Department approve or require adjustments from the target values provided for bid purposes, a contract modification will be executed for the increased or decreased percentage change for asphalt, Portland cement or lime changes by more than 0.10%. Positive and negative price adjustments will be made. The price adjustment will be based upon receipted bills for materials delivered to the project site. If a price adjustment is warranted, the Contractor will supply the Department with all receipted bills for PG asphalt binder, Portland cement or lime for the entire project. Adjustments in water content exceeding the initial targets shall not be paid for directly but shall be considered incidental.

311.032 Portland Cement The Portland Cement shall be Type 1 or 2 that meets the requirements of AASHTO M85 and section 700 of the Standard Specifications.

311.033 Hydrated Lime The hydrated lime shall meet the requirements of AASHTO M216.

311.034 New Aggregates and Additional Recycled Material New aggregate, if required by the contract or job mix, shall meet the requirements of Section 411.02 - Untreated Aggregate Surface Course, or an approved Recycled Asphalt Pavement (RAP) source.

311.035 Water Water shall be clean and free from deleterious concentrations of acids, alkalis, salts or other organic or chemical substances.

## EQUIPMENT

(Emulsion or Foaming technologies)

311.040 Equipment The existing bituminous pavement shall be recycled in a continuous operation using a recycling train consisting of the following major components. The recycling equipment and operations may be combined onto one unit:

311.041 Mainline Cold Milling Machine The unit shall be self-propelled with a down cutting drum, and be automated to continuously adjust and maintain treatment depth and cross slope as directed. The cutting drums shall be a minimum of 10 feet in width, with the ability to add extensions to the drum or have hydraulically extendable milling heads that will treat the required width in one pass. Dust suppression systems are required. The unit shall be capable of recycling the pavement for the entire lane width to the required dimensions in one pass. The forward speed of the recycler may be reduced, and sizing or blending dwell time increased to achieve the two inch (2") particle sizing requirements. Forward speed of the milling machine shall not exceed 30 FPM.

311.042 Shoulder Cold Milling Machine If required, the shoulder milling unit shall have a minimum cutting drum of 6.5 ft in width, or equal to the shoulder width to be recycled. This unit shall precede the larger mainline milling machine to remove existing pavement off any existing paved shoulders. The material will be placed via a lift conveyor onto the existing mainline roadway surface to be incorporated and processed by the mainline milling machine.

311.043 Screening and Sizing Unit This unit shall be capable of reducing and sizing the recycled asphalt pavement to the specified gradations prior too, or after mixing with the asphalt emulsion, cement or lime additives. The screening unit may an independent unit, part of the recycler, windrow pick up machine, mounted on the paver surge hopper, or other configuration that will enable the screening of recycled materials, capture of any oversize particles, and be configured to allow offloading of any oversize particles to be either wasted or reincorporated into the work as required. Oversize particles shall not be included in the final mix. Some manufacture of waste through a screening process will be allowed. If more than 5% of the recycled material is screened off as waste, the Contractor will be required, at no additional compensation, to re-introduce the material ahead of the train to be reprocessed. If more than 10% of the of the recycled material is screened off, in addition to returning the oversized material back ahead of the train to be re-introduced to be processed, then forward speed of the recycler shall be reduced to achieve the two inch (2") particle sizing requirements. The Contractor may propose an alternative to slowing the recycling process but must demonstrate the effectiveness of the alternative while meeting the blending and particle sizing requirements.

311.0440 Portable Mixing Unit and Support Equipment The unit shall be capable of producing a uniform, thoroughly blended, cold mix asphalt product using either Emulsified Asphalt or Foamed Asphalt Technology. Recyclers shall be filled with end gate baffles, seals, or scrapers designed to eliminate or remove untreated windrows of material from longitudinal cut joints. The recycling unit shall be designed to either deposit the mixed product onto the roadway in a sized windrow, into a screening unit, or capable of depositing the product directly into a paver hopper once sized.

This mixing unit shall be of a dual duty milling and mixing design, equipped with a metering device which will continuously meter and maintain the amount of emulsion or asphalt being added to the milling and mixing process to a tolerance of  $\pm 0.25\%$  of the total, by weight.

The additive material feed system to the mixing unit shall be equipped with a computer controlled weigh bridge that will determine the mass of recycled material, by weight, being deposited into the mixing unit prior to the addition of the asphalt. The scales shall be calibrated to the manufacturer's tolerance at the start of the contract and will be checked for conformance to Section 401.074.

The asphalt control unit shall be equipped with a flow meter and a total delivery meter. A positive displacement pump capable of accurately metering the required quantity of emulsion or asphalt down to a rate of 4 gal/min into the recycled material is required. The pump shall be equipped with a positive interlock system that will shut off automatically when material is not present in the mixing chamber.



311.0441 Portable Mixing Unit for Emulsion Treatments The modified milling or recycling machine for Emulsified Asphalt technologies, as a minimum, shall have the following features:

- a. A minimum power capability of 1000 horsepower.
- b. Two spray bars each fitted with nozzles at a maximum spacing of one nozzle for each 6 in width of the chamber.
- c. A single asphalt feed pipe installed between the recycling machine and low point of the supply tanker. Circulating systems that incorporate a return pipe to the supply tanker shall not be used.
- d. The recycler shall be fitted with a front breaker bar system to ensure that the reclaimed material is broken down to the 2" sizing requirements. The forward speed of the recycler may be reduced, and sizing or blending dwell time increased to achieve the two inch (2") particle sizing requirements if a the equipment is not equipped with a front breaker bar system.

311.0442 Portable Mixing Unit for Foamed Asphalt The modified milling or recycling machine for Asphalt Foaming technologies, as a minimum, shall have the following features:

- a. A minimum power capability of 1000 horsepower.
- b. Two microprocessor-controlled systems, complete with 2 independent pumping systems and spray bars, to regulate the application of foamed asphalt stabilizing agent, separate from water (for increasing the moisture content of the recycled material), in relation to the forward speed and mass of the material being recycled.
- c. Two spray bars shall each be fitted with self-cleaning nozzles at a maximum spacing of one nozzle for each 6 in width of the chamber.
- d. The foamed asphalt shall be produced at the spray bar in individual expansion chambers into which both hot asphalt and water are injected under pressure through individual and separate small orifices that promote atomization. The rate of addition of water into hot asphalt shall be kept at a constant (percentage by mass of asphalt) by the same microprocessor.
- e. An inspection (or test) nozzle shall be fitted at one end of the spray bar that produces a representative sample of foamed asphalt.
- f. An electrical heating system capable of maintaining the temperature of all asphalt flow components above the required 347°F.
- g. A single asphalt feed pipe installed between the modified milling or recycling machine and the supply tanker. Circulating systems that incorporate a return pipe to the supply tanker shall not be used.
- h. The recycler shall be fitted with a front breaker bar system to ensure that the reclaimed material is broken down to the 2" sizing requirements. The forward speed of the recycler may be reduced, and sizing or blending dwell time increased to achieve the two inch (2") particle sizing requirements if a the equipment is not equipped with a front breaker bar system.

311.045 Emulsion or Asphalt Tank and Delivery Only tankers with a capacity exceeding 2500 gal shall be used to supply the recycling machine with asphalt. No leaking tanker will

be permitted on the job site.

In addition, each tanker shall be equipped with the following:

- a. A thermometer to show the temperature of the contents in the bottom third of the tank.
- b. Unless otherwise approved by the Department, a rear and forward feed valve, with a minimum internal diameter of 3 in, capable of draining the contents of the tank when fully opened.
- c. Insulation to retain heat.
- d. A calibrated dipstick marked at intervals of no more than 25 gal, for measuring the contents of the tank.

Unless otherwise approved, each tanker shall be fitted with two recessed pin-type tow hitches, one in front and the other behind, thereby allowing the tanker to be pushed from behind by the recycling machine.

In order to accurately track asphalt usage, tankers shall be emptied whenever possible. Should it become necessary to use partial loads, reload partially loaded tankers, or supply partially loaded tankers, the Contractor shall provide the Department with the partial load weights and corresponding gallons of emulsion on the tankers prior to having more emulsion loaded.

For tanks that have not been filled at a facility equipped with the ability to weigh or track gallons being loaded and/or if tankers are reloaded on-site where an accurate measurement of gallons loaded is not available, the Contractor shall source local certified scales to weigh the partially loaded tankers. Prior to detaching the partial load from the CIPR train, the Contractor shall notify the onsite Department Representative. If local scales are used, the Contractor shall supply the Department with the remaining weights and gallons prior to using the refilled tanker. For loads shipped back to a terminal, the Contractor shall provide the remaining weights and gallons within 24 hours of when the tanker was detached from the CIPR train.

311.0451 Emulsion or Asphalt Delivery Temperatures Supplied asphalt temperatures will be measured by the Department immediately prior to attaching to the recycling train using an independent check. The minimum required temperatures for the asphalt shall be as follows:

Emulsified Asphalt Technology	120°F
Asphalt use for Foam Asphalt Technology	347°F

311.046 Cement or Lime Spreader If required by the contract, spreading of the Portland Cement or Hydrated Lime shall be done with a spreader truck designed to spread dry particulate (such as Portland Cement or Lime) or other approved means to insure a uniform distribution across the roadway and minimize fugitive dust. Pneumatic application, including through a slotted pipe, will not be permitted. Other systems that have been developed include fog systems, vacuum systems, etc. Slurry applications may also be accepted. The Department reserves the right to accept or reject the method of spreading

cement. The Contractor shall provide a method for verifying that the correct amount of cement is being applied.

311.047 Placement Equipment Recycled materials may be conveyed into a paver by means of a recycler out feed conveyor, or windrow pick up conveyor. If a pick-up conveyor is to be utilized to transfer the windrow into a paver hopper, the pickup conveyer machine shall be capable of removing the entire windrow down to the underlying material. The use of a screening unit will be required to remove oversize particles before being conveyed into the paver surge hopper.

The paver utilized to place the recycled product shall conform to Section 401.09, be of a free-floating design equipped with automation to include slope and ski equipped grade control, and addition of a minimum capacity 12-ton surge hopper insert. Placement activities shall be evaluated during the control section construction and evaluated for segregation, density, surface tolerance, and smoothness.

Equipment or methods that fail to produce a final product meeting the requirements of this specification will be removed, replaced, modified and work dis-continued until it can demonstrated that an acceptable product can be furnished.

311.048 Compaction Equipment Compaction equipment shall meet the requirements of Standard Specification 401, subsection 401.10 – Rollers, with the following additional requirements:

The Minimum compaction equipment shall consist of two 10 ton double drum steel wheel vibratory rollers; and one 20 ton pneumatic tired roller. The minimum allowable tire pressure shall be 85 psi. The Contractor shall furnish a suitable tire gauge for determining air pressure in the tires.

Additional equipment may be required in sufficient numbers and weight to obtain the required compaction or maintain the desired forward speed of the CIPR operation.

## CONSTRUCTION REQUIREMENTS (Emulsion or Foaming technologies)

311.050 Removal of Existing Pavement The existing pavement surface, including cracks, shall be visibly free from all foreign matter before recycling commences. The Contractor is responsible for removing any deleterious materials or crack sealants decided to be an interference with the cold recycle process. In areas where paved shoulders exist and the shoulders are to be treated with the CIPR process, the shoulders will be milled just ahead of the mainline milling and removed material incorporated into the recycle process.

When areas of the pavement surface are inaccessible because of the physical constraints of the equipment, the pavement shall be removed by other means and replaced by an approved source of hot mix asphalt.

311.051 Weather and Temperature Limitations The Cold In-Place Recycled process shall be performed when:

- a. CIPR operations will be allowed between May 15<sup>th</sup> and September 15<sup>th</sup> inclusive in Zone 1 - Areas north of US Route 2 from Gilead to Bangor and north of Route 9 from Bangor to Calais. CIPR operations will be allowed between May 1<sup>st</sup> and September 30<sup>th</sup> inclusive in Zone 2 - Areas south of Zone 1 including the US Route 2 and Route 9 boundaries.
- b. The atmospheric temperature, as determined by an approved thermometer placed in the shade at the recycling location, is 50<sup>0</sup>F and rising.
- c. When there is no standing water on the surface.
- d. During generally dry conditions, or when weather conditions are such that proper pulverizing, adding, mixing, and curing can be obtained using proper procedures, and when compaction can be accomplished as determined by the Resident.
- e. When the surface is not frozen and when overnight temperatures are expected to be above 32<sup>0</sup>F.
- f. Wind conditions as such that the spreading of lime or cement on the roadway ahead of the recycling machine will not adversely affect the operation.

311.052 Curing No new hot mix asphalt pavement or additional layers of CIPR shall be placed on the recycled asphalt pavement until a curing period of (4) four days has elapsed or until curing has reduced the moisture content to 1 percent or less by total weight of the mixture, whichever comes first. The curing period starts once the CIPR process has been completed in the roadway. The cure period may be reduced by the Department if can be demonstrated by coring that the layer has cured and stabilized and able to be paved upon. The curing period may be extended by the Resident if the weather has been unfavorable during the cure period, and core samples demonstrate that the layer has not cured and stabilized.

311.053 Surface Tolerance The completed recycled pavement surface will be shaped, compacted, smoothed and true to required line and grade. Deviations in the finished surface shall not exceed  $\frac{3}{8}$  in in any direction using a 10 ft minimum straight edge. Any repairs required to correct surface deviations are at the Contractor's expense using Department approved material and methods.

The Contractor shall protect the completed surface from damage caused by construction vehicles and equipment. The recycled pavement surface shall be protected and closed to traffic until it is determined that surface damage no longer occurs when a test vehicle is passed over it. The contractor is responsible for determining when the completed surface is suitable for traffic loading without damage. Any repairs to correct damage will be at the Contractor's expense.

311.054 Joints Joints shall be constructed in accordance with Section 401.17. The Contractor shall be responsible for establishing centerline control to ensure that the original centerline alignment will be re-established once the CIPR process is complete. The method of establishing centerline control shall discussed and approved by the Department at, or prior to, the pre-recycle meeting. As a minimum centerline control will be delineated every 100 linear foot (on station) using pavement marking paint on the existing pavement, and be established by splitting the total existing travel way width by half or by referencing to

the existing centerline joint if it is jointly determined by the department and Contractor that it is consistently in the center of the total width being processed.

The Contractor shall maintain centerline control during any construction activity up and to the completion of the contract.

311.055 Project Layout Unless otherwise specified in the Contract Documents, the Contractor will be responsible for the layout of existing conditions. Contractor shall, at minimum, establish the following control a minimum of 10 days prior to the recycling procedure and shall maintain the layout throughout the construction process:

1. Side Staking: Careful side staking of existing centerline as per Standard Specification Section 105.6.2, Contractor Provided Services. Side stakes shall be placed safely outside of the construction limits and the existing centerline grades shall be transferred to these stakes. These stakes and grades will be used to lay out centerline and determine new construction finish grades from differential elevation sheets furnished by MaineDOT.
2. Centerline: The Contractor shall be responsible to establish a painted centerline. This control will be used to establish the alignment of the recycling procedure. Crosshairs will be painted at every half station and a “control line” will be painted consistently between crosshairs.

All layout, stakes, and grades will be checked and must be acceptable to the Resident.

311.056 General Procedure Mainline milling is to be accomplished full width in one pass, and the material sized and blended with the specified percentage of asphalt emulsion (or Foamed Asphalt), Portland Cement or lime. Forward milling speed shall be adjusted to ensure material sizing and the coating and mixing process.

Milling and recycling passes shall overlap a minimum of 3” along the centerline or any adjacent lane or shoulder matching passes.

The thoroughly mixed recycled product will either be deposited, (a) in a windrow behind the mixing unit and picked up via a conveyor, or (b) directly conveyed into a paver hopper for laydown. The mix will be laid full width, including shoulders if required, to the specified depth, grade and slope.

Water shall be used as necessary to assist the compaction effort.

311.057 Repairs Repairs and maintenance of the recycled layers, resulting from damage caused by traffic, weather or environmental conditions, or resulting from damage caused by the Contractor’s operations or equipment, shall be completed at no additional cost to the Department.

Low areas will be repaired using a hot mix asphalt shim. Areas up to 1 inch high can be repaired by shimming with hot mix asphalt or milling provided that the thickness of the treated area exceeds the contract requirements. Areas greater than 1 inch high will be repaired using a hot mix asphalt shim. All repair work will be done with the Department’s approval at the Contractor’s expense. Depending on the severity of the

repair, the Department may consider alternative repair methods, such as retreating the affected area, with prior discussion.

### TESTING REQUIREMENTS (Emulsion or Foaming technologies)

311.060 Quality Control The Contractor shall operate in accordance with the approved Quality Control Plan (QCP) to assure a product meeting the contract requirements. The QCP shall meet the requirements of Section 106.4 - Quality Control and this Section. The Contractor shall not begin recycling operations until the Department approves the QCP in writing.

Prior to performing any recycling process, the Department and the Contractor shall hold a Pre-recycle conference to discuss the recycling schedule, type and amount of equipment to be used, sequence of operations, and traffic control. A copy of the QC random numbers to be used on the project shall be provided to the Resident at the Pre-recycle conference. All field and plant supervisors including the responsible onsite recycling process supervisor shall attend this meeting.

The QCP shall address any items that affect the quality of the Recycling Process including, but not limited to, the following:

- a. JMF(s).
- b. Make and type of rollers including weight, weight per inch of steel wheels, and average contact pressure for pneumatic tired rollers.
- c. The maximum distance of the knockdown roller from the CIPR train and maximum separation of each roller within the rolling train.
- d. Make and type of equipment in recycling train.
- e. Testing Plan.
- f. Laydown operations including joint construction, additive yield monitoring, procedures for avoiding recycling and curing in inclement weather, methods to ensure that segregation is minimized, and procedures for mix design modification.
- g. Methods for protection the finished product from damage and procedures for any necessary corrective action.
- h. Method of grade checks.
- i. Examples of Quality Control forms.
- j. Name, responsibilities, and qualifications of the Responsible onsite Recycling Supervisor experienced and knowledgeable with the process.
- k. Method for calibration/verification of density gauge.
- l. A note that all testing will be done in accordance with AASHTO and MaineDOT/Industry procedures.
- m. Description of the Cold In-place recycled verification procedure.

The Project Superintendent shall be named in the QCP, and the responsibilities for successful implementation of the QCP shall be outlined.

The Contractor shall sample, test, and evaluate the cold in-place recycling process in accordance with the following minimum frequencies:

### MINIMUM QUALITY CONTROL FREQUENCIES

Test or Action	Frequency	Test Method
Density	1 per 1000 ft / lane	ASTM D 2950
Air Temperature	4 per day at even intervals	
Surface Temperature	Beginning and end each day	
Yield of all materials (daily)	1 per 1000 ft/ lane	
New Aggregate Gradations	2 per day	AASHTO T 30

The Department may view any QC test and request a QC test at any time. The Contractor shall submit all QC test reports and summaries in writing, signed by the appropriate technician, and present them to the Department's onsite representative by 1:00 P.M. on the next working day, except when otherwise noted in the QCP due to local restrictions. The Contractor shall make all test results, including randomly sampled densities, available to the Department onsite.

Penalties for QCP non-compliance will be in accordance with Standard Specification 106.4.6

During the Cold In-Place Recycling procedure the Department may require the Contractor to take verification samples of the recycled material prior to adding the emulsion at a rate of one per 26,000 lane ft, or a minimum of one per project. The samples will be mixed to the proportions specified in the job mix formula, and tested by the Contractor, with a split to be provided to the Department to be evaluated for conformance to the contract specifications.

The Contractor shall cease recycling operations whenever one of the following occurs:

- a. The computed yield differs from the approved Job Mix Formula by 10% or more.
- b. The Contractor fails to follow the approved QCP.
- c. The Contractor fails to achieve 98% density after corrective action has been taken.
- d. The Contractor's verification samples show the air void content of the recycled product is outside the 8-11% range.
- e. The finished product is visually defective, as determined by the Resident.

Recycling operations shall not resume until the Contractor and the Department agree on the corrective action to be taken.

311.061 Control Section The Contractor shall assemble all items of equipment for the recycling operation on the first day of the recycling work. The Contractor shall construct a control section for the project at a location approved by the Resident. The Contractor shall have on site a pavement engineer expert in CIP work to direct construction of the control section, advise on suitability of mixed material, bitumen dispersion within the mixed material, moisture control within the mixed material, compaction and surface finish. The control section is required to:

- a. Demonstrate that the equipment and processes can produce recycled layers to meet the requirements specified in these special provisions.
- b. Determine the effect on the grading of the recycled material by varying the forward speed of the recycling machine and the rotation rate of the milling drum.
- c. Determine the sequence and manner of rolling necessary to obtain a target TMD. The Contractor and the Department will calibrate their respective nuclear gauges at this time.

The control section shall be at least 750 ft in length of a full lane-width (or a half-roadway section width).

The test strip shall be rolled using the specified compaction equipment as directed until the density readings show an increase in dry density of less than 1 pcf for the final four roller passes of each roller. The Contractor and Department will each determine a target density using their respective nuclear gauges by performing five density tests at different transverse offsets across the treated recycled layer in intervals of no less than 60 longitudinal feet and averaging them. The average of these tests will be used as the target density of the recycled material for QC and Acceptance purposes.

The Contractor shall repeat the control section process until parameters of the material properties conform to the requirements specified herein and as directed by the Resident. If a control section fails to meet the requirements outlined in this Special Provision, the Contractor will be required to take corrective action to remedy the test strip defect to the satisfaction of the Resident at no additional cost to the Department. The repeated process of the control section construction shall be done at the Contractor's expense. The corrective method shall be determined by the Contractor, as directed by the Resident.

Equipment or methods that fail to produce a final product meeting the requirements of this specification will be removed, replaced, modified and work dis-continued until it can demonstrated that an acceptable product can be furnished.

Following completion of the control section, compaction of the material shall continue until a density of not less than 98 percent of the control section target density has been achieved for the full width and depth of the layer. During the construction and compaction of the Full Depth Recycled base, should three consecutive Acceptance test results for density fail to meet a minimum of 95 percent of the target density, or exceed 102 percent of target density, a new test strip shall be constructed.

311.062 Quality Acceptance Quality Assurance densities of the recycled material will be determined by the Department using the nuclear method. The test strip section will be rolled as directed until the nuclear density readings show an increase in dry density of less than 1 pcf for the final four roller passes. The Department will determine a target density by performing five density tests at different transverse offsets across the treated recycled layer in intervals of no less than 60 longitudinal feet and averaging them. The average of these tests will be used as the target density of the recycled material for acceptance purposes. The remaining full depth recycled material shall be compacted to a minimum density of 98% of the target density as determined in the control section.



## ACCEPTANCE TEST FREQUENCY

Property	Frequency	Test Method
In-place Density	1 per 2000 ft / lane	ASTM D 2950

311.11 Methods of Measurement Cold In-Place Recycled Pavement will be measured by the square yard.

311.12 Basis of Payment The accepted quantity of Cold In-Place Recycled Pavement will be measured and paid for by the square yard complete and in place to the limits specified in the contract documents. Joint or lane overlaps will be considered incidental. The unit price shall include all materials, equipment, supervision, and labor and tools incidental thereto.

No additional payment will be made for hot mix required to replace material that cannot be compacted to the specified density, or used to replace damaged or raveled sections.

The removal of existing pavement, placement, and compaction of any hot mix asphalt required in areas that are inaccessible due to the limitations of equipment shall be paid for as Cold in place Recycle mix per square yard.

Payment to be made under:

Pay ItemPay Unit

311.34 4 inch Cold In-Place Recycled Asphalt Pavement

Square Yard

311.35 5 inch Cold In-Place Recycled Asphalt Pavement

Square Yard