

SECTION 02645

HOT IN-PLACE RECYCLED ASPHALT CONCRETE PAVEMENT

PART 1 - GENERAL

1.1 Description

A. Description of Work

The work under this item shall consist of softening the existing asphalt pavement with heat, milling/scarifying the top 1.5 to 2.5 inches and thoroughly remixing, leveling and compacting the milled/scarified material. The work items shall include the addition and mixing of recycling agents and the addition and mixing of new hot mix asphalt as required by the **ENGINEER**. The work shall be accomplished by a single pass of an equipment train which is capable of cleaning, heating, milling/scarifying, mixing, re-leveling, and compaction.

The recycled asphalt concrete pavement shall meet the design, quantity and placement requirements of Specification Section 2630, Asphalt Concrete Pavement.

The work shall include the furnishing of all labor, tools, equipment, materials and performing all required operations to provide a complete item in accordance with the project plans and these specifications.

B. Related Work Specified Elsewhere

Aggregate Base Course.....Section 02610
Bituminous Prime and Tack Coat.....Section 02620
Asphalt Concrete Pavement..... Section 02630

1.2 Quality Assurance

Reference test standards and specifications, Frequency of Testing, acceptable Tolerances and Acceptance per Specification 2630, Asphalt Concrete Pavement, except as modified herein.

A. Reference Test Standards and Specifications

ASTM D4552, Practice for Classifying Hot Mix Recycling Agents

1.3 Submittals

A. Certificates of Compliance

1. Mineral Filler
2. Asphalt Cement
3. Recycling Agent

B. Materials Test Reports

1. Report on Coarse Aggregate (new)
2. Report on Fine Aggregate (new)
3. Recycled Asphalt Concrete Mix Design, include the following items in the report:
 - a. Asphalt binder content of the asphalt pavement to be recycled
 - b. Penetration at 77 degrees Fahrenheit and viscosity at 140 degrees Fahrenheit of asphalt pavement to be recycled.
 - c. Gradation of the asphalt pavement to be recycled.
 - d. Gradation of new aggregate (as required).
 - e. Percent asphalt cement added to new aggregate (as required).
 - f. Type and amount of recycling agent (as required).
 - g. Penetration at 77 degrees Fahrenheit and viscosity at 140 degrees Fahrenheit and 275 degrees Fahrenheit of recycled mixture (includes asphalt from pavement to be recycled, new asphalt cement and recycling agent).

- h. Aggregate gradation of recycled mixture (includes aggregate in pavement to be recycled and new aggregate).
- i. Stability and volume analysis information as described in the Asphalt Institute Manual, Series (MS-2).

1.4 Job Conditions

A. Soils Report

This section does not apply to this project.

PART 2 - MATERIALS

2.1 Asphalt Cement

The asphalt cement used in new hot mix asphalt shall conform to one of the following specifications:

Penetration graded	ASTM D946	AASHTO M20
Original viscosity	ASTM D3381	AASHTO M226

2.2 Recycling Agent

The recycling agent used in this item shall conform to ASTM D4552.

2.3 Aggregate

The aggregate used in new hot mix asphalt or as an addition without coating with asphalt cement shall conform to ASTM D692 and D103.

2.4 Hot Mix Asphalt

New hot mix asphalt used in this item shall conform to ASTM 3515 with an exception for gradation as required by the **ENGINEER**.

2.5 Recycled Hot Mix Asphalt

The complete hot in-place recycled hot mix asphalt shall meet the requirements of ASTM D3515.

2.6 Equipment

A. General

The equipment used must be capable of performing the completed work at a minimum rate of 750 square yards per hour of operation to the depth shown on the plans.

B. Heating Unit(s)

On or more heating units, consisting of clusters of radiant heaters, shall be used. These units shall impart thermal energy to the asphalt pavement without charring the asphalt binder and without producing:

1. Unacceptable health risks to the **CONTRACTOR'S** workforce and citizenry;
2. Unacceptable air quality;
3. Direct flames on the pavement surface; and
4. Breaking aggregate particles.

The heating unit shall be so equipped that heat application shall be under an enclosed or shielded hood. Each heating unit shall contain safety equipment to minimize workforce injury.

C. Milling/Scarification Unit(s)

One or more pavement removal units capable of removing the pavement to the desired depth shall be used. These units shall contain a rotating drum with cutting teeth and/or an acceptable scarifier which uniformly loosens the heated asphalt pavement to the depth specified. Automatic grade and cross slope controls are required on the final pavement removal unit in the equipment train. The equipment shall be capable of height adjustments in order to clear utility hardware and other obstructions in the pavement surface.

D. Distribution and Blending Unit(s)

Units capable of uniformly distributing recycling agents and mixing hot mix asphalt shall be integral components of this equipment. This

mixing equipment shall be capable of uniformly mixing recycling agent, hot mix asphalt and other materials such as specified by the **ENGINEER**. This equipment shall be capable of providing the following:

1. Positive feed and shut-off of the recycling agent linked to the movement of the machine.
2. Control of the quantity of the recycling agent to ± 0.05 gallons per square yard of surface treated with a recycling agent application range of from 0.1 to 2.0 percent recycling agent by weight of recycled mixture.
3. Proportional interlinking of the recycling agent application rates to the machine's processing rate.
4. Heating of the recycling agent to within ± 25 degrees Fahrenheit of the temperature of the recycled material.
5. Measurement of the amount of recycling agent by means of a device capable of recording accumulated gallons to an accuracy of ± 2 percent.
6. Uniform mixing of recycled pavement and new hot mix asphalt in a pugmill, continuous mixing chamber such that the specified proportion of new hot mix asphalt can be accommodated.

E. Spreading and Leveling Unit

A unit capable of spreading and leveling the blended and mixed recycled material uniformly over the width being processed and to the finished grade and cross slope as specified on the plan shall be provided. This unit shall have characteristics equivalent to those associated with conventional hot mix asphalt laydown machines and shall contain automated grade and cross slope controls.

F. Compaction

Compaction equipment shall be supplied in accordance with Section 2630, "Asphalt Concrete Pavement".

PART 3 - EXECUTION

3.1 General

The hot-in-place recycling shall be performed with self-propelled equipment that is capable of 1) softening the existing asphalt concrete surface by applying heat, 2) milling/scarifying the surface to the depth shown on the plans, 3) blending and mixing recycling agent and/or new hot mix asphalt and/or new aggregate, 4) spreading and leveling the heated material, and 5) compacting the resulting mixture to the desired air void content. This operation shall be accomplished with a single pass of the equipment train.

3.2 Cleaning of Existing Surface

The existing paved surface to be recycled shall be cleaned of all dirt, fabric, thermoplastic markers, rubberized materials, oils and other objectionable materials by placing, brooming, flushing with water or other approved methods prior to beginning hot in-place recycling.

3.3 Heating and Milling/Scarifying

The pavement surface shall be evenly heated, milled/scarified and reworked to the widths and depths shown on the plans. There shall be no burning or scorching of trees, shrubs or other items near the recycled pavement. It shall be the responsibility of the **CONTRACTOR** to protect the adjacent landscape from damage by shielding and/or water spray or other methods approved by the **ENGINEER**. The heated and milled/scarified materials shall have a temperature in a range between 230 degrees Fahrenheit and 290 degrees Fahrenheit as measured immediately behind the laydown machine. The temperature shall be selected within this range to provide for adequate compaction. This selected temperature shall not vary by more than ± 20 degrees Fahrenheit from this target value and shall always be above the lower limit of 230 degrees Fahrenheit.

3.4 Blending, Mixing, Spreading and Leveling

The recycled pavement materials, recycling agent (if required), new hot mix asphalt (if required), and new aggregate (if required), shall be fed into a mixing unit and thoroughly mixed. The resulting mixture shall be fed into a spreading and leveling unit.

3.5 Joints

The heating unit shall supply heat a minimum of 4 inches beyond the width of recycling. When a pass is adjacent to a previously placed mat, the heating shall extend 6 inches into the adjacent mat and the joint shall be located a minimum of 4 inches into the previously placed mat.

3.6 Compaction

The compaction operation shall meet the density/air void requirements of Section 2630, "Asphalt Concrete Pavement". Compaction shall be complete prior to the mixture temperatures reaching 170 degrees Fahrenheit.

3.7 Regulation

The **CONTRACTOR** shall be required to meet all local county, regional, state and federal air quality standards and all workforce health and safety standards.

3.8 Test Strip

At the beginning of the hot in-place recycling operation, the **CONTRACTOR** shall construct a test strip on the project a minimum of 0.1 miles but not more than 0.2 miles in length using the equipment and methods for the remainder of the project. No further work shall be performed until the test strip is evaluated and the process approved by the **ENGINEER**.

3.9 Acceptance

Acceptance of hot in-place recycled asphalt concrete pavement shall conform to the requirements of Section 2630, "Asphalt Concrete Pavement".

PART 4 - MEASUREMENT AND PAYMENT

4.1 Measurement

Measurement of recycled asphalt concrete quantities shall be per Specification Section 2630, Asphalt Concrete Pavement.

4.2 Payment

Recycled asphalt concrete pavement shall be paid per Specification Section 2630, Asphalt Concrete Pavement.

****END OF SECTION****

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