

# HOT IN PLACE RECYCLING OF EXISTING ASPHALT PAVEMENT

## DESCRIPTION

This work shall consist of recycling the existing hot mix asphalt (HMA) pavement surface. This multi-step recycling process requires the use of a recycling agent for Hot In-Place Recycling as a rejuvenator. The HMA pavement surface is heated using specialized equipment causing the asphalt to soften. This work requires the use of a rejuvenating process that incorporates a milling head to increase the scarification depth and enhance the blending of the rejuvenating agent with the asphalt surface material. In a continuous process, the softened HMA surface is scarified to a specified depth as detailed in the Contract documents. The scarified and milled asphalt pavement is then mixed with a recycling agent that rejuvenates the asphalt. This mix is then placed and compacted back onto the roadway. Installing a surface treatment or overlay is a separate and/or concurrent function of this work.

## EQUIPMENT

### General:

Each unit shall have an integrated water spray system and water misters to pre-wet vegetation and provide heat control. Hand hoses with adjustable nozzles will be placed on each unit to allow for pre-wetting specific plants or objects. Each unit shall have integrated water tanks having a minimum 500 gallon capacity. The operation of these systems shall be demonstrated to the Engineer to be fully functional prior to the commencement of work and shall be refilled as required during daily production.

All propane tanks on recycling equipment units shall conform to the manufacturing standards and regulations of the Federal Motor Carrier Safety Administration Section 178.345. Tanks are to be inspected and certified by a Federal and DOT registered inspection and repair facility. External visual tank inspections and tank leakage tests shall be performed annually per regulations. Hydro pressure tests shall be performed every 5 years per regulations. Certification compliance stickers shall be prominently displayed on recycling units.

- **Heating Unit** – This unit shall generate sufficient heat to soften the asphalt pavement to the depth required. Care shall be taken not to overheat the existing pavement thereby softening the underlying asphalt pavement not to be scarified. The burner assembly shall be adjustable to heat between 8 and 14 feet in width. The entire heating unit shall be enclosed and vented to contain the heat and prevent damage to adjacent properties and landscape. In cooler temperatures, an additional heating unit may be required. A minimum of two pre-heater units shall be used to allow lower heating temperatures and longer durations to enhance temperature penetration into the existing roadway surface. A third pre-heater unit shall be available if warranted or required for project.
- **Heater Scarification Train** – This equipment shall be a self-contained machine designed to reprocess only the upper layers of the existing HMA pavement. The heater scarification train shall be self-propelled and capable of operating at speeds of 8 to 26 feet per minute while uniformly heating and scarifying the existing HMA pavement. Listed below are the various units that are part of the heater scarification train.
  1. **Scarifying Unit** – The scarifying unit shall contain at least 2 rows of carbide spring-loaded tines that are adjustable to scarify 8 to 14 feet wide. The tines in row shall be no more than 1.0 inch apart. This unit shall also have a center break and be able to conform to the pavement contours to insure a uniform penetration from the tines and prevent damage to utility structures.
  2. **Spray Unit** – This unit shall be immediately behind the scarifying unit and capable of applying the recycling agent to the reclaimed asphalt pavement at the approved rate. The size of the nozzles located on the spray bar and pump shall be selected based upon the rate of application and the forward speed of the heater scarification unit.

This unit shall be equipped with a metered measuring system, which shall be capable of maintaining the required application rate of the recycling agent with a tolerance of  $\pm 5\%$  for the mix design. The measuring system shall continuously verify and display the application rate of recycling agent and cumulative total with respect to volume of scarified material for the road surface.

Calibration of the metered measuring system shall be done annually with a certified scale. The recycling agent will be measured by weight vs. quantity and results will be recorded. Calibration results will be provided to the Contracting Agency for verification.

The recycling agent tank on the machine as well as the storage tank shall be heated and thermostatically controlled to maintain the specified temperature requirements.

- 3. Mill/Re-mixer Unit** – Immediately following the application of the recycling agent, a dual-drum milling head(s) shall follow the configuration of the screed and mill the asphalt pavement to a loose mix depth up to 1.5 inches. The milling heads shall produce a resized gradation representative of the existing materials being recycled in the 1.5 inch layer. The milling heads shall then thoroughly mix the recycling agent with the scarified and milled pavement to produce a well coated homogenous recycled mixture.

The mill/ re-mixer unit shall be an integral part of the recycling machine and be located between the recycling agent spray bar unit, which applies the rejuvenator, and the screed. This unit shall be operated hydraulically, able to work at variable speeds up to 120 rpm(s) and shall be retractable from 14 to 8 feet wide. In addition, this unit shall be able to break in the center and allow for quarter point and crown control.

- 4. Screed Unit** – The hot scarified material shall be uniformly distributed to the desired longitudinal and transverse section by the use of an attached heated, augured vibratory screed. The screed shall be equipped with center break for adjustable crown control and each end of the screed shall have hand wheel adjusting screws for providing the desired longitudinal grade and transverse slope.
- 5. Compaction Unit** – Immediate compaction shall take place with rolling equipment of sufficient type and size to compact the recycled bituminous material to the required density. Normally this can be established with the application of an eight (8) to twelve (12) ton vibratory roller.

## DESCRIPTION

This work shall consist of using a recycling agent as a rejuvenator for hot in-place recycled projects. The recycling agent shall meet the requirements detailed in this specification. This material will improve the penetration value of the recycled hot mix asphalt which will increase the overall life of the existing pavement.

## MATERIALS

Materials shall meet the requirements of ASTM D 4552, Standard Practice for Classifying Hot-Mix Recycling Agents, grades RA25 or ERA25 (Emulsified RA25) petroleum-based recycling agents. Only materials that are designed to perform as rejuvenating agents and meeting the requirements outlined in Table 1 – Recycling Agents shall be permitted. At the start of production and during, certified test results and documented quantities shall be provided to the Engineer for each shipment of recycling agent. Acceptance of this material is based on a signed Manufacturer's Certification stating conformance to this specification. The use of any other grade of recycling agent shall require prior approval.

**Table 1 – Recycling Agent**

Test Requirements	Test Method	Minimum	Maximum
Tests on Residue from Distillation			
Viscosity, 140° F cSt	T201	901	4500
Flash Point, CSC, °F	T48	215	-
Test on Residue from RTFO, 325° F			
Viscosity Ratio	T240	-	3
Weight Change, ±, %		-	4
Specific Gravity	T228	Report	Report
Saybolt Furol Viscosity @77° F, s		15	85
Storage Stability, 24 hrs, %	T59 *(1)	-	1.0
Sieve, %		-	0.1
Cement Mixing, %		-	2.0
Asphalt Content by Evaporation, %		65.0	

\*1. This testing requirement is only for ERA25.

## MIXTURE DESIGN

The Contractor will take representative surface course cores a minimum of two to a maximum of 20 cores per contract from the existing HMA pavement for analysis and mixture design if required by the contracting agency for projects over 50,000 square yards.

### The Contractor shall provide the following mixture design data to the contracting agency:

- Descriptive notes of the core locations along with their test results showing percent of asphalt content, aggregate gradation, and penetration value for each sample.
- The depth, in inches, of the loose heater scarified HMA behind the screed unit. Based on the information above, the Contractor shall determine the application rate of the recycling agent such that the penetration value of the recovered performance-graded (PG) binder from the recycled mix samples is at least 30% increase of the average penetration value of the existing pavement cores. Testing of all samples for the penetration values required using this specification will be performed in accordance with AASHTO T49, Penetration of Bituminous Materials.
- Recycling Agent shall be heated and maintained on machine between 160° F and 170° F.
- The bidder shall include with bid a letter of supply of the recycling agent from an approved manufacturer and ability to meet the above specifications.
- The bidder shall include with a bid the name of the Accredited Laboratory of who will be performing the mix design and testing of recycled samples from field during recycling operations.

## CONSTRUCTION DETAILS

1. **Weather and Seasonal Limitations** – Heater scarification is allowed only when the surface temperature is 45° F or above.
2. **Cleaning** – Clean the existing pavement and shoulder to be scarified by using mechanical sweepers, hand brooms, or other effective means until the surface is free of all materials, which might interfere with the scarification process is the responsibility of the contracting agency.

3. **Heater Scarification** – Operate the heating unit in a manner to prevent damage to adjacent property and vegetation. Repair all heat damaged areas immediately, at no additional cost to the Department, control the heater scarification equipment to insure the temperature of the scarified mixture is maintained between 275°F and 325°F. Verify this temperature within 5 feet behind the screed unit. Control the speed of the equipment to ensure that the recycled pavement is properly milled, mixed and uniformly distributed to the proper thickness, slope, and crown shown on the Contract plans. Take extra care in controlling heater scarification equipment to prevent segregation of the recycled mix at the start and end of paving production as well as any points where the heater scarification train needs to stop and restart. Tolerances shall be within ¼ inch of the specified depth.

Measure the depth of the loose scarified mix behind the screed unit prior to rolling operation. Adjust the paving equipment if the loose mix depth does not meet the depth specified in the Contract documents. Control the width of each pass to provide proper placement of longitudinal joints including a 3 inch overlap onto adjacent lane passes.

Add recycling agent uniformly to the scarified HMA pavement at the predetermined application rate to produce a homogenous HMA recycled mix.

In areas such as catch basins or manholes not accessible to scarifying equipment, the Engineer will determine if they require repair. Pavement surfaces that are in good condition and are less than one square yard in size do not require repair. Areas with cracks or spalls that are greater than one square yard in size shall be repaired as approved by the Engineer at no additional cost.

4. **Compaction** – Vibratory compaction is required immediately behind the screed. Rollers shall be in 8 ton to 12 ton class. Recycling operations shall cease immediately upon break-down or other impairment of the vibratory roller.
5. **Scarified Mixture Verification** – On roadway projects having more than 50,000 square yards, the Contractor shall take two loose mix samples prior to compaction in the first 500 feet of the day's production. These samples will be representative of the day's production. Take samples either behind the screed or any place after the spraying and mixing units. Identify all samples by their locations at the project site. Production may continue while the Contractor tests for penetration. Penetration data shall be provided to the Engineer. The average penetration value of the loose mix samples must be 30% or higher than the average penetration of the core samples from the existing pavement. If the average penetration values of the loose mix samples fail to meet this requirement, adjust the application rate and submit a new adjusted application rate to the Engineer. Also, if the recycled pavement is not satisfactory to the Engineer, additional tests may be performed at no cost.
6. **Traffic Control** – Bidder shall supply a minimum of (3) three flagger/traffic control personnel to maintain work zone safety and traffic flow. Bidder will supply all necessary daily traffic device signs. They will include but not limited to:
  - **ROAD WORK AHEAD**
  - **FLAGGER SYMBOL**
  - **BE PREPARED TO STOP**
  - **ONE LANE ROAD AHEAD**
7. **Temporary Pavement Markings** – Bidder shall apply yellow reflectorized tape at 40 feet intervals on centerline with current days recycling production.
8. **Overlay** - The heater scarified HMA pavement can be overlaid once work is completed to the satisfaction of the Engineer. The overlay shall be placed prior to the end of the paving season. Any overlay work shall be performed under separate pay items and are not included to this Item.

## **METHOD OF MEASUREMENT**

Asphalt recycling performed and application of rejuvenating agent shall be measured by the square yard.

## **BASIS OF PAYMENT**

Prices shall include all labor, equipment, materials, fuels, supplies, rejuvenating agent, mobilization, core sampling, mix design, quality control testing, bond and insurance required to complete the above item. Payment for heating, scarifying, application of rejuvenating agent, milling/remixing, and compaction will be made at the price bid per square yard.

## **GENERAL CONDITIONS**

- Bidder shall have a minimum of (5) five years of experience in hot in-place recycling of roads, including at least (5) five years experience for the operators to be employed in the performance of this Contract in the operation of said machines supplied for this process.
- All operators and laborers shall be current OSHA Certified and Flagger Certified per the ATSSA (American Traffic Safety Services Association).
- If Bidder supplies traffic control, the Contracting Agency will purchase from Item #1. If the Contracting Agency provides traffic control, the Contracting Agency will purchase from Item #2.
- Bidder shall own recycling equipment and may not subcontract others to perform work.
- Bidder is required to demonstrate the ability of bidder's crew(s) and equipment to comply with specifications and be able to perform work consistent with time agreed and allowed with purchaser. Bidder is required to submit a list of recycling and affiliated recycling equipment presently owned to be used for this bid and this information shall be construed to be completely in accord with specifications.
- Bidder shall provide with bid a minimum of (5) five references listing agency name, address, contact person and telephone number who have used bidder for hot in-place recycling.
- Contract shall be (1) one year from the date of issuance of Contract and may be extended by mutual consent between the bidder and Contracting Agency for a second (1) one year period at the identical prices and conditions.
- Other Political Districts may purchase under this contract and will issue purchase orders directly to the Contractor.
- Bidder shall meet all conditions and requirements of said specification. All items must be bid or will be considered an incomplete bid and will not be accepted.

# BID PROPOSAL

## HOT IN PLACE RECYCLING OF EXISTING ASPHALT PAVEMENT

### Option A – With Maintenance and Protection of Traffic

30,000 to 50,000 square yards \$ \_\_\_\_\_ per sq. yd.

More than 50,000 square yards \$ \_\_\_\_\_ per sq. yd.

### Option B – Without Maintenance and Protection of Traffic

30,000 to 50,000 square yards \$ \_\_\_\_\_ per sq. yd.

More than 50,000 square yards \$ \_\_\_\_\_ per sq. yd.

**Company Name:** \_\_\_\_\_

**Address:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Phone:** \_\_\_\_\_ **Fax:** \_\_\_\_\_

**Signature:** \_\_\_\_\_ **Date:** \_\_\_\_\_