

SECTION 412 - HOT IN-PLACE RECYCLING OF ASPHALT PAVEMENT

412.1 DESCRIPTION

412.11 This work shall consist of hot in-place recycling of the existing asphalt pavement to the depth specified in the contract, up to two (2) inches in depth. The remixing method shall be a multi-step process of cleaning, heating, milling, adding rejuvenating agent as specified in the contract, adding virgin PMBP as specified in the contract, mixing, spreading, leveling and compacting the mixed material.

The work shall be accomplished by a single pass of an equipment train.

The Contractor shall furnish all equipment, tools, labor, materials (except the existing asphalt pavement), and any other appurtenances necessary to complete the work.

412.2 MATERIALS

412.21 Rejuvenating Agent. When rejuvenating agent is required it shall be so designated in the contract. The rejuvenating agent added to the milled material shall be either an asphalt emulsion conforming to the requirements of Section 402 or a petroleum resin-oil base uniformly emulsified with water conforming to the requirements of AASHTO R 14.

412.22 Virgin Plant Mix Bituminous Pavement (PMBP). Virgin PMBP shall conform to the material requirements of either Section 420 or Section 422 of the Standard Specifications, with an exception for gradation when approved by the Project Manager.

The Contractor shall provide a mix design for the virgin PMBP that was developed by an approved testing laboratory. The job mix formula must be approved by the Project Manager prior to its use.

412.23 Laboratory Analysis of Existing Pavement Material. When rejuvenating agent is specified in the contract, the contractor shall obtain representative samples of the in-place asphalt pavement material in a manner approved by the Project Manager and shall have an independent testing laboratory determine the following information:

(a) asphalt content and extracted gradation of the in-place pavement;

(b) penetration at 77 °F (25 °C) and viscosity at 140 °F (60 °C) of the recovered asphalt from the in-place pavement;

(c) penetration at 77 °F (25 °C) and viscosity at 140 °F (60 °C) of asphalt recovered from at least three trial mixtures prepared at different rejuvenating agent addition rates. The three addition rates must bracket the recommended addition rate;

(d) the recommended amount of rejuvenating agent to be used to optimize the properties of the in-place pavement.

412.3 CONSTRUCTION REQUIREMENTS.

412.31 Equipment.

412.311 General. The Contractor shall notify the Project Manager at the pre-construction conference of the type of equipment intended for use. The equipment shall be on the project in general operating condition in sufficient time for evaluation by the Project Manager.

412.312 Heating Units. The heating units shall be radiant heating devices capable of heating the existing asphalt pavement to a temperature high enough to allow milling of the material to the specified depth without breaking aggregate particles, without charring the existing asphalt, and without producing undesirable pollutants. The heating mechanism shall be so equipped that heat application shall be under an enclosed or shielded hood. Units that employ direct flame heating of the pavement surface shall not be used.

412.313 Milling Units. Two (2) individual Milling units (each capable of milling ½ the specified depth.) and up to twelve (12) feet in width shall be capable of loosening the in-place asphalt pavement to the specified depth without excessive breaking of the aggregate
The units(s) shall have sufficient power to mill through the high spots and create a leveled surface conforming to the plan finished profile of the pavement.

412.314 Rejuvenating Agent Storage Unit(s). The storage unit(s) shall be thermostatically controlled to maintain the rejuvenating agent at a constant temperature as specified by the supplier.

412.315 Metering Unit(s). The unit(s) shall be capable of applying the recycling agent in a uniform manner to the entire quantity of the milled material and shall incorporate a meter for continuous verification of quantities. The volume applied shall vary in direct proportion to the operating speed of the recycling system and shall be synchronized with the volume of material milled to maintain a tolerance within 5% of the specified rate. The rejuvenating agent shall be added to the milled material prior to the addition of virgin PMBP.

412.316 Blending Unit. The unit shall be a twin shaft pugmill capable of thoroughly mixing the milled material, rejuvenating agent, and virgin PMBP so as to produce a uniform, consistent final product.

412.317 Spreading and Leveling Unit(s). The unit(s) shall be equipped with automatic grade controls. It shall be capable of spreading and leveling the blended and mixed recycled material uniformly and without segregation over the width being processed and to the finished grade and cross slope as specified on the plans.

412.318 Compaction Equipment. Equipment proposed for use shall conform to the requirements of SECTION 420–PLANT MIX BITUMINOUS PAVEMENT.

412.32 Construction Details.

412.321 Cleaning of Existing Pavement Surface. The existing pavement surface to be recycled shall be cleaned of all dirt, fabric, thermoplastic markers, rubberized materials, oils and other objectionable materials by blading, brooming, or other methods approved by the Project Manager prior to beginning hot in-place recycling.

412.323 Heating, Milling, and Processing. The in-place asphalt surface shall be evenly heated, milled, and processed to the widths and depths shown in the contract.

Heating shall be controlled to assure uniform heat penetration without causing differential softening of the pavement, without breaking of the aggregate particles, without charring of the asphalt, and without producing undesirable pollutants.

Rejuvenating agent, if required, shall be uniformly applied to the milled material before the addition of any virgin PMBP. The contractor shall determine the actual amount of rejuvenating agent to be added, to address field conditions, and to optimize the properties of the in-place pavement.

The milled material, rejuvenating agent (if required), and virgin PMBP (if required) shall be uniformly mixed to produce a consistent, homogeneous final product.

Environmental Standards. The equipment shall be equipped with emission control devices in order to meet required, state and federal air quality standards.

412.324 Placing and Compacting. The recycled mixture shall be uniformly spread and leveled, without segregation, to the width, finished grade, and cross slope as specified on the plans.

Immediately after the recycled mixture has been spread, leveled, and surface irregularities have been adjusted, it shall be thoroughly and uniformly compacted in accordance with the requirements of SECTION 420-PLANT MIX BITUMINOUS PAVEMENT.

412.325 Temperature Requirements. The recycled mixture shall have a temperature in a range between 225 °F (107 °C) and 300 °F (149 °C) as measured immediately behind the laydown machine.

412.326 Joints. The heating unit shall supply heat a minimum of 4 inches (100 mm) beyond the width of recycling.

412.327 Debris and Waste Material Disposal. The Contractor shall dispose of all debris and waste material in an environmentally safe manner and at locations approved by the Project Manager.

412.328 Weather Limitations. Hot in-place recycling of asphalt pavement shall not take place when the roadway surface is wet or when weather conditions otherwise prevent the proper handling or finishing of the bituminous mixture.

412.33 Density Control.

412.331 Density Acceptance Testing. In the event an individual test result falls below 90%, or exceeds 98% of the theoretical maximum density, the District Construction Engineer shall determine the disposition of the material represented by the test.

412.4 METHOD OF MEASUREMENT

412.41 Hot in-place recycling of asphalt pavement will be measured by the square yard (square meter).

412.42 When specified in the contract, virgin PMBP will be measured in accordance with SECTION 420 - PLANT MIX BITUMINOUS PAVEMENT.

412.43 When specified in the contract, rejuvenating agent shall be measured by the gallon (liter).

412.5 BASIS OF PAYMENT

412.51 The accepted quantities of hot in-place recycling of asphalt pavement will be paid for at the contract unit price per square yard (square meter) complete in place and will be considered full compensation for all materials, testing, labor, tools, equipment, and any appurtenances necessary to complete the work including cleaning of existing pavement, hauling and disposal of debris, heating, milling, mixing and relaying of recycled material, applying rejuvenating agents, and rolling and compacting of the recycled asphalt mixture

412.52 When specified in the contract, virgin Plant Mix Bituminous Pavement (PMBP) material will be paid for in accordance with SECTION 420 - PLANT MIX BITUMINOUS PAVEMENT.

Payment will be made under:

Pay Item

Hot In-place Recycling of Asphalt Pavement
Virgin PMBP
Rejuvenating Agent

Pay Unit

Square Yard (square meter)
Square Yard (square meter)
Gallon (liter).