SECTION 341—COLD RECYCLED BITUMINOUS BASE COURSE, COLD-IN-PLACE

341.1 DESCRIPTION—This work is the on-grade construction and material processing of a cold recycled bituminous base course (base course) that uses bituminous material combined with RAP, RAM, or virgin aggregates. Construction typically includes milling to an indicated depth, adding and mixing emulsified asphalt, placing, compacting, and testing.

341.2 MATERIAL—

(a) Reclaimed Material. Reduce oversized materials until 95% of the material passes the 50.0 mm (2-inch) sieve. Incorporate all reclaimed material into the recycled bituminous base course.

1. RAM. As specified in Section 703.1, Table A or 703.2, Table B. The Contractor may use RAM from the project or from stockpiles off the project.

2. RAP. Processed paving material containing bitumen and aggregates.

(b) Bituminous Material. Add bituminous material to the reclaimed material according to the approved mix design. Use one of the following bituminous materials, conforming to the applicable requirements of Bulletin 25:

- Emulsified Asphalt—MS-2(E-4), CMS-2(E-5), SS-1(E-6A), CSS-1(E-6C), SS-1h(E-8A), CSS-1h(E-8C), HFMS-2h(E-11-60), HFMS-2(E-11-90), HFMS-2S(E-11-150), or polymer modified grades of the above materials may be used when approved by the Engineer.

(c) Aggregate. Section 703.2 (Type A), No. 8, No. 57, and No. 67.

(d) Mixture Design. Take samples of reclaimed materials, and perform testing to establish the mix design. If RAM is included in the depth indicated for removal, take separate samples of RAP and RAM. Establish the mix design according to Bulletin 27, and submit the mix design to the District Materials Engineer/District Materials Manager for review at least 3 weeks before the planned start of mixture production.

(e) Mixture. Combine the reclaimed material, aggregates, and bitumen according to the mix design and at the mix design recommended optimum moisture and emulsion content. If RAP gradations and composition vary sufficiently, make field adjustments as recommended in the mix design to obtain satisfactory coating and the specified compaction.

1. Review of QC Plan. Prepare a QC Plan, as specified in Section 106, and submit for review at the start of the project. Do not start actual work until the QC Plan has been reviewed and approved by the Engineer.

341.3 CONSTRUCTION—

(a) Equipment. Provide equipment to produce recycled bituminous base course mixture as follows:

1. Provide a self-propelled milling machine having a down cutting drum, screening/crushing plant, and pugmill mixer. Use single-unit or multiple-unit machine with plant and/or mixer as trailer(s). Use pugmill mixer with liquid additive system and spray bar capable of volumetrically controlling liquid additive based on milling depth, milling width, and machine speed.

2. Use equipment capable of automatically metering liquids with a variation of not more than ± 2.0% by mass (weight) of liquids.

3. Maintain all equipment as specified in Section 108.05(c).

(b) Mixing. Do not place base course from September 1 to April 30 in Districts 1-0, 2-0, 3-0, 4-0, 9-0, and 10-0; and from October 1 to April 30 in all other districts. With written approval of the Representative, the Contractor may place base course when no freezing temperatures occur for 24 hours before paving and when the project ambient air temperature is 7°C (45F) and rising.

Maintain adequate total liquids in the mixture to ensure thorough mixing of the reclaimed material and aggregates with the bituminous material. If necessary, add water at the mill head using a calibrated meter.

(c) Compaction. After processing, uniformly spread, shape, grade, and compact the base course to the lines, grades, and depth indicated. Before compaction, cure the base course as necessary.

Provide compacted layers between 80 mm and 130 mm (3 inches to 5 inches) in depth. Use rollers as specified in Section 108.05(c).

Begin rolling at the low side of each layer; except, initially leave 80 mm to 150 mm (3 inches to 6 inches) from unsupported edges unrolled to prevent distortion.

Determine the maximum density by constructing at least one control strip of approximately 500 m^2 (600 square yards) under the guidance of a nuclear gauge operator. After each pass of the compaction equipment, take a nuclear density reading according to AASHTO T 310. Continue compaction until the Representative determines additional passes do not appreciably increase the density. After compaction, take a minimum of ten density tests at random locations and determine the average control strip density.

Compact the base course to a minimum density of 96% of the average control strip density. Determine the in-place density of each 2500 m^2 (3,000-square yard) area according to AASHTO T 310. If the density of an area is less than the minimum density and if additional compaction does not achieve the minimum density, rescarify, adjust the moisture content, and recompact. If the density is still below the minimum, and the base course is uniform in texture, stable, and acceptable, define the area as a new control strip. Take a minimum of ten density tests at random locations and determine the average in-place density. The new minimum density is 96% of the average in-place density.

If the Representative determines that the Contractor achieved the minimum density with minimal compaction, the Representative may require the Contractor to construct a new control strip to verify or establish a new minimum density.

If the completed base course is unacceptable, stop base course construction. Resume construction only after correcting the cause of unacceptable construction.

(d) Finishing. Unless otherwise allowed, complete base course construction during daylight hours.

(e) Protection. Protect completed portions of base course that are opened to construction equipment from marring, distortion, and other damage. Immediately correct damage to the base course caused by construction equipment to the Representative's satisfaction.

(f) Surface Tolerance. If directed, test the completed base course for smoothness and accuracy of grade, both transversely and longitudinally, using a 3 m (10-foot) straight edge or template. Test a 2500 m^2 (3,000-square yard) area at three locations. At each location determine the maximum space under the straight edge or template. Correct each 2500 m^2 (3,000-square yard) area where the average of the maximum space at the three locations exceeds 13 mm (1/2 inch).

(g) Maintenance and Traffic. Maintain the completed base course and control traffic as specified in Section 401.3(n). Use a pilot car for speed control if damage, such as raveling, is likely to occur.

(h) Curing. Cure the base course for at least 1 week before placing the wearing course or binder course. In addition, if requested by the Representative and before placing a wearing or binder course, determine the moisture content of the completed base course according to PTM No. 749. Do not place the overlying course if the average moisture content exceeds 2%.

(i) Not used.

(j) Tests for Depth. Measure milling depth at time of pulverization. Make at least one measurement for each 2500 m^2 (3,000 square yards) or less of work done and record measurements to ensure that specified milling depth is

met. Correct or replace any section deficient by 13 mm (1/2-inch) or more from specified depth at no expense to the Department.

341.4 MEASUREMENT AND PAYMENT—

(a) Cold In-Place Recycled Bituminous Base Course. Square Meter (Square Yard)

(b) Coarse Aggregate for Cold Recycled Bituminous Base Course. Tonne (Ton)

(c) Bituminous Material. Liter (Gallon)