Standard Practice for

Emulsified Asphalt Content of Cold Recycled Mixture Designs

AASHTO Designation: PP 86-20 (2021)[1]

Technically Revised: 2020 **Reviewed but Not Updated: 2021**

Technical Subcommittee: 2a, Emulsified Asphalts

AASHTO

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1. SCOPE

1.1. This standard for mix design evaluation is used to determine the amount and composition of emulsified asphalt and other additives when using cold recycling (CR) of asphalt mixtures, which includes cold in-place recycling (CIR) or cold central plant recycling (CCPR). The mix design is based on strength and other performance properties.

2. REFERENCED DOCUMENTS

2.1. *AASHTO Standards*:

- MP 31, Materials for Cold Recycled Mixtures with Emulsified Asphalt
- R 90, Sampling Aggregate Products
- R 97, Sampling Asphalt Mixtures
- T 11, Materials Finer Than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
- T 27, Sieve Analysis of Fine and Coarse Aggregates
- T 30, Mechanical Analysis of Extracted Aggregate
- T 164, Quantitative Extraction of Asphalt Binder from Hot Mix Asphalt (HMA)
- T 166, Bulk Specific Gravity (G_{mb}) of Compacted Asphalt Mixtures Using Saturated Surface-Dry Specimens
- T 209, Theoretical Maximum Specific Gravity (G_{mm}) and Density of Asphalt Mixtures
- T 245, Resistance to Plastic Flow of Asphalt Mixtures Using Marshall Apparatus
- T 269, Percent Air Voids in Compacted Dense and Open Asphalt Mixtures
- T 283, Resistance of Compacted Asphalt Mixtures to Moisture-Induced Damage
- T 308, Determining the Asphalt Binder Content of Asphalt Mixtures by the Ignition Method
- T 312, Preparing and Determining the Density of Asphalt Mixture Specimens by Means of the Superpave Gyratory Compactor
- T 331, Bulk Specific Gravity (G_{mb}) and Density of Compacted Asphalt Mixtures Using Automatic Vacuum Sealing Method

2.2. *ASTM Standards*:

- D3549/D3549M, Standard Test Method for Thickness or Height of Compacted Asphalt Mixture Specimens
- D7196, Standard Test Method for Raveling Test of Cold Mixed Emulsified Asphalt Samples

2.3. *Other Documents*:

- LTPP Seasonal Asphalt Concrete Pavement Temperature Models, LTPPBind 3.1
- *Basic Asphalt Recycling Manual*, Asphalt Recycling and Reclaiming Association and FHWA-HIF-14-001, Annapolis, MD.

3. TERMINOLOGY

3.1. *cold central-plant recycling (CCPR)*—the process in which the asphalt recycling takes place at a central location using a stationary cold mix plant. The resulting pavement serves as a base layer overlaid with a surface treatment or asphalt mixture overlay.

3.2. *cold in-place recycling (CIR)*—the on-site recycling process to a typical treatment depth of 75-100 mm (3-4 in.), using a train of equipment (tanker trucks, milling machines, crushing and screening units, mixers, pavers, and rollers) and an emulsified asphalt with or without a combination of additives (lime, cement, aggregate), generating and re-using 100 percent of the milled material, with the resulting pavement serving as a base layer overlaid with a surface treatment or asphalt mixture overlay.

3.3. *reclaimed asphalt pavement (RAP)*—removed and/or processed pavement materials containing asphalt binder and aggregate.

4. SIGNIFICANCE AND USE

4.1. The procedure described in this standard is used to produce CIR or CCPR that satisfies mix design requirements.

4.2. Specifying an emulsified asphalt alone for CIR or CCPR may not be satisfactory in producing a good-performing mixture. The mix design described in this standard practice has been used successfully in many projects.

5. OBTAINING AND PREPARATION OF MATERIALS

5.1. *Sampling Existing Pavement for CIR and CCPR*:

5.1.1. Obtain cores from the areas to be recycled. The material provided must be representative of the material to be recycled.

Where visual differences in the pavement surface are noted or where construction or maintenance records indicate differences, obtain additional cores to evaluate the difference. If these additional cores show significant material differences, perform a separate mix design for each identified pavement segment.

Note 1—Take cores using a pattern that results in a representative sample of the pavement to be recycled including at or near lane lines, within and between wheel paths, at the pavement edge and within shoulders if shoulders are to be recycled. Provide at least 180 kg (400 lb) of RAP per design, more if asphalt content or binder properties or recovered aggregate gradation analysis of the RAP are desired.