ALDOT-349-86
HOT-MIX ASPHALT TESTING EQUIPMENT

1. Scope

1.1. This procedure covers equipment required for testing of hot-mix asphalt (HMA) mixtures. All testing equipment shall meet or exceed the following requirements, as well as any requirements in the referenced AASHTO, ASTM, or ALDOT documents (including additional equipment), and be present on site and maintained in proper working order during all HMA production. Any equipment not meeting the requirements herein shall not be used without the written approval of the Materials and Tests Engineer.

2. Referenced Documents

2.1. AASHTO Standards

2.1.1. AASHTO R 47, Standard Practice for Reducing Samples of Hot Mix Asphalt (HMA) to Testing Size

2.1.2. AASHTO T 27, Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates

2.1.3. AASHTO T 30, Standard Method of Test for Mechanical Analysis of Extracted Aggregates

2.1.4. AASHTO T 84, Standard Method of Test for Specific Gravity and Absorption of Fine Aggregate

2.1.5. AASHTO T 85, Standard Method of Test for Specific Gravity and Absorption of Coarse Aggregate

2.1.6. AASHTO T 166, Standard Method of Test for Bulk Specific Gravity of Compacted Hot-mix Asphalt Mixtures Using Saturated Surface-Dry Specimens

2.1.7. AASHTO T 168, Standard Method of Test for Sampling Hot-Mix Asphalt Paving Mixtures

2.1.8. AASHTO T 176, Standard Method of Test for Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test

2.1.9. AASHTO T 209, Standard Method of Test for Theoretical Maximum Specific Gravity and Density of Hot-Mix Asphalt (HMA)

2.1.10. AASHTO T 245, Standard Method of Test for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus

2.1.11. AASHTO T 275-91 (2005), Standard Method of Test for Bulk Specific Gravity of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens

2.1.12. AASHTO T 283, Standard Method of Test for Resistance of Compacted Hot-Mix Asphalt (HMA) to Moisture-Induced Damage

2.1.13. AASHTO T 304, Standard Method of Test for Uncompacted Void Content of Fine Aggregate (As Influenced by Particle Shape, Surface Texture, and Grading)

2.1.14. AASHTO T 308, Standard Method of Test for Determining the Asphalt Content of Hot-Mix Asphalt (HMA) by the Ignition Method

2.1.15. AASHTO T 312, Standard Method of Test for Preparing and Determining the Density of Hot-mix Asphalt (HMA) Specimens by Means of the Superpave Gyratory Compactor

2.1.16. AASHTO T 331 , Standard Method of Test for Bulk Specific Gravity and Density of Compacted Hot-mix Asphalt(HMA) using Automatic Vacuum Sealing Method

2.2. ASTM Standards

2.2.1. ASTM D2041, Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures

2.2.2. ASTM D4125, Standard Test Methods for Asphalt Content of Bituminous Mixtures by the Nuclear Method

2.2.3. ASTM D4791, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate

2.3. ALDOT Procedures

2.3.1. ALDOT-130, Moisture Content of Hot-Mix Asphalt Mixtures by Drying

2.3.2. ALDOT-307, Design Method for Selecting Optimum Asphalt Cement Content of Hot-Mix Asphalt Mixture by Means of the Marshall Apparatus

2.3.3. ALDOT-319, Rapid Method to Determine the Asphalt Content in Hot-Mix Asphalt Paving Mixtures

2.3.4. ALDOT-354, Asphalt Content of Hot-Mix Asphalt Mixtures by the Nuclear Method

2.3.5. ALDOT-361, Resistance of Compacted Hot-Mix Asphalt Mixture to Moisture Induced Damage

2.3.6. ALDOT-381, Method for Correlation of Marshall Hammers

3. General Equipment Needed

3.1. Sample quartering apparatus, (AASHTO R47).

3.2. Sieves and sieve shaker, (AASHTO T 30).

3.3. Washing screen deck and decanter (AASHTO T 27).

3.4. Balances/scales shall have an 11 kg capacity and 0.1 g sensitivity calibrated every six months.

3.5. Wire basket or platform suspended from scales into an overflow-equipped temperature-controlled water bath to determine compacted specimen bulk specific gravity (AASHTO T 166).

3.6. Vacuum pump, capable of evacuating air from the vacuum container to a residual pressure of 4.0 kPa (30mm Hg) (AASHTO T 209).

3.7. Manometer, accurate to 1 mm mercury pressure.

3.8. Fan.

3.9. Calibrated pycnometer, which is a thick-walled volumetric glass flask with a rubber stopper and a connection for a vacuum line. (AASHTO T 209).

3.10. Tensile strength residual (TSR) breaking head, sized for the proper specimen diameter and height (AASHTO T 245).

3.11. Vacuum saturation pycnometer, of sufficient capacity to completely immerse the specimen while the specimen is held off the bottom of the pycnometer with a mesh spacer or other device, equipped with a transparent cover with a rubber gasket and a connection for the vacuum line (AASHTO T-209).

3.12. Stability and flow breaking heads with recording device. (AASHTO T 245).

3.13. Constant temperature water bath, 140ºF (60°C) (AASHTO T 283 & T 245).

3.14. Thermometers accurate to 1°F (0.5 ºC) from 68 to 356 ºF (20 to 180°C) traceable to NISH.

3.15. Specimen extruder using a rigid 0.5 in (12.7 mm) thick steel disk having a diameter no more than 1/16 in (1.6 mm) smaller than the diameter of the specimen mold.

3.16. Forced draft oven(s), having a minimum interior oven space of 10 ft^3 (0.3 m^3) total. Two ovens, one for mix and one for molds, at different temperatures, are required for Marshall designs. The Superpave molds are larger, but in the field molds and mix are at the same temperature.

3.17. Trowels, towels, pans, bowls, spoons, spatulas, insulated gloves, rubber gloves, lumber crayons or paint pens, scoops, machine lubricant, asphalt solvent, soap, and protective paper specimen disks.

3.18. Sand equivalent apparatus (AASHTO T176).

3.19. Uncompacted void content apparatus (AASHTO T 304).

3.20. Flat or elongated proportional caliper (ASTM D 4791).

3.21. Microwave oven, hot burners and Pyrex dish (ALDOT-130).

3.22. Nuclear gauge (ALDOT-354) or asphalt content ignition furnace (AASHTO T 308).

4. Equipment for Marshall Mixes

4.1. Marshall compactor assembly, including a concrete slab with approximate dimensions of 3 ft x 3 ft x 1 ft (1.0 x 1.0 x 0.3 m), calibrated and correlated according to ALDOT-381.

4.2. Marshall molds minimum six (6) (AASHTO T 245).

4.3. Stability and flow breaking head with recording devices (AASHTO T 245).

5. Superpave Equipment

5.1. Superpave gyratory compactor and specimen height recorder maintained and calibrated according to the manufacturer's or Superpave's recommended schedule, whichever is more frequent (AASHTO T 312).

5.2. Gyratory molds, a minimum of two (2).

6. Bulk and Density Verification Equipment for High Absorption HMA

6.1 Vacuum sealing device (AASHTO T 331).

6.1.1 An laboratory density measurement device by vacuum sealing is an optional method for determining the bulk specific gravity and/or density of a compacted hot-mix specimen. The vacuum apparatus must be maintained and calibrated according to manufacturer's recommended schedule if the device is used during the initial design phase of the job mix formula.

6.1.2 Plastic bags shall conform to the requirements found in AASHTO T 331.

6.2 Paraffin Coated Specimens (AASHTO T 275).

6.2.1 Paraffin is another optional method for determining the bulk specific gravity and/or density of a compacted hot-mix specimen. The following items are required to run the test:

6.2.1.1 A melting pot for melting paraffin.

6.2.1.2 Brush for administering paraffin.

6.2.1.3 Suspension apparatus shall conform to the requirements of AASHTO T 166.

6.2.1.4 Paraffin (including the specific gravity of the paraffin).

6.3 If the design bulk specific gravity results indicate high absorptions, either of these two (2) options may be performed during design phase for absorption accountability. The test shall be approved by the Bureau of Materials and Tests' Hot-Mix Asphalt Laboratory.

6.4 If roadway density testing indicates high absorptions, either of these two (2) options can be performed to determine roadway density.