

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
MATERIALS CONTROL, SOILS AND TESTING DIVISION
MATERIALS PROCEDURE

METHOD OF TEST FOR DETERMINATION OF "R" VALUE AND COHESIOMETER
VALUE OF ASPHALT EMULSION OR CUT BACK ASPHALT EMULSION PRIMER ON
TREATED AGGREGATE BASE COURSE (COLD MIX)
(CALIFORNIA PROCEDURE MODIFIED)

1.0 PURPOSE

- 1.1 To determine the resistance "R" Value and cohesiometer value of Asphalt Emulsion or Cut Back Asphalt Emulsion Primer treated aggregate base course.

2.0 SCOPE

- 2.1 This method covers a procedure for determining the "Resistance Value" of a Asphalt Emulsion or Cut Back Asphalt Emulsion Primer treated aggregate mixture by measuring the transmitted horizontal pressure, developed in a compacted test specimen under a given vertical pressure, and indicates the relative ability of the base course to resist plastic deformation under the action of traffic.

- 2.2 The cohesiometer test provides a measure of the cohesive resistance or tensile strength of a compacted asphalt emulsion or cut back asphalt emulsion primer treated aggregate mixture.

3.0 INSTRUCTIONS:

3.1 Preparation of Samples

- 3.1.1 Initial preparation of aggregate samples including such phases as sieve separation, weighing, and removing of aggregate coating shall be performed.

- 3.1.2 Discard all oversize material (say +25.4 mm material), determine the desired total weight of the aggregate needed for each specimen (size of specimen to be 102 mm diameter x 61 mm - 66 mm). Weight of the specimen produced should weigh between 1100 and 1300 grams.

- 3.1.2.1 As an example, if a specimen weighs 1150 grams and the percent of residual bitumen is 3 percent, then, $0.03 \times 1150 = 34.5$ grams residual bitumen. One Thousand One Hundred Eleven (1150) grams minus 34.5 grams 1115.5 grams, aggregate needed. Calculate the weight of aggregate needed for each sieve size by multiplying the percent retained on each sieve from a given gradation (see governing specification) by the total weight of aggregate needed for one specimen.
- 3.1.3 Weigh out approximately 600 grams of material having the same grading as the test specimens for determination of the initial moisture content. Initial moisture content determination is imperative as all specimens will be compacted at optimum moisture content.
- 3.2 Mixing
- 3.2.1 All specimens will be mixed at optimum moisture content (determined by kneeding proctor compactor).
- 3.2.2 The water content of the Asphalt Emulsion SS-1 or the content of all components other than bitumen in CBAEP (as determined by the bituminous laboratory) will be treated as a part of the optimum moisture content. For example: If a given sample of SS-1 contains 65 percent residual bitumen and 35 percent water or other components, the 35 percent water should be taken into consideration when calculating the amount of water to be added to the specimen for optimum moisture content.
- 3.2.3 Pour aggregate into the mixing bowl, place the mixing bowl with its contents in the mixer and mix for five (5) minutes.
- 3.2.4 When mixing, add water to specimens first, to coat aggregate, then add proper amount of asphalt emulsion SS-1 or cut back asphalt emulsion primer CBAEP.
- 3.2.5 After mixing is completed, specimens are ready for compaction.

3.3 Compaction

3.3.1 Place mix in trough and thoroughly disperse to insure a uniform sample when transferred to a 102 mm diameter mold. Place the mold in position in the mold holder and place a paper disc over the plate on the mold holder. Use a paddle, shaped to fit the trough to push on half (1/2) of the material into the mold. Rod the material 20 times in the center and 20 times around the edge with a bullet nosed steel rod, then push the remainder of the sample into the mold and repeat the rodding procedure.

3.3.2 Place mold holder containing the mix and mold into position in the mechanical compactor. Place a 102 mm diameter rubber disc on the top of the specimen.

3.3.3 Start compactor and adjust air pressure to a point where 350 PSI will be exerted by tamper foot. (Area approximately 3.2 in.²). Apply 100 blows to complete the compaction.

3.3.4 Place compacted test cylinder (see Section 3.3.3) in Versa Tester and apply a leveling off load of 454 Kg by using the double plunger method in which a free fitting plunger is placed below the sample as well as on top.

3.3.5 Take sample from Versa Tester, place in extrusion machine and extrude specimen from the mold by using a 102 mm diameter plunger. Care must be taken while extruding specimen, as any mishandling could rupture the specimen.

3.3.6 Weigh and record specimen to the nearest 0.1 gram and record average height to nearest .254 mm for density calculation.

3.3.7 Place specimens on sample tray and set them aside to cure at room temperature for a period of seven (7) days.

3.4 Stabilometer Test

3.4.1 Check displacement of stabilometer with metal dummy specimen and if necessary adjust to give 2.00 ± 0.05 turns (calibration of stabilometer).

- 3.4.2 Put the cure specimen in the stabilometer and arrange a 102 mm diameter plunger on the top of specimen. Place the stabilometer in Versa Tester, then adjust stabilometer pump to give horizontal pressure of 34 KPa.
- 3.4.3 Start vertical movement of Versa Tester at a speed of 0.02 mm per minute and record the stabilometer gauge readings when the vertical pressures are 227 kg, 454 kg, 680 kg, 907 kg total load.
- 3.4.4 Stop vertical loading at 907 kg and immediately reduce the load to 454 kg. Turn displacement pump so that the horizontal pressure is reduced to 34 KPa. Set the displacement indicator dial to zero. Turn pump handle approximately two turns per second until the stabilometer gauge reads 689.5 KPa.
- 3.4.5 Record the number of turns indicated on the dial as the displacement of the specimen. The displacement indicator dial reads in .0254 mm and each 2.54 mm is equal to one turn, ie. A reading of 6.35 mm indicates that 2.5 turns were made with the displacement pump. This measurement is known as turns displacement of the specimen.
- 3.5 Cohesimeter Test
 - 3.5.1 Cohesimeter tests are performed on the same specimen previously used in stabilometer test.
 - 3.5.2 Calibrate cohesimeter device by placing shot into the receiving bucket at the rate of 1800 ± 20 grams per minute. This receiving bucket is located at the end of a 762 mm level arm.
 - 3.5.3 Place the specimen in position inside cabinet and clamp firmly, with top plates paralalled with top surface of specimen.
 - 3.5.4 Pull release pin and allow shot flow to continue until the specimen breaks, indicated by a sudden drop of beam.
 - 3.5.5 In the event that the specimen is flexible or ductile rather than brittle, the flow of shot is stopped when the horizontal end of the 762 mm beam is lowered 12.7 mm from the horizontal.

3.5.6 Weigh shot caught in the receiving bucket to the nearest gram and record as shot weight.

3.6 Calculation

3.6.1 "R" Value calculated as :

$$R = 100 - \frac{100}{\frac{2.5}{D} \frac{P_v}{P_h} - 1 + 1}$$

Where:

R = "R" Value
P_v = Vertical pressure (Typically 1130 KPa)
P_h = Horizontal pressure (Stabilometer reading in KPa
P_h taken at the instant P_v is 1103 KPa)
D = Turns displacement reading on specimen

3.6.2 Cohesimeter Value Calculate as:

$$C = \frac{L}{W \times (0.20H + 0.044H^2)}$$

Where:

C = Cohesimeter value
L = Weight of shot in grams
W = Diameter of width of specimen in millimeters
H = Height of specimen in millimeters

3.7 Equipment

3.7.1 Pans - 279 mm x 178 mm x 38.1 mm

3.7.2 Mechanical Bituminous Mixer.

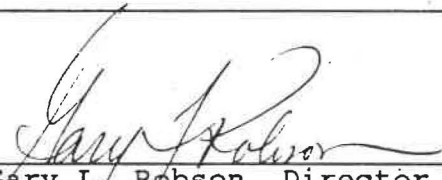
3.7.3 Beakers - 800 ML for adding asphalt

3.7.4 Balance

3.7.5 Spatulas

3.7.6 Mechanical Kneeding Compactor

- 3.7.7 Compaction molds, steel 102 mm inside diameter x 127 mm high x 6.35 mm wall thickness.
 - 3.7.8 Paper disc, corrugated cardboard paper 100 mm diameter, to place in the bottom of mold during compaction.
 - 3.7.9 Baldwin Machine
 - 3.7.10 Hveem Stabilometer
 - 3.7.11 Cohesimeter
 - 3.7.12 Extrusion Machine
 - 3.7.13 Rubber disc. 100 mm diameter.
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