

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

METHOD OF TEST FOR DETERMINATION OF "R" VALUE,
BULK SPECIFIC GRAVITY COHESION, MAXIMUM
SPECIFIC GRAVITY, AND AIR VOID VALUE OF
BITUMINOUS TREATED BASE COARSE
(HOT MIX AND COLD MIX)

- 1.0 PURPOSE
- 1.1 To determine the resistance value, bulk specific gravity, unit weight, maximum specific gravity, maximum density, cohesion and air void value of bituminous treated base coarse (Hot and Cold Mix).
- 2.0 SCOPE
- 2.1 "R" Value
 - 2.1.1 This method of test covers a procedure for determining the "resistance" value of a bituminous mixture by measuring the transmitted horizontal pressure developed in a compacted specimen under a given vertical pressure and indicates the relative ability of the base coarse to resist plastic deformation. Re: ASTM D-1560
- 2.2 Bulk Specific Gravity
 - 2.2.1 This method of test determines the bulk specific gravity of the compacted specimen. Re: AASHTO T-165-I
- 2.3 Maximum Specific Gravity
 - 2.3.1 This method of test determines the maximum specific gravity of the uncompacted bituminous paving mixtures. Re: AASHTO T-209

2.4 Cohesion

- 2.4.1 This method provides a measure of the cohesion resistance or tensile strength of the compacted bituminous specimen.
Re: ASTM D-1560

2.5 Air Voids

- 2.5.1 A calculated value to obtain the percent voids of the total mix. Primary purpose of air void criteria is to avoid pavement designs that will result in flushed or bleeding pavement.

3.0 EQUIPMENT

- 3.1 Apparatus and equipment as specified in the following procedures: ASTM D-1560, ASTM D-1561, AASHTO T-165-I, AASHTO T-209, and Form HS-20.

4.0 PREPARATION OF THE AGGREGATE AND MIXTURES

- 4.1 Material for "R" value determination to be prepared in accordance with ASTM D-1560.

5.0 MOLDING SPECIMENS

- 5.1 The mixtures are compacted and molded in accordance with ASTM D-1561.

NOTE: Cold Mix specimens are cured prior to determination of "R" value.

6.0 STABILIMETER

- 6.1 Determine the horizontal pressure at a given vertical load in accordance with ASTM D-1560.

NOTE: Start the vertical movement of the press at the speed of 1.3 mm per second and record the stabilimeter gauge reading at 907 kg (8.90 kN) on Form HS-20.

7.0 CALCULATIONS

- 7.1 "R" value is determined by using the following equation, or use Nomograph I:

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

Where:

R = "R" Value

P_v = Vertical Pressure (usually 1130 KPa)

P_h = Horizontal Pressure stabilimeter readings in KPa (8.90 kN)

D = Displacement Reading

- 7.1.1 Attachment II Chart to be used to correct "R" value result on effective height, record result on Form HS-20.

8.0 BULK SPECIFIC GRAVITY AND UNIT WEIGHT

- 8.1 Determine the bulk specific gravity in accordance with AASHTO T-165-I, record on Form HS-20, use equation on Form HS-20 to determine unit weight in pcf and record on Form HS-20.

9.0 COHESION

- 9.1 Measure height of the specimen, record height on Form HS-20, test the specimen in accordance with ASTM-D-1560, record on Form HS-20.

NOTE: The height factors in Table 1 may be used to calculate the cohesion value. See example in Table 1.

TABLE 1

Multiply the weight of the shot necessary to break the specimen by the factors established for various heights of a 102 mm diameter specimen.

<u>Height</u>	<u>Factor</u>	<u>Height</u>	<u>Factor</u>
55.9 mm	.382	63.5 mm	.322
57.1 mm	.371	64.8 mm	.313
58.4 mm	.360	66 mm	.305
59.7 mm	.349	67.3 mm	.297
61.0 mm	.340	68.6 mm	.290
62.2 mm	.331	69.9 mm	.283

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Example: Assume it takes 600 grams of shot to break a specimen 102 mm in diameter, a height of 63.5 mm. Cohesion Value = $600.0 \times .322 = 193$.

10.0 MAXIMUM SPECIFIC GRAVITY AND MAXIMUM THEORETICAL DENSITY

10.1 Determine the maximum specific gravity in accordance with AASHTO T-209, record on Form HS-20. Use equation on Form HS-20 to determine the maximum theoretical density in pcf, and record on Form HS-20.

11.0 AIR VOIDS

11.1 Air Voids determined by the following equation:

$$\% \text{ Air} = \frac{A - B}{A} (100)$$

Voids

Where:

A = Maximum theoretical density pcf

B = Unit Weight pcf, record results on Form HS-20



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GLR:c

Attachments

HT	Factor	HT	Factor
2 20	582	2 50	322
2 25	371	2 55	313
2 30	360	2 60	305
2 35	349	2 65	297
2 40	340	2 70	290
2 45	331	2 75	283

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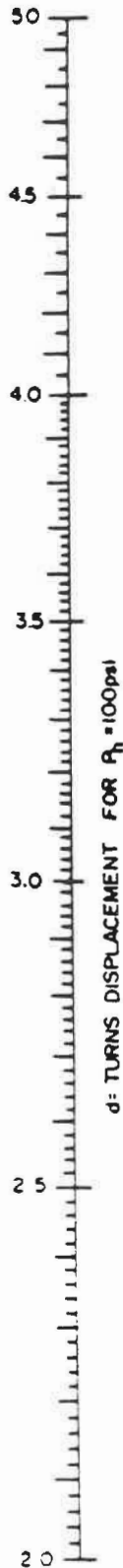
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ATTACHMENT NO. 2

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CHART FOR DETERMINING R-VALUE

FROM STABILOMETER DATA



$$R = 100 - \frac{100}{\frac{2.5}{d} \left(\frac{P_v}{P_h} - 1 \right) + 1}$$

where $P_v = 160$ psi

