Designation: D 1075 – 96 (Reapproved 2000)

American Association State
Highway and Transportation Officials Standard
AASHTO No.: T165

Standard Test Method for Effect of Water on Compressive Strength of Compacted Bituminous Mixtures[1]

This standard is issued under the fixed designation D 1075; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This test method covers measurement of the loss of compressive strength resulting from the action of water on compacted bituminous mixtures containing asphalt cement. A numerical index of reduced compressive strength is obtained by comparing the compressive strength of freshly molded and cured specimens with the compressive strength of duplicate specimens that have been immersed in water under prescribed conditions.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

C 670 Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials[2]

D 1074 Test Method for Compressive Strength of Bituminous Mixtures[3]

D 2726 Test Method for Bulk Specific Gravity of Compacted Bituminous Mixtures Using Saturated Surface-Dry Specimens[3]

3. Significance and Use

3.1 This test method is useful as an indicator of the susceptibility to moisture of compacted bitumen-aggregate mixtures.

4. Apparatus

4.1 One or more automatically controlled water baths shall be provided for immersing the specimens. The baths shall be of sufficient size to permit total immersion of the test specimens. They shall be so designed and equipped as to permit accurate and uniform control of the immersion temperature within ±1°C (1.8°F). They shall be constructed of or lined with copper, stainless steel, or other nonreactive material. The water used for the wet storage of the specimens shall be either distilled or otherwise treated to eliminate electrolytes and the bath shall be emptied, cleaned, and refilled with fresh water for each series of tests.

4.2 A manually or automatically controlled water bath also shall be provided for bringing the immersed specimens to the temperature of 25 ± 1°C (77 ± 1.8°F) for the compression test. Any convenient pan or tank may be used provided it is of sufficient size to permit total immersion of the specimens.

4.3 A balance and a water bath with suitable accessory equipment will be required for weighing the test specimens in air and in water in order to determine their densities, the amount of absorption, and any changes in specimen volume resulting from the immersion test.

4.4 A supply of flat transfer plates of glass or other non-reactive material will be required. One of these plates shall be kept under each of the specimens during the immersion period and during subsequent handling, except when weighing and testing, in order to prevent breakage or distortion of the specimens.

5. Test Specimens

5.1 At least six 101.6 by 101.6-mm (4 by 4-in.) cylindrical specimens shall be made for each test. The procedures described in Test Method D 1074 shall be followed in preparing the loose mixtures and in molding and curing the test specimens.

NOTE 1—This test method was developed to measure the loss of compressive strength due to water for specimens designed at approximately 6 % air voids by the compaction procedures of Test Method D 1074. When used with mixtures designed by other test methods, it is possible that the specimens will be compacted to some other void level which may influence the results. Some agencies have established an air void or percent density target to which the specimens should be compacted. This is accomplished by adjusting the loading in the Molding and Curing Test Specimens Section of Test Method D 1074.

6. Determination of Bulk Specific Gravity of Test Specimens

6.1 Allow each set of six test specimens to cool for at least 2 h after removal from the curing oven described in Test Method D 1074. Determine the bulk specific gravity of each

[1] This test method is under the jurisdiction of ASTM Committee D04 on Road and Paving Materials and is the direct responsibility of Subcommittee D04.22 on Effect of Water and Other Elements on Bituminous Coated Aggregates.

Current edition approved May 10, 1996. Published July 1996. Originally published as D 1075 – 49 T. Last previous edition D 1075 – 94.

[2] *Annual Book of ASTM Standards*, Vol 04.02.

[3] *Annual Book of ASTM Standards*, Vol 04.03.

specimen in accordance with the procedure (thoroughly dry specimens) and calculation (bulk specific gravity) sections of Test Method D 2726.

7. Procedure

7.1 Sort each set of six test specimens into two groups of three specimens each so that the average bulk specific gravity of the specimens in Group 1 is essentially the same as for Group 2. Test the specimens in Group 1 as described in 7.1.1. Test the specimens in Group 2 as described in 7.1.2 unless the alternative procedure described in 7.1.3 is specified.

7.1.1 *Group I*—Bring the test specimens to the test temperature 25 ± 1°C (77 ± 1.8°F), by storing them in an air bath maintained at the test temperature for not less than 4 h and determine their compressive strengths in accordance with Test Method D 1074.

7.1.2 *Group 2*—Immerse the test specimens in water for 24 h at 60 ± 1°C (140 ± 1.8°F). Transfer them to the second water bath maintained at 25 ± 1°C (77 ± 1.8°F) and store them there for 2 h. Determine the compressive strength of the specimens in accordance with Test Method D 1074.

7.1.3 *Group 2, Alternative Procedure*—Immerse the test specimens in water for four days at 49 ± 1°C (120.2 ± 1.8°F). Transfer them to the second water bath maintained at 25 ± 1°C (77 ± 1.8°F) and store them there for 2 h. Determine the compressive strength of the specimens in accordance with Test Method D 1074.

8. Calculation

8.1 Calculate the numerical index of resistance of bituminous mixtures to the detrimental effect of water as the percentage of the original strength that is retained after the immersion period as follows:

$$\text{Index of retained strength, \%} = (S_2/S_1) \times 100 \quad (1)$$

where:

S_1 = compressive strength of dry specimens (Group 1), and

S_2 = compressive strength of immersed specimens (Group 2).

9. Precision and Bias

9.1 *Single-Operator Precision*—The single-operator standard deviation has been found to be 6 % (see Note 2). Therefore, results of two properly conducted tests by the same operator on the same material should not differ by more than 18 % (see Note 2).

NOTE 2—These numbers represent, respectively, the (1s) and (d2s) limits as described in ASTM Practice C 670.

9.2 *Multilaboratory Precision*—The multilaboratory standard deviation has been found to be 18 % (see Note 2). Therefore, results of two properly conducted tests from two different laboratories on identical samples of the same material should not differ by more than 50 % (see Note 2).

10. Keywords

10.1 bituminous paving mixtures; compression testing; moisture; water