

Method of  
**DETERMINING THE INDEX OF RETAINED  
MARSHALL STABILITY OF IMMERSSED SPECIMEN**  
LDH DESIGNATION: TR 313-66

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**Scope**

1. This method of test is intended to measure the reduction in Marshall stability resulting from the action of water on compacted bituminous mixtures containing penetration grade asphalt. A numerical index of reduced stability of specimens is obtained by comparing the stability of specimens determined in accordance with Marshall test method LDH TR: 305, with the stability of specimens that have been immersed in water for a prescribed period.

**Apparatus**

2. The following apparatus is required:
- (a) Water bath. A water bath at least 6 inches deep provided with mechanical water agitator, heating elements, and thermostatic controls capable of maintaining the bath water at temperatures ranging from 77° to 140°F. The bath shall have a perforated false bottom or be equipped with a shelf for supporting specimens 2 inches above the bottom of the bath. The specimens shall be completely immersed.
  - (b) Balance and water container with suitable accessory equipment for weighing the test specimens in air and in water to determine the densities of the specimens.
  - (c) Transfer plates, flat, of glass or metal. One of these plates shall be kept under each test specimen during immersion and subsequent handling, except when weighing and testing, in order to prevent breakage or distortion of the specimens.

**Test Specimens**

3. A minimum of eight standard Marshall test specimens, 4 inches in diameter and 2 1/2 ± 1/4 inches in height, shall be prepared for each test in accordance with the procedures described in LDH TR: 303 and LDH TR: 305.

**Determination of Specific Gravity**

4. The specific gravity of the test specimen shall be determined according to LDH TR: 304, Section 4.

**Test Procedure**

5. (a) Sort the test specimens into two groups so that the average specific gravity of the specimens in group 1 is essentially the same as that of group 2. Test the specimens in group 1 for Marshall stability and flow as described in LDH TR: 305. Immerse the group 2 specimens in water for 24 hours at 140° ± 1°F.
- (b) After 24 hour immersion in water at 140° ± 1°F, transfer the specimens into a water bath maintained at 77° ± 1°F. and leave them in the bath for a minimum of 30 minutes.
- (c) Remove the specimens from the bath, surface dry with a clean rag or paper towel and determine the specific gravity as described in Section 4 of LDH TR: 304.
- (d) After specific gravity determination, test the specimens for stability and flow as described in LDH TR: 305.

**Calculations:**

- (a) Absorption:

Calculate the per cent absorption as follows:

$$\text{Per cent absorption} = \frac{A_2 - A_1}{A_1} \times 100$$

Where:  $A_1$  = Weight of the specimen before immersion.

$A_2$  = Weight of the specimen after immersion.

- (b) Swell:

Calculate the per cent swell as follows:

$$\text{Per cent swell} = \frac{V_2 - V_1}{V_1} \times 100$$

Where:  $V_1$  = Volume of the specimen before immersion.

$V_2$  = Volume of the specimen after immersion.

(c) The numerical index of resistance of bituminous mixtures to the detrimental effect of water shall be expressed as a percentage of the original stability as follows:

$$\text{Index of retained stability} = \frac{S_2}{S_1} \times 100$$

Where:  $S_2$  = Marshall stability of group 2  
(average).  
 $S_1$  = Marshall stability of group 1  
(average).