

## **COMPRESSIVE STRENGTH OF MOLDED CEMENT TREATED BASE OR SOIL-CEMENT SPECIMENS**

**(An Arizona Method)**

### **1. SCOPE**

- 1.1 This test method is used to determine the unconfined compressive strength of cement treated base or soil-cement specimens.
- 1.2 This test method may involve hazardous materials, operations, and equipment. This test method does not purport to address all of the safety problems associated with its use. It is the responsibility of whoever uses this test method to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

### **2. APPARATUS**

- 2.1 Requirements for the frequency of equipment calibration and verification are found in Appendix A3 of the Materials Testing Manual.
- 2.2 4 inch split ring proctor molds having a capacity of approximately 1/30 cubic foot, with an internal diameter of 4.000 plus 0.024 or minus 0.016 inches and a height of 4.584 plus 0.005 or minus 0.008 inches shall be used. The molds shall have a nominal wall thickness of 1/4 inch. They shall be equipped with an extension collar approximately 2-3/8 inches high.
- 2.3 A hand or mechanical rammer weighing  $5.50 \pm 0.02$  pounds, having a flat face, and equipped with a suitable arrangement to control the height of drop to a free fall of  $12 \pm 0.06$  (1/16) inches above the elevation of the soil. The rammer face shall be circular with a diameter of 2.000 plus 0.010 or minus 0.015 inches.
- 2.4 Hardened-steel straightedge, at least 10 inches in length. It shall have one beveled edge, and at least one longitudinal surface (used for final trimming) shall be plane within 0.01 inch per 10 inches (0.1 percent) of length with the portion used for trimming the soil.

- 2.5 A circular sample follower with a diameter slightly less than the inner diameter of the proctor mold to aid in the removal of the mold collar.
- 2.6 Sieves of sizes as required for screening conforming to the requirements of ASTM E11.
- 2.7 Screw type or hydraulically operated compression testing machine capable of meeting the requirements of Subsection 6.3 below.
- 2.8 Miscellaneous mixing tools and pans.

### **3. SAMPLE PREPARATION**

- 3.1 A representative sample of approximately 10 kg shall be obtained in a random manner from the completed mixture prior to final compaction, and immediately placed in an air-tight container. Not more than 90 minutes shall lapse between the time of mixing and the final mold fabrication.
- 3.2 Sieve the material over a 3/4 inch sieve and discard any Plus 3/4 Inch Material.

### **4. FABRICATION**

- 4.1 The required number of specimens shall be promptly fabricated, following the procedure below.
- 4.2 Form a specimen by compacting the prepared soil in the four inch mold (with the extension collar attached) in three equal layers to give a total compacted depth of about 5 inches. The top of the first and second layers shall be scratched to aid in bonding to subsequent layer. Compact each layer with 25 uniformly distributed blows from the rammer, dropping free from a height of 12 inches. While each layer is being compacted, the remainder of material shall be in a pan covered by a damp cloth. During compaction, the mold shall rest firmly on a dense, uniform, rigid and stable foundation.

**NOTE:** Each of the following has been found to be a satisfactory base on which to rest the mold during compaction of the soil: A block of concrete, weighing not less than 100 lbs, supported by a stable foundation; a sound concrete floor; and for field application, such surfaces as found in concrete box culverts, bridges, and pavements.

- 4.3 Following compaction, carefully remove the extension collar. It may be necessary to use a follower to retain the specimen in the mold while removing the collar to prevent damage or disturbance of the soil below the top of the mold. Carefully trim the compacted specimen even with the top of the mold by means of the straightedge. If any voids are created during trimming, these shall be filled with fine material and smoothed off. Level the specimen again with the straightedge, spraying with a fine mist of water as necessary to maintain specimen surface in a moist condition.
- 4.4 If it is necessary to transport the specimens, transport the specimens in the molds with the baseplate and collar attached, in a secure, moist environment as described in Subsection 5.2.
- 4.5 Following arrival at the location where curing will occur, remove specimens from molds within one hour, taking proper care in removing the specimens so that the shape of the molded specimens is maintained. To assure that specimens are in a moist condition they may be sprayed with a fine mist of water upon demolding, and promptly placed in the curing environment.

## **5. CURING**

- 5.1 The specimens to be tested for acceptance shall be cured in a fog room at 100% humidity between 65°F and 80°F for six days. The specimens shall be protected from direct contact with free water to prevent saturation and/or leaching of cementitious material from the specimen.
- 5.2 If the specimens are cured where a “fog” room is not available, the curing is to be accomplished by surrounding the specimens with pre-saturated perlite in a sealed container. Pre-saturation is determined as the maximum amount of water which can be absorbed without the presence of free standing water. This sealed container shall be promptly placed in a 65°F and 80°F environment. Store the specimens on a rigid, non-absorbent surface.
- 5.3 After six days the specimens to be tested for acceptance shall be immersed in saturated lime water at 65 to 80 °F for 24 hours.

**NOTE:** Informational specimens utilized for 1-day compressive strength testing are not immersed in saturated lime water.

**6. COMPRESSIVE STRENGTH**

- 6.1 Carefully remove the specimens from the water and towel dry. Due to the fragility of the specimens they must be handled carefully to assure that they are not damaged. Determine the diameter of each test specimen to the nearest 0.01 inch by averaging two diameter determinations measured at right angles to each other at mid-height of the specimen. The specimens shall be capped in accordance with ASTM C617/AASHTO T 231, and broken as soon as practical while specimens are in their moist condition after capping.
- 6.2 Place each specimen on the bearing block of the compression machine and center it under the loading head.
- 6.3 Continuously apply a uniform load to the specimen at the rate of  $0.05 \pm 0.01$  inches per minute for the screw type testing machines, or 20 to 50 psi/sec for the hydraulically operated machines until failure is noted. Record the load at failure and convert to psi using the diameter determined in Subsection 6.1 above. No further correction shall be applied to the results. The average of three results shall constitute one test value for purposes of compressive strength specification compliance.

**7. REPORT**

- 7.1 Record the load failure point and compressive strength in psi for each specimen, and the average compressive strength for the three specimens.