
Test Procedure for**SOIL-CEMENT TESTING****TxDOT Designation: Tex-120-E****Effective Date: April 2013**

1. SCOPE

- 1.1 This method consists of two parts.
- 1.1.1 Part I determines the unconfined compressive strength of compacted soil-cement specimens after seven days curing (10 lb. hammer, 18-inch drop, 50 blows/layer using 6 × 8 in. mold).
- 1.1.2 Part II applies to cement treated materials sampled from the roadway during construction.
- 1.2 The values given in parentheses (if provided) are not standard and may not be exact mathematical conversions. Use each system of units separately. Combining values from the two systems may result in nonconformance with the standard.
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2. APPARATUS

- 2.1 As outlined in test methods:
- Tex-101-E
 - Tex-113-E
 - Tex-117-E.
- 2.2 *Compression testing machine*, with capacity of 267 kN (60,000 lb.), meeting the requirements of ASTM D 1633.
- 2.3 *Triaxial screw jack press* (Tex-117-E), used when anticipated strengths are not in excess of 2758 kPa (400 psi).
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3. MATERIALS

- 3.1 *Hydraulic (portland) cement.*
- 3.2 *Tap water.*
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4. PREPARING SAMPLE

- 4.1 Select approximately 90 kg (200 lb.) of material treat with cement in accordance with Tex-101-E, Part II.

PART I—COMPRESSIVE STRENGTH TEST METHODS (LABORATORY MIXED)

5. PROCEDURE

- 5.1 Determine the optimum moisture content and maximum density for a soil-cement mixture containing 6% cement in accordance with Tex-113-E. The amount of cement added is a percentage based on the dry mass of the soil.
- 5.2 Recombine the sizes prepared in accordance with Tex-101-E, Part II, to make three individual samples and add the optimum moisture content, from Tex-113-E, to each sample. Mix thoroughly.
- 5.2.1 Cover the mixture to prevent loss of moisture by evaporation. Allow the wetted samples to stand for at least 12 hours before compaction. When the plasticity index (PI) is less than 12, the standing time may be reduced to not less than three hours. Split or referee samples should stand the full term.
- 5.2.2 Prior to compaction, replace any evaporated water and thoroughly mix each specimen.
- 5.2.3 Add cement uniformly and mix thoroughly.
- 5.3 Compact the specimen in four layers using Tex-113-E compactive effort.
- 5.3.1 Alter the percent molding water slightly as the percent cement is increased or decreased. Do this in order to mold nearer optimum moisture without running a new M/D curve for each percentage of cement.
- Note 1**—A new M/D curve for each percentage of cement may be performed, if desired.
- 5.3.2 Use the following equation to vary the molding water:
- $$\% \text{ molding water} = \% \text{ optimum moisture from M/D curve} + 0.25 (\% \text{ cement increase})$$
- Where:
- $$\% \text{ cement increase} = \text{difference in cement content between curve and other cement contents.}$$
- 5.4 Using the moisture contents outlined above, mold three specimens for each cement content using 4, 8, and 10% cement to complete the full set.

- 5.4.1 After the top surface of each specimen has been leveled and the specimen measured, carefully center over porous stone and remove specimen from mold by means of small press.
- 5.4.2 Place a card on each specimen showing the laboratory identification number and the percent of cement.
Note 2—In calculating the actual dry density of laboratory mix soil-cement specimens, the dry mass of material is the total mass of oven dry soil in the specimen plus the mass of cement. The amount of moisture should be the mass of hygroscopic moisture in the soil plus the amount of water added based on the dry mass of the soil plus cement. Determine moisture and density of road-mixed and wetted materials and soil-cement cores from the oven dry masses.
- 5.5 Store test specimens the same day as molded, with top and bottom porous stones, in the damp room for seven days. Do not subject specimen to capillary wetting or a surcharge. Do not use a triaxial cell. Place a pan on top of the top porous stone to protect the specimen from dripping water.
- 5.6 Remove test specimens from the damp room and use a cloth to remove any free water on the surface of the specimens.
- 5.7 Test specimens in compression at 0 kPa (0 psi) lateral confinement in accordance with Tex-117-E, Section 5.19 when using an automated load frame, or Section 5.20 when using a screw jack press.

6. TEST REPORT

- 6.1 Report molding moisture to the nearest 0.1%.
- 6.2 Report dry density to the nearest 1 kg/m^3 (0.1 pcf).
- 6.3 Report unconfined compressive strength to the nearest whole kPa (psi) for each cement content tested.
- 6.4 Report recommended cement content to the nearest 0.5%.
Note 3—Store cement in airtight container or use fresh supply.
Note 4—When comparing laboratory strengths with roadway strength, use the H/D correction factors in Tex-118-E, Table 1 on both laboratory and roadway specimens.

PART II—COMPACTION TESTING OF ROAD MIXED MATERIAL

7. PROCEDURE

- 7.1 Obtain samples for moisture/density curve just prior to the start of compaction operations on the roadway.

- 7.2 Screen cement stabilized materials taken from the roadway during construction over a 6.3 mm (1/4 in.) sieve at field moisture content, without drying.
- 7.2.1 Mix each of these two sizes, plus 6.3 mm (1/4 in.) and minus 6.3 mm (1/4 in.), for uniformity and weigh.
- 7.2.2 Cover each size fraction to maintain field moisture.
- 7.3 Recombine and mold one specimen at the field moisture condition and estimated mass to produce specimen compacted using Tex-113-E compactive effort. Molding should be accomplished using the same equipment and compactive effort as in Part I.
- 7.3.1 Adjust mass, if necessary, and weigh out not less than two additional specimens at the field moisture content for compaction. Molding moisture can be adjusted in each specimen by adding or removing moisture uniformly as needed.
- 7.3.2 Compact cement stabilized material in the laboratory in approximately the same timeframe as on the road. Compaction sample of cement-stabilized material from the road mix should not be prepared by oven drying.
- Note 5**—To determine moisture-density relationship of fine-grained materials with less than 20% retained on the 6.3 mm (1/4 in.) sieve and 100% passing the 9.5 mm (3/8 in.) sieve, the engineer may elect to use a mold with approximate dimensions of 101.6 mm (4.0 in.) in diameter by 152.4 mm (6.0 in.) in height. The number of blows must be calculated when changing mold size to maintain a compactive effort of 1100 kN-m/m³ (13.26 ft-lb/in.³)
- Note 6**—The contractor should be provided an initial optimum moisture based on preliminary laboratory tests.
- 7.4 Store test specimens the same day as molded, with top and bottom porous stones, in the damp room for seven days. Do not subject specimen to capillary wetting or a surcharge. Do not use a triaxial cell. Place a pan on top of the top porous stone to protect the specimen from dripping water.
- 7.5 Remove test specimens from the damp room and use a cloth to remove any free water on the surface of the specimens.
- 7.6 Test specimens in compression at 0 kPa (0 psi) lateral confinement in accordance with Tex-117-E, Section 5.19 when using an automated load frame, or Section 5.20 when using a screw jack press.

8. TEST REPORT

- 8.1 Report density to the nearest 1 k/m³ (0.1 pcf).
- 8.2 Report moisture content to the nearest 0.1 %.
- 8.3 Report unconfined compressive strength to the nearest whole kPa (psi).

9. ARCHIVED VERSIONS

9.1 Archived versions are available.