Standard Method of Test for

The California Bearing Ratio

AASHTO Designation: T 193-13 (2017)

Technical Section: 1a, Soil and Unbound Recycled Materials

Release: Group 3 (August 2017)

AASHTO

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1. SCOPE

1.1. This test method covers the determination of the California Bearing Ratio (CBR) of pavement subgrade, subbase, and base/course materials from laboratory compacted specimens. The test method is primarily intended for, but not limited to, evaluating the strength of cohesive materials having maximum particle sizes less than 19 mm ($^3/_4$ in.).

1.2. When materials having maximum particle sizes greater than 19 mm ($^3/_4$ in.) are to be tested, this test method provides for modifying the gradation of the material so that the material used for tests all passes the 19.0-mm ($^3/_4$-in.) sieve while the total gravel 4.75-mm (No. 4) to 75-mm (3-in.) fraction remains the same. While traditionally this method of specimen preparation has been used to avoid the error inherent in testing materials containing large particles in the CBR test apparatus, the modified material may have significantly different strength properties than the original material. However, a large experience base has developed using this test method for materials for which the gradation has been modified and satisfactory design methods are in use based on the results of tests using this procedure.

1.3. Past practice has shown that CBR results for those materials having substantial percentages of particles retained on the 4.75-mm (No. 4) sieve are more variable than for finer materials. Consequently, more trials may be required for these materials to establish a reliable CBR.

1.4. This test method provides for the determination of the CBR of a material at optimum water content or a range of water content from a specified compaction test and a specified dry unit mass. The dry unit mass is usually given as a percentage of maximum dry unit mass from the compaction tests of T 99 or T 180.

1.5. The agency requesting the test shall specify the water content or range of water content and the dry unit mass for which the CBR is desired.

1.6. Unless specified otherwise by the requesting agency, or unless it has been shown to have no effect on test results for the material being tested, all specimens shall be soaked prior to penetration.

1.7. The values stated in SI units are to be regarded as the standard.

2. REFERENCED DOCUMENTS

2.1. *AASHTO Standards*:

- T 99, Moisture–Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop

- T 180, Moisture–Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop
- T 265, Laboratory Determination of Moisture Content of Soils

3. SIGNIFICANCE AND USE

3.1. This test method is used to evaluate the potential strength of subgrade, subbase, and base course material, including recycled materials, for use in road and airfield pavements. The CBR value obtained in this test forms an integral part of several flexible pavement design methods.

3.2. For applications where the effect of compaction water content on CBR is small, such as cohesionless, coarse-grained materials, or where an allowance is made for the effect of differing compaction water contents in the design procedure, the CBR may be determined at the optimum water content of a specified compaction effort. The dry unit mass specified is normally the minimum percent compaction allowed by using the agency's field compaction specification.

3.3. For applications where the effect of compaction water content on CBR is unknown or where it is desired to account for its effect, the CBR is determined for a range of water content, usually the range of water content permitted for field compaction by using the agency's field compaction specification.

3.4. The criteria for test specimen preparation of self-cementing (and other) materials that gain strength with time must be based on a geotechnical engineering evaluation. As directed by the engineer, self-cementing materials shall be properly cured until bearing ratios representing long-term service conditions can be measured.

4. APPARATUS

4.1. *Molds*—The molds shall be cylindrical in shape, made of metal, with an internal diameter of 152.40 ± 0.66 mm (6.0 ± 0.026 in.) and a height of 177.80 ± 0.46 mm (7.0 ± 0.018 in.), and provided with an extension collar approximately 50 mm (2.0 in.) in height and a perforated base plate that can be fitted to either end of the mold. (See Figure 1.) It is desirable to have at least three molds for each soil to be tested.