Standard Method of Test for

Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate

AASHTO Designation: T 104-99 (2020)

Technical Subcommittee: 1c, Aggregates

Release: Group 3 (July)

AASHTO

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1. SCOPE

1.1. This method covers the procedure to be followed in testing aggregates to determine their resistance to disintegration by saturated solutions of sodium sulfate or magnesium sulfate. This is accomplished by repeated immersion in saturated solutions of sodium or magnesium sulfate followed by oven drying to partially or completely dehydrate the salt precipitated in permeable pore spaces. The internal expansive force, derived from the rehydration of the salt upon re-immersion, simulates the expansion of water on freezing. This test method furnishes information helpful in judging the soundness of aggregates subject to weathering action, particularly when adequate information is not available from service records of the material exposed to actual weathering conditions. Attention is called to the fact that test results by the use of the two salts differ considerably and care must be exercised in fixing proper limits in any specifications that may include requirements for these tests.

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

1.3. *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety concerns associated with its use. It is the responsibility of the user of this procedure to consult and establish appropriate safety and health practices and to determine the applicability of regulatory limitations prior to its use*. Regulatory information for the chemicals used in this standard can be found in 29 CFR 1910.1200.

2. REFERENCED DOCUMENTS

2.1. *AASHTO Standards*:

- M 231, Weighing Devices Used in the Testing of Materials
- T 27, Sieve Analysis of Fine and Coarse Aggregates

2.2. *ASTM Standards*:

- C670, Standard Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials
- E11, Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves
- E100, Standard Specification for ASTM Hydrometers

2.3. *Federal Standard*:

- Fed. Std. No. 29, CFR 1910.1200 OSHA Hazard Communication Standard; see also Permissible Exposure Limits—Annotated Tables, available at https://www.osha.gov/dsg/annotated-pels/

3. APPARATUS

3.1. *Sieves*—With square openings of the following sizes conforming to ASTM E11, for sieving the samples in accordance with Sections 5, 6, and 8:

4.75 mm	(No. 4)	63 mm	($2^1/_2$ in.)
4.00 mm	(No. 5)	50 mm	(2 in.)
2.36 mm	(No. 8)	37.5 mm	($1^1/_2$ in.)
1.18 mm	(No. 16)	31.5 mm	($1^1/_4$ in.)
600 µm	(No. 30)	25.0 mm	(1 in.)
300 µm	(No. 50)	19.0 mm	($^3/_4$ in.)
150 µm	(No. 100)	16.0 mm	($^5/_8$ in.)
		12.5 mm	($^1/_2$ in.)
		9.5 mm	($^3/_8$ in.)
		8.0 mm	($^5/_{16}$ in.)

3.2. *Containers for Samples*—Sieves 203.2 mm (8 in.) in diameter for each separate size fractions of aggregate during test. Used, out-of-tolerance sieves according to ASTM E11, in acceptable condition, may be used as containers (Note 1).

3.2.1. *Coarse Aggregate*—2.36-mm (No. 8) Size.

3.2.2. *Fine Aggregate*—250-µm (No. 60) Size.

Note 1—Sieves 203.2 mm (8 in.) in diameter may be substituted with containers that permit free access of solution to the sample and drainage of the solution from the sample without loss of aggregate. Substitution with such containers may affect results. Referee testing, comparison testing, or testing of aggregate to be used in critical applications must be performed using sieves 203.2 mm (8 in.) in diameter.

3.3. *Apparatus for Immersing Samples in Solution (optional)*—When necessary, apparatus for holding the sieves containing the sample for immersing into the solution shall be constructed in such a manner as to permit free access of the solution to the sample and drainage of the solution from the sample.

3.4. *Temperature Regulation*—Suitable means for regulating the temperature of the samples during immersion in the sodium sulfate or magnesium sulfate solution shall be provided.

3.5. *Thermometer*—A thermometer covering the recommended temperature range for solutions during test and readable to 0.1°C (0.2°F).

3.6. *Temperature Recorder*—A unit capable of recording solution temperature a minimum of once every 10 min for the duration of the test with an accuracy of 0.3°C (0.5°F).

3.7. *Balance*—The balance shall have sufficient capacity, be readable to 0.1 percent of the sample mass or better, and conform to the requirements of M 231.