



Designation: C307 – 23

Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacing¹

This standard is issued under the fixed designation C307; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This test method covers the determination of tensile strength of cured chemical-resistant materials in the form of molded briquets. These materials include mortars, brick and tile grouts, machinery grouts, and monolithic surfacings. These materials shall be based on resin, silicate, silica, or sulfur binders.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

[C904 Terminology Relating to Chemical-Resistant Nonmetallic Materials](#)

¹ This test method is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.46 on Industrial Protective Coatings.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[E4 Practices for Force Calibration and Verification of Testing Machines](#)

[E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods](#)

[E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method](#)

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in this test method, see Terminology [C904](#).

4. Significance and Use

4.1 It is recognized that chemical-resistant mortars, grouts, and monolithic surfacings are not usually under tension when in service; however, such data are useful for purposes of determining the rate of cure and other properties.

4.2 This test method is not recommended for mortars, grouts, and monolithic surfacings containing aggregate greater than $\frac{1}{4}$ in.

5. Apparatus

5.1 *Weighing Equipment*, shall be capable of weighing materials or specimens to $\pm 0.3\%$ accuracy.

5.2 *Specimen Molds*—The molds for making briquet test specimens shall be sufficiently rigid to prevent deformation during molding and shall be made of corrosion-resistant material. Gang molds, when used, shall be of the type shown in [Fig. 1](#). The dimensions of the briquet molds shall be the width of the mold, between inside faces, at waist line of briquet, 1 in. The width and the depth of the briquet mold at the waist line shall be 1 in. ± 0.02 in. (25 mm ± 0.5 mm). The molds shall conform to the dimensional requirements shown in [Fig. 2](#).

5.3 *Equipment for Mixing Materials*, shall consist of a container of suitable size, preferably corrosion resistant, and a strong, sturdy spatula, trowel, or mechanical mixer.

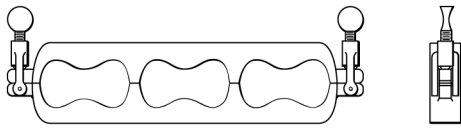


FIG. 1 Briquet Gang Mold

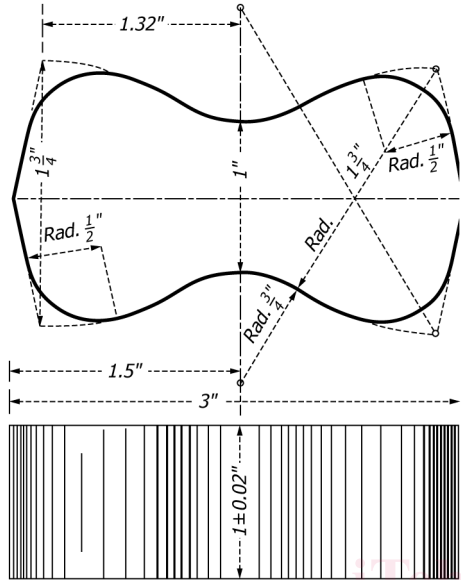


FIG. 2 Briquet Specimens for Tensile Strength Test

5.4 The following additional equipment is required for sulfur mortars.

5.4.1 *Melting Chamber*, of sufficient volume and heat capacity to melt the mortar sample and maintain the temperature of the melt between 260 °F and 290 °F (127 °C and 143 °C).³

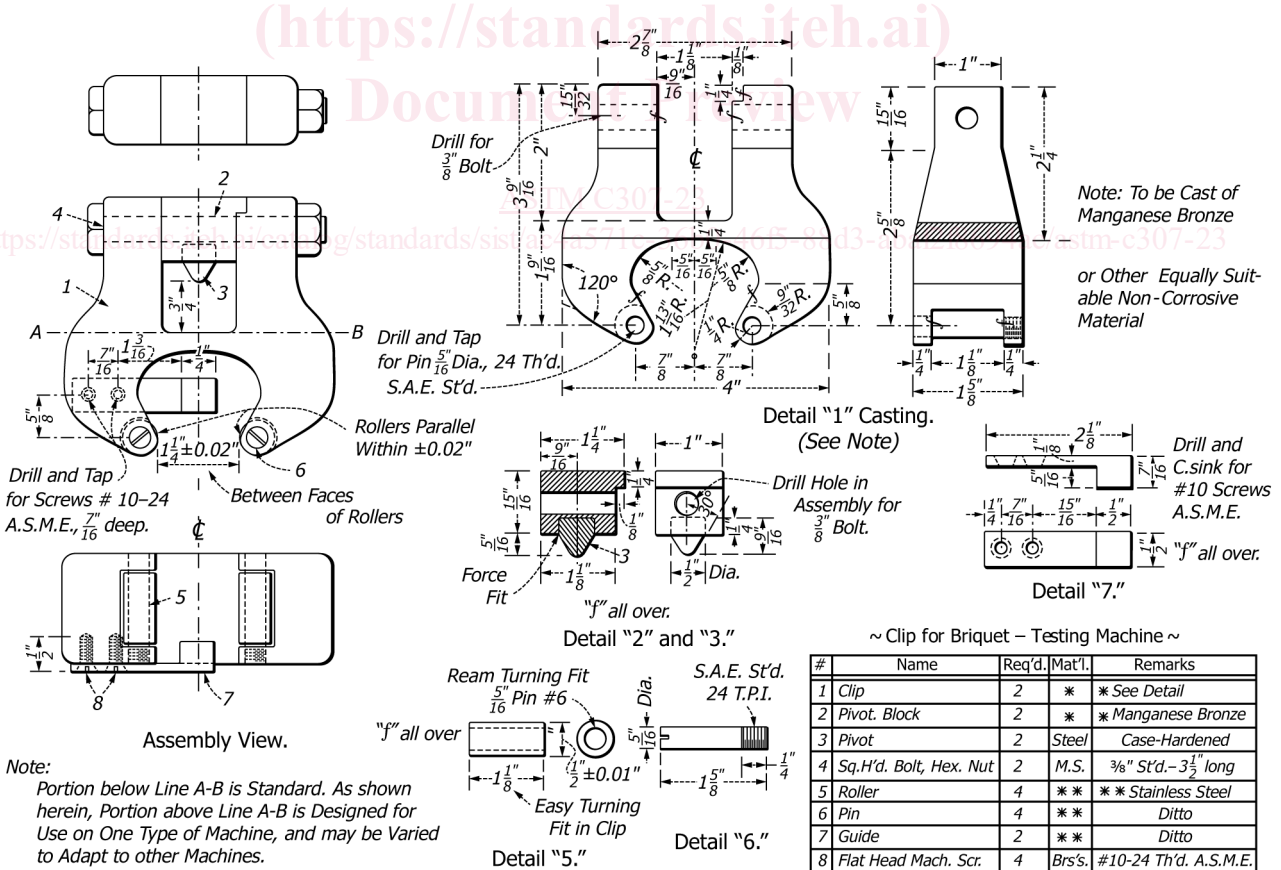
5.4.2 *Laboratory Mixer*, of such a type and speed to be capable of lifting the aggregate without beating air into the melt.

5.4.3 *Ladle*, of sufficient capacity to completely pour one briquet.

5.5 *Testing Machine*, the testing machine shall be of any type sufficient to provide the required load and the rate of crosshead movement prescribed. It shall have been verified to have an accuracy of 1.0 % or better within 12 months of the time of use in accordance with Practices E4.

5.6 *Tension Clips*, for holding the tension test specimens, shall be in accordance with Fig. 3.

³ The sole source of supply of the Forney capping compound melting chamber, Model LA-0130, known to the committee at this time is Forney Industries, Inc., 1565 Broadway Ave., Hermitage, PA 16148. If you are aware of alternative suppliers, please provide this information to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,¹ which you may attend.



1 in. = 25.4 mm

FIG. 3 Clips for Briquet Towing Machines

6. Test Specimens

6.1 All specimens for a single determination shall be made from a single mix containing sufficient amounts of the components in the proportions and in the manner specified by the manufacturer of the materials. If the proportions so specified are by volume, the constituents shall be weighed and the corresponding proportions by weight shall be reported.

6.1.1 *Number of Specimens*—Prepare a minimum of six briquet specimens for each material tested.

6.2 Temperature:

6.2.1 *Resin, Silicate, and Silica Materials*—The standard temperature of the materials, molds apparatus, and the ambient temperature of the mixing area shall be $73\text{ }^{\circ}\text{F} \pm 4\text{ }^{\circ}\text{F}$ ($23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$). Record the actual temperature.

6.2.2 *Sulfur Mortars*—The material shall be maintained at $275\text{ }^{\circ}\text{F} \pm 15\text{ }^{\circ}\text{F}$ ($135\text{ }^{\circ}\text{C} \pm 8\text{ }^{\circ}\text{C}$). The temperature of the molds and the ambient temperature of the mixing area shall be $73\text{ }^{\circ}\text{F} \pm 4\text{ }^{\circ}\text{F}$ ($23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$). Record the actual temperature.

6.3 Molding Test Specimens:

6.3.1 Assemble and lubricate the mold by applying a thin film of an appropriate mold release or lubricant like silicone stop-cock grease or petroleum jelly.

6.3.2 *Resin, Silicate, and Silica Materials*—Mix a sufficient amount of the components in the proportions and in the manner specified by the manufacturer of the materials. Fill the molds one-half full. Remove any entrapped air by using a cutting and stabbing motion with a spatula or rounded-end rod. Fill the remainder of the mold, working down into the previously placed portion. Upon completion of the filling operations, the tops of the specimens should extend slightly above the tops of the molds. When the molds have been filled, strike off the excess material so that it is even with the top of the mold. Permit the material to remain in the mold until it has set sufficiently to allow removal without danger of deformation or breakage.

6.3.3 *Silicate Materials*—Some silicates may require covering during the curing period. After removal from the molds, acid-treat the specimens, if required, in accordance with the recommendations given by the manufacturer. No other treatment shall be permitted. Record the method of treatment in the report section under Conditioning Procedure.

6.3.4 Sulfur Mortars:

6.3.4.1 Assemble the mold in 6.3.1. However, cover the waist of the mold with a small lubricated plate.

6.3.4.2 Melt at least 2.2 lb (1.0 kg) of sulfur mortar in the melt chamber in not more than 1 h. Hold the temperature of the melt at $275\text{ }^{\circ}\text{F} \pm 15\text{ }^{\circ}\text{F}$ for at least 15 min while stirring gently with the laboratory mixer. (The mixer speed should be controlled so that it is sufficient to lift the aggregate without beating air into the melt.)

6.3.4.3 Using the ladle, pour the molten sulfur mortar into both sides of the mold and puddle it to completely fill the space under the plate. Allow the plate, placed across the center of the mold, to remain in place for at least 15 min after the briquet has been poured.

7. Conditioning

7.1 *Resin, Silicate, and Silica Materials*—Age the test specimens for a period of seven days, including the cure period in the mold, at $73\text{ }^{\circ}\text{F} \pm 4\text{ }^{\circ}\text{F}$ ($23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$). If a longer or shorter conditioning period is used, the time shall be reported.

7.2 *Sulfur Materials*—Before testing, condition the specimens at $73\text{ }^{\circ}\text{F} \pm 4\text{ }^{\circ}\text{F}$. The time between casting the specimen and testing the specimen shall be at least 24 h.

8. Procedure

8.1 *Measurement of Specimens*—Measure the depth and the width at the waist of each test specimen to the nearest ± 0.02 in. (0.5 mm).

8.2 Test the specimens on the seventh day after preparation. If desired, the conditioning time may be lengthened or shortened to establish the age-strength relationship. Report the age of the specimens.

8.2.1 Sulfur materials may be tested 24 h after preparation.

8.3 Center the specimens carefully in the clips of the testing machine. Pull the specimens at a speed of 0.20 in./min to 0.25 in./min (5 mm/min to 6.4 mm/min) of crosshead movement.

9. Calculations

9.1 *Tensile Strength*—The tensile strength is equal to the stress calculated at maximum load. It is calculated as follows:

$$S = P/bd \quad (1)$$

where:

S = stress in the specimen at the waist, psi (MPa),
 P = load at the moment of crack or break, lbf (N),
 b = width at the waist of the briquet tested, in. (mm), and
 d = depth of briquet tested, in. (mm).

10. Report

10.1 The report shall include the following:

- 10.1.1 Manufacturer, product trade name, and generic type,
- 10.1.2 Mixing ratio, if applicable,
- 10.1.3 Conditioning procedure,
- 10.1.4 Test conditions (temperature and humidity),
- 10.1.5 Total duration of conditioning in days, and
- 10.1.6 Individual and averaged results of tensile strength.

11. Precision and Bias⁴

11.1 The precision of this test method is based on an interlaboratory study of ASTM C307, Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacing, conducted in 2017. Six facilities participated in this study. Each participant was instructed to report three replicate test results. Every “test result” reported represents the average of six individual determinations. Except for the inclusion of just a single material type, Practice E691 was followed for the design and analysis of the data; the details are given in ASTM Research Report RR:D01-1185.

⁴ Supporting data have been filed at ASTM International Headquarters and may be obtained by requesting Research Report RR:D01-1185. Contact ASTM Customer Service at service@astm.org.