Designation: ~~C307 – 18~~ C307 – 23

Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacings[1]

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 reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

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
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.

[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.

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 ¼ in.

5. Apparatus

5.1 *Weighing Equipment,* shall be capable of weighing materials or specimens to ±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. ± ~~0.02in. (25mm ± 0.5mm).~~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.

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 and 290°F (127 and 143°C).~~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.

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:*

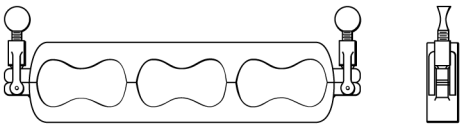


FIG. 1 Briquet Gang Mold

[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.

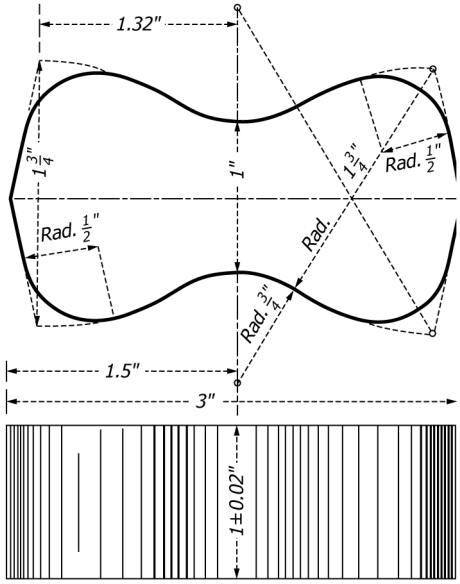


FIG. 2 Briquet Specimens for Tensile Strength Test

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 ± 4°F (23 ± 2°C).~~73 °F ± 4 °F (23 °C ± 2 °C). Record the actual temperature.

6.2.2 *Sulfur Mortars*—The material shall be maintained at ~~275 ± 15°F (135 ± 8°C).~~275 °F ± 15 °F (135 °C ± 8 °C). The temperature of the molds and the ambient temperature of the mixing area shall be ~~73 ± 4°F (23 ± 2°C).~~73 °F ± 4 °F (23 °C ± 2 °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.

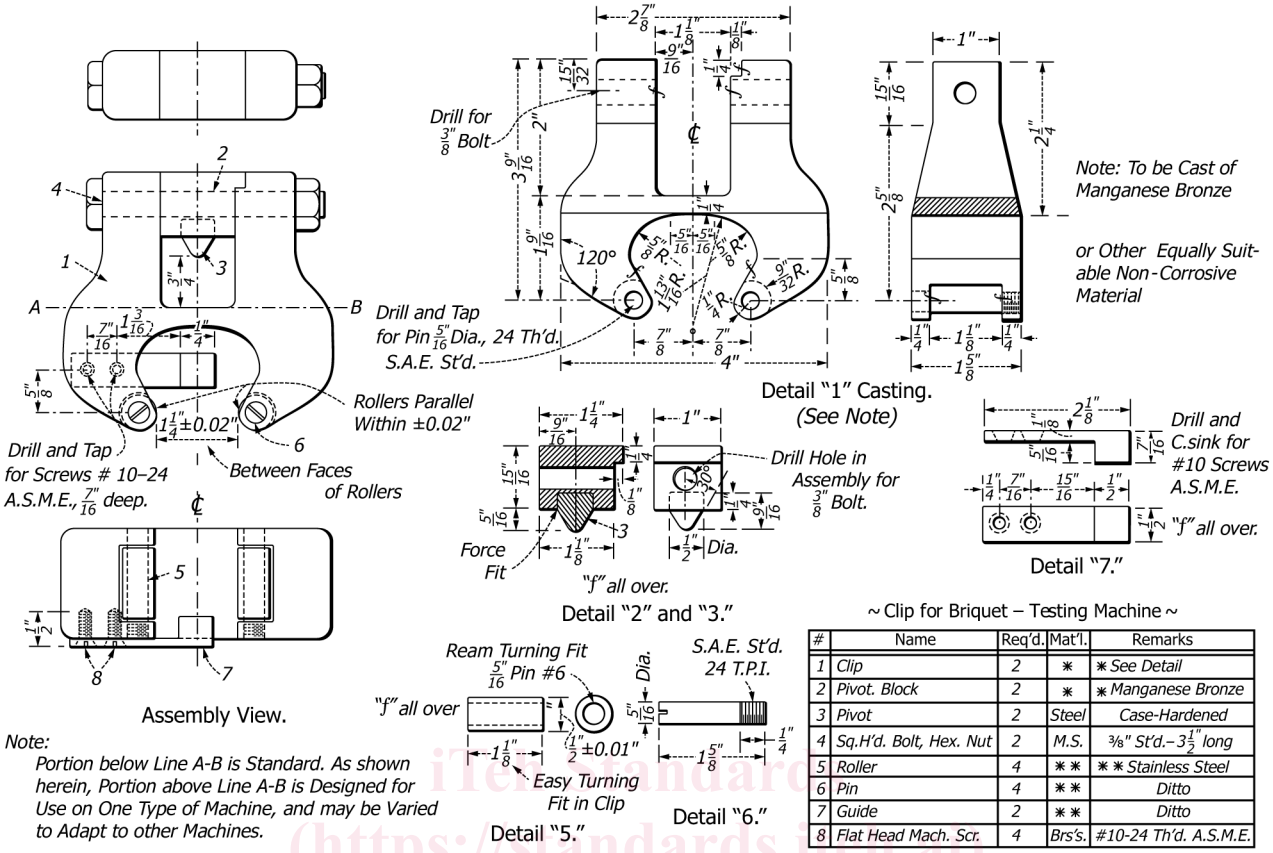
6.3.3 *Silicate Materials*—Some silicates may require covering during the curing period. After removal from the molds, acid-treat the specimens, if required, in accordance with the recommendations given by the manufacturer. No other treatment shall be permitted. Record the method of treatment in the 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 ± 15°F~~275 °F ± 15 °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.



Note:
Portion below Line A-B is Standard. As shown herein, Portion above Line A-B is Designed for Use on One Type of Machine, and may be Varied to Adapt to other Machines.

~ Clip for Briquet – Testing Machine ~

#	Name	Req'd.	Mat'l.	Remarks
1	Clip	2	*	* See Detail
2	Pivot. Block	2	*	* Manganese Bronze
3	Pivot	2	Steel	Case-Hardened
4	Sq.H'd. Bolt, Hex. Nut	2	M.S.	3/8" St'd.–3 1/2" long
5	Roller	4	* *	* * Stainless Steel
6	Pin	4	* *	Ditto
7	Guide	2	* *	Ditto
8	Flat Head Mach. Scr.	4	Brs's.	#10-24 Th'd. A.S.M.E.

1 in. = 25.4 mm

FIG. 3 Clips for Briquet Towing Machines

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 ± 4°F (23 ± 2°C).~~73 °F ± 4 °F (23 °C ± 2 °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 ± 4°F.~~73 °F ± 4 °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~~0.20 in./min to 0.25 in./min (~~5~~(5 mm/min to 6.4 mm/min) of crosshead ~~movement (speed of movement when the machine is running without a load).~~movement.

9. Calculations

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