



Technical Bulletin 143

Testing for Compressive Strength ASTM C109 (Cubes) & ASTM C39 (Cylinders)

Five Star® Cementitious Repair Mortars should be tested for compressive strength using 2" x 2" cube specimens made in brass or steel cube molds per ASTM C109 (when testing neat material and material extended with aggregate up to 50%). 3" x 6" or 4" x 8" cylinders should be used (according to ASTM C39) for mixes extended with greater than 50% aggregate.

- Curing at temperatures below 70°F (21°C) will result in lower compressive strengths being reported.
- 3/8" pea gravel is the largest aggregate size acceptable for 2" cube molds.

ASTM C109 – COMPRESSIVE TESTING 2" CUBES

A. Equipment Required for Testing 2" cubes, with up to 50% aggregate extension

- 2" x 2" brass or steel cube mold and cover plate (plastic molds or plastic inserts are not acceptable; cover plate not needed for mortars)
- Tamper (per ASTM C109)
- Release agent
- Moist Cabinet - Temperature 70°F - 77°F (21°C - 25°C), Humidity 95% minimum

B. Test Time Tolerances

- 3 hour ± 15 min (from start time) or appropriate break point
- 1 day ± ½ hour (from start time)
- 7 days ± 3 hours (from start time)
- 28 days ± 12 hours (from start time)

C. Testing Procedure ASTM C109

1. Using mold release agent, spray cube mold.
2. Plastic consistency:
 - a. Fill all cube molds halfway with mortar.
 - b. Tamp mortar with tamper 32 times (per ASTM C109).
 - c. Fill remainder of mold with mortar, tamp 32 times (per ASTM C109).
3. Screenshot off excess mortar so the surface of each specimen is flush with the top of the mold.



A. 2" x 2" Brass Cube Mold



C.2.a. Fill cube mold halfway with mortar



C.2.b. Tamp 32 times

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FIVE STAR PRODUCTS, INC.
60 Parrott Drive
Shelton, CT 06484 USA
Phone: +1 203-336-7900

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Testing for Compressive Strength ASTM C109 (Cubes) & ASTM C39 (Cylinders)

C. Testing Procedure ASTM C109 cont'd

4. Clean off any excess material on the top of the mold.
5. Immediately upon completion of molding: Place laboratory specimens in the moist room and cure in accordance with the applicable portions of Test Method C109/C109M. On a job site, place molds in a lidded cooler, with wet towels for curing. Move to lab at an appropriate time and place in humidity cabinet, if available.
6. Identify cubes with product name, batch code, start time, age, test date, and water content.
7. Leave mold undisturbed for 3 hours.
8. De-mold cubes after 3 hours or appropriate break point and break one cube. Place remaining cubes in a moisture cabinet in a laboratory. One mold only makes 3 cubes. If breaking early age (e.g. 3 hours), this only leaves 2 cubes for other ages. Other cubes may be tested at 1, 7, or 28 days or as appropriate per test requirement.
9. When testing cubes, do not apply the load to the original top or bottom cube surfaces (rotate cubes 90 degrees before loading in compression tester).
10. Record the compressive strength in pounds per square inch by dividing the load by cross-sectional area.

ASTM C39 - COMPRESSIVE TESTING CYLINDERS

A. Equipment Required for Testing, >50% aggregate extension

- 3"x 6" or 4"x 8" plastic cylinders, moisture caps or wet towels
- Sulfur capping compound or pad caps
- 3/8" rod (per ASTM C31)
- Rubber mallet (per ASTM C31)
- Moist Cabinet - Temperature 70° F - 77° F (21° C - 25° C), Humidity 95% minimum

B. Test Time Tolerances

- 3 hour ± 15 min (from start time) or appropriate break point
- 1 day ± ½ hour (from start time)
- 7 days ± 3 hours (from start time)
- 28 days ± 12 hours (from start time)



Testing for Compressive Strength ASTM C109 (Cubes) & ASTM C39 (Cylinders)

C. Testing Procedure ASTM C39

1. Plastic consistency:
 - a. Fill all cylinders halfway with mortar.
 - b. Rod mortar in cylinder 25 times with 3/8" rounded tamping rod.
 - c. Tap sides of cylinder 10-15x with rubber mallet to release air.
 - d. Fill cylinder with mortar.
 - e. Rod 25 times.
 - f. Tap sides of cylinder 10-15x to release air.
2. Screed off excess mortar so the surface of each specimen is flush with the top of the cylinder.
3. Place plastic cap or wet towels on the cylinder to prevent moisture loss.
4. Immediately upon completion of sample: Place laboratory specimens in moist room and cure in accordance with the applicable portion of Test Method C109/C109M. On a job site, place cylinders in cooler with top, with wet towels. Move to lab at an appropriate time and place in humidity cabinet, if available. Expansive grouts require restraint; repair mortars do not.
5. Identify cylinders with product name, batch code, start time, age, test date, and water content.
6. Leave cylinders undisturbed until appropriate break point, or 24 hrs.
7. De-mold cylinders at appropriate break point and break one sample. Place remaining samples in a moisture cabinet in a laboratory. The other samples are tested at 1, 7, or 28 days.
 - Record the compressive strength in pounds per square inch by dividing the load by the cross-sectional area.

Note: Cylinder break results may not match published data sheet properties. A reduction in strength due to differing test method and sample shape should be expected.



C.1.a. Fill cylinder halfway with mortar



C.1.b. Rod mortar 25 times per lift



C.1.f. Tap cylinder 10-15x to release air

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