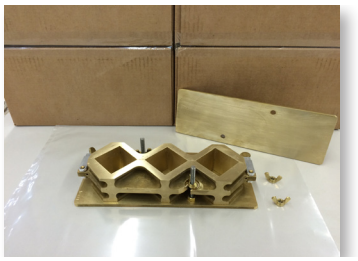
EUCLID CHEMICAL

COMPRESSIVE STRENGTH TESTING

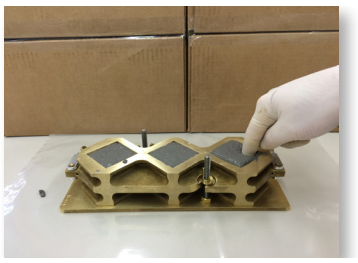
THE CUBE CONFUSION

Compressive strength testing using 2" x 2" (50mm x 50mm) cubes is specified on many structural grouting projects, high strength topping projects, structural vertical/overhead repair projects and DOT projects in the industry today. Cube testing is also the most popular way of advertising compressive strength on technical data sheets. Choosing the appropriate test method is critical. Since an accepted industry certification program for cube testing does not exist, owners, manufacturers and contractors spend a considerable amount of time throughout the year "dealing" with undesirable or inaccurate compressive strength testing results when cubes are tested following incorrect testing procedures.

ASTM C 1107

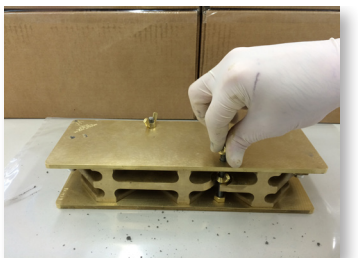


Finger consolidation



Cleaning top of mold

Cover plate installed



Proper curing

ASTM C 1107/C 1107M
Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)

ASTM C 1107 is not a compressive strength testing method!
ASTM C 1107 does not address epoxy grouts!

ASTM C 1107 is a specification for nonshrink cement-based grouts. Under the compressive strength section ASTM C 1107 requires the following modifications to ASTM C 109:

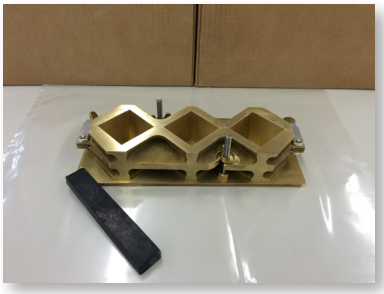
• For fluid or flowable grouts: fill each mold half way with grout and consolidate/puddle with a gloved finger five times. Fill the mold and consolidate/puddle with a gloved finger five more times. The use of a rubber tamper is not allowed.

• It is required (not optional) to use a flat, ridged, nonreactive cover plate that is at least 6 mm (1/4") thick. This cover plate must be clamped to the cube mold using two C-clamps. Other methods include using longer studs on the cube mold and restraining the cover plate with wing nuts or placing a weight on the cover plate that is at least 7 kg (15lb).

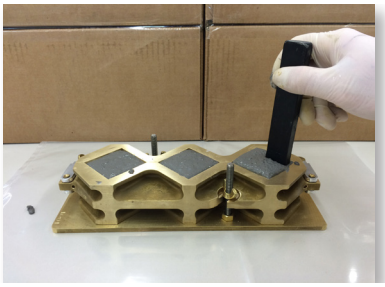
• The cover plate is not to be removed until 72 +/- 1 hour after molding. The only exception is to test compressive strength at 24 hours. The molded specimens must be cured in a moist cabinet or moist room for 72 hours with the restraining lid securely clamped to the mold. The use of a large zip lock bag containing the entire cube mold and a moist rag has been proven to be an acceptable way of curing cube molds in the field.

• An average of three cubes (from the same mixture) must be tested for each age. Cubes from multiple mixes throughout the day are not allowed to be combined and averaged for compressive strength determination at each age.

ASTM C 109



Tamper consolidation

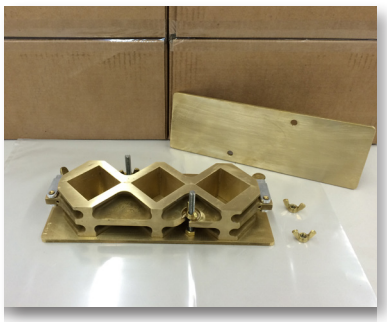


Proper curing

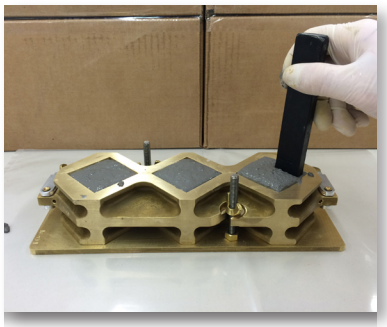
ASTM C 109/C109M Standard Test Method for Compressive Strength Testing of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)

ASTM C 109 is the most common test method when specifying or reporting compressive strength of mortar or grout cubes. This test method was originally written and still only applies to testing cement. The method only covers standard Portland cement mortars that contain 1 part cement and 2.75 parts sand. Over time, our industry has modified the ASTM C 109 to ASTM C 109M. (M means modified) These modifications are needed to test mortars with all types of blended cements and all types of aggregate. The ASTM C 109 or ASTM C109M testing methods should **NEVER** be used to evaluate nonshrink (expansive) structural grouts without applying the modifications stated in ASTM C 1107. ASTM C 109 states that "The molds shall be made of hard metal" and "the Rockwell hardness number of the metal shall not be less than 55 HRB". Plastic molds or plastic mold inserts are **NOT** permitted in the method and should **NEVER** be used! This test method should also **NEVER** be used to measure compressive strength of epoxy grouts.

ASTM C 579 Method B



Tamper consolidation



ASTM C 579 Method B Standard Test Method for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes

ASTM C 579 Method B is the most common test method when specifying or reporting compressive strength of epoxy grout cubes. The testing method, under method B, is very similar to ASTM C 109. The critical difference is the rate of loading when the cube is compressed. Structural epoxy grouts should be loaded according to the "Load Rate II" spelled out in ASTM C 579. When tested under Load Rate II, the rate of load applied to the cube is controlled by *movement* over time. ASTM C 109 requires that the load applied to the cube is controlled by *stress* over time. The loading rates in ASTM C109 and ASTM C 579 are different and may produce considerably different compressive strength results. ASTM C 579 does not address the testing of nonshrink (expansive) structural epoxy grouts. The use of a ridged cover plate as stated in ASTM C 1107 is required when testing the compressive strength of nonshrink materials.

5.2016