

WSDOT Test Method T 813

Field Method of Fabrication of 2 in (50 mm) Cube Specimens for Compressive Strength Testing of Grouts and Mortars

1. Scope

This method covers the fabrication of 2 in (50 mm) cube specimens for compressive strength testing of grouts and mortars.

2. Equipment

- a. **Specimen Molds** – Specimen molds for the 2 in (50 mm) cube specimens shall be tight fitting. The molds shall not have more than three cube compartments and shall not be separable into more than two parts. The parts of the molds, when assembled, shall be positively held together. The molds shall be made of hard metal not attacked by the cement mortar. For new molds, the Rockwell hardness number shall not be less than HRB 55. The sides of the molds shall be sufficiently rigid to prevent spreading or warping. The interior faces of the molds shall conform to the tolerances of Table 1.

Table 1 Permissible Variations of Specimen Molds

Parameter	2 in Cube Molds		50 mm Cube Molds	
	New	In Use	New	In Use
Planeness of Sides	<0.001 in	<0.002 in	<0.025 mm	<0.05 mm
Distance Between Opposite Sides	2 in ± 0.005 in	2 in ± 0.02 in	50 mm + 0.13 mm	50 mm + 0.50 mm
Height of Each Compartment	2 in + 0.001 in to -0.005 in	2 in + 0.01 in to -0.015 in	50 mm + 0.25 mm to -0.013 mm	50 mm + 0.25 mm to -0.38 mm
Angle Between Adjacent Faces*	90 + 0.5°	90 + 0.5°	90 + 0.5°	90 + 0.5°

*Measured at points slightly removed from the intersection. Measured separately for each compartment between all the interior faces and the adjacent face and between interior faces and top and bottom planes of the mold.

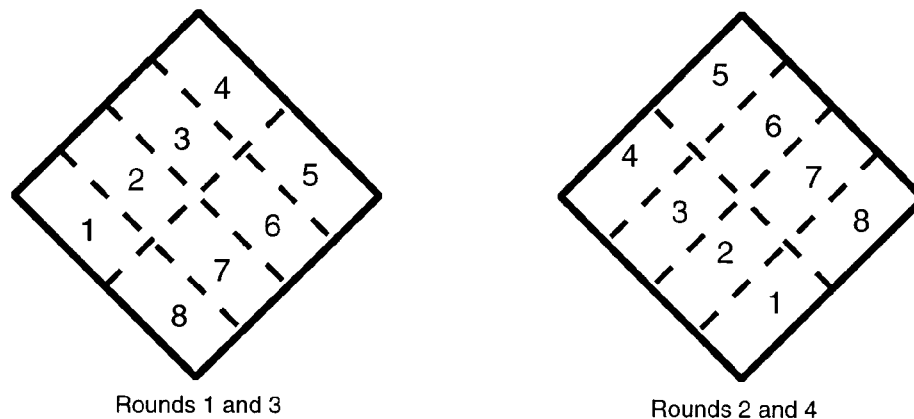
- b. **Base Plates** – Base plates shall be made of a hard metal not attacked by cement mortar. The working surface shall be plane and shall be positively attached to the mold with screws into the side walls of the mold.
- c. **Cover Plates** – Cover plates shall be made of a hard metal or glass not attacked by cement mortar. The surface shall be relatively plane.

- d. **Tamper** – The tamper shall be made of a nonabsorptive, nonabrasive, nonbrittle material such as a rubber compound having a Shore A durometer hardness of 80 + 10, or seasoned oak wood rendered nonabsorptive by immersion for 15 minutes in paraffin at approximately 392°F (200°C), and shall have a cross-section of ½ in × 1 in (13 mm × 25 mm) and a length of about 5 to 6 in (125 to 150 mm). The tamping face shall be flat and at right angles to the length of the tamper.
- e. **Trowel** – A trowel which has a steel blade 4 to 6 in (100 to 150 mm) in length, with straightedges.

3. Field Procedure

- a. Three or more specimens shall be made for each period of test specified.
- b. All joints shall be water tight. If not water tight, seal the surfaces where the halves of the mold join by applying a coating of light cup grease. The amount should be sufficient to extrude slightly when the halves are tightened together. Repeat this process for attaching the mold to the base plate. Remove any excess grease.
- c. Apply a thin coating of release agent to the interior faces of the mold and base plate. (WD-40 has been found to work well as a release agent.) Wipe the mold faces and base plate as necessary to remove any excess release agent and to achieve a thin, even coating on the interior surfaces. Adequate coating is that which is just sufficient to allow a distinct fingerprint to remain following light finger pressure.
- d. Begin molding the specimens within an elapsed time of not more than 2½ minutes from completion of the mixing.
- e. For plastic mixes, place a first layer of mortar about 1 in (25 mm) deep in all the cube compartments (about one-half the depth of the mold). Tamp the mortar in each cube compartment 32 times in about 10 seconds making four rounds, each round perpendicular to the other and consisting of eight adjoining strokes over the surface of the specimen, as illustrated in Figure 1, below. The tamping pressure should be just sufficient to ensure uniform filling of the molds. The four rounds of tamping (32 strokes) shall be completed in one cube before going on to the next. When the tamping of the first layer is completed, slightly over fill the compartments with the remaining mortar and then tamp as specified for the first layer. During tamping of the second layer, bring in the mortar forced out onto the tops of the molds after each round of tamping, by means of gloved fingers and the tamper, before starting the next round of tamping. On completion of tamping, the tops of all the cubes should extend slightly above the tops of the molds.

Figure 1



- f. Bring in the mortar that has been forced out onto the tops of the molds with a trowel and smooth off the cubes by drawing the flat side of the trowel (with the leading edge slightly raised) once across the top of each cube at right angles to the length of the mold. Then, for the purpose of leveling the mortar and making the mortar that protrudes above the top of the mold of more uniform thickness, draw the flat trailing edge of the trowel (with leading edge slightly raised) once lightly along the length of the mold. Cut off the mortar to a plane surface flush with the top of the mold by drawing the straight edge of the trowel (held nearly perpendicular to the mold) with a sawing motion over the length of the mold.
- g. When fabricating fluid mixes, steps e. and f. need not be followed. Instead, the cube mold is filled with mortar and cut off to a plane surface with a sawing motion over the length of the mold.
- h. Immediately after molding, place cover plate on top of the mold, cover the sample with wet burlap, towels, or rags, seal it in a plastic sack in a level location out of direct sunlight, avoid freezing of cubes and record the time. Allow the sample to set undisturbed, away from vibration, for a minimum of four hours or as recommended by manufactures instructions before moving.
- i. Deliver the sample to the Regional or State Materials Laboratory **in the mold** with the cover plate in wet burlap, towels or rags sealed in a plastic bag within 24 hours. **Time of molding MUST be recorded on the Concrete Transmittal.** If delivery within 24 hours is unachievable, contact the Laboratory for instructions on caring for the cubes.
- j. Once received in the lab, the molded sample is to be immediately placed in a moist curing room, with the upper surfaces exposed to the moist air but protected from dripping until the sample is a minimum of 20 hours old or has cured sufficiently that removal from the mold will not damage the cube. If the specimens are removed from the mold before they are 24 hours old they are to be kept on the shelves of the moist curing room until they are 24 to 36 hours old.
- k. When the specimens are 24 to 36 hours old, immerse them in a lime-saturated water storage tank (Note 1). The specimens are to remain in the storage tank until time of test. (Curing test specimens of material other than hydraulic cement shall be in conformance with the manufacturer's recommendations.)

Note 1: The storage tank shall be made of noncorroding materials. The water shall be saturated with calcium hydroxide such that excess is present. Stir the lime-saturated water once a month and clean the bath as required by AASHTO M 201.

Performance Exam Checklist

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Participant Name: _____ Exam Date: _____

Record the symbols "P" for passing or "F" for failing on each step of the checklist.

Procedure Element	Trial 1	Trial 2
1. The tester has a copy of the current procedure on hand?	_____	_____
2. All equipment is functioning according to the test procedure, and if required, has the current calibration/verification tags present?	_____	_____
3. Three cubes made for each time period of test?	_____	_____
4. All joints (mold halves, mold to base plate) shall be water tight?	_____	_____
5. Adequate coating of release agent applied to interior surfaces of the mold?	_____	_____
6. Molding began within 2½ minutes from completion of mixing?	_____	_____
7. Molding performed in two lifts? (Not necessary if mix is fluid.)	_____	_____
8. Lifts tamped 32 times, made up of 4 rounds of 8, each perpendicular to the other? (Not required if mix is fluid.)	_____	_____
9. For second layer, mortar forced out of the mold brought back in before each round? (Not required if mix is fluid.)	_____	_____
10. Mix extends slightly above the mold at the completion of tamping?	_____	_____
11. Mortar smoothed by drawing flat side of trowel across each cube at right angles?	_____	_____
12. Mortar leveled by drawing the flat side of trowel lightly along the length of mold?	_____	_____
13. Mortar cut off flush with mold with edge of trowel using sawing motion?	_____	_____
14. Time of molding recorded?	_____	_____
15. Cover plate placed on top of the mold and covered with wet burlap, towel or rag?	_____	_____
16. Covered sample sealed in a plastic sack in a level location out of sunlight?	_____	_____
17. Sample delivered to the laboratory in the mold within 24 hours?	_____	_____
18. Transmittal includes the time of molding?	_____	_____

Comments: First Attempt: Pass _____ Fail _____ Second Attempt: Pass _____ Fail _____

Examiner Signature: _____ WAQTC #: _____

