Designation: C943 – 10

Standard Practice for Making Test Cylinders and Prisms for Determining Strength and Density of Preplaced-Aggregate Concrete in the Laboratory[1]

This standard is issued under the fixed designation C943; 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.

1. Scope*

1.1 This practice covers procedures for making standard test cylinders used to determine the compressive strength and density of preplaced-aggregate (PA) concrete.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

C125 Terminology Relating to Concrete and Concrete Aggregates

C192/C192M Practice for Making and Curing Concrete Test Specimens in the Laboratory

C219 Terminology Relating to Hydraulic Cement

C637 Specification for Aggregates for Radiation-Shielding Concrete

C937 Specification for Grout Fluidifier for Preplaced-Aggregate Concrete

C938 Practice for Proportioning Grout Mixtures for Preplaced-Aggregate Concrete

C939 Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method)

C940 Test Method for Expansion and Bleeding of Freshly Mixed Grouts for Preplaced-Aggregate Concrete in the Laboratory

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in this test method, refer to Terminologies C125 and C219.

4. Summary of Practice

4.1 Coarse aggregate is placed in a standard cylinder mold having end plates to which pipe fittings have been attached. Grout is pumped into the mold until full. The test cylinder, demolded after hardening, may be cured and used for determination of strength or cut into prisms for the determination of unit weight.

5. Significance and Use

5.1 This practice is used for making test cylinders or prisms of PA concrete. Cylinders are used for determining compressive strength and approximate density. Prisms, cut from cylinders, eliminate the surface effect and thus more accurately represent the actual density of PA concrete in place.

6. Apparatus

6.1 *Cylinder Molds* (Fig. 1), cast iron or steel, for making 150 by 300-mm (6 by 12-in.) cylinders. Base and top plates shall be arranged for tight assembly to the cylinder. All mating and inside surfaces shall be machined smooth such that the assembled mold will be essentially watertight. End plates shall be drilled and tapped at their centers for standard 19 mm (¾-in.) pipe nipples. The top end plate shall also be perforated, as shown in Fig. 2.

6.2 *Venting Fabric,* white cotton cloth, free of oil and grease.

6.3 *Grouting Apparatus* (Fig. 3), capable of delivering grout at a uniform rate of 1.4 to 2.8 L (0.05 to 0.10 ft^3)/min at pressures up to 345 kPa (50 psi).

6.4 *Mallet,* with rubber or rawhide head weighing approximately ¼ kg (½ lb).

6.5 *Platform Scales,* accurate to within 0.3 % of the test load at any point within the range of use.

6.6 *Stop Watch,* least reading not more than 0.2 s.

[1] This practice is under the jurisdiction of ASTM Committee C09 on Concrete and Concrete Aggregates and is the direct responsibility of Subcommittee C09.41 on Hydraulic Cement Grouts.

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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.

***A Summary of Changes section appears at the end of this standard**

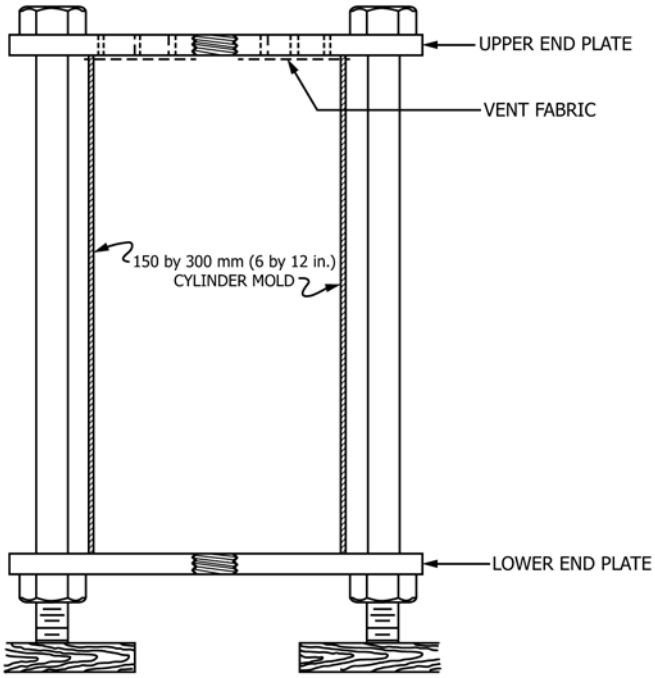


FIG. 1 Cylinder Mold Assembly Cross Section

6.7 *Flow Cone*—See Test Method C939.

6.8 *Thermometer,* accurate to 0.5°C (1°F), for measuring ambient and grout temperatures.

7. Materials

7.1 *Coarse Aggregate*—Except when tests are made for specific projects, coarse aggregate shall conform to the requirements of Specification C637, Table number 2, Coarse Aggregate, Grading 1, unless Grading 2 is specified.

7.2 *Grout*—Except when tests are made for specific projects, grout ingredients, proportioning, and mixing shall be in accordance with Practice C938.

7.3 *Tests for Specific Projects*—When tests are to be made for specific projects, materials shall be representative of those in use or proposed for use in the work.

7.3.1 If not taken from project-mixed grout being used in the work, grout materials shall be mixed in the laboratory using the procedure described in Specification C937.

8. Sampling

8.1 Coarse aggregate shall be representative of material used or to be used in the work or of that tested and stockpiled for test work.

8.2 Grout to be used in making PA concrete cylinders shall be typical of the batch from which it is drawn.

9. Preparation and Measurement of Prisms

9.1 When the determination of unit weight is required, prisms shall be cut from the central portions of the cylinders to dimensions as close as feasible to 101 by 101 by 254 mm (4 by 4 by 10 in.). Weigh the specimen to an accuracy of at least 1 part in 250. Compute the volume from the averages of two measurements of each dimension, taken to the nearest 0.25 mm (0.01 in.).

10. Procedure

10.1 *Temperature:*

10.1.1 When test cylinders are prepared in the laboratory, bring all materials to and maintain the laboratory in a temperature range of 23.0 ± 2.0°C (73.5 ± 3.5°F).

10.1.2 When test cylinders are prepared in the field, record ambient temperature in the vicinity of test operation.

10.2 Place each cylinder mold upright on its bottom plate on a firm, level surface.

10.3 Place the coarse aggregate in the mold in three approximately equal layers. Consolidate each layer by striking the mold ten times around its periphery with the mallet. When the mold has been filled, strike off the contents so that no aggregate particle projects above the plane of the top of the mold.

10.4 Place a single layer of venting fabric, in which a hole has been cut to match the 19-mm (¾-in.) hole in the top end plate, over the aggregate. Place the top plate on the mold, install bolts, and tighten. Attach the top and bottom valve assemblies and prepare to connect to hose from grout pump, as shown in Fig. 3.

10.5 Measure flow (Test Method C939) and temperature of the representative sample of grout. Pour 800 ± 10 mL into a 1000-mL graduate for observation of expansion and bleeding, Test Method C940.

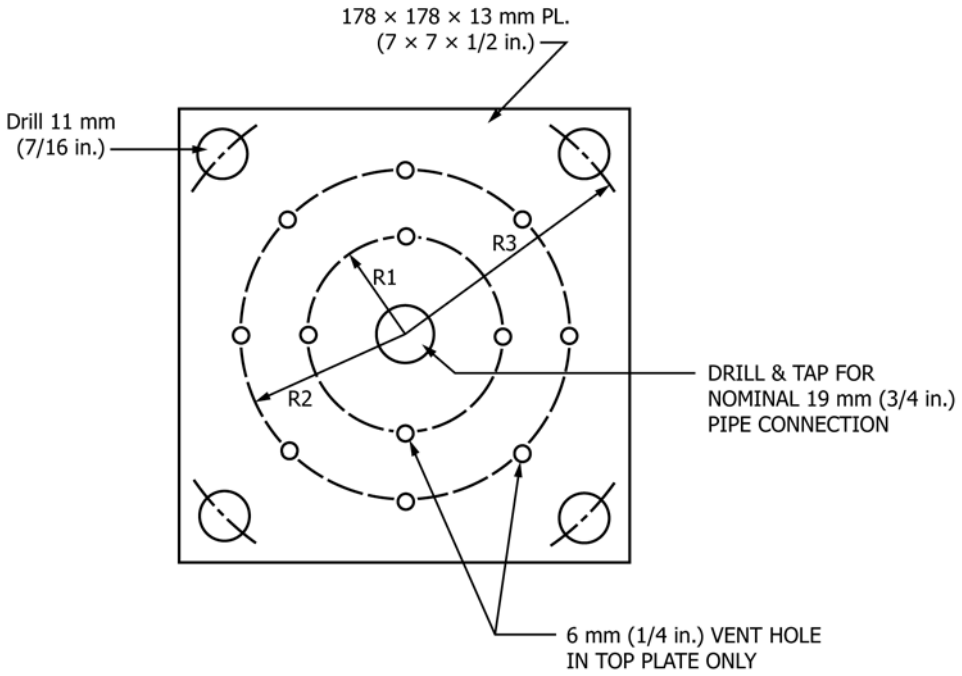
10.6 If grout consistency is satisfactory, charge grout hopper and pump to waste until all water and diluted grout in the pump system has been expelled. Divert the grout flow to recirculation (to hopper) and make the connection to the bottom of the cylinder mold at valve *3*, shown in Fig. 3.

10.7 With valves *2*, *3*, and *4* open, fill the cylinder slowly by partially closing bypass valve *1*. When grout flows freely through upper plug valve *4*, open bypass and close valves *2* and *4*. Apply 70 to 100 kPa (10 to 15 psi) air pressure on the sample for 30 ± 5 s through air valve *5*; then close valve *3*. Move the grout supply line to succeeding cylinders in turn and repeat the above procedure for each.

10.7.1 The total elapsed time for intruding and pressurizing a cylinder mold shall be between 1½ and 3 min.

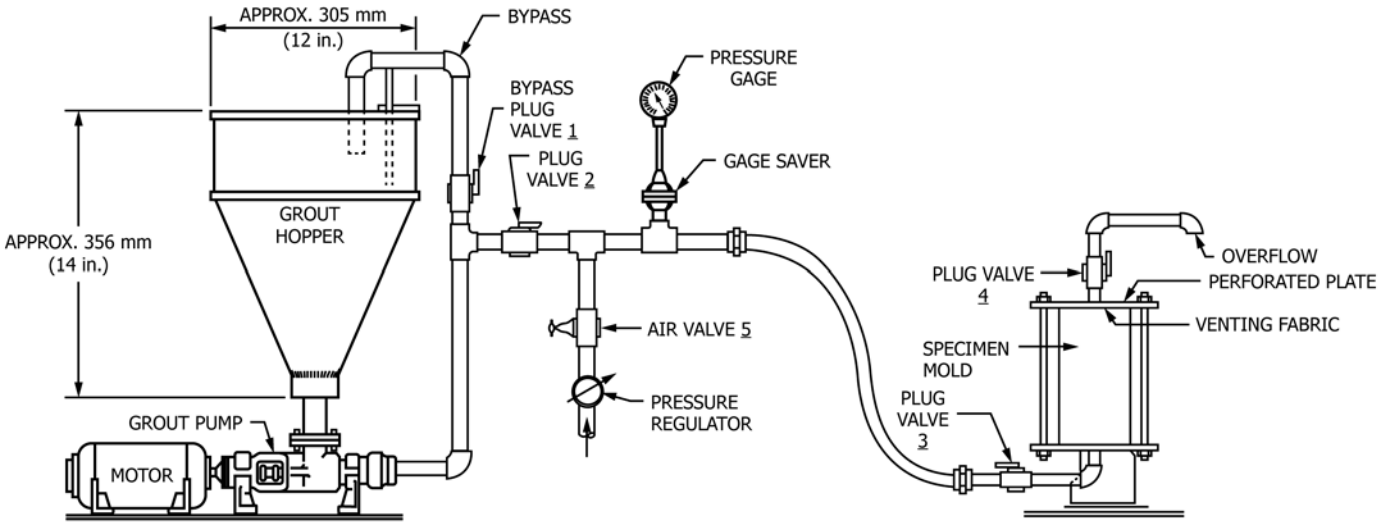
10.7.2 Grout, if continually agitated, may be used for intruding PA cylinders for as long as 30 min after original mixing provided no additional water is added and fluidity remains under 35 s, flow cone, Test Method C939.

10.8 After grout expansion is complete, as determined by observation of the specimen set aside for the purpose, 10.5, remove the upper valve assembly and install a pipe plug in the center hole of the upper plate. Using care to avoid jarring the specimen, invert the cylinder, remove valve *3* assembly, and install a pipe plug in the center hole of the lower plate. Carefully turn the assembly back to its original position. Clean valves and fittings immediately upon removal from end plates.



R1 = 38 mm (1 1/2 in.)
R2 = 64 mm (2 1/2 in.)
R3 = 101 mm (4 in.)

FIG. 2 End Plate Details



NOTE 1—Grout hose pipe and fittings 25 mm (1 in.) nominal.

FIG. 3 Typical Grouting Apparatus

11. Handling and Curing

11.1 Do not disturb the specimen after removal of valve assemblies for at least 24 h. Then strip molds and cure cylinders in accordance with the section on Curing of Practice C192/C192M.

11.2 Protect field-made specimens during initial storage period in the molds from direct sunlight or freezing temperatures. When large amounts of pozzolan are used in the grout mixture or in cool curing conditions, delay stripping of cylinders to avoid damaging the specimens.

12. Report

12.1 Report the following information:

12.1.1 Identification of specimens, date cast, and whether done in laboratory or field.

12.1.2 Description of fine and coarse aggregate.

12.1.3 Identification of cementing materials and admixtures.

12.1.4 Description of grout including proportions, flow, temperature, expansion, and bleeding.

12.1.5 Temperatures at which the specimens were made and cured.

13. Keywords

13.1 cylinders; density; flow cone; grout; grouting apparatus; preplaced-aggregate; prisms; strength

SUMMARY OF CHANGES

Committee C09 has identified the location of selected changes to this practice since the last issue, C943 – 02, that may impact the use of this practice. (Approved June 15, 2010.)

(*1*) Added new Section 3 Terminology to reference appropriate terminology documents under C01 and C09 and renumbered subsequent sections.