

Casting Concrete Test Cylinders

CSA A23.2-3C

The material properties of concrete can only be properly evaluated if test specimens are made and cured according to CSA standards. Concrete compression cylinders are typically made to evaluate the compressive strength of the concrete. If curing conditions, methods of sampling and methods of casting are allowed to vary, the resulting material evaluations are worthless because one can seldom determine whether a low strength is due to poor quality concrete or poor testing practices. For reliable test results, the following CSA test procedures must be followed:

1. USE ONLY NON-ABSORPTIVE MOULDS

Metal, plastic, 100 x 200 mm or 150 x 300 mm cylinder moulds are used for casting concrete test specimens in the field. Before filling, they should be placed on a smooth, firm, level surface. A single strength test is defined as the average strength of 2 standard test specimens.

2. SAMPLING

Obtain a representative grab sample from between the 10% and 90% points of discharge. The minimum sample size shall be 20 L for 100 x 200 mm cylinders and 30 L for 150 x 300 mm cylinders.

3. CONCRETE AT DIFFERENT SLUMP LEVELS REQUIRE DIFFERENT METHODS OF CONSOLIDATION

The methods of consolidation are rodding and external or internal vibration. Rod concretes with a slump > 40 mm. Vibrate concretes with a slump ≤ 40 mm.



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A. RODDING CONCRETE

100 mm diameter – moulds should be filled in 3 equal layers and each layer rodded uniformly 20 times with a 10 mm diameter x 450 - 600 mm long hemispherically tipped steel rod.

150 mm diameter – moulds should be filled in 3 equal layers and each layer rodded uniformly 25 times with a 16 mm diameter x 450 - 600 mm long hemispherically tipped steel rod.

The strokes shall be distributed uniformly over the cross-section of the mould. The bottom layer shall be rodded throughout its depth. For each upper layer, the rod shall penetrate about 25 mm into the underlying layer. If voids are left by the rod, the sides of the mould should be tapped to close voids before adding the next layer of material.



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B. VIBRATING CONCRETE

- Fill moulds in 2 equal layers and vibrate each layer until the concrete becomes smooth and there is no further egress of entrapped air bubbles.
- Care shall be taken that the vibrator is withdrawn in such a manner that no air pockets are left in the specimen.
- The procedure of external and internal vibration is clearly set out in CSA A23.2 - 3C Clause 4.4.



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5. CURE AND HANDLE CYLINDERS WITH CARE

After setting for a minimum 20 hours, cylinders should be moved to a laboratory for standard curing, taking care to ensure that a temperature of $20 \pm 5^\circ\text{C}$ is maintained at all times and during transportation to the laboratory. Careful handling is necessary since cylinders which are allowed to rattle around in a box, or the back of a car, or pickup, can suffer considerable damage. Use sawdust or similar materials for cushioning.



Photo courtesy of CAC

4. LET CYLINDERS CURE MINIMUM 20 HOURS IN $20 \pm 5^\circ\text{C}$ TEMPERATURES

Cylinders should be placed on a rigid horizontal surface free from vibration and left undisturbed until they have hardened enough to withstand handling – minimum 20 hours after casting. Test cylinders should be placed in a controlled environment, such as a curing box, during this period. Tops should be covered with a nonabsorptive, non-reactive plate or placed in an impervious plastic bag to prevent loss of moisture. **The temperature should be $20 \pm 5^\circ\text{C}$ WHERE CYLINDERS ARE STORED and records of the maximum and minimum temperatures kept.**

6. DEMOULDING TIME OF TEST SPECIMENS

Test specimens to be used as the basis of acceptance of the concrete shall be removed from the moulds at the end of 28 ± 8 hours and stored in a moist condition at a temperature of $23 \pm 2^\circ\text{C}$ until the time of testing. Demoulding time may be extended to a maximum of 76 h for cylinders representing a specified compressive strength of < 35 MPa.

References:

- 1 CSA A23.2-04 Methods of Test and Standard Practices for Concrete.

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