TECHNICAL SPECIFICATIONS

Making and Curing Concrete Compression Test Specimens

CONCRETE ONTARIO
Ready Mixed Concrete Association of Ontario

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 procedure must be followed.

Apparatus

1. Use cylindrical moulds, meeting the requirements of CSA A23.2-1D, having nonabsorbent surfaces which are sufficiently rigid to hold their shape during the moulding of the test specimens. Reusable moulds are acceptable as long as they are cleaned and lightly coated with mineral oil or other suitable non-reactive form release materials before use.
2. For 100 mm × 200 mm cylinders - A round straight steel tamping rod 10 mm ± 1 mm in diameter and between 450 mm and 600 mm in length, having at least one end rounded to a hemispherical tip.
3. For cylinders 150 mm in diameter or greater, use a round straight steel tamping rod 16 mm ± 1 mm in diameter and not less than 450 mm nor more than 600 mm in length, having at least one end rounded to a hemispherical tip.

Procedure for testing

1. **Time constraint** – Complete the moulding of strength test specimens within 20 minutes after sampling, including transport and remixing.
2. **Sampling** – Obtain a representative grab sample from between the 10% and 90% points of discharge as per CSA A23.2-1C. The minimum sample size shall be 20L for 100 x 200 mm cylinders and 30L for 150 x 300 mm cylinders.
3. **Place of Moulding** – Use a location which has a level, rigid surface, free of vibration and other disturbances and is as close as possible to the place where the cylinders are to be stored during the first 28 h ± 8 h. When moving the specimens, avoid all jarring, striking, tilting, and deformation of the concrete specimens or scarring of the surface.

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.

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.

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The strokes shall be distributed uniformly over the cross-section of the mould. The bottom layer shall be rodded throughout its depth. For the next two subsequent layers, the rod shall penetrate approximately 25 mm into the underlying layer. Tap the sides of the mould smartly 10 to 15 times if voids are left by the tamping rod to consolidate the concrete and to release any large air bubbles that might have been trapped.

Vibrating Concrete

1. Fill moulds in approximately 2 equal layers and vibrate each layer until the concrete becomes smooth and there is no further egress of entrapped air bubbles.
2. Care shall be taken that the vibrator is withdrawn in such a manner that no air pockets are left in the specimen.
3. The procedure of external and internal vibration is clearly set out in CSA A23.2-3C Clause 9.2.3 and 9.2.4.

Finishing

Strike off and finish the surface using the appropriate rod until it is flat and even with the rim or edge of the mould, ensuring that there are not any depressions larger than 3mm for <35 MPa, 1mm for ≥ 35 MPa.

Protection

Immediately cover the specimens with a non-absorptive, non-reactive cap or sheet, or plastic sheet.

Initial Curing (Field Curing)

Cylinders should be placed on a rigid horizontal surface free from vibration and other disturbances for 28 ± 8 h. Test cylinders should be placed in a controlled environment, such as a curing box, that maintains the temperature between 15-25°C. The records of the maximum and minimum temperature within the curing enclosure shall be reported.

Transportation of Concrete Test Specimens

After curing for a minimum 20 hours, cylinders should be moved to a laboratory for final curing ensuring that a temperature of 20 ± 5°C is maintained during transportation. The test specimens shall be protected during transportation, from any shocks or exposure to adverse conditions.

Final Curing (Laboratory Curing)

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 ± 2°C until the time of testing.

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