

Making & Curing Concrete Test Cylinders

Avoiding the most common mistake in concrete construction...

Of all the field problems encountered during concrete construction, improper making, curing, and handling of concrete test cylinders is the most common, and many times, the most costly. You can avoid this problem by following a few simple rules.

All concrete sampling, testing, and curing needs to be done by an ACI Certified Technician (Grade I Concrete Field Technician).

The technician needs to obtain a representative sample of the concrete in accordance with ASTM C172. They must perform a slump test, an air test, and record the temperature of the concrete and the ambient air. They also must begin to make the test cylinders within 15 minutes of obtaining the concrete sample.

Even if all of the above are done properly, it is during the next step where most of the mistakes are made.

Immediately after they are cast, all cylinders are to be placed where they will receive their initial curing.

This means all cylinders always need to be:

- Kept at 60° - 80° F (6000 PSI or greater should be kept at 68° - 78° F)
- In an environment that prevents moisture loss
- Free from disturbance

The above all are in accordance with the building code requirements in Pennsylvania.

What is the best way to do this?

Immersing cylinders in a tank of water is the best way and the preferred way to do this.

- Have a tank of water ready and at the correct temperature before you place the cylinders in it.
- The test cylinders can be kept in the tank up to 48 hours.
- Monitor the temperature range using a high-low thermometer and record the results.
- Properly and carefully transport the cylinders for final curing and testing.



*Picture provided by the
National Ready Mixed Concrete Association (Aug. 2016)*

What is final curing?

There are two types of final curing.

The first, and the one that is required under the building code, is *standard curing*.

- This is for the cylinders used to determine that the concrete meets the project specifications.
- The cylinders must be kept immersed in a lime bath or in a moist room, and at 73.5° F +/- 3.5° F, until tested.

The second is ***field curing***.

This type of curing is used if you wish to test an additional set of cylinders to compare the results with the standard cure cylinders, or to check the adequacy of curing and protection of the concrete in the structure.

- These cylinders are kept as near as possible to the placed concrete. You also need to provide these cylinders with the same temperature and moisture environment as the concrete they represent. This is almost impossible to do in the field.
- These cylinders are not to be used for the acceptance of concrete strength results.

When you transport the cylinders to the lab, protect them from disturbance, damage, and any moisture loss.

While the making, curing, and testing of concrete in the field is an all too common problem, following the checklist below will help to avoid many problems and costly delays.

Checklist for making and proper curing of Concrete Test Cylinders

- Making the test cylinders, and all concrete tests, must be done by an ACI Certified Field Technician.
- Obtain a representative sample of the concrete as described in ASTM C172.
- When making test cylinders, always record the concrete and air temperature and always perform a slump test and an air test.
- Mold and consolidate the test cylinder in layers and cap, or cover, the cylinders as described in ASTM C31.
- Place the test cylinders immediately into their protected environment for their initial curing.
- Maintain the temperature for initial curing between 60° - 80° F* and prevent any moisture loss or disturbance to the cylinders.
- Within 48 hours, properly transport the test cylinders for final curing and testing. In final curing, keep the cylinders at 73° F +/- 3.5° F and maintain moisture using water tanks or moist rooms as per ASTM C31 and C511.
- Report all strength test result to all parties, including the concrete producer. This is required under ACI 301 and 318.

**For concrete 6000 psi or greater, keep test cylinders between 68°- 78° F during the initial cure.*

References:

NRMCA CIP #34 – Making Concrete Cylinders in the Field
NRMCA CIP #9 - Low Concrete Cylinder Strength
ASTM C31, C39, C143, C172, C173, C231, C511, & C1049
ACI 301-10, ACI 318 -14

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