PCI Plant Quality Talk
Quality Enhancement Committee

SERIES 1, ISSUE 7 – MAKING AND TESTING 4 × 8 CYLINDER SPECIMENS

The correct preparation and storage of cylindrical test specimens as per ASTM C31 and PCI requirements is an imperative step in the production of quality precast concrete members. The proper testing of cylinders and recording of compressive strengths as per ASTM C39 and PCI requirements is important as well. Cylinders are needed to determine when concrete has the required compressive strength to strip forms, and safety is of the greatest importance. If required, cylinders are used to determine 7-day strengths. They are also used to determine the 28-day compressive strength as per engineering design requirements.

Best Practices

Making 4 × 8 inch test specimens:

- Equipment needed: cylinder molds, scoop, $\frac{3}{8}$ in. diameter steel rod with hemispherical tip, flat level surface.
- Plastic single use molds can be reused a limited number of times; discard plastic molds if they lose their shape.
- Cylinder molds are to be lightly oiled so that the specimen can easily be removed from the mold.
- Take the concrete needed for the cylinders from the middle of the load after all water has been added. The minimum sample size is 1 ft^3.
- Put the concrete in the cylinder mold in two layers of equal volume.
- Each layer must be rodded 25 times, with the rod penetrating about 1 in. into the layer below.
- Each specimen is to be tapped 10 to 15 times with a rubber mallet or an open hand after rodding each layer.
- For self-consolidating concrete, fill the entire mold with concrete at one time with no lifts. Do not rod the concrete or tap the molds.
- Strike off the top of the cylinder.
- Finish the top of the cylinder to smooth the surface with a mag float or a steel trowel.

Storing specimens:

- Move the cylinders to their storage place immediately after finishing, keeping movement to a minimum.
- Once the cylinders have been placed in their curing spot, they are not to be moved until it's time to remove them from the molds.
- Store the cylinders in or on the form where the concrete they represent is being poured.
- Cover the cylinders in the same way that the concrete is covered.
- Handling of hardened cylinders is to be done with care to avoid chipping, breaking, or cracking.
- Remove the cylinder from the mold using air pressure applied to a small hole on the bottom of the mold, or remove the cylinder from the mold using a mold splitter.
- All cylinders must be marked with: job number, product type, mixture design number, cast date, 28-day test date, casting location.

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Compression testing of cylinder specimens:

- Turn on the compression machine.
- Check the condition of the neoprene pads. If they are in bad condition, immediately bring this to the attention of the lab technician to obtain new pads. Place the cylinder in the caps.
- Place the cylinder in the compression machine and center the cylinder in the compression machine with the top and bottom platens.
- Ensure the spherically-seated top platen is free to rotate and that the cylinder is perpendicular to the bottom platen.
- Run at full advance until the numbers on the display begin to climb; at this point turn the machine setting to metered advance.
- Continue to load the cylinder at metered advance until failure.
- The load on the cylinder is to be added at a rate of 28 to 42 psi per second.
- Read the number on the display. This number is in pounds of force and needs to be converted to pounds per square inch (psi).
- To convert the display reading to compressive strength in psi, the math is as follows:

$$\frac{\text{load}}{\text{area}} = \text{compressive strength in psi}$$

Example: Load reading = 48,500/area for a 4×8 in. cylinder = 12.57 in.^{2} (Area = πr^2)

$$\frac{48{,}500}{12.57} = 3858 \text{ psi}$$

- When the conversion is made, record the compressive strength in psi and the age of the concrete.
- For the release strength, break a second cylinder using the same procedure as the first, record the psi, and average the two tests. For the 28-day test, an average of three cylinders is necessary.
- If the compressive strengths are within the required range, the corresponding piece is safe to strip from the form. If the compressive strengths are not within required range, then a Quality Control Inspector is to be contacted and made aware of this critical situation right away.

Note: Please complete this form and return to the Quality Control Manager. All crew members should be observant and report to their foreman anything out of the ordinary on a project. *See something, say something.*

NOTES	ATTENDEE SIGNATURES
DATE _____	_____
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