

CONCRETE BASICS

Concrete Testing

by John Albinger, IRMCA Technical Consultant

The reliability of testing on jobs and in laboratories is a concern many producers share. Below are various aspects of testing and suggestions to be considered when a problem arises.

1. Responsibilities of an independent testing laboratory (ITL) on the job

An ITL may be employed by the owner, the engineer or architect, or the contractor. Whoever hires the ITL decides what its responsibilities are. They generally include (for concrete) running air and slump tests and making cylinders. Running unit weight tests and taking temperatures are may also be required. The ITL's responsibilities rarely include rejecting loads. If the air content or slump are not within the specified limits the ITL representative may bring the nonconformance to someone's attention who then decides what will happen to the load or he may merely record the failure.

2. Expertise of the inspector

Inspectors performing tests on jobs must be properly trained to insure that all test be conducted as required by the applicable ASTM standard so that the results may be considered representative of the concrete tested. Test takers (inspectors) should be certified by ACI, IDOT or another reputable industry agency or association. It is absolutely proper to ask an inspector to see his or her certification card.

3. Job testing equipment and facilities

Air meters, slump cones, unit weight buckets, scales and thermometers must be calibrated at least as often as required by ASTM standards. Asking an inspector when the last time his equipment was calibrated is not improper.

"Immediately after molding and finishing, the specimens shall be stored for a period of up to 48 h in a temperature range of 60 and 80 °F and in an environment preventing moisture loss from the specimens." ASTM C31

"The contractor shall afford the inspector all reasonable access and assistance, without charge, for the procurement of samples of fresh concrete."

4. Where concrete should be tested

Air and slump should be taken at the point of discharge and if pumped or conveyed, at the point of placement as well. Cylinders should be cast at the point of placement if the concrete is pumped or conveyed.

5. Field cured cylinders and the relevancy of test results of cylinders not "standard" cured.

Field cured cylinders do not represent the quality of the concrete as delivered and therefore may not be used for rejection or acceptance. Their primary purpose is (ASTM C31):

- 5.3.1 Determination of whether a structure is capable of being put into service,
- 5.3.2 Comparison with test results of standard cured specimens or with test results from various in-place test methods,
- 5.3.3 Adequacy of curing and protection of concrete in the structure, or
- 5.3.4 Form or shore removal time requirements.

Cylinders not standard cured cannot be used as a basis of rejection. Like field cured cylinders, the strength of cylinders not standard will reflect the environment in which they have been kept and not the strength of the concrete as delivered.

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6. Reviewing Cylinder break reports

The mix

Dates cast and broken

Slump and air content

Type of Fracture

7. Issues to be discuss with the contractor prior to the first pour.

- a. Who can reject loads
- b. If specified test limits are exceeded what is the recourse, immediate and later
- c. How are cylinders to be cured
- d. What action will be taken if the ITL is observed not conducting tests properly
- e. Will the concrete supplier be sent copies of all test results

8. Applicable ASTM Standards

C31 Practice for Making and Curing Concrete Test Specimens in the Field

C39 Test Method for Compressive Strength of Cylindrical Concrete Specimens

C94 Specification for Ready-Mixed Concrete

C138 Test Method for Density, Yield, and Air Content (Gravimetric) of Concrete

C143 Test Method for Slump of Hydraulic-Cement Concrete

C172 Practice for Sampling Freshly Mixed Concrete

C231 Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method

C1064 Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete