

## Testing standards and specifications

The concrete industry is blessed with superb collections of standards and specifications dealing with everything imaginable to assure quality concrete construction. Those standards and specifications are continually subject to review and updating by working committees of ASTM and ACI. They are familiar to and respected by almost everyone in the cement and concrete industries. Yet we must continually deal with problems that are the product of inadequate project specifications, inadequate enforcement of specifications, a lack of mutual understanding between parties as to the meaning of the specification, and disregard of standard testing procedures.

The atmosphere surrounding a concrete technician on a construction project in the field, sampling the concrete as it's being deposited, conducting a slump test and an air test and molding cylinders for on-site storage, doesn't usually foster a picture of precise science. In fact, all too often, it's just the opposite. That's one reason why the technician has to be well-trained, self-assertive, and disciplined in order to be able to adhere to standard procedures.

How important is it to observe standard test procedures? Readers of Technical Talk have seen this old adage that explains it very well: "It isn't the things we don't know that hurt us the most, it's the things we know that aren't true". That's precisely what we get from non-standard tests—things to "know" that may not be true.

### Justifying standard procedures

Over and over again, when concrete technicians are rodding concrete while filling a slump cone or cylinder mold, some humorist will make a joke about 25 strokes per layer. Obviously, there's nothing precious about using 25 strokes as a standard, except that it happens to be the number agreed upon by the ASTM committee responsible for writing that specification. The important thing is that everyone must perform the test in the same way each time it is performed. That's the only way a specification for slump (ASTM C143) can mean the same thing to every specifier, every ready mix producer and every contractor on any project anywhere in this country or any other country where ASTM standards are used.

The same principle applies to every standard test method. The standards come from the appropriate committees of ASTM and ACI. They are openly debated and consensus reached on what they should contain. They remain open at all times to revision. There are many alternative choices that are debated. In order to have a rational order of things, a specific standard is adopted. It is a standard test method that may then be incorporated into any project specification simply by reference. That means that a test for a specific purpose, if it is to be valid, will be performed in precisely the same way every time. The results of the tests can then be evaluated according to specified standards that have the same meaning to all parties concerned.

### Enforcing a specification

Many project specifications that read well—that is, they reference all the right things—don't serve their intended purpose

because of lack of enforcement. That's especially true when we're dealing with field testing procedures. For example: almost all project specifications refer to ASTM C31 and ASTM C39 for testing concrete cylinders for acceptance in meeting the specified strength. There is often no one to make certain this occurs, however. In reality, there is only a specified strength for the ready mix producer to meet without proper regard for the quality of testing.

Most of us dislike the overly strict, by-the-book inspector, but assuring that test cylinders are properly made and handled in the field is one exception that should be made. The problem is that the ready mix producer will probably have to be the inspector who finds violations and reports them to the specifier. Be prepared to be disappointed at first. Such "help" may be interpreted as an intrusion on the specifier's authority. Tact is paramount, although it really is a service to everyone. A pre-job conference with the specifier would be a good way to start.

### Areas of common misunderstanding

It is likely, on any major project, that the specifier, contractor and ready mix producer will not have the same understanding of the specification in some crucial areas:

1. Proper curing of cylinders while stored on the job (60 to 80 degrees F for the first 24 to 48 hours and protected from drying).
2. The effect of exposure of cylinders to high temperatures in the first 24 hours (loss of 10 percent+ in 28 day strength).
3. Evaluation of cylinder tests; a test defined as an average of two cylinders (moving average of any three successive tests equals or exceeds specified strength; no single test more than 500 psi below specified strength.)
4. Relationship of core strength to specified strength (average of 3 cores required to equal or exceed 85 percent of specified strength; no core less than 75 percent).
5. Sampling of concrete for testing (sample taken from "mid-portion" of load. Avoid taking from beginning or end of load).
6. Air content (don't forget deduction for aggregate correction factor—could be 1 to 2 percent. Adequate air content is crucial to durability. Higher than needed air contents reduce strength without benefit).
7. Addition of water (one addition allowed by specification for slump adjustment at start of discharge. Additional 30 rev. mixing required).

As a ready mix producer or contractor, never take for granted that the specifier understands his own specification in the same way you do. These are just some of the common areas of potential misunderstanding that should be discussed before a project starts. One purpose of standard test procedures is to provide a basis for a mutual understanding of what the project specification requires and to assure the requirements are met. Properly used, they will do just that.

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