Virginia Ready-Mixed Concrete Association

VRMCA Technical Bulletin #1

Sampling Ready Mixed Concrete

Where and Why

The point where ready mixed concrete should be sampled for testing is an issue that is often surrounded by confusion and misunderstanding; at times it may even become a point of contention. Usually this centers around whether to sample the concrete at the discharge of the ready mix truck or at the point of placement such as at the end of a pump line. To clarify this issue, one must examine the codes, specifications, and test method requirements related to sampling concrete, as well as understand the purpose that the subsequent tests are intended to address.

The relevant documents, listed by their hierarchy are:

Uniform Statewide Building Code of Virginia
International Building Code
ACI 318, Building Code Requirements for Structural Concrete
ASTM C 94, Standard Specification for Ready-Mixed Concrete
ASTM C 172, Standard Practice for Sampling Freshly Mixed Concrete

In most states, uniform standards for design and construction have been mandated by legislation. In Virginia, the Office of the Uniform Statewide Building Code was established in 1973 to develop the mechanisms to foster and enforce this legislation. In order to establish uniform minimum standards for design and construction, the Office of the Statewide Uniform Building Code chose to adopt the Building Officials and Code Administrators *BOCA Building Code* as a model code that would be applied statewide. BOCA has since merged with other code writing organizations to form the International Code Council and the model codes that exist are the *International Building Code* and *International Residential Code*. Therefore, the requirements within these codes serve as a legal foundation by which design and construction activities must abide.

The two International Building Codes have specific text addressing numerous subjects, and also utilize industry standards as a part of the Code by adoption of the respective standards. Both ACI 318 and ASTM C 94 are incorporated as a part of the "Code" by this system of adoption.

The Code and the reference standards of ACI 318 and ASTM C94 all have specific requirements related to obtaining a sample of ready-mixed concrete when the purpose of the tests on that sample are for the "evaluation and acceptance of the concrete." As stated in the Code, ***"Samples for strength tests shall be taken in accordance with ASTM C 172."*** Nearly identical wording is used in ACI 318 and ASTM C 94. This applies to samples for both laboratory and field cured test cylinders.

ASTM C 172 details the methods and requirements for obtaining samples of concrete from a "revolving drum truck mixer" or ready mix truck. The Scope of ASTM C 172 clearly identifies that the "*practice covers the procedures for obtaining representative samples of fresh concrete* ***as delivered to the project site*** *. . ."* The types of delivery units included in this standard are truck mixers, and both agitating and non-agitating equipment used to transport central mixed concrete. ASTM C 172 does not cover sampling at other locations, such as from a pump or at point of placement. One source of confusion arises from Note 2 within ASTM C 172, which states "however, specifications may require other points of sampling, such as the discharge of a concrete pump." It must be understood that a Note in ASTM does not alter the requirements set forth in the standard. In the case of Note 2, it merely acknowledges that **additional, not alternate,** points of sampling may be referenced in project specifications.

Naturally, there will be occasions where it is desirable to obtain **additional** samples of concrete for testing purposes other than that required for "evaluation and acceptance" as stipulated in the Code. Conveying and placing techniques may alter the properties of concrete such as slump, air content, and subsequent strength. There may be legitimate reasons to evaluate the properties of the concrete at the point of placement, which can then be compared to the properties of the concrete as sampled in the standard manner, in accordance with ASTM C 172. As an example, ACI 301 *Standard Specification for Structural Concrete* requires samples to be obtained in accordance with ASTM C 172, and acknowledges a supplementary provision to samples at the point of placement under the section on *Additional Testing Services*. However, the additional sampling and testing cannot be used in place of the sampling and testing necessary for evaluation and acceptance of the concrete, as mandated by the Code.

With the enormous amount of information contained in the Code and reference standards it is no surprise that confusion and misunderstandings arise related to many issues. However, this review of the Code should clarify that it **is mandatory to sample ready-mixed concrete at the discharge of the truck** when the purpose of the subsequent testing is to determine compliance with the strength requirements of the project specifications and as set forth by the Code.

The Technical Committee of the Virginia Ready-Mixed Concrete Association has supplied this information as a service to the concrete construction industry. For more information contact VRMCA headquarters at: 600 Peter Jefferson Parkway, Suite 300, Charlottesville, Va. 22911; 434-977-3716 (p); 434-979-2439 (f). Email: easter@easterassociates.com

References:

International Building Code 2003, International Code Council, Inc. Falls Church, VA, 2003.
ACI 318-02 Building Code Requirements for Structural Concrete, American Concrete Institute, Farmington Hills, MI.2002.
ASTM C94-00, Standard Specification for Ready-Mixed Concrete, ASTM International, 100 Bar Harbor Drive, West Conshohocken, PA 19428, 2003.
ASTM C 172-99, Standard Practice for Sampling Ready Mixed Concrete, ASTM International, 100 Bar Harbor Drive, West Conshohocken, PA 19428, 2003.

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