

BULLETIN #4: CODE REQUIREMENTS FOR CONCRETE TEST CYLINDER MOLDS

Construction projects regularly require the preparation of concrete test cylinders at the job site which will be compression tested at a later age. The test specimens are made by placing a representative sample of the concrete in a cylindrical mold, consolidating the concrete properly, and then curing the test cylinder in a prescribed manner (see VRMCA Technical Bulletin #3). Since the resulting test specimen will take the shape of the mold it is placed in, the dimensions and ruggedness of the mold are very important because any imperfections in the mold will be transferred to the concrete test specimen. Therefore, standards exist regarding the mold for use in forming the concrete test specimen to assure that the resulting specimens are of the proper dimensions and have ends that are sufficiently plane and perpendicular to the vertical axis.

The prescribed requirements related to the type of cylinder molds permitted for use in making concrete test specimens are addressed by the Virginia Uniform Statewide Building Code in the following applicable documents:

- IBC – *International Building Code*
- ACI 318 – *Building Code Requirements for Structural Concrete*
- ASTM C 31 – *Standard Practice for Making and Curing Concrete Test Specimens in the Field*
- ASTM C 470 – *Standard Specification for Molds for Forming Concrete Test Cylinders Vertically.*

ASTM C 31 Standard Practice for Making and Curing Test Specimens in the Field is the test method cited by the Building Code that must be followed when making concrete test specimens in the field. ASTM C 31 has many specific requirements relating to the fabrication and curing of the test specimens made in the field (see VRMCA Bulletin # 3 for more information). One such requirement addresses the permissible types of cylindrical molds that can be used to make the concrete test specimens. ASTM C 31 defers the specific requirements for the test cylinder molds to ASTM C 470 Standard Specification for Molds for Forming Concrete Test Cylinders Vertically. ASTM C 470 recognizes two categories of test molds, described as either “Reusable Molds” or “Single-Use Molds”. There are different requirements for each category.

Reusable Molds: As stated in ASTM C 470, “reusable molds are those which are designed to be used more than a single time.” Molds meeting the criteria for reuse are generally made of either steel or cast iron. These molds most often are of a 2-piece construction with a cylinder and detachable base plate. Although reusable molds are relatively expensive, they have the advantage of allowing multiple or repeated uses while maintaining their dimensional tolerance for many years. However, due to their cost and weight, they are rarely used in field applications.

Single-Use Molds: As the name implies, single-use molds are just that – molds intended to be used only once. The cylinder test molds commonly in use today are made of either treated cardboard or plastic. These molds are relatively inexpensive and lightweight thus being more suited for use in the field than reusable molds. After their one use they can be discard-

ed or returned to a recycling center. Plastic cylinder molds are the most common type of the single-use molds. These plastic test molds are clearly identified as “Single-Use Plastic Molds” in ASTM C 470. Mold removal techniques can be used to remove these plastic molds intact, however they cannot be used again to make another test cylinder. The removal process (injecting compressed air into the mold) will place stresses on the plastic causing it to weaken and deform. Quite often this will result in deformities in the test mold that will transfer to the concrete specimen and result in defective specimens.

For a concrete compressive strength test result to be valid, the test specimen must be molded in accordance with the appropriate methods and in a proper mold as stipulated in the Virginia State-wide Building Code.

The Technical Committee of the Virginia Ready-Mixed Concrete Association has supplied this information as a service to the concrete construction industry.

References:

- International Building Code 2015, International Code Council, Inc. Falls Church, VA, 2015.
- ACI 318-14, Building Code Requirements for Structural Concrete, American Concrete Institute, Farmington Hills, MI, 2014.
- ASTM C 31-12, Standard Practice for Making and Curing Test Specimens in the Field, ASTM International, West Conshohocken, PA, 2012.
- ASTM C 470-08, Standard Specification for Molds for Forming Concrete Test Cylinders Vertically ASTM International, West Conshohocken, PA, 2008.