

Code References: CMU Testing Responsibility

2019 California Administrative Code, 2016 TMS 602

Concrete masonry construction includes concrete masonry units (CMU), mortar, grout, and reinforcement. Quality Assurance for masonry includes building code mandated submittals, special inspections, and material tests, though requirements for each of the component materials in concrete masonry are not the same.

Submittals for mortar and grout, for example, must include test reports when those materials are specified to the property specification of their respective standards. CMU are excluded from that requirement. Often, however, that code distinction is not understood, and manufacturers are expected to provide a test report. This is contrary to the intent and requirements of the California Building Code (CBC) and TMS 602 as referenced by the CBC.

As the code excerpts below indicate, CMU tests are solely within the process of verification of the specified compressive strength of masonry (f'_m), which is accomplished by the unit strength method or prism test method ("or", not both) [TMS 602 Section 1.4 B]. The testing and inspection program is solely the responsibility of the project owner through the design professional in general responsible charge and their designees.

CBC REFERENCED MATERIAL AND TESTING STANDARDS

ASTM C90-16a Standard Specification for Loadbearing Concrete Masonry Units

Section 8. Sampling and Testing

8.1 The purchaser or authorized representative shall be accorded proper facilities to inspect and sample the units at the place of manufacture from the lots ready for delivery.

Note: 6 - The purchaser is the public body or authority, association, corporation, partnership, or individual entering into a contract or agreement to purchase or install, or both, concrete masonry units.

Note: 13 - ...if the results of the tests show that the units conform to the specification requirements, the cost is typically borne by the purchaser.

ASTM C140-18a Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units

Section 3. Terminology

3.2.1 *lot, n*—any number of concrete masonry units of any configuration or dimension manufactured using the same materials, concrete mix design, manufacturing process, and curing method.

Section 5. Sampling

5.1.1 For purposes of testing, full-sized units shall be selected by the purchaser or authorized representative. The selected specimens shall be of similar configuration and dimensions, and representative of the whole lot from which they are selected.

5.2.1 A set of units shall consist of six full-size units.

Note: These sections in ASTM C140 are frequently misunderstood. In simplest terms, a typical project utilizing cmu with the same mix design from the same plant – regardless of unit size or configuration – would only need six representative units of similar size and configuration to each other.

For example, a project requiring 8-inch wide and 12-inch wide concrete masonry walls of ASTM C90 Medium Weight cmu would typically need 8x8x16s in open end regulars and bond beams, double open end bond beams, u-lintels, halves, etc., and the same in 12x8x16 sizes. These are all of the same lot, therefore, only six pieces of an 8x8x16 open end regular would be needed. The six pieces are similar in dimension and configuration to each other. Sampling six specimens of every size and configuration is NOT intended, is completely redundant, and is not required by the standard.

Code References: CMU Testing Responsibility

2019 California Administrative Code, 2016 TMS 602

BUILDING CODES

TMS 602 Specification for Masonry Structures [2016 edition; referenced by 2019 CBC]

Article 1.5 - Submittals

1.5 B. Submit the following:

1. Mix designs and test results
 - a. ...mortar mix...
 - i. proportion specification – submit mix design, or
 - ii. property specification (minimum strength requirement) – submit mix design and test report
 - b. ...grout mix...
 - i. proportion specification – submit mix design, or
 - ii. property specification (minimum strength requirement) – submit mix design and test report

[CMU is NOT listed for submittals of mix designs or test results]

2. Material certificates – Material certificates for the following, certifying that each material is in compliance.
 - a. Reinforcement
 - b. Anchors, ties...
 - c. Masonry units
 - d. Mortar...
 - e. Self-consolidating grout

Article 1.6 – Quality Assurance

1.6 A. Testing Agency's services and duties

1. Sample and test in accordance with Table 3, 4, or 5 as specified for the project.
5. Unless otherwise required, the Owner will retain the Testing Agency.

Commentary 1.6 – Quality Assurance

Quality assurance consists of the actions taken by an owner or owner's representative, including establishing the quality assurance requirements, to provide assurance that materials and workmanship are in accordance with the contract documents. Quality assurance includes quality control measures as well as testing and inspection to verify compliance.

CALIFORNIA ADMINISTRATIVE CODE TITLE 24, PART 1 [2019]

Chapter 4 Administrative Regulations for the Division of the State Architect-Structural Safety (DSA-SS)

Article 1 Essential Services Buildings

Section 4-213. Tests.

- (a) **General.** A list of all required tests of materials shall be prepared and submitted by the architect, structural engineer, or civil engineer in general responsible charge of the project.
- (b) **Test sampling.** Test samples or specimens of material for testing may be taken by the architect or registered engineer, the architect's or engineer's representative, the project inspector or a representative of the testing agency. In no case shall the contractor, his employee or a vendor select the samples or specimens.

Code References: CMU Testing Responsibility

2019 California Administrative Code, 2016 TMS 602

Section 4-217. Duties of the architect and registered engineers.

(d) **Testing program.** The architect or registered engineer in general responsible charge shall establish the extent of the testing of materials consistent with the needs of the particular project and shall issue specific instructions to the testing agency.

Article 2 State Buildings

Section 4-239. Tests.

In addition to the requirements of Section 4-213, Article 1 of these regulations, the following provisions shall apply:

(a) **Performance of tests.** The owner, with the recommendation of the architect or registered engineer shall select a qualified testing laboratory to conduct the tests. Sampling, preparation of samples and tests shall be in accordance with the standards as provided in the approved plans and specifications and in the applicable building regulations. Where a sample has failed to pass the required tests, the architect or registered engineer, subject to the approval of the enforcement agency, may permit retest of the sampled material.

(b) **Payments.** The owner shall pay for all tests.