

### **Description of Inspection**

The inspection was designed to include a review of the laboratory's quality assurance system, an examination of the apparatus and an observation of the test procedures used in determining the physical properties of masonry mortar as set forth in ASTM Specification C270. The ASTM Standards on which the work was based are as follows: C91, C109/C109M, C185, C230/C230M, C270, C305, C511, C1005, C1093, C1437, C1506 and E4.

### **Documentation**

The inspection of the laboratory's documentation was designed to include a review of the laboratory's quality system and quality system manual as described in ASTM Standard Practice C1093. The quality system is defined in C1093 as the organizational structure, responsibilities, procedures, processes, capabilities, and resources for implementing quality management. The quality system, as listed in Section 8 of C1093, includes the requirements for equipment calibration and verification and records of calibration and verification, inspection of facilities, agency accreditation, proficiency sample testing and records, test records, traceability of calibration, external audit records, and test methods. The quality system manual, as listed in Section 9 of C1093, includes the requirements for organization and organizational policies, staff, facilities and equipment, equipment calibration and verification, test records and reports, sample management, diagnostic and corrective actions, internal quality system reviews, and subcontracting.

### **Apparatus**

#### Storage Facilities for Test Specimens (C511)

The physical condition and the functioning of the various mechanical features of the moist air storage facilities for cement test specimens were observed, and where possible, the temperature and humidity of the storage atmosphere were checked for conformance to the requirements of C511. In addition, it was determined whether or not the unit was equipped with automatic temperature control and with a temperature recording device.

#### Graduates (C1005)

One or more glass graduates typical of those used by the laboratory in the testing of mortar were checked for conformance to the marking and volumetric requirements of C1005.

#### Flow Table (C230)

Each ten-inch flow table and accompanying concrete pedestal, and each flow caliper and flow mold presented for inspection were checked for conformance to the design and dimensional requirements of C230. In addition, the performance of each table was tested with a sample of the CCRL flow table material.

#### Compression Test Apparatus (C109 and E4)

Compression Machine - Unless otherwise noted, only one testing machine was inspected. During this inspection, several of the more important mechanical features of the machine were examined, the bearing blocks were checked for conformance to the design and dimensional requirements of C109, and the accuracy of load indication was verified.

The verification tests were made using force measuring instruments (load cells) calibrated at the National Institute of Standards and Technology. The selection of test points was made based on loads consistent with the range of use of the material being inspected. In all tests, the test loads were approached by increasing the load from a lower load as specified in Method E4.

Cube Molds and Tampers - The cube molds and tampers presented for inspection were checked for conformance to the design and dimensional requirements of C109.

#### Mix Balances (C1005)

Each mix balance presented for inspection was tested for accuracy and sensitivity at 1000 grams and 2000 grams as specified in the various methods of test. Any balance which could be read directly over its entire capacity was tested for accuracy of indication at five test points over its capacity. Any balance which used a dial or beam in addition to equal arms was tested for accuracy at five points across its range of use. Accuracy and sensitivity tolerances for the tests listed above were obtained from C1005. When a balance met all the requirements of the tests, and no obvious operational difficulty was present, it was assigned a CCRL identification number.

#### Mix Weights (C1005)

All SI unit weights (masses), if used in the normal weighing operation, were checked for conformance to the maintenance tolerances of C1005. Frequency of verification was determined. Confirmation of the verification of these weights (masses) at the prescribed frequency was determined. When all the weights (masses) in a set were within the accuracy tolerances and were suitably stored, the storage container was assigned a CCRL identification number. In the event that mix weights (masses) were not required for balance operation, the reporting of balance weights will be omitted.

#### Mechanical Mixing Apparatus (C305)

Each mechanical mixer presented for inspection was checked for conformance to the requirements of C305, and the physical condition was observed. A check was made to determine if a lid or lids and one or more scrapers conforming to specification requirements were available.

#### Air Content of Mortar Apparatus (C185)

Each of the 400-mL. measures, steel straightedges, tapping sticks, and spoons presented for inspection was checked for conformance to the applicable requirements of C185. Apparatus not listed, but also needed for use in this test, is covered elsewhere in this report.

#### Water Retention Apparatus (C91 and C1506)

Each water retention apparatus, and each piece of related equipment presented for inspection was checked for conformance to the requirements of C1506.

Miscellaneous

The temperature and relative humidity of the air in the laboratory and the temperature of the mixing water were checked for conformance to the requirements of the various methods of test for mortar. The suitability of the rubber gloves furnished testing personnel was considered. A check was made to determine if the laboratory had been supplied with copies of the latest editions of the ASTM Book of Standards pertaining to the testing of mortar.

**Procedures**

The standard test methods which were observed and discussed during the inspection were as follows: Determination of Mix Proportions in the Making of Mortar Cubes; Compressive Strength of Mortar Cubes; Testing of Mortar Cubes; Water Retention Test; and Air Content Determination. The laboratory's conformance to specified procedures was as indicated in the Summary of Findings.

The procedures used in transporting, processing, and storing test samples were also discussed, and the handling and storage of molded specimens were observed. The laboratory's conformance to standard practices was as indicated in the Summary Section.

All departures from specified procedures or standard practices noted by the CCRL representative were reviewed in detail with the operator, with particular attention being given to those matters described in the Footnote Section.