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 slag cements as set forth in ASTM Specifications C989.

The ASTM Standards on which the work was based are as follows: C109/C109M, C114, C115, C150, C151, C183, C185, C187, C191, C204, C230/C230M, C266, C305, C430, C451, C490/C490M, C511, C778, C989, C1005, C1222, C1437, C1506, and E11.

Quality System

The inspection was designed to include those sections of ASTM Standard Practice C1222 which comprise the quality system of the laboratory. The quality system is defined in C1222 as those internal procedures and practices that a laboratory utilizes to ensure continued compliance with applicable testing standards. The inspection is a review of the laboratory's written procedures which document that the quality system has been established and the records which confirm on-going compliance are maintained.

Documentation maintained by the laboratory was reviewed for compliance with C1222 requirements. This documentation consists of procedures which establish that a quality system is in place in the laboratory and records which confirm that on-going compliance is maintained. The laboratory's quality system was examined for procedures which cover the following areas: technician training and evaluation; calibration and verification of equipment; standard operating procedures; handling of technical complaints; and ensuring the quality of external technical services utilized. A review was conducted to determine that the following records were available and contained the minimum information required by C1222: personnel records of training, evaluation, experience, and education; calibrations and verifications of equipment; equipment inventory; test results; and test reports. The laboratory's latest CCRL Cement Proficiency Sample Report was examined to verify the laboratory's participation in the applicable proficiency sample program.

Qualification of Chemical Analysis

If the scope of the laboratory included the chemical analysis of slag cement, data and procedures were reviewed to determine that the test methods used by the laboratory have met the qualification requirements described in ASTM Test Method C114.

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.

The cleanliness and physical condition of all water storage tanks presented for inspection were observed, and it was noted whether or not the water was lime saturated. Where possible, the temperature of the water was checked for conformance to the requirements of the various methods of test for cements for which such facilities are required.

Wet Sieving Apparatus (C430)

Each No. 325 sieve, spray nozzle, and pressure gage presented for inspection was checked for conformance to the requirements of C430, and the physical condition was observed. A check was made of the nozzle in use to determine if the flow rate was within the limits set forth in C430.

Density (C188)

The availability of an apparatus to be used in determining density was checked. Where a Le Chatelier flask was presented for this purpose, checks were made to determine compliance with the design requirements of C188. Where other alternative equipment or methods were presented, a review of laboratory comparison results was conducted to establish similarity in results between the method used and the Le Chatelier method.

Graduates (C1005)

One or more glass graduates typical of those used by the laboratory 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) traceable to 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. 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.

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.

Air Permeability Apparatus (C204)

Each complete air permeability apparatus, and related accessory equipment, presented for inspection was checked for conformance to the requirements of C204.

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. Observations were made to determine if the necessary sample splitter and sieves were available for checking the standard sand and graded standard sand for conformance to C778. The trowel required by various tests was examined for design and edge condition. The suitability of the rubber gloves furnished testing personnel was considered. A check was made to determine if the laboratory had been supplied with a copy of the latest edition of the ASTM Book of Standards pertaining to the testing of cement.

Additional Methods

At the discretion of the laboratory, selected additional test methods may be presented for inspection. If presented, the inspection of these test methods for concrete consists of an examination of prescribed equipment and specified procedures for the individual test method.

Procedures

The standard test methods which were observed and discussed during the inspection were as follows: Preparation of Mortar Cubes; Testing of Mortar Cubes; Air Content Determination; No. 325 Sieve Fineness Test; Air Permeability Fineness Test; and Density. 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 practice 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.