

**CEMENT AND CONCRETE REFERENCE LABORATORY**  
AT THE  
NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY  
GAITHERSBURG, MARYLAND 20899  
(301) 975-6704

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COMMITTEE C-1 ON CEMENT  
COMMITTEE C-9 ON CONCRETE AND  
CONCRETE AGGREGATES  
AMERICAN SOCIETY FOR TESTING AND MATERIALS

March 10, 2005

Mr. Reynolds H. Toney, P.E.  
Materials Division Engineer  
Oklahoma Department of Transportation  
200 Northeast 21<sup>st</sup> Street  
Oklahoma City, Oklahoma 73015-3204

Subject: Inspection of Cement, Pozzolan and Concrete Testing Laboratories

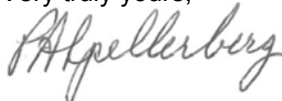
Dear Mr. Toney:

Enclosed is a confirmatory report on Inspection Number J-88, which was completed in your testing laboratories at Oklahoma City, Oklahoma, on January 28, 2005, by a representative of the Cement and Concrete Reference Laboratory.

This letter, and the accompanying report, provide written evidence that your laboratories have been inspected during the 32<sup>nd</sup> Inspection Tour.

It is requested that these evidences of the inspection not be used for advertising, publication, or promotional purposes.

Very truly yours,



Peter A. Spellerberg  
Manager, Cement and Concrete Reference Laboratory  
Building Materials Division  
Building and Fire Research Laboratory

Enclosure

cc: K. R. Hobson, P.E.  
Division Administrator, FHWA

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March 10, 2005

**INTRODUCTION  
TO  
REPORT OF INSPECTION  
OF  
CEMENT QUALITY SYSTEM**

This report covers an inspection, designated Inspection Number J-88, which was performed by a representative of the Cement and Concrete Reference Laboratory of the quality system in the cement testing laboratory of Oklahoma Department of Transportation, at Oklahoma City, Oklahoma, on January 28, 2005.

The report has three sections. The first section describes the scope of the inspection. The second section contains a summary of the findings. The third section contains a series of footnotes in which departures from specification requirements and other important matters are covered in detail. In addition, there is a closure.

Corrections of minor deficiencies are encouraged during the course of each inspection. In the interest of brevity, any adjustments of this nature which may have been made have not been mentioned in the report. When necessary, additional explanatory information about the inspection will be furnished in separate correspondence.

Unless otherwise indicated, the specifications and methods of test to which reference is made are standards of the American Society for Testing and Materials.

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## DESCRIPTION OF INSPECTION

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 is maintained. Written procedures, as listed in Section 9 of C1222, include those for training and evaluating personnel, calibration and verification of equipment, standard operations, handling technical complaints, ensuring quality of external technical services used, and qualification of chemical test methods where applicable. The records, as listed in Section 10 of C1222, include personnel records that document education, experience, training, and performance evaluation; calibration and verification of equipment; qualification of chemical test methods where applicable; test results and final report; participation in CCRL Proficiency Sample Program(s), and inventory of equipment.

### Organization

A review of the laboratory's records was made to ascertain if a complete description of the organization of the laboratory was available. This description includes the following: the complete legal name and address of the laboratory, the principal officers, the management structure, other laboratories under the technical direction of this laboratory and a listing of technical services offered.

### Human Resources

The resume of the laboratory manager was reviewed to see if the education and experience requirements of C1222 were met. The laboratory's written documents were reviewed to verify that training and performance evaluation procedures were properly established. Personnel records were reviewed to determine if training, performance evaluations, education and experience of laboratory technicians were documented.

### Operations

Standard operating procedures were examined for descriptions of the sampling, handling and testing of cement samples required by C1222. The final test report and records used to generate the report were reviewed to ensure that it contained the minimum required information.

### Quality

Laboratory documentation was reviewed to determine if written procedures were available for handling technical complaints and to ensure the quality of external technical services utilized. The laboratory's latest CCRL Cement Proficiency Sample Report was examined to verify the laboratory's participation in the applicable proficiency sample program. A review of the available ASTM standards was made to determine that the laboratory possessed the latest copies of the appropriate standards.

### Equipment

Laboratory records were reviewed to establish that the laboratory has a complete inventory list of the required testing equipment. Written calibration and verification procedures were reviewed with the associated records to determine the frequency and depth of review.

### Qualification of Chemical Analysis

If the scope of the laboratory included the chemical analysis of hydraulic 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.

SUMMARY OF FINDINGS

<u>Inspection Item</u>	<u>*Status</u>
1. <u>Organization</u> .....	<u>Satisfactory</u>
2. <u>Human Resources</u>	
a. Director of Testing .....	<u>Satisfactory</u>
b. Training .....	<u>Satisfactory</u>
c. Performance Evaluation .....	<u>Satisfactory</u>
d. Personnel Records .....	<u>Satisfactory</u>
3. <u>Operations</u>	
a. Standard Operating Procedures .....	<u>Satisfactory</u>
b. Final Report .....	<u>Satisfactory</u>
4. <u>Quality</u>	
a. Technical Complaints .....	<u>Satisfactory</u>
b. External Technical Services .....	<u>Satisfactory</u>
c. Proficiency Sample(s) .....	<u>Satisfactory</u>
d. Standard Test Methods .....	<u>Satisfactory</u>
5. <u>Equipment</u>	
a. Inventory .....	<u>Satisfactory</u>
b. Equipment Calibration .....	<u>Satisfactory</u>
c. Records .....	<u>Satisfactory</u>
d. Calibration Procedures .....	<u>Satisfactory</u>
6. <u>Qualification of Chemical Analysis</u>	
a. Practice:	
(1) Procedures .....	<u>Satisfactory</u>
(2) Frequency .....	<u>Satisfactory</u>
b. Records .....	<u>Satisfactory</u>

\*Entry covers conformance to specification requirements. Where reference is made to a footnote in which one or more deficiencies are described, it may be concluded that the item or items in question were judged to be satisfactory in all respects other than as described in the footnote.

## FOOTNOTE SECTION

No footnotes.

## CLOSURE

This inspection was performed by the writer. While the work was in progress, many of the details covered by this report were discussed with laboratory personnel. At the conclusion of the inspection the special work sheets, on which all observations were recorded, were made available for review by members of the laboratory staff, and all of the entries thereon were discussed in detail.

It is recommended that this report be compared with the report of the preceding inspection which was made in January 2003.


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Cement and Concrete Reference Laboratory



Nicholas R. Lang  
Inspector

Report Approved By:



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March 10, 2005

**INTRODUCTION  
TO  
REPORT OF INSPECTION  
OF  
CEMENT TESTING LABORATORY**

This report covers an inspection, designated Inspection Number J-88, which was performed by a representative of the Cement and Concrete Reference Laboratory in the cement testing laboratory of Oklahoma Department of Transportation, at Oklahoma City, Oklahoma, on January 28, 2005.

The report has three sections. The first section describes the scope of the inspection. The second section contains a summary of the findings. The third section contains a series of footnotes in which departures from specification requirements, mechanical deficiencies in apparatus, and other important matters are covered in detail. In addition, there is a closure.

Some pieces of apparatus in the laboratory have been assigned CCRL identification numbers. As applicable, these numbers are listed in the summary and footnote section.

Corrections of minor deficiencies in testing equipment are encouraged during the course of each inspection. In the interest of brevity, any adjustments of this nature which may have been made have not been mentioned in the report. When necessary, additional explanatory information about the inspection will be furnished in separate correspondence.

Unless otherwise indicated, the specifications and methods of test to which reference is made are standards of the American Society for Testing and Materials.

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## DESCRIPTION OF INSPECTION

The inspection was designed to include an examination of the apparatus and an observation of the test procedures used in determining the physical properties of portland cement set forth in ASTM Specification C150, and an examination of the apparatus used in determining the physical properties of masonry cement set forth in ASTM Specification C91.

The ASTM Standards on which the work was based are as follows: C91-03, C109/C109M-02, C114-04, C115-96a, C150-04, C151-00, C183-02, C185-02, C187-98, C191-04, C204-00, C230/C230-03, C266-03, C305-99, C430-96, C451-04, C490-00, C511-03, C778-02, C1005-00, C1222-03, C1437-01, C1506-03, and E11-01.

### 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 recording thermometer.

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.

#### Wagner Turbidimeter (C115)

Each Wagner turbidimeter, stirring apparatus, timing buret, and sedimentation tank presented for inspection was checked for conformance to the design and dimensional requirements of C115. Each microammeter presented was checked for conformance to the design and accuracy of indication requirements of the specification, and the physical condition was observed.

#### 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.

#### Autoclave Soundness Apparatus (C151)

The operating characteristics of each autoclave presented for inspection were observed to determine if the autoclave was operating in general conformance to the requirements of C151. Particular attention was given to rate of heating, maintenance of test pressure, and rate of cooling; and each pressure gage was checked for conformance to the design and accuracy requirements of C151. Each length comparator and bar mold presented was checked for conformance to the design and dimensional requirements of the specification and the accuracy of indication of each comparator was checked.

#### Graduates (C1005)

One or more glass graduates typical of those used by the laboratory in the testing of cements were checked for conformance to the marking and volumetric requirements of C490.

### 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. In addition, a shift test, as prescribed by NIST Handbook 44, was made at 1000 grams. 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 metric mix weights presented for inspection, if used in the normal weighing operation, were checked for conformance to the maintenance tolerances of C1005. Frequency of verification was determined. When all the weights 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 were not required for balance operation, the reporting of balance weights will be omitted.

### Vicat Apparatus (C187, C191, and C451)

Each Vicat apparatus and Vicat ring presented for inspection was checked for conformance to the requirements of the various methods of test for cement for which such equipment is required.

### Gillmore Needles (C266)

Each initial and final Gillmore needle presented for inspection was checked for conformance to the weight and dimensional requirements of C266, and a check was made to determine that at least one set of needles was properly mounted.

#### 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 were checked for conformance to the requirements of C204.

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

Each water retention apparatus and each piece of related equipment presented for inspection were 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 cement. 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 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.

#### Procedures

The standard test methods which were observed and discussed during the inspection were as follows: Water Retention Test; Normal Consistency Test; Vicat Time of Set Test; Preparation of Gillmore Pats, Autoclave Bars, and Mortar Cubes; Testing of Autoclave Bars; Testing of Mortar Cubes; Air Content Determination; No. 325 Sieve Fineness Test; Turbidimeter Fineness Test; Air Permeability Fineness Test; and Early Stiffening Test (Paste Method). 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.

SUMMARY OF FINDINGS

<u>Inspection Item</u>	<u>Apparatus</u>	<u>*Status</u>
1. <u>Storage Facilities for Test Specimens</u>		
a. Moist Air Storage Facilities .....		<u>Satisfactory</u>
b. Water Storage Facilities .....		<u>Satisfactory</u>
2. <u>Wagner Turbidimeter</u>		
a. Turbidimeter(s):		
(1) Maker: <u>                    </u> Serial Number: <u>          </u> .....		<u>                                    </u>
(2) Maker: <u>                    </u> Serial Number: <u>          </u> .....		<u>                                    </u>
b. Microammeter(s):		
(1) Maker: <u>                    </u> Serial Number: <u>          </u> .....		<u>                                    </u>
(2) Maker: <u>                    </u> Serial Number: <u>          </u> .....		<u>                                    </u>
(3) Maker: <u>                    </u> Serial Number: <u>          </u> .....		<u>                                    </u>
c. Accessory Apparatus: .....		<u>                                    </u>
3. <u>Wet Sieving Apparatus</u> .....		<u>Satisfactory</u>
4. <u>Autoclave Soundness Apparatus</u>		
a. Autoclave(s):		
(1) Maker: <u>Boekel</u> Serial Number: <u>1011-24</u> .....		<u>Satisfactory</u>
(2) Maker: <u>                    </u> Serial Number: <u>          </u> .....		<u>                                    </u>
(3) Maker: <u>                    </u> Serial Number: <u>          </u> .....		<u>                                    </u>
(4) Maker: <u>                    </u> Serial Number: <u>          </u> .....		<u>                                    </u>
(5) Maker: <u>                    </u> Serial Number: <u>          </u> .....		<u>                                    </u>
b. Length Comparator(s): .....	Number Checked: <u>1</u> .....	<u>Satisfactory</u>
c. Bar Mold(s): .....	Number Checked: <u>6</u> .....	<u>Satisfactory</u>
5. <u>Graduates</u>		
(1) Capacity: <u>500 mL</u> CCRL Number: <u>J-237</u> .....		<u>Satisfactory</u>
(2) Capacity: <u>250 mL</u> CCRL Number: <u>J-238</u> .....		<u>Satisfactory</u>
(3) Capacity: <u>150 mL</u> CCRL Number: <u>K-4011</u> .....		<u>Satisfactory</u>
(4) Capacity: <u>                    </u> CCRL Number: <u>          </u> .....		<u>                                    </u>
(5) Capacity: <u>                    </u> CCRL Number: <u>          </u> .....		<u>                                    </u>
6. <u>Flow Table</u>		
a. Flow Table(s):		
(1) Maker: <u>Humboldt</u> .....		<u>Satisfactory</u>
(2) Maker: <u>                    </u> .....		<u>                                    </u>
b. Accessory Apparatus: .....		<u>Satisfactory</u>

\*Entry covers availability, physical condition, and/or conformance to specification requirements. Where reference is made to a footnote in which one or more deficiencies are described, it may be concluded that the item or items in question were judged to be satisfactory in all respects other than as described in the footnote.

<u>Inspection Item</u>	<u>*Status</u>
7. <u>Compression Test Apparatus</u>	
a. Compression Testing Machine:	
(1) Maker: <u>Tinius Olsen</u>	
(2) Serial Number: <u>148710</u> (3) Capacity: <u>60,000 lbf</u>	
(4) Accuracy of Indication:	
(a) Range: <u>60,000 lbf</u> From: <u>6,000</u> to <u>35,000 lbf</u> ..	<u>Satisfactory</u>
(b) Range: _____ From: _____ to _____ ..	- - - - -
(c) Range: _____ From: _____ to _____ ..	- - - - -
(d) Range: _____ From: _____ to _____ ..	- - - - -
(e) Range: _____ From: _____ to _____ ..	- - - - -
(f) Range: _____ From: _____ to _____ ..	- - - - -
(5) Mechanical Condition .....	<u>Satisfactory</u>
(6) Design .....	<u>Satisfactory</u>
(7) Bearing Blocks .....	<u>Satisfactory</u>
b. Additional Compression Machines .....	<u>None</u>
c. Cube Molds: Number Checked: <u>28</u> .....	<u>See footnote (a)</u>
d. Tampers: .....	<u>Satisfactory</u>
8. <u>Mix Balance(s)</u>	
(1) Maker: <u>Mettler</u>	
Capacity: <u>3,100 g</u> CCRL Number: <u>M-1142</u> .....	<u>Satisfactory</u>
(2) Maker: _____	
Capacity: _____      CCRL Number: _____ .....	- - - - -
(3) Maker: _____	
Capacity: _____      CCRL Number: _____ .....	- - - - -
(4) Maker: _____	
Capacity: _____      CCRL Number: _____ .....	- - - - -
9. <u>Mix Weights</u>	
(1) CCRL Number: - - - -      Number of Weights Checked <u>  </u> ..	- - - - -
(2) CCRL Number: _____      Number of Weights Checked <u>  </u> ..	- - - - -
(3) CCRL Number: _____      Number of Weights Checked <u>  </u> ..	- - - - -
10. <u>Vicat Apparatus</u>	
a. Vicat Apparatus(es):	
(1) CCRL Number: <u>P-280</u> .....	<u>Satisfactory</u>
(2) CCRL Number: <u>U-2450</u> .....	<u>See footnote (b)</u>
(3) CCRL Number: _____ .....	- - - - -
(4) CCRL Number: _____ .....	- - - - -
b. Additional Vicat Rings: Number Checked <u>11</u> .....	<u>Satisfactory</u>
11. <u>Gillmore Needles</u>	
a. Initial Needles	b. Final Needles
(1) CCRL Number: <u>T-3011</u>	(1) CCRL Number: <u>T-3012</u> .....
(2) CCRL Number: _____	(2) CCRL Number: _____ .....
(3) CCRL Number: _____	(3) CCRL Number: _____ .....
c. Mountings: .....	<u>Satisfactory</u>

<u>Inspection Item</u>	<u>*Status</u>
12. <u>Mechanical Mixing Apparatus</u>	
a. Mixer(s):	
(1) Maker: <u>Hobart</u> Serial Number: <u>31-1229-744</u> . . . . .	<u>Satisfactory</u>
(2) Maker: _____ Serial Number: _____ . . . . .	- - - - -
(3) Maker: _____ Serial Number: _____ . . . . .	- - - - -
b. Accessory Apparatus . . . . .	<u>Satisfactory</u>
13. <u>Air Content Apparatus</u>	
a. 400 mL Measure(s) . . . . .	<u>Satisfactory</u>
b. Accessory Apparatus . . . . .	<u>Satisfactory</u>
14. <u>Air Permeability Apparatus</u>	
a. Blaine Meter(s)	
(1) CCRL Number: <u>K-1620</u> . . . . .	<u>Satisfactory</u>
(2) CCRL Number: _____ . . . . .	- - - - -
(3) CCRL Number: _____ . . . . .	- - - - -
b. Accessory Apparatus . . . . .	<u>Satisfactory</u>
15. <u>Water Retention Apparatus</u> . . . . .	- - - - -
16. <u>Miscellaneous</u>	
a. Temperature of Air in Laboratory . . . . .	<u>Satisfactory</u>
b. Relative Humidity of Air in Laboratory . . . . .	<u>Satisfactory</u>
c. Temperature of Mixing Water . . . . .	<u>Satisfactory</u>
d. Miscellaneous Accessory Testing Apparatus . . . . .	<u>Satisfactory</u>
e. ASTM Standards . . . . .	<u>Satisfactory</u>
f. Additional Observations of Interest to Laboratory . . . . .	<u>None</u>

<u>Test</u>	<u>Procedures</u> Method Reference	<u>Technique in Exact Agreement With Standard Practice</u>
Water Retention Test . . . . .	C1437-01, 1506-03 . . . . .	<u>Not demonstrated</u>
Normal Consistency Test . . . . .	C187-98 . . . . .	<u>Yes</u>
Vicat Time of Set Test . . . . .	C191-04 . . . . .	<u>Yes</u>
Preparation of:		
Gillmore Pat . . . . .	C266-03 . . . . .	<u>Yes</u>
Autoclave Bar . . . . .	C151-00 . . . . .	<u>Yes</u>
Mortar Cubes . . . . .	C109-02, C1437-01 . . . . .	<u>See footnote (c)</u>
Testing of Autoclave Bars . . . . .	C151-00 . . . . .	<u>Yes</u>
Testing of Mortar Cubes . . . . .	C109-02 . . . . .	<u>Yes</u>
Air Content Determination . . . . .	C185-02 . . . . .	<u>Yes</u>
No. 325 Sieve Fineness Test . . . . .	C430-96 . . . . .	<u>Yes</u>
Turbidimeter Fineness Test . . . . .	C115-96 . . . . .	<u>Not demonstrated</u>
Air Permeability Fineness Test . . . . .	C204-00 . . . . .	<u>Yes</u>
Early Stiffening Test . . . . .	C451-04 . . . . .	<u>Not demonstrated</u>
Handling of Samples . . . . .	C183-02 . . . . .	<u>Yes</u>
Handling of Molded Specimens . . . . .	XXXXXX . . . . .	<u>Yes</u>

## FOOTNOTE SECTION

### Cube Molds (C109-02):

(a) Three cube molds, bearing CCRL Numbers Y-310, Y-312 and Y-313, were found not to comply with the angular requirements of C109. It was noted that, during the course of the inspection, these cube molds were taken out of service.

### Vicat Apparatus (C187-98, C191-04 and C451-04):

(b) It was understood that the Vicat apparatus, bearing CCRL Number U-2450, was only used to determine the normal consistency; therefore, no check of the attached needle was made.

### Procedures:

(c) Preparation of Mortar Cubes (C109-02): The amount of time taken between the completion of mixing and the molding of the cubes was more than the specified 2 minutes 30 seconds required in Section 10.4.3 of C109.

## CLOSURE

This inspection was performed by the writer. While the work was in progress, many of the details covered by this report were discussed with laboratory personnel. At the conclusion of the inspection the special work sheets, on which all observations were recorded, were made available for review by members of the laboratory staff, and all of the entries thereon were discussed in detail.

Testing equipment that was used during the inspection to make temperature determinations, to determine compliance of selected apparatus to specified weights and to verify the accuracy of indication of compression testing machines is identified as follows:

Thermometers: CCRL Numbers 009-G124, 1601, S60, S108 and S114  
Test Weights: NIST Numbers 163682 and 172809  
Load Cell: Serial Number 991108

It is recommended that this report be compared with the report of the preceding inspection which was made in January 2003.

This report is not to be used for advertising, publication, or promotional purposes.

Cement and Concrete Reference Laboratory



Nicholas R. Lang  
Inspector

Report Approved By:





# **CEMENT AND CONCRETE REFERENCE LABORATORY**

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CONCRETE AGGREGATES  
AMERICAN SOCIETY FOR TESTING AND MATERIALS

March 10, 2005

## **INTRODUCTION TO REPORT OF INSPECTION OF POZZOLAN TESTING LABORATORY**

This report covers an inspection, designated Inspection Number J-88, which was performed by a representative of the Cement and Concrete Reference Laboratory in the pozzolan testing laboratory of Oklahoma Department of Transportation, at Oklahoma City, Oklahoma, on January 28, 2005.

The report has three sections. The first section describes the scope of the inspection. The second section contains a summary of the findings. The third section contains a series of footnotes in which departures from specification requirements, mechanical deficiencies in apparatus, and other important matters are covered in detail. In addition, there is a closure.

Some pieces of apparatus in the laboratory have been assigned CCRL identification numbers. As applicable, these numbers are listed in the summary and footnote sections.

Corrections of minor deficiencies in testing equipment are encouraged during the course of each inspection. In the interest of brevity, any adjustments of this nature which may have been made have not been mentioned in the report. When necessary, additional explanatory information about the inspection will be furnished in separate correspondence.

Unless otherwise indicated, the specifications and methods of test to which reference is made are standards of the American Society for Testing and Materials.

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## DESCRIPTION OF INSPECTION

The inspection was designed to include an examination of the apparatus and an observation of the test procedures used in determining the physical properties of pozzolans set forth in ASTM Specification C311, and an examination of the apparatus and procedures used in determining Loss on Ignition.

The ASTM Standards on which the work was based are as follows: C109/C109M-02, C114-04, C150-04, C151-00, C157/C157M-04, C185-02, C187-98, C188-95, C227-03, C230/C230M-03, C305-99, C311-02, C430-96, C441-02, C490-00, C511-03, C618-03, C778-02, C1012-04, C1202-97, C1437-01, and E11-01.

### 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 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.

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 which such facilities are required.

The availability of warm and dry storage facilities was checked. The temperature of the air in the storage facilities was checked for conformance to the specification if the facilities were in operation during the inspection.

Monitoring devices for temperature and relative humidity of the dry storage facilities were checked for physical condition and conformance to pertinent requirements.

#### Sieves (E11)

The physical condition of each sieve presented for inspection was noted, and a check was made to determine if the size of the opening was within the tolerances prescribed by E11.

With the exception of such omissions as may be set forth in the footnote section, the group of sieves presented for inspection contained one or more of each of the sieves listed in Specifications C441 and C778. The particular sieve numbers are: No. 4, No. 8, No. 16, No. 20, No. 30, No. 40, No. 50, and No. 100.

#### 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.

### Autoclave Soundness Apparatus (C151 and C490)

The operating characteristics of each autoclave presented for inspection were observed to determine if the autoclave was operating in general conformance to the requirements of C151. Particular attention was given to rate of heating, maintenance of test pressure, and rate of cooling; and each pressure gage was checked for conformance to the design and accuracy requirements of C151. Each length comparator and bar mold presented was checked for conformance to the design and dimensional requirements of C490 and the accuracy of indication of each comparator was checked.

### 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, C311 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. In addition, a shift test, as prescribed by NIST Handbook 44, was made at 1000 grams. 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 metric mix weights presented for inspection, if used in the normal weighing operation, were checked for conformance to the maintenance tolerances of C1005. When all the weights 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 were not required for balance operation, the reporting of balance weights will be omitted.

#### Mechanical Mixing Apparatus (C305 and C227)

Each mechanical mixer presented for inspection was checked for conformance to the requirements of C305 and C227, 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.

#### Vicat Apparatus (C187)

Each Vicat apparatus and Vicat ring presented for inspection was checked for conformance to the requirements of C187.

#### Density (C188)

The availability of an apparatus 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.

#### Curing Containers (C227, C311, and C441)

Curing containers and accessory apparatus for the test for Effectiveness of Mineral Admixture in Controlling Alkali-Silica Reactions were examined for conformance to the requirements of the specifications.

#### Effectiveness of Mineral Admixtures in Contributing to Sulfate Resistance (C311 and C1012)

Cube molds, bar molds and all other apparatus needed for use in this test are covered elsewhere in this report.

#### Loss on Ignition (C114)

The physical condition of the oven used for drying samples to constant weight was observed, and a check was made to determine that the operating temperature was maintained at 105° to 110°C.

The crucibles used in this test were checked for capacity and physical condition. The balance used was checked for conformance to the requirements of the specification. The muffle furnace was also checked for correct operating temperature range.

### 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 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 pozzolans.

### Procedures

The test methods which were observed and discussed during the inspection were as follows: Normal Consistency Test; Soundness Test by Autoclave; Preparation of Strength Activity Index with Portland Cement; Increase of Drying Shrinkage of Mortar Bars; Effectiveness of Mineral Admixture in Controlling Alkali-Silica Reactions; Air-Entrainment of Mortar; No. 325 Sieve Fineness Test; Effectiveness of Mineral Admixtures in Contributing to Sulfate Resistance; Loss on Ignition; and Density. The laboratory's conformance to specified procedures was as indicated in the summary of findings.

The procedures used in testing 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.

SUMMARY OF FINDINGS

<u>Inspection Item</u>	<u>Apparatus</u>	<u>*Status</u>
1. <u>Storage Facilities for Test Specimens</u>		
a. Moist Air Storage Facilities .....		<u>Satisfactory</u>
b. Water Storage Facilities .....		<u>Satisfactory</u>
c. Warm Storage Facilities .....		<u>-----</u>
d. Dry Storage Facilities .....		<u>-----</u>
e. Monitoring Devices for Dry Storage .....		<u>-----</u>
2. <u>Sieves</u> .....		<u>Satisfactory</u>
3. <u>Wet Sieving Apparatus</u> .....		<u>Satisfactory</u>
4. <u>Autoclave Soundness Apparatus</u>		
a. Autoclave(s):		
(1) Maker: <u>-----</u> Serial Number: <u>-----</u> .....		<u>-----</u>
(2) Maker: <u>-----</u> Serial Number: <u>-----</u> .....		<u>-----</u>
(3) Maker: <u>-----</u> Serial Number: <u>-----</u> .....		<u>-----</u>
(4) Maker: <u>-----</u> Serial Number: <u>-----</u> .....		<u>-----</u>
(5) Maker: <u>-----</u> Serial Number: <u>-----</u> .....		<u>-----</u>
b. Length Comparator(s): .....	Number Checked: <u>0</u> .....	<u>-----</u>
c. Bar Mold(s): .....	Number Checked: <u>0</u> .....	<u>-----</u>
5. <u>Graduates</u>		
(1) Capacity: <u>500 mL</u> CCRL Number: <u>J-237</u> .....		<u>Satisfactory</u>
(2) Capacity: <u>250 mL</u> CCRL Number: <u>J-238</u> .....		<u>Satisfactory</u>
(3) Capacity: <u>150 mL</u> CCRL Number: <u>K-4011</u> .....		<u>Satisfactory</u>
(4) Capacity: <u>-----</u> CCRL Number: <u>-----</u> .....		<u>-----</u>
(5) Capacity: <u>-----</u> CCRL Number: <u>-----</u> .....		<u>-----</u>
6. <u>Flow Table</u>		
a. Flow Table(s):		
(1) Maker: <u>Humboldt</u> .....		<u>Satisfactory</u>
(2) Maker: <u>-----</u> .....		<u>-----</u>
b. Accessory Apparatus: .....		<u>Satisfactory</u>

\*Entry covers availability, physical condition, and/or conformance to specification requirements. Where reference is made to a footnote in which one or more deficiencies are described, it may be concluded that the item or items in question were judged to be satisfactory in all respects other than as described in the footnote.

<u>Inspection Item</u>	<u>*Status</u>
7. <u>Compression Test Apparatus</u>	
a. Compression Testing Machine:	
(1) Maker: <u>Tinius Olsen</u>	
(2) Serial Number: <u>148710</u> (3) Capacity: <u>60,000 lbf</u>	
(4) Accuracy of Indication:	
(a) Range: <u>60,000 lbf</u> From: <u>6,000</u> to <u>35,000 lbf</u> ..	<u>Satisfactory</u>
(b) Range: _____ From: _____ to _____ ..	- - - - -
(c) Range: _____ From: _____ to _____ ..	- - - - -
(d) Range: _____ From: _____ to _____ ..	- - - - -
(e) Range: _____ From: _____ to _____ ..	- - - - -
(f) Range: _____ From: _____ to _____ ..	- - - - -
(5) Mechanical Condition .....	<u>Satisfactory</u>
(6) Design .....	<u>Satisfactory</u>
(7) Bearing Blocks .....	<u>Satisfactory</u>
b. Additional Compression Machines .....	<u>None</u>
c. Cube Molds: Number Checked: <u>28</u> .....	<u>See footnote (a)</u>
d. Tampers: .....	<u>Satisfactory</u>
8. <u>Mix Balance(s)</u>	
(1) Maker: <u>Mettler</u>	
Capacity: <u>3,100 g</u> CCRL Number: <u>M-1142</u> .....	<u>Satisfactory</u>
(2) Maker: _____	
Capacity: _____      CCRL Number: _____ .....	- - - - -
(3) Maker: _____	
Capacity: _____      CCRL Number: _____ .....	- - - - -
(4) Maker: _____	
Capacity: _____      CCRL Number: _____ .....	- - - - -
9. <u>Mix Weights</u>	
(1) CCRL Number: - - - -      Number of Weights Checked <u>- -</u> ..	- - - - -
(2) CCRL Number: _____      Number of Weights Checked _____ ..	- - - - -
(3) CCRL Number: _____      Number of Weights Checked _____ ..	- - - - -
10. <u>Mechanical Mixing Apparatus</u>	
a. Mixer(s):	
(1) Maker: <u>Hobart</u> Serial Number: <u>31-1229-744</u> ....	<u>Satisfactory</u>
(2) Maker: _____      Serial Number: _____ ....	- - - - -
(3) Maker: _____      Serial Number: _____ ....	- - - - -
b. Accessory Apparatus .....	<u>Satisfactory</u>
11. <u>Air Content Apparatus</u>	
a. 400 mL Measure(s) .....	- - - - -
b. Accessory Apparatus .....	- - - - -

<u>Inspection Item</u>	<u>*Status</u>
12. <u>Vicat Apparatus</u>	
a. Vicat Apparatus(es):	
(1) CCRL Number: <u>P-280</u> .....	<u>Satisfactory</u>
(2) CCRL Number: <u>U-2450</u> .....	<u>See footnote (b)</u>
(3) CCRL Number: _____ .....	<u>-----</u>
(4) CCRL Number: _____ .....	<u>-----</u>
b. Additional Vicat Rings: Number Checked <u>11</u> .....	<u>Satisfactory</u>
13. <u>Density</u>	
a. Density Equipment .....	<u>Satisfactory</u>
b. Accessory Apparatus .....	<u>Satisfactory</u>
14. <u>Curing Containers</u>	
a. Contributing to Sulfate Resistance .....	<u>-----</u>
b. Controlling Alkali-Silica Reactions .....	<u>-----</u>
15. <u>Loss on Ignition</u>	
a. Crucible .....	<u>Satisfactory</u>
b. Muffle Furnace .....	<u>Satisfactory</u>
c. Miscellaneous .....	<u>Satisfactory</u>
16. <u>Miscellaneous</u>	
a. Temperature of Air in Laboratory .....	<u>Satisfactory</u>
b. Relative Humidity of Air in Laboratory .....	<u>Satisfactory</u>
c. Temperature of Mixing Water .....	<u>Satisfactory</u>
d. Miscellaneous Accessory Testing Apparatus .....	<u>Satisfactory</u>
e. ASTM Standards .....	<u>Satisfactory</u>
f. Additional Observations of Interest to Laboratory .....	<u>None</u>



<u>Test</u>	<u>Procedures</u>	<u>Technique in Exact Agreement With Standard Practice</u>
	<u>Method Reference</u>	
Normal Consistency Test	C187-98	<u>Yes</u>
Soundness Test by Autoclave	C151-00, C311-02	<u>Not demonstrated</u>
Preparation of:		
Strength Activity Index with Portland Cement	C109-02, C311-02, C1437-01	<u>See footnote (c)</u>
Increase of Drying Shrinkage of Mortar Bars	C157-04, C311-02	<u>Not demonstrated</u>
Effectiveness of Mineral Admixture in Controlling Alkali-Silica Reactions	C441-02, C311-02, C1437-01	<u>Not demonstrated</u>
Effectiveness of Mineral Admixture in Contributing to Sulfate Resistance	C1012-04, C311-02	<u>Not demonstrated</u>
Air-Entrainment of Mortar	C185-02, C311-02	<u>Not demonstrated</u>
No. 325 Sieve Fineness Test	C430-96, C311-02	<u>Yes</u>
Loss on Ignition	C114-04, C311-02	<u>Yes</u>
Density	C188-95, C311-02	<u>Yes</u>
Testing of Specimens	C109-02	<u>Yes</u>

## FOOTNOTE SECTION

### Cube Molds (C109-02):

(a) Three cube molds, bearing the CCRL Numbers Y-310, Y-312 and Y-313, were found not to comply with the angular requirements of C109. It was noted that, during the course of the inspection, these cube molds were taken out of service.

### Vicat Apparatus (C187-98,C191-04, and C451-04):

(b) It was understood that the Vicat apparatus, bearing CCRL Number U-2450, was only used to determine the normal consistency; therefore, no check of the attached needle was made.

### Procedures:

(c) Preparation of Mortar Cubes (C109-02): The amount of time taken between the completion of mixing and the molding of the cubes was more than the specified 2 minutes 30 seconds required in Section 10.4.3 of C109.

## CLOSURE

This inspection was performed by the writer. While the work was in progress, many of the details covered by this report were discussed with laboratory personnel. At the conclusion of the inspection the special work sheets, on which all observations were recorded, were made available for review by members of the laboratory staff, and all of the entries thereon were discussed in detail.

Testing equipment that was used during the inspection to make temperature determinations, to determine compliance of selected apparatus to specified weights and to verify the accuracy of indication of compression testing machines is identified as follows:

Thermometers: CCRL Numbers 009-G124, 1601, S60, S108 and S114  
Test Weights: NIST Numbers 163682 and 172809  
Load Cell: Serial Number 991108

It is recommended that this report be compared with the report of the preceding inspection which was made in January 2003.

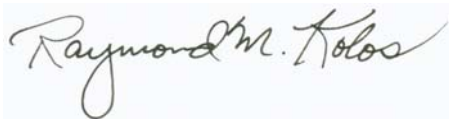
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Cement and Concrete Reference Laboratory



Nicholas R. Lang  
Inspector

Report Approved By:



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March 10, 2005

**INTRODUCTION  
TO  
REPORT ON INSPECTION  
OF  
CONCRETE TESTING LABORATORY**

This report covers an inspection, designated Inspection Number J-88, which was performed by a representative of the Cement and Concrete Reference Laboratory in the concrete testing laboratory of Oklahoma Department of Transportation, at Oklahoma City, Oklahoma, on January 28, 2005.

The report has one, two or three parts, depending on the scope of the inspection. Part I covers the inspection of concrete testing facilities; Part II, when included, covers the inspection of aggregate testing facilities; and Part III, when included, covers the inspection of the testing facilities for concrete reinforcing bars.

Each part has three sections. The first section describes the scope of the inspection. The second section contains a summary of the findings. The third section contains a series of footnotes in which departures from specification requirements, mechanical deficiencies in apparatus, and other important matters are covered in detail. In addition, there is a closure.

Several pieces of apparatus in the laboratory have been assigned CCRL identification numbers. Some of these numbers are listed in the summary and footnote sections.

In the interest of brevity, any minor adjustments of apparatus which may have been made while the inspection was in progress have not been mentioned. When necessary, additional explanatory information about the inspection will be furnished in separate correspondence.

Information concerning the qualifications of supervisory personnel is included where appropriate.

Unless otherwise indicated, the specifications and methods of test to which references are made are standards of the American Society for Testing and Materials.

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## **PART I: INSPECTION OF CONCRETE TESTING FACILITIES**

### **DESCRIPTION OF INSPECTION**

The inspection of concrete testing facilities was designed to include a review of the laboratory's quality assurance system; an examination of the apparatus prescribed for use in the methods of test for concrete indicated in Section 7.2 of ASTM C1077; an examination of the apparatus or procedures prescribed in any optional test methods presented for inspection; and an observation of the concrete test procedures required in Section 7.2 of ASTM C1077.

The ASTM Standards on which the work was based are as follows: C31/C31M-03, C39/C39M-03, C138-01, C143/C143M-03, C172-04, C173/C173M-01, C231-03, C470/C470M-02, C511-03, C617-98, C1064/C1064M-03, C1077-03, C1231/C1231M-00 and E4-03.

#### Documentation

##### Quality Assurance System (C1077)

Documentation maintained by the laboratory was reviewed for compliance with C1077 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, certification 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 C1077: personnel records of training, evaluation, experience, and education; calibrations and verifications of equipment; equipment inventory; test results; and final test reports.

The qualifications of the laboratory director were reviewed to establish that the laboratory was under the technical direction of a registered professional engineer with five years experience in construction materials testing as required by C1077.

#### Apparatus

##### Facilities for Curing Test Specimens (C31 and C511)

The availability of storage facilities for curing concrete test specimens was confirmed. Each water storage tank or moist room used was then checked for conformance to the requirements of C511.

During the examination, temperature and relative humidity readings were taken as appropriate to determine that the curing environment conformed to the requirements of applicable standards; an observation was made to determine that each specimen in storage had free water on the entire surface area; and a check was made to determine that each unit was equipped with thermostatic temperature control and a recording thermometer as required by C511. In addition, the water in the storage tanks was checked for lime saturation.

##### Compression Test Apparatus (C31, C39, C470, C617 and C1231)

Apparatus used in making compressive strength tests of concrete not covered elsewhere in this report include the cylinder molds and vibrators used in fabricating specimens, the capping equipment and materials used to obtain smooth load bearing surfaces on specimens, and the compression machine in which specimens are tested.

Cylinder Molds - Several cylinder molds of each type used by the laboratory were checked for design, dimensions, and watertightness as required by C470. Where applicable molds were also subjected to strength, elongation and absorption tests described in the specification.

Vibrators - Vibrators used in consolidating test specimens made from low-slump concrete were checked for conformance to the requirements for such devices set forth in C31.

Capping Equipment and Materials - The apparatus used in capping concrete cylinders were checked for conformance to the requirements of C617, with particular attention being given to the dimensions, planeness, surface condition, and thickness of capping plates. The preparation and use of the capping material was observed and special safety and verification apparatus were checked. In addition, the planeness and perpendicularity of the caps on several specimens were verified by the inspector.

Unbonded Caps - An alternative to the sulfur, gypsum or cement capping methods of C617 is the unbonded method described in C1231. The retaining rings and pads were checked for conformance to the design requirements of the test method. The availability of required accessory equipment to determine perpendicularity of the cylinder, to assess the planeness of cylinder ends and to saw or grind irregular end surfaces of the cylinders was checked. Where applicable, the laboratory's qualification data and calculations were reviewed to determine conformance to the requirements of the test method.

Compression Machine - Unless otherwise noted, only one testing machine was inspected. During this inspection, several of the more important mechanical and design features were noted; the design, dimensions, and surface planeness of bearing blocks used in testing concrete cylinders were checked for conformance to the requirements of C39; 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. In these tests, each load indicator was set at the zero position customarily employed by the laboratory. The selection of test points was made based on loads consistent with the range of use of the material being inspected. Test loads were approached by increasing the load from a lower load as specified in Method E4.

#### Tamping Rods (C31)

The tamping rods which were available for use in various rodding operations were checked for conformance to the design and dimensional requirements of C31.

#### Slump Cones (C143)

Each slump cone presented for inspection was checked for conformance to the design and dimensional requirements of C143, and the physical condition was observed. Comparison test records were checked for non-metallic molds.

#### Unit Weight Apparatus (C138)

The capacity of each scale or balance used in determining the unit weight of plastic concrete was recorded, and the accuracy checked for conformance to the requirements of C138. The design, dimensions, and physical condition of each unit weight measure presented for inspection were checked for conformance to the requirements of the standard; a check was made to determine that the required flat strike-off plate was available; and inquiry was made as to whether the measure had been calibrated in accordance with C29.

Apparatus for Air Content of Plastic Concrete (Volumetric Method) (C173)

At least one of the air meters used in determining the air content of concrete by the volumetric method was checked for conformance to the design requirements of C173, and observations were made to determine that the necessary funnel, strike-off bar, metal measuring cup, mallet, syringe, and tamping rod were available.

Apparatus for Air Content of Plastic Concrete (Pressure Method) (C231)

At least one of the air meters used in determining the air content of freshly mixed concrete by the pressure method was checked for conformance to the design requirements of C231, and observations were made to determine that the necessary syringe, tamping rod, mallet, and strike-off bar were available.

Temperature of Concrete (C1064)

A thermometer or other temperature measuring device typical of that used by laboratory personnel was checked for compliance to the requirements of the specification. A reference temperature measuring device and its pertinent calibration or verification records were examined.

Miscellaneous

The containers used to transport cylinders from the field to the laboratory were inspected to ensure that the cylinders were protected from damage due to jarring, freezing temperatures, and moisture loss. Also, transportation arrangements were discussed with the laboratory to determine that the time of transportation for concrete specimens did not exceed the maximum time specified.

A check was made to determine that the laboratory had been supplied with a copy of the latest edition of the ASTM Book of Standards pertaining to the testing of concrete.

Optional Methods (C1077)

At the discretion of the laboratory, selected optional test methods as set forth in Section 7.3.1 of C1077 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 concrete testing procedures which were observed and discussed during the inspection were as follows: Sampling Freshly Mixed Concrete, Slump of Concrete, Unit Weight Test, Air Content Test (Volumetric Method), Air Content Test (Pressure Method), Temperature of Concrete, and Determination of the Compressive Strength of Molded Concrete Cylinders. The review of the strength test covered fabrication of cylinders, capping, storage after capping, measurement before testing, and testing of cylinders. The laboratory's conformance to specified procedures was as indicated in the summary of findings.

All departures noted were reviewed in detail with laboratory personnel with particular attention being given to those matters described in the footnote section.

SUMMARY OF FINDINGS

<u>Inspection Item</u>	<u>Apparatus</u>	<u>*Status</u>
1.	<u>Quality System</u>	
	a. Organization .....	<u>Satisfactory</u>
	b. Human Resources .....	<u>See footnote (a)</u>
	c. Operations .....	<u>Satisfactory</u>
	d. Quality Assurance .....	<u>Satisfactory</u>
	e. Equipment .....	<u>See footnote (b)</u>
2.	<u>Curing Facilities</u>	
	a. Moist Air Storage Facilities .....	<u>Satisfactory</u>
	b. Water Storage Facilities .....	<u>Satisfactory</u>
3.	<u>Compression Test Apparatus</u>	
	a. Compression Testing Machine:	
	(1) Maker: <u>Soiltest</u>	
	(2) Serial Number: <u>8928</u> (3) Capacity: <u>600,000 lbf</u>	
	(4) Accuracy of Indication:	
	(a) Range: <u>600,000 lbf</u> From: <u>50,000</u> to <u>300,000 lbf</u> ..	<u>Satisfactory</u>
	(b) Range: _____ From: _____ to _____ ..	-----
	(c) Range: _____ From: _____ to _____ ..	-----
	(d) Range: _____ From: _____ to _____ ..	-----
	(e) Range: _____ From: _____ to _____ ..	-----
	(f) Range: _____ From: _____ to _____ ..	-----
	(5) Mechanical Condition .....	<u>Satisfactory</u>
	(6) Design .....	<u>Satisfactory</u>
	(7) Bearing Blocks for Cylinders .....	<u>See footnote (c)</u>
	b. Additional Compression Machines .....	<u>None</u>
	c. Cylinder Molds:	
	(1) Reusable Molds .....	-----
	(2) Single-use Molds .....	<u>Satisfactory</u>
	d. Capping Equipment and Materials:	
	(1) Capping Equipment .....	<u>Satisfactory</u>
	(2) Capping Material .....	<u>Satisfactory</u>
	(3) Planeness of Caps .....	<u>Satisfactory</u>
	e. Unbonded Caps:	
	(1) Retaining Rings .....	<u>Satisfactory</u>
	(2) Pads .....	<u>Satisfactory</u>
	(3) Accessory Apparatus .....	<u>Satisfactory</u>
	(4) Qualification .....	<u>Satisfactory</u>
	f. Vibrator(s) .....	<u>Satisfactory</u>

\*Entry covers availability, physical condition, and/or conformance to specification requirements. Where reference is made to a footnote in which one or more deficiencies are described, it may be concluded that the item or items in question were judged to be satisfactory in all respects other than as described in the footnote.



<u>Inspection Item</u>	<u>*Status</u>
4. <u>Slump Cone(s)</u> .....	<u>Satisfactory</u>
5. <u>Tamping Rod(s)</u> .....	<u>Satisfactory</u>
6. <u>Temperature of Concrete</u>	
a. Temperature Measuring Device .....	<u>Satisfactory</u>
b. Reference Temperature Measuring Device .....	<u>Satisfactory</u>
7. <u>Unit Weight Apparatus</u>	
a. Scale or Balance .....	<u>Satisfactory</u>
b. Unit Weight Measure(s) .....	<u>Satisfactory</u>
c. Accessory Apparatus .....	<u>Satisfactory</u>
8. <u>Air Content Apparatus (Volumetric)</u>	
a. Air Meter(s) .....	<u>Satisfactory</u>
b. Accessory Apparatus .....	<u>Satisfactory</u>
9. <u>Air Content Apparatus (Pressure)</u>	
a. Air Meter(s) .....	<u>Satisfactory</u>
b. Accessory Apparatus .....	<u>Satisfactory</u>
10. <u>Miscellaneous</u>	
a. Specimen Shipping Containers .....	<u>See footnote (d)</u>
b. Additional Observations of Interest to Laboratory .....	<u>None</u>
11. <u>Optional Methods</u> .....	<u>See footnote (e)</u>

<u>Test</u>	<u>Procedures</u> <u>Method Reference</u>	<u>Technique in Exact Agreement With Standard Practice</u>
Slump of Concrete .....	C143-03 .....	<u>Yes</u>
Unit Weight of Concrete .....	C138-01 .....	<u>Yes</u>
Air Content (Volumetric Method) .....	C173-01 .....	<u>Yes</u>
Air Content (Pressure Method) .....	C231-03 .....	<u>Yes</u>
Sampling Freshly Mixed Concrete .....	C172-04 .....	<u>Yes</u>
Measuring Temperature of Concrete .....	C1064-03 .....	<u>Yes</u>
Fabrication of Cylinders .....	C31-03 .....	<u>Yes</u>
Curing of Cylinders .....	C31-03 .....	<u>Yes</u>
Compression Test (Bonded Caps):		
a. Capping of Cylinders .....	C617-98 .....	<u>Yes</u>
b. Cylinder and Cap Measurements .....	C39-03, C617-98 .....	<u>Yes</u>
c. Testing of Cylinders .....	C39-03, C617-98 .....	<u>Yes</u>
Compression Test (Unbonded Caps):		
a. Cylinder Measurements .....	C39-03, C1231-00 .....	<u>Yes</u>
b. Testing of Cylinders .....	C39-03, C1231-00 .....	<u>Yes</u>

## FOOTNOTE SECTION

### Quality System (C1077-03):

(a) Human Resources: It was understood that the laboratory technicians had not been certified for all relevant tests required in Section 6.1 of C1077.

(b) Equipment: Verifications were not performed on single-use cylinder molds as required by Section 8.3.3 of C1077.

### Compression Testing Machine (C39-03 and E4-03):

(c) The lower solid bearing block with which the machine was equipped did not conform to the planeness requirement specified in Section 5.2 of C39.

### Miscellaneous:

(d) It was understood that, normally, laboratory personnel did not fabricate cylinders outside the laboratory; therefore, containers for transporting cylinders from the field to the laboratory were not maintained.

### Optional Methods (C1077-03):

(e) The following optional methods (ref.: Section 7.3.1 of C1077) were selected by the laboratory to be included as part of the concrete inspection: Obtaining and Testing Drilled Cores and Sawed Beams of Concrete (C42); Measuring Thickness of Concrete Elements Using Drilled Concrete Cores (C174); Making and Curing Concrete Test Specimens in the Laboratory (C192); and Resistance of Concrete to Rapid Freezing and Thawing (C666). The examination of facilities and procedures included those requirements for water storage tanks (C511) and for making concrete test specimens (C31) that apply to these tests. Except as noted below, the equipment and test procedures were found to be satisfactory.

In the test for obtaining and testing cores, reference is made to footnote (c).

## **PART III: INSPECTION OF FACILITIES FOR TESTING REINFORCING BARS**

### **DESCRIPTION OF INSPECTION**

The inspection was designed to include an examination of the apparatus and an observation of the procedures prescribed for use in the tests for reinforcing steel. The ASTM Standards on which the work was based are as follows: A370-03, A615/A615M-03, A996/A996M-03, E4-03, and E8/E8M-03.

#### Apparatus

##### Measuring Equipment

A check was made to determine if appropriate equipment was on hand for measuring the diameter, gage length, and elongation of test specimens.

##### Testing Machine (E4)

In instances where the testing machine was used for testing both concrete cylinders and reinforcing steel, checks were made to ensure that it was suitable for use in both tension and compression, and that the tension grips with which it was equipped were properly designed and in good condition.

If the machine had not been otherwise inspected, several of the more important mechanical and design features were noted, checks were made to ensure that the tension grips with which it was equipped were properly designed and in good physical condition, and the accuracy of load indication was verified. The verification tests were made using compression 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, test loads were approached by increasing the load from a lower load as specified in Method E4.

##### Bend Test Jig for Reinforcing Bars

The bend test jig for reinforcing bars was inspected for proper design. An inquiry was made to determine which bending pins were required for the reinforcing bars tested. A maximum of 14 pins would be necessary for testing bars for all sizes listed of Grades 40, 60 and 75 billet steel, Grades 50 and 60 "rail symbol" steel, Grades 50 and 60 rail steel, and Grades 40 and 60 axle steel. Only those pins consistent with the types and sizes of reinforcing bars tested were checked. The bending pins were checked for the design and size requirements of A615 and A996.

##### Weight of Reinforcing Bars

When part of the laboratory's routine testing, a check was made to determine if adequate equipment was available for determining the unit weight of reinforcing bars.

Miscellaneous

A check was made to determine if the laboratory had been supplied with copies of the latest edition of the various parts of the ASTM Book of Standards that pertain to the testing of steel reinforcing bars.

Procedures

Where possible, the tensile testing of a test specimen and the bending of a test specimen were observed.

SUMMARY OF FINDINGS

<u>Inspection Item</u>	<u>Apparatus</u>	<u>*Status</u>
1. <u>Measuring Equipment</u>		
a. Hand Tools .....		<u>Satisfactory</u>
2. <u>Testing Apparatus</u>		
a. Testing Machine:		
(1) Maker: <u>Tinius Olsen</u>		
(2) Serial Number: <u>76235</u>	(3) Capacity: <u>300,000 lbf</u>	
(4) Accuracy of Indication:		
(a) Range: <u>300,000 lbf</u> From: <u>50,000</u> to <u>250,000 lbf</u> ..		<u>Satisfactory</u>
(b) Range: _____ From: _____ to _____ ..		<u>-----</u>
(c) Range: _____ From: _____ to _____ ..		<u>-----</u>
(d) Range: _____ From: _____ to _____ ..		<u>-----</u>
(e) Range: _____ From: _____ to _____ ..		<u>-----</u>
(f) Range: _____ From: _____ to _____ ..		<u>-----</u>
(5) Mechanical Condition .....		<u>Satisfactory</u>
(6) Tension Grips .....		<u>Satisfactory</u>
(7) Additional Testing Machines .....		<u>None</u>
(8) Tensile Test Demonstration .....		<u>Satisfactory</u>
b. Bend Test Jig for Steel Reinforcing Bars:		
(1) Mechanical Condition .....		<u>See footnote (a)</u>
(2) Bending Pins:		
(a) Billet Steel .....		<u>See footnote (a)</u>
(b) Rail Steel .....		<u>See footnote (a)</u>
(c) Axle Steel .....		<u>See footnote (a)</u>
(3) Additional Bend Test Jigs .....		<u>None</u>
(4) Bending Test Demonstration .....		<u>Not demonstrated</u>
3. <u>Weight of Reinforcing Bars</u>		
a. Weighing Equipment .....		<u>Satisfactory</u>
4. <u>Miscellaneous</u>		
a. ASTM Standards .....		<u>Satisfactory</u>
b. Additional Observations of Interest to Laboratory .....		<u>See footnote (b)</u>

\*Entry covers availability, physical condition, and/or conformance to specification requirements. Where reference is made to a footnote in which one or more deficiencies are described, it may be concluded that the item or items in question were judged to be satisfactory in all respects other than as described in the footnote.

## FOOTNOTE SECTION

### Bend Test Jig for Steel Reinforcing Bars (A370-03, A615-03 and A996-03):

(a) A bend test jig and the related bending pins were not presented for inspection. It is understood that, customarily, the laboratory does not perform bend tests on reinforcing bars.

### Miscellaneous:

(b) Inasmuch as the equipment and procedures for testing concrete aggregates are examined by the AASHTO Materials Reference Laboratory (AMRL), no inspection of this equipment was performed by the CCRL representative. Therefore, with reference to paragraph two of the Introduction, this report has only two parts.

## CLOSURE

This inspection was performed by the writer. While the work was in progress, many of the details covered by this report were discussed with laboratory personnel. At the conclusion of the inspection the special work sheets, on which all observations were recorded, were made available for review by members of the laboratory staff, and all of the entries thereon were discussed in detail.

Testing equipment that was used during the inspection to make temperature determinations and to verify the accuracy of indication of compression testing machines is identified as follows:

Thermometers: CCRL Numbers 009-G124, S108 and S114  
Load Cell: Serial Number 961015C

It is recommended that this report be compared with the report of the preceding inspection which was made in January 2003.

This report is not to be used for advertising, publication, or promotional purposes.

Cement and Concrete Reference Laboratory



Nicholas R. Lang  
Inspector

Report Approved By:

