



**CCRL**  
Cement and Concrete  
Reference Laboratory

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October 26, 2009

Dr. Stacy Williams  
Director of CTPP  
University of Arkansas  
700 Research Center Boulevard  
Fayetteville, Arkansas 72701

Subject: Inspection of Concrete Testing Laboratory

Dear Dr. Williams:

Enclosed is a confirmatory report on Inspection Number D-217, which was completed in your testing laboratory at Fayetteville, Arkansas, on September 15, 2009, by a representative of the Cement and Concrete Reference Laboratory.

This letter, and the accompanying report, provide written evidence that your laboratory has been inspected during the 34<sup>th</sup> Inspection Tour.

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

Very truly yours,

Steven E. Lenker, P.E.  
Director, Construction Materials Reference Laboratories  
Cement and Concrete Reference Laboratory  
Materials and Construction Research Division  
Building and Fire Research Laboratory

Enclosure

cc: F. Griffith



October 26, 2009

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

This report covers an inspection, designated Inspection Number D-217, which was performed by a representative of the Cement and Concrete Reference Laboratory in the concrete testing laboratory of University of Arkansas, at Fayetteville, Arkansas, on September 15, 2009.

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.

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

Copies of this report, or parts thereof, are not to be used for promotional purposes.

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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-08a, C39/C39M-05, C138-08, C143/C143M-08, C172-08, C173/C173M-08, C231-08b, C470/C470M-02a, C511-06, C617-98, C1064/C1064M-05, C1077-07a, C1231/C1231M-08 and E4-07.

#### 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>Satisfactory</u>
c. Operations .....		<u>Satisfactory</u>
d. Quality Assurance .....		<u>Satisfactory</u>
e. Equipment .....		<u>Satisfactory</u>
2. <u>Curing Facilities</u>		
a. Moist Air Storage Facilities .....		<u>- - - - -</u>
b. Water Storage Facilities .....		<u>Satisfactory</u>
3. <u>Compression Test Apparatus</u>		
a. Compression Testing Machine:		
(1) Maker: <u>Forney</u>		
(2) Serial Number: <u>95037</u>	(3) Capacity: <u>400,000 lbf</u>	
(4) Accuracy of Indication:		
(a) Range: <u>400,000 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) Design .....		<u>Satisfactory</u>
(7) Bearing Blocks for Cylinders .....		<u>Satisfactory</u>
b. Additional Compression Machines .....		<u>None</u>
c. Cylinder Molds:		
(1) Reusable Molds .....		<u>- - - - -</u>
(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) Condition 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>- - - - -</u>
f. Vibrator(s) .....		<u>- - - - -</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 (a)</u>
b. Additional Observations of Interest to Laboratory .....	<u>None</u>
11. <u>Optional Methods</u> .....	<u>None</u>

<u>Test</u>	<u>Procedures</u> <u>Method Reference</u>	<u>Technique in Exact Agreement With Standard Practice</u>
Slump of Concrete .....	C143-08 .....	<u>Yes</u>
Unit Weight of Concrete .....	C138-08 .....	<u>Yes</u>
Air Content (Volumetric Method) .....	C173-08 .....	<u>Yes</u>
Air Content (Pressure Method) .....	C231-08b .....	<u>Yes</u>
Sampling Freshly Mixed Concrete .....	C172-08 .....	<u>Yes</u>
Measuring Temperature of Concrete .....	C1064-05 .....	<u>Yes</u>
Fabrication of Cylinders .....	C31-08a .....	<u>Yes</u>
Curing of Cylinders .....	C31-08a .....	<u>Yes</u>
Density of Cylinders .....	C39-05 .....	<u>Not demonstrated</u>
Compression Test (Bonded Caps):		
a. Capping of Cylinders .....	C617-98 .....	<u>Yes</u>
b. Cylinder and Cap Measurements .....	C39-05, C617-98 .....	<u>Yes</u>
c. Testing of Cylinders .....	C39-05, C617-98 .....	<u>Yes</u>
Compression Test (Unbonded Caps):		
a. Cylinder Measurements .....	C39-05, C1231-08 .....	<u>Yes</u>
b. Testing of Cylinders .....	C39-05, C1231-08 .....	<u>Yes</u>

## FOOTNOTE SECTION

### Miscellaneous:

(a) **Informational Footnote:** 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.



## 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.

Identification of the testing equipment used by the CCRL inspector during the inspection can be found on the CCRL website at [www.ccrl.us](http://www.ccrl.us) under the heading of traceability.

It is recommended that this report be compared with the report of the preceding inspection which was made in May 2007.

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

Cement and Concrete Reference Laboratory



Guy D. Trease  
Inspector

Report Approved By:

