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## Cement Laboratory Inspection Checklist

It is advised that a careful review of the following criteria be undertaken by the laboratory personnel who will be taking an active role in the inspection.

### Scope of Inspection

The inspection covers the demonstration of each test method presented and a review of the equipment associated with each test. The laboratory is not required to present all test methods.

The following ASTM test methods are included during a CCRL Cement Inspection:

- C109 Compressive Strength of Hydraulic Cement Mortars
- C114 Chemical Analysis of Hydraulic Cement
- C114 Loss on Ignition
- C151 Autoclave Expansion of Hydraulic Cement
- C183 Sampling and the Amount of Testing of Hydraulic Cement
- C185 Air Content of Hydraulic Cement Mortar
- C187 Amount of Water Required for Normal Consistency
- C188 Density of Hydraulic Cement
- C191 Time of Setting of Hydraulic Cement by Vicat Needle
- C204 Fineness of Hydraulic Cement by Air-Permeability Apparatus
- C230 Flow Table for Use in Tests of Hydraulic Cement
- C266 Time of Setting of Hydraulic-Cement Paste by Gillmore Needles
- C305 Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency
- C430 Fineness of Hydraulic Cement by the 45- $\mu\text{m}$  (No. 325) Sieve
- C451 Early Stiffening of Hydraulic Cement (Paste Method)
- C490 Use of Apparatus for the Determination of Length Change of Hardened Cement Paste
- C511 Mixing Rooms, Moist Cabinets, Moist Rooms, Water Storage Tanks, and Mix Water
- C778 Standard Sand
- C1005 Reference Masses, Graduated Cylinders, and Balances
- C1437 Flow of Hydraulic Cement Mortar
- C1506 Water Retention of Hydraulic Cement-Based Mortars and Plasters
- C1222 Standard Practice for Evaluation of Laboratories Testing Hydraulic Cement

There are various additional test methods (listed on the request form) that the laboratory may wish to add on to the scope of their inspection. Any additional tests that the laboratory might wish to include for inspection should be clearly conveyed to the inspector **prior to the scheduled inspection date.**

### How to Prepare for Your Inspection

- The laboratory should be prepared to mix fresh material to demonstrate each test, fill and operate the autoclave with dummy bars, and have a cured cube ready to break.

- Equipment should be clean and free of debris from laboratory testing, in working order, and in an accessible location. Any equipment that requires calibration/verification should be marked with accurate identification numbers.
- The demonstrations of these procedures should be made in accordance with the requirements of the applicable **ASTM test methods**, and **special laboratory practices should be avoided**.
- The following checklists are not all inclusive and should be used along with careful review of the applicable standards to prepare the laboratory for the cement inspection.

*Those pieces of equipment which the laboratory would like to present for inspection should be cleaned, in working order, and in an accessible location for the inspector's examination. Have the following equipment ready and available:*

	Flow Table (C230)	Indicate location of flow table and all accessories. Cam shaft must be accessible to inspector during the inspection.
	Loss on Ignition (C114)	Indicate location of muffle furnace and balance. Present appropriate crucible for material type(s) presented.
	Density (C188)	Present a Le Chatelier flask, Stereopycnometer, or other apparatus. Indicate the location of kerosene or naphtha.
	Air Fineness (C204)	Indicate the location of all CCRL-verified apparatus and cells. New apparatus should be made available and identified. Present all accessories such as filter papers, disk, etc.
	Air Content (C185)	Indicate the location of all 400 mL cylindrical measures and accessories.
	Water Retention Apparatus (C1506)	Indicate location of apparatus and all CCRL-verified dishes. New dishes should be made available and identified.
	Wet Sieve Apparatus (C430)	The spray nozzle and pressure gauge should be easily removable by the inspector for verification. Be prepared to assist with removal if necessary. Present all # 325 sieves with appropriate correction factors for review.
	Autoclave (C151)	The inspector will need to place a thermocouple probe in the autoclave thermometer access hole during operation. The inspector will observe heating, cycling, and cooling.
	Bar and Cube Molds (C151, C109)	Clean cube molds, assemble halves, and remove them from base plates. Bar molds should be assembled with gauge studs.
	Graduates, Balances, and Scales (C1005)	All CCRL marked test graduates should be available. New graduates should be made available and identified, unless the laboratory weighs water for testing. Please indicate the location of all balances and/or scales used.
	Vicat, Gillmore, Normal Consistency (C187, C191, C266)	All Vicat rings, Vicat apparatuses, and Gillmore apparatuses should be available.

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	Standard Sands (C778)	Splitter with appropriate feeder and pans and all specified sieves should be available.
	Compressive Strength (C109)	Compression machine should be in safe operating condition.
	Mix Water, Work Room, and Moist Storage (Cabinet, Room, and/or Tanks) (C511)	Moist/water storage facilities should be in operating order for the inspection. Indicate to the inspector where the temperature recorder(s) is located, as well as retained records for weekly data evaluations. Specimens for demonstration should stay in appropriate storage until testing. The inspector will also monitor the temperature and humidity of the work room. Make available a reference thermometer with accompanying calibration paperwork.

***Be prepared to demonstrate the following procedures:***

	Normal Consistency, Time of Set (C305, C187, C191 and/or C266)	Mix fresh cement and prepare a Normal Consistency, Vicat sample, and/or Gillmore pat, as desired.
	Molding of Cube Specimens (C109, C305, and C1437)	Mix fresh mortar, perform flow procedure, and make one full set of cubes. If an alternative tamping method is presented, qualification records must also be presented.
	Autoclave Testing (C151, C305, C490)	Leftover cement from Normal Consistency test may be used as applicable to make a bar. Fill and operate autoclave at the inspector's direction.
	Testing of Compressive Strength (C109)	Break one cube.
	Water Retention (C305, C1437, C1506)	Mix material, perform flows and fill the dish as required under working vacuum.
	Air Content (400 mL) (C185)	Mix material, run flow, fill measure per the standard.
	Fineness of Cement (C430 and/or C204)	Test materials per the standard.
	Loss on Ignition (C114)	Be prepared to measure and ignite a sample per the standard.
	Density (C188)	Perform test per the standard.
	Early Stiffening (C451)	Mix material and perform test within the specified time limit.

**C1222 Quality System Requirements:**

	Organization	Quality System manual should be made available, including information on the organization and management structure.
	Human Resources	Training and evaluation records for each technician, biographical sketches for laboratory personnel.
	Operations	Procedures as they pertain to materials testing, and a copy of a materials report as it would be issued to a client, and/or a mill cert, when applicable.
	Quality	Written procedures and policies, Proficiency Sample Program records, internal reviews, and current ASTM methods.
	Equipment	A current inventory with appropriate records. The inspector will review all calibration/verification records for all equipment requiring calibration/verification. Have current and previous records available for review.
	Qualification of Methods for Chemical Testing (C114)	Qualification records for each technician, and each rapid and wet method using a CRM.