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## BUILDINGS BULLETIN 2009-014

### Technical

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**Supersedes:** None

**Issuer:** Fatma M. Amer, P.E.  
First Deputy Commissioner

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**Purpose:** To evaluate the condition of the concrete in structures where the testing performed on the concrete by the testing laboratory has been identified as questionable, and thus must be supplemented by additional testing and evaluation.

<b>Related Code</b>	AC 28-116.2.2	BC 1713.1	ACI 214.4R-03
<b>Section(s):</b>	AC 27-607(a)	BC 1905.6	ASTM C803-03 ASTM C805-08

**Subject(s):** Concrete, testing, licensed concrete testing laboratories, evaluation of structures

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Where the validity of test results required by the 2008 NYC Construction Codes or the 1968 Building Code performed by a concrete testing laboratory is called into question, additional testing and evaluation shall be required. In accordance with AC 28-116.2.2, and BC 1713.1, the following procedures shall be followed when the Department determines that a structure must comply with this Buildings Bulletin.

**Procedure:**

**1. Identification of structures**

**1.1.** The Department of Buildings (DOB) will identify the structures where the concrete testing reports of concrete cylinder tests performed per BC 1905.6 or 27-607(a) have been called into question. Such structures shall follow this Buildings Bulletin to evaluate the acceptability of the strength of the concrete as specified in the approved design documents.

**1.2.** DOB will provide the Building Owner (Owner) with available information regarding specific structures.

**2. The Owner shall obtain the services of a qualified Professional Engineer licensed and registered in the State of New York (PE) to assess the concrete used in the structure based on this Buildings Bulletin. The PE shall be acceptable to DOB.**

**3. Assessment by the PE**

**3.1. Visual inspection** – A general visual inspection of the concrete construction for signs of structural deficiencies shall be performed by the PE.

**3.2. Review of existing information.** The PE shall perform a review of the existing information available, including:

- 3.2.1. Review of existing test reports and inspection reports
- 3.2.2. Review of information provided by DOB or other governmental entities
- 3.2.3. Review of the approved design documents

### **3.3. Initial Structural Analysis**

**3.3.1.** The PE shall perform an analysis of the existing concrete structural elements based on the review of existing information required by section 3.2. The initial structural analysis shall determine:

- 3.3.1.1. Identification of areas where low strength test results identified in section 3.2 cannot be accepted by structural analysis.
- 3.3.1.2. Identification of concrete Critical Structural Members. Critical Structural Members are elements that support in aggregate more than 15% of the total building area.

**3.4. Testing requirements. Testing shall be performed by a licensed concrete testing laboratory (Lab) in good standing with DOB under the direction of the PE, and shall comply with Sections 3.4.1 through 3.4.2:**

**3.4.1. Testing per ACI 214.4R-03** -Testing shall be performed per ACI 214.4R-03 "Guide to Obtaining Cores and Interpreting Compressive Strength Results" by the American Concrete Institute with the following stipulations:

- 3.4.1.1. There shall be separate categories of concrete for the following:
  - 3.4.1.1.1. Each ultimate compressive strength (4000 psi, 5000 psi, 6000 psi, etc.)
  - 3.4.1.1.2. Each supplier for the project.
  - 3.4.1.1.3. Each mix containing different materials.
- 3.4.1.2. Separate categories shall be established for horizontally cast concrete conditions (such as slabs and beams) and vertically cast concrete conditions (such as columns and walls). For each category and condition of concrete, core samples shall be taken randomly throughout the structure.
- 3.4.1.3. Number of core samples. The number of core samples shall be as per ACI 214.4R-03 Table 2.1 and Equation 3-1, but not less than five core samples for each category and condition of concrete.
- 3.4.1.4. Non-destructive test methods. Non-destructive test methods (such as Penetration Tests performed in accordance with ASTM C805, and Rebound Hammer Tests performed in accordance with ASTM C803), correlated to the results of the core sampling and testing may be included in the PE's assessment and can be used to verify the condition of the concrete relative to the core sampling.
- 3.4.1.5. Number of Tests. The number of tests performed on the concrete, including both core sampling and non-destructive testing, shall not be less than one test per 10,000 square feet of floor area of the structure. In no event shall the number of core samples be less than that specified in section 3.4.1.3.
- 3.4.1.6. Concrete on Metal Deck. For concrete placed on metal decking, the total number of tests performed, including both core sampling and non-destructive testing, shall not be less than one test per every other floor of the structure. In no event shall the number of core samples be less than that specified in section 3.4.1.3.

**3.4.1.7. Existing Structures.** At the request of the PE, the Department may consider on a case-by-case basis the substitution of non-destructive test methods for a portion of the core samples in structures that have been loaded and occupied.

**3.4.1.8. Other Tests.** At the request of the PE, the Department may consider on a case-by-case basis the substitution of test methods other than those described in this Buildings Bulletin in lieu of the non-destructive tests described in section 3.4.1.4 provided the other tests are correlated to the results of the core sampling and testing required by section 3.4.1.3.

**3.4.2. Additional Testing.** In addition to the testing specified in section 3.4.1, testing shall be performed in accordance with the following:

**3.4.2.1. Testing of low-strength test results** Areas where strength test results identify concrete of strength lower than what can be accepted based on the analysis set forth in section 3.3 shall be investigated by taking core samples from the area represented by the original compression tests.

**3.4.2.2. Testing of Deficiencies identified by Visual Inspection.** Areas where deficiencies are identified in the visual inspection set forth in section 3.1 shall be investigated by taking core samples from the area represented by the deficiencies.

**3.4.2.3. Testing of Critical Structural Members.** For each concrete Critical Structural Member, core samples shall be taken from Critical Structural Members as determined in section 3.3.

**4. Analysis of testing.** The PE shall determine an equivalent  $f'c$  value per ACI 214.4R-03 Section 8.4.1 (Tolerance Factor Approach) or Section 8.4.2 (Alternate Approach). The PE shall analyze the results of testing against criteria for acceptance based upon the approved design documents and/or structural analysis performed in accordance with the New York City Building Code.

**4.1.** The confidence level to be used in determining the lower boundary of the equivalent value of  $f'c$  shall be 90%

**4.2.** The confidence level to be used in determining the lower boundary of the equivalent value of  $f'c$  for concrete on metal decking shall be permitted to be 75%.

**4.3.** Any additional inspection and testing required shall be performed in accordance with section 3, and the New York City Building Code.

**5. Reporting of Results.** The PE shall report the results of the assessment to the Owner and DOB. All test results shall be reported, and the method of randomly selecting test locations shall be identified. The assessment report shall conclude one of the following:

**5.1. The concrete meets the strength requirements specified in the design documents.**

**5.2. The concrete does not meet the strength requirements specified in the design documents, however the equivalent concrete strength was found acceptable based on structural analysis of the affected areas.**

**5.3. The concrete does not meet the strength requirements specified in the design documents, remedial work is to be performed in accordance with plans to be filed with DOB, or the relevant government entity for structures outside DOB's jurisdiction.**

**6. Final Analysis Report.** The report of the completed assessment (Report) shall be filed with DOB by the PE.

**6.1.** The Report of the assessment results shall be filed by the PE by the submission of a CCD1 "Construction Code Determination" form to DOB. Plans for any remedial actions necessary or amendments to the original design drawings required shall be filed with DOB as either post-approval amendments or separate alteration applications.