

SECTION 03 08 13

AD-2: Section 03 08 13: Change Section Title.

CONCRETE TESTING AND EVALUATION - CONTRACTOR (Revised AD-2) ~~CONCRETE TESTING AND EVALUATION - BNL~~

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Test concrete materials and inspect operations as work progresses. Failure to detect defective work or material shall not prevent later rejection when such defect is discovered nor shall it obligate Architect/Engineer for final acceptance.
- B. Payment for testing:
 - 1. Pay for testing services required in paragraph "Responsibilities and Duties of Contractor":

AD-2: Section 03 08 13: Revise paragraph 1.1.2.

- 2. Routine testing of concrete furnished to job site for compliance with Contract Documents will be performed by ~~BNL's Contractor's~~ testing agency at ~~BNL's Contractor's~~ expense:
 - a. Routine testing consists of tests for compressive strength, slump, air, temperature and unit weight.
 - b. Tests shall be performed every 75 YD³ or fraction thereof, for each mixture design placed in one day.
 - c. Composite samples shall be obtained in accordance with ASTM-C172. Obtain each sample from a different batch of concrete on a random basis. Test batch shall be selected at random before commencement of concrete placement.
 - d. Agency shall mold and cure 6 (six) specimens from each sample in accordance with ASTM-C31 and report deviations from requirements, if any.
 - e. Specimens shall be tested in accordance with ASTM-C39. A Minimum of two specimens tested at 28 days for acceptance and one at 7 days for information shall constitute a single test. Acceptance test results shall be average of strengths of two specimens tested at 28 days.

1.2 QUALITY ASSURANCE

- A. Standards:
 - 1. ASTM-C31: Standard Practice for Making and Curing Concrete Test Specimens in Field.
 - 2. ASTM-C42: Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
 - 3. ACI 318: Building Code Requirements for Structural Concrete and Commentary.
 - 4. ASTM-E329: Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.
- B. Contractor's testing agency:
 - 1. Qualifications: Acceptable to Architect/Engineer, with evidence of recent inspection by Cement and Concrete Reference Laboratory of National Institute of Standards and Technology and of having corrected deficiencies noted, and meet requirements of ASTM E 329.
 - 2. Authority: Agency and its representatives are not authorized to revoke, alter, relax, enlarge or release any requirement of Contract Documents, nor to approve or accept portion of Work.

~~Brookhaven National Lab~~ ~~Brookhaven National Lab~~
~~Interdisciplinary Science Building~~ ~~Interdisciplinary Science Building - May 7, 2010~~ ~~May 7, 2010~~
~~CONCRETE TESTING AND EVALUATION - CONTRACTOR (Revised AD-2)~~ ~~CONCRETE TESTING AND EVALUATION -~~
~~BNL~~

1.3 SUBMITTALS

- A. Project information:
 - 1. Contractor's testing agency qualifications.
 - 2. Production sample test reports (when required): Include same data as for mix designs.
 - 3. Reports of Contractor-optional tests.
 - 4. Test reports on in-place testing, if such testing is performed.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 RESPONSIBILITIES AND DUTIES OF CONTRACTOR

- A. Provide necessary testing services for qualification of proposed materials and establishment of mix designs. Services performed by Contractor's testing agency.
- B. Submit concrete materials and concrete mix designs proposed for use. Include results of testing performed to qualify materials and to establish mix designs. Place no concrete until Contractor has received approval in writing. See submittals paragraph.
- C. Use of testing service shall in no way relieve Contractor of responsibility to furnish materials and construction in full compliance with Contract Documents.
- D. To facilitate testing and inspection:

AD-2: Section 03 08 13: Revise paragraphs 3.1.D.1. thru 3.1.D.3.

- 1. Provide notice to ~~BNL-Contractor~~ and ~~BNL's-Contractor's~~ testing and inspections agency of intended dates of concrete placement at least 2 weeks prior to placement.
- 2. Furnish labor to assist ~~BNL's-Contractor's~~ testing agency in obtaining and handling samples at site or other sources of materials.
- 3. Advise ~~BNL's-Contractor's~~ testing agency sufficiently in advance of operations to allow for completion of routine testing and for assignment of personnel.
- 4. Provide and maintain adequate facilities for safe storage and proper curing of concrete compressive strength test specimens on site for first 8 HR or until they gain sufficient strength, as required by ASTM-C31.

AD-2: Section 03 08 13: Revise paragraph 3.1.E.

- E. Pay for following additional testing services to be performed by ~~BNL's-Contractor's~~ testing agency, on occasions indicated:
 - 1. Additional testing and inspection, whenever changes in materials or proportions are requested by Contractor.
 - 2. Additional testing of materials or concrete, whenever they fail by test or inspection, to meet specification requirements.
 - 3. Other testing services needed or required by Contractor, such as:
 - a. Additional field cured test specimens as needed for control of work by Contractor such as, when concrete may be stripped, reshored, unshored, post-tensioned, etc.

3.2 EVALUATION AND ACCEPTANCE OF COMPRESSIVE STRENGTH TEST RESULTS

- A. Evaluate test results for standard molded and cured test cylinders separately for each concrete mix design. For evaluation of potential strength and uniformity, each mix design shall be represented by at least five tests.

- B. Strength level of concrete will be considered acceptable so long as averages of sets of three consecutive strength test results equal or exceed specified strength ($f'c$) and no individual strength test result falls below specified strength ($f'c$) by more than 500 PSI.

3.3 TESTING CONCRETE IN PLACE

- A. When compressive strength tests indicate potential strength deficiency of in-place concrete, testing of concrete in place may be required as an aid in evaluating actual strength. If required, Contractor shall pay for concrete tests and engineering time and analysis required to evaluate actual in-place concrete strength made necessary by deficient strength cylinder tests.
- B. Testing by rebound hammer, ultrasonic, or other non-destructive device: Such tests shall be used to determine relative strengths at various locations in structure as an aid for selecting areas to be cored. Such tests, unless properly calibrated and correlated with other test data, will not be used as a basis for acceptance or rejection.
- C. Core tests: Obtain and test largest practical diameter cores, 2 IN minimum, in accordance with ASTM-C42. If concrete in structure will be dry under service conditions, air dry cores temperature 60 to 80 degF, relative humidity less than 60 percent for 7 days before test. Test dry. If concrete in structure will be more than superficially wet under service conditions, test cores after moisture conditioning:
 - 1. Take at least three representative cores from each member or area of concrete in place that is considered potentially deficient in strength. Location will be determined by Architect/Engineer. If, before testing, one or more of cores indicates evidence of having been damaged subsequent to or during removal from structure, replace it.
 - 2. Concrete in area represented by a core test will be considered acceptable if average strength of cores is equal to at least 85 percent of, and if no single core is less than 75 percent of, specified strength ($f'c$).
 - 3. Fill core holes with low slump patching compound per Section 03 35 00.

3.4 ACCEPTANCE OR REJECTION OF CAST-IN-PLACE CONCRETE

- A. General:
 - 1. Completed concrete work which conforms to applicable requirements of Contract Documents will be accepted without qualification.
 - 2. Concrete work which fails to conform to one or more requirements of Contract Documents is rejected and will not be accepted until remedied in accordance with 3.4 B, 3.4 C, and 3.4 D.
 - 3. Contractor pays costs incurred in providing remedial work necessary to change rejected work to accepted work. Remedial work includes, but is not necessarily limited to, applicable repairs, replacement, reinforcement, engineering, and testing as denoted in following paragraphs.
- B. Dimensional tolerances:
 - 1. Formed surfaces resulting in concrete outlines smaller than permitted by tolerances are potentially deficient in strength and subject to provisions of Paragraph 3.4 D.
 - 2. Formed surfaces resulting in concrete outlines larger than permitted by tolerances will be rejected if strength or finish of structure is not acceptable, or function is adversely affected. Otherwise members will be accepted. If surfaces are rejected, and removal of excess material is permitted, repair of surfaces in an approved manner will constitute acceptance. If surfaces are rejected, and removal of excess material is not permitted, replacement of member(s) in an approved manner will constitute acceptance.
 - 3. Concrete member(s) cast in wrong location will be rejected if strength or finish is not acceptable, function of Building or Structure is adversely affected as determined by the Architect or Engineer or they interfere with other construction. Otherwise, member(s) will be accepted. If they are rejected, replacement of member(s) in an approved manner and in conformance with Contract Documents will constitute acceptance.

4. Inaccurately formed concrete surfaces that exceed limits of tolerances or are exposed to view will be rejected. Repair of surfaces or replacement of member(s) in an approved manner and in conformance with Contract Documents will constitute acceptance.
- C. Finish:
1. Slabs:
 - a. Finished slabs exceeding tolerance limits of Section 03 35 00 will be rejected if finish is not acceptable and function is adversely affected. If rejected, repair of finished surfaces or replacement of slab in an approved manner and in conformance with Contract Documents will constitute acceptance.
 - b. Repair may involve removing high spots with a terrazzo grinder, filling low spots with a patching compound, or other remedial measures as permitted.
 2. Formed surfaces:
 - a. Concrete exposed to view with defects which adversely affect appearance of specified finish will be rejected. Repair of surface defects in conformance with Section 03 35 00 will constitute acceptance.
- D. Strength of structure:
1. Strength of structure in place will be considered potentially deficient and will be rejected if it fails to comply with requirements which control strength of structure, including but not necessarily limited to following:
 - a. Deficient concrete strength based on compressive strength tests.
 - b. Reinforcing steel size, quantity, strength, position, or arrangement at variance with requirements on reinforcement.
 - c. Concrete which differs from required dimensions or location in such a manner as to reduce strength.
 - d. Curing less than that specified, likely to result in deficient concrete strength.
 - e. Inadequate protection of concrete from extremes of temperature during early stages of hardening and strength development.
 - f. Mechanical injury, construction fires, accidents or premature removal of formwork likely to result in deficient strength.
 - g. Substandard workmanship likely to result in deficient strength.
 2. When strength of structure is considered potentially deficient and is rejected, it will not be accepted until one of following remedies is completed. All proposed fixes to repair deficient concrete should be submitted by Contractor to Engineer for review and approval prior to any action by Contractor:
 - a. Confirmation of safety of structure by structural analysis. Submit signed and sealed calculations by a Professional Engineer registered in the State of New York.
 - b. Core tests per 3.3 C. Performed only when concrete strength is potentially deficient, and when safety of structure is not confirmed by structural analysis. Do not use if impractical to obtain or not feasible.
 - c. Confirmation of safety of structure by load tests performed and evaluated in accordance with ACI 318. Do not use if impractical to perform or not feasible.
 - d. Replacement of structure deficient in strength.
 - e. Subject to functional feasibility and BNL's approval, structure deficient in strength may be reinforced with supplement supports as directed by Architect.

END OF SECTION