

NYC CONCRETE PRODUCERS QUALITY CONTROL / QUALITY ASSURANCE PLAN MINIMUM STANDARDS

(The following are excerpts from NRMCA Quality Control Manual, Section 1.
This manual will be the basis for the minimum standards of a QC/QA Plan.)
(EXCEPT FOR CHANGES TO THE MANUAL AS INDICATED HERE IN RED)

1. INTRODUCTION (As written in the manual)

2. COMPANY POLICY REGARDING QUALITY CONTROL

2.1 TARGET QUALITY

This requires management's commitment to a prescribed and desired level of product quality. The decision making process regarding selection of materials to be used in the production of concrete must include the willingness to maintain product quality regardless of the competitive pressures.

2.2 PERSONNEL POLICIES

Qualified personnel must be in place for the operation of plants and trucks, including production and delivery. They should have the ability to comprehend the effects of various factors on concrete quality to be able to make the right decisions in problem situations. Personnel should be trained to control concrete quality within their various job assignments. Training sessions and seminars are necessary to ensure that each person gets the information needed to perform his or her job effectively. The commitment to this training and personnel selection is a further reflection of a producers' commitment to product quality.

2.3 SELECTION AND MAINTENANCE OF PLANT EQUIPMENT

Investment in the best available plant and truck equipment and its maintenance will govern the capability of an operation to consistently put out a quality product. Full automation and recordation is a minimum standard. Complete physical separation and proper identification is required in the handling of aggregates, admixes, cement, fly ash, granulated slag and other supplementary cementitious materials. The more extensive the storage and separation capabilities, the greater ability to prevent accidental misuse and errors regarding the use of the incorrect materials for the many mixes used.

2.4 MATERIALS SELECTION

Selection of materials strictly based on economy and with disregard to evidence of variable or inferior quality is counterproductive to quality control. A poor quality cement or aggregate may eventually turn out to produce highly variable concrete strengths and unexplained erratic water demand.

2.5 MIX PROPORTIONS

The concrete producer shall provide the mix designs based on Section 5.3 of ACI 318-05 "Proportioning on the basis of field experience or trial mixes" in accordance with the project requirements.

3. THE SCOPE OF QUALITY CONTROL ACTIVITIES

Quality Control activities include:

- sampling and testing of concrete and concrete materials;
- plant and field control of concrete production
- evaluation and procurement of new equipment and tools to improve quality
- concrete mixture optimization
- research and development testing
- specification review' evaluation of concrete performance; and
- failure analysis and prevention
- **minimum batch plant testing and inspection requirements that are subject to audit and verification as outlined in the "QUALITY CONTROL CHECKLIST MINIMUM STANDARDS"**

4. QUALITY CONTROL ORGANIZATION AND STAFFING

4.1 BASIC QUALITY CONTROL STAFF

Concrete Producing Facilities shall employ Certified Quality Control Personnel to perform the following minimum activities: sampling and testing of concrete and concrete materials; plant and field control of concrete production; evaluation of concrete performance; failure analysis and prevention. Field Technicians shall be certified ACI Grade I Field Testing technicians. Laboratory technicians shall be certified through ACI Laboratory Certification Program, Concrete Laboratory Testing Technician Grades I and II. Responsibilities include sampling and testing of concrete, and control of production at the plant and in the field. Some sampling and testing functions may be performed by a **certified AAP laboratory accredited in concrete and aggregate testing.**

4.2 CENTRAL LABORATORY

Staffed by qualified and sufficiently certified personnel, it includes testing facilities which permit a wide range of in-house testing of concrete and concrete materials. It will include some or all of the advanced testing capabilities referenced in Section 3, TESTING EQUIPMENT AND STANDARDS. **The producer's laboratory shall be a certified AAP laboratory accredited in concrete and aggregate testing.**

4.3 QUALITY CONTROL MANAGER

The Quality Control Manager shall be a certified NRMCA Level 3 Concrete Technologist Field Technician, ACI Concrete Testing Laboratory Technician Grades I and II and Field Level 1, and Concrete Construction Special Inspector. The Quality Control Manager works to implement management's objectives concerning the desirable product quality within the overall quality commitment of the company. The Manager establishes and is directly responsible for quality standards for concrete materials and the quality control plan, which include:

- Review of project specifications and selection of job mixtures
- Preparation of concrete mix designs and other product information for approval by the building official or specifying agency;
- Evaluation of concrete performance, **including statistical evaluation of data**
- Product optimization
- Research and development testing
- Failure analysis and prevention
- Personnel training

5. TESTING EQUIPMENT AND STANDARDS

The testing priorities of a ready mixed concrete producer's laboratory are primarily directed at those tests which are most important to the acceptance of the product by the customer. Capabilities for testing fresh concrete for quality and strength and other properties of hardened concrete are a primary requirement, followed by certain tests for significant properties of aggregates and other concrete materials which have a bearing on concrete performance. The following tests are referenced by current ASTM Standards in parenthesis.

The following list is equipment required for quality control tests:

5.2.1 TESTS ON CONCRETE

1. Accessory equipment
2. Slump test (C143): Cone Mold.
3. Air content – volumetric (C173): Roll-A-Meter
4. Air content – pressure method (C231): Various types of pressure meters available.
5. Unit weight and yield (C138 and C29): Platform scale
6. Concrete temperature (C1064): Thermometer accurate within $\pm 1^{\circ}\text{F}$
7. Curing facilities (C511): Using a curing tank for low volume operations or 10.Moisture Room for high volume operations
8. Cylinder capping (C617 and C1231): various approved capping methods available.
9. Testing machine (C39): Must be power operated and controlled rate of loading.
10. Trial batches (C192): Preferred use of truck mixer for batches of three (3) cubic yards per test. Alternate is use of laboratory equipment including mixer, facility for presoaking of aggregates, shakers for separating aggregates, batch scale, admixture measuring equipment and all other equipment is needed.
- 11. Slump test for Self Consolidating Concrete (C1611)**

5.2.2 TESTS ON AGGREGATES

1. Aggregate moisture (C566): Hot plate or drying oven and scale accurate to 1 gram.
2. Fine aggregate gradation (C136): Splitter, sieve shaker, and full range of sieves.
3. Coarse aggregate gradation (C136): Splitter, screen shaker and full set of sieves.
4. Specific gravity and absorption of coarse and fine aggregate (C127 & C128): 1 kg scale and pycnometer.
5. Unit weight of aggregate Dry Rod (C29)

6. Organic impurities(C40): Glass bottles, sodium hydroxide, color standard solution.

5.3 QUALITY CONTROL OF LABORATORY OPERATIONS

A quality control operation must generate reliable information. Testing errors are the result of incorrect testing procedures, mistakes in processing of samples and specimens, or equipment out of calibration. The following measures taken at regular intervals must be in place to control these potential causes of testing errors:

1. Quality control staff is examined for proficiency in test procedures every two years. Results are recorded.
2. Verification that QC staff are knowledgeable on quality limits and, when failure to meet these limits occur, respond with the proper action,
3. Audit procedures for identification and processing of specimens and record keeping of results.
4. Within-test uniformity and uniformity of replicate tests on same sample are evaluated.
5. Reliability of strength test results on concrete is evaluated through comparison testing on same samples jointly with an outside laboratory.
6. Ensure that equipment is calibrated and a manual is maintained in which calibration schedules are listed and results of calibrations, adjustments and corrective actions are recorded.

5.4 LABORATORY EVALUATION AND ACCREDITATION

Whenever self-inspection of a producer laboratory indicates a satisfactory status, appropriate credentials should exist which document the laboratory's qualifications. The following documentation is available by way of scheduled periodic inspections by the ASTM-sponsored CCRL (Cement and Concrete Reference Laboratory) of the NIST (National Institute of Standards and Technology), and through accreditation by the U.S. Department of Commerce through the AASHTO Accreditation Program (AAP) in Concrete and Aggregate Testing.

1. **CCRL Inspection:** A CCRL representative determines compliance of laboratory staffing, equipment, and procedures with applicable standards and document the laboratory's compliance status in a summary report. The report gives no ratings but does substantiate the laboratory's qualifications.
2. **AASHTO Accreditation Program (AAP): Certification in Concrete and Aggregate Testing:** Recognizes a laboratory's compliance to the requirements of ASTM Practice C 1077. The AAP utilizes laboratory inspection and proficiency sample services regarding concrete testing provided by the AASHTO Materials Reference Laboratory (AMRL) and CCRL. AMRL and CCRL are Research Associate programs located at the Building and Fire Research Laboratory of the National Institute of Standards and Technology (NIST).

Participation in the CCRL inspection program is a prerequisite for certification under this program. Recognizing that the CCRL inspection tour is on a biannual basis, a waiver for this requirement will be granted on the initial certification inspection provided that the producer has written evidence that an inspection has been requested and is scheduled for the next CCRL tour. Lacking the CCRL inspection report, the auditor will select random equipment and test methods for audit during the initial certification inspection. The producer must forward the CCRL inspection report and closure responses within four weeks of submittal to CCRL.