



CLARK COUNTY DEPARTMENT OF BUILDING & FIRE PREVENTION

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Ronald L. Lynn, Director/Building & Fire Official
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SUBJECT: TG-42-10 APPROVED CONCRETE SUPPLIERS

1.0 PURPOSE: This guideline sets forth the minimum requirements which shall be completed to become listed as an approved supplier of structural concrete or concrete products to projects within the Clark County Department of Building CCDB jurisdiction.

2.0 SCOPE: This approval process is applicable to concrete batching, mixing and delivery equipment, material and facilities located at either the project construction site or a remote production location. This approval process is limited to producers of reinforced structural concrete, both ready-mixed and precast, and architectural precast concrete which is intended to be used in projects within the Clark County Building Division jurisdiction. This approval process is also applicable to review of structural concrete mix designs for projects within the Clark County Building Division jurisdiction.

Precast concrete structures which comply with NRS Chapter 461, Manufactured Buildings, will be exempt from compliance with this Technical Guideline. These structures and their manufacturing facilities will be inspected by the State of Nevada, Department of Business and Industry, Manufactured Housing Division. Evidence of compliance will be submittal of structural plans and calculations approved by the Manufactured Housing Division of the State of Nevada.

3.0 ABBREVIATIONS & ACRONYMS:

ACI:	American Concrete Institute
APA:	Architectural Precast Association
ASTM:	American Society for Testing Materials
CCDB	Clark County Department of Building
CSA:	Canadian Standards Association
IBC:	International Building Code
NPCA:	National Precast Concrete Association
NRMCA:	National Ready Mixed Concrete Association
NRS:	Nevada Revised Statute
PCI:	Precast/Prestressed Concrete Institute
PSI:	Pounds per square inch
TG:	Technical Guideline

4.0 DEFINITIONS:

Admixture: A material other than water, aggregates, cement or fiber reinforcement used as an ingredient of concrete and added to the batch immediately before or during the mixing of the batch.

Alkali Reactivity: Susceptibility of aggregate to alkali-aggregate reaction and degradation.

Architectural Precast Concrete: A product with a specified standard of uniform appearance, surface details, color and texture.

Certificate of Compliance: A certificate stating that materials and products meet specified standards or that work was done in compliance with approved construction documents.

Lightweight Concrete: Concrete intentionally produced with low density by use of lightweight aggregate and usually required to have an air-dry unit weight of less than 115 pounds per cubic foot.

Normal Weight Concrete: Concrete for which density is not a controlling requirement, made with normal density aggregate and usually having a density of approximately 150 pounds per cubic foot.

Precast Concrete: Concrete cast elsewhere than its final position.

Ready-Mixed Concrete: Concrete manufactured for delivery to a purchaser in a fresh state.

5.0 REFERENCES:

ACI Glossary 116R, Cement and Concrete Terminology

ACI Report 212.3R, Chemical Admixtures for Concrete

ACI Guide 212.4R, Guide for the Use of High-Range Water-Reducing Admixtures (Superplasticizers) in Concrete

ACI Guide 213R, Guide for Structural Lightweight Aggregate Concrete

ACI Guide 221R, Guide for Use of Normal Weight and Heavyweight Aggregates in Concrete

ACI Report 221.1R, State-of-the-Art Report on Alkali-Aggregate Reactivity

ACI Report 225R, Guide to the Selection and Use of Hydraulic Cements

ACI Report 232.2R, Use of Fly Ash in Concrete

ACI Report 233R, Slag Cement in Concrete and Mortar

ACI Guide 234R, Guide for the Use of Silica Fume in Concrete

ACI Reference Specification 301, Specifications for Structural Concrete

ACI Guide 304R, Guide for Measuring, Mixing, Transporting, and Placing Concrete

ACI Report 305R, Hot Weather Concreting

ACI Guide 311.4R, Guide for Concrete Inspection

ACI Guide 311.5R, Guide for Concrete Plant Inspection and Testing of Ready-Mixed Concrete

ACI Standard 318, Building Code Requirements for Structural Concrete and Commentary

ACI Guide 533R, Guide for Precast Concrete Wall Panels

APA Plant Certification Program

ASTM Standard C 33, Standard Specification for Concrete Aggregates

ASTM Standard C 94, Standard Specification for Ready-Mixed Concrete

ASTM Standard C 125, Standard Terminology Relating to Concrete and Concrete Aggregates

ASTM Standard C 150, Standard Specification for Portland Cement

ASTM Standard C 260, Standard Specification for Air-Entraining Admixtures for Concrete

ASTM Standard C 330, Standard Specification for Lightweight Aggregates for Structural Concrete

ASTM Standard C 404, Standard Specification for Aggregates for Masonry Grout

ASTM Standard C 494, Standard Specification for Chemical Admixtures for Concrete

ASTM Standard C 595, Standard Specification for Blended Hydraulic Cements

ASTM Standard C 618, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

ASTM Standard C 685, Standard Specification for Concrete Made By Volumetric Batching and Continuous Mixing

ASTM Standard C 845, Standard Specification for Expansive Hydraulic Cement

ASTM Standard C 917, Standard Test Method for Evaluation of Cement Strength Uniformity From a Single Source

ASTM Standard C 979, Standard Specification for Pigments for Integrally Colored Concrete

ASTM Standard C 989, Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars

ASTM Standard C 1017, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete

ASTM Standard C 1157, Standard Performance Specification for Hydraulic Cement

ASTM Standard C 1240, Standard Specification for Silica Fume Used in Cementitious Mixtures

ASTM Standard C 1582, Standard Specification for Admixtures to Inhibit Chloride-Induced Corrosion of Reinforcing Steel in Concrete

ASTM Standard C 1602, Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete

ASTM Standard D 98, Standard Specification for Calcium Chloride

CSA Standard A23.4, Precast Concrete – Materials and Construction

Clark County Building Administrative Code, current adopted edition

International Building Code, current adopted edition

Southern Nevada Amendments to the International Building Code, current adopted edition

NPCA Quality Control Manual

NRMCA Plant Certification Check List, Tenth Edition

PCI Manual 116, Manual for Quality Control for Plants and Production of Structural Precast Concrete Products

PCI Manual 117, Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products

PCI Manual 130, Manual for Quality Control for Plants and Production of Glass Fiber Reinforced Concrete Products

TG-17, Minimum Approval Criteria for Special Inspectors and Other Personnel

Note: The revision of the applicable standard is the revision referenced in the International Building Code or an attachment to TG-42, otherwise the latest revision will apply.

6.0 RESPONSIBILITIES:

6.1 The CCDDS-BD will maintain copies of completed audit and application forms for approved suppliers and a list of approved concrete suppliers current within the last calendar year.

6.2 The CCDDS-BD will review mix designs for structural concrete on a project basis.

6.3 Concrete suppliers will complete the Precast Concrete/Ready-Mixed Concrete Fabricator Application Form (Attachment A).

6.4 A registered professional engineer experienced with concrete production facilities will complete and stamp the Concrete Supplier Audit form (Attachment B).

6.5 Concrete suppliers will submit a completed Precast Concrete/Ready-Mixed Concrete Fabricator_Application Form and a completed Concrete Supplier Audit form annually to the CCDDS-BD to obtain or renew status as a Clark County approved concrete supplier. Payment for listing fees must be enclosed with the application form and the audit form in accordance with Section 22.02.385(A) of the Building Administrative Code. Concrete suppliers will provide inspection access to the production facility in accordance with ASTM Standards C94, Section 14.1 and C 685, Section 14.1.

6.6 Precast concrete suppliers will complete a Certificate of Compliance (Attachment E) at project completion and submit the Certificate to the project contractor for placement in the project structural inspection final report.

7.0 PROCEDURE:

7.1 Concrete Production and Delivery Facilities and Equipment:

7.1.1 Ready-Mixed Concrete: The concrete producer will certify the concrete production facility and equipment and concrete delivery equipment by completing an original copy of the NRMCA Plant Certification Check List (Attachment C) and submitting an original copy of the Check List to the Engineering Division of the NRMCA, in accordance with the instructions provided in the Check List. The concrete producer will receive a Certificate of Conformance furnished by the NRMCA, which is valid for a period of two years from the inspection date. A copy of this Certificate of Conformance will be maintained at the ready-mixed concrete production facility.

7.1.2 Precast Concrete: The concrete producer will certify the concrete production facility by obtaining a PCI Plant Certification in accordance with PCI Manuals 116 and 117 or APA Plant Certification Program for architectural precast concrete products or PCI Manual 116 for structural precast concrete products, or by obtaining a NPCA plant certification for structural precast concrete products using conventional reinforcement (rebar, not pre-stressed or post-tensioned tendons), or by obtaining a PCI Plant Certification in accordance with PCI Manual 130 for glass fiber reinforced precast concrete products, or by obtaining a CSA Plant Certification for Canadian precast concrete products. A copy of the PCI, APA, NPCA or CSA Plant Certification, current for the present year, will be maintained at the precast concrete production facility.

7.1.3 One-Time Approval for Precast Concrete: A new precast concrete plant may require a lengthy initial production run to obtain a PCI or NPCA certification. The plant may obtain a conditional approval during this initial production run, in accordance with Section 22.02.535 of the Building Administrative Code, by submitting an application form and listing fee and hiring a full-time precast/pre-stressed concrete inspector, certified in accordance with Sections 7.1 and 7.9 of TG-17, during fabrication.

7.2 Concrete Materials: Materials for ready-mixed concrete will be supplied, mixed, delivered and inspected in accordance with ASTM Standard C 94. Materials for concrete continuously batched by volume and mixed in a continuous mixer will be supplied, mixed, delivered and inspected in accordance with ASTM Standard C 685. Materials for architectural precast concrete will be supplied, mixed, delivered and inspected in accordance with PCI Manual 117. Materials for other structural precast concrete will be supplied, mixed, delivered and inspected in accordance with PCI Manual 116 or the NPCA Quality Control Manual, whichever is applicable. Individual concrete components will be supplied and certified as follows:

7.2.1 Aggregate: Aggregate for normal weight concrete shall conform to ASTM Standard C 33 requirements. Aggregate for lightweight concrete shall conform to ASTM Standard C 330 requirements. Aggregate for masonry grout shall conform to ASTM Standard C 404 requirements. A testing laboratory approved by the CCDDS-BD shall annually test and certify each aggregate to the appropriate ASTM standard. The annual test will include a test for alkali reactivity per ASTM Standard C 33 for normal weight concrete aggregates.

7.2.2 Cement: Cement shall conform to ASTM Standard C 150, C 595, C 845 or C 1157 requirements, whichever is applicable. Copies of manufacturer's test reports, product data or shipping documents will be available for inspection at the concrete production site to verify conformance to ASTM Standard C 150, C 595, C 845 or C 1157, whichever is applicable.

7.2.3 Water: Mix water for cast-in-place concrete shall conform to requirements of Section 5.1.3 of ASTM Standard C 94, Section 5.1.3 of ASTM Standard C 685 or ASTM Standard C 1602, whichever is applicable. Mix water for structural precast concrete shall conform to requirements of Sections 3.1.6, A3.1.6 and 6.2.2.3 of PCI Manual 116; Section 2.1.5 of the NPCA Quality Control Manual, or ASTM Standard C 1602, whichever is applicable. Mix water for architectural precast concrete shall conform to requirements of Sections 3.1.6, C4.12 and 6.2.2.3 of PCI Manual 117. Water sources shall be evaluated annually for conformance with these requirements.

7.2.4 Admixtures: Air entraining admixtures shall conform to ASTM Standard C 260 requirements. Chemical admixtures shall conform to either ASTM Standard C 494 or C 1017 requirements, whichever is applicable. Mineral admixtures shall conform to ASTM Standard C 618 or C 1240 requirements, whichever is applicable. Blast-furnace slag used as a concrete additive shall conform to ASTM Standard C 989 requirements. Corrosion inhibitors shall conform to ASTM Standard C 1582 requirements. Coloring agents shall conform to ASTM Standard C 979 requirements. Calcium chloride accelerating admixtures shall conform to ASTM Standard D 98 requirements. Copies of manufacturer's test reports, product data or shipping documents on each admixture will be available for inspection at the concrete production site to verify conformance to the appropriate ASTM Standard.

7.3 Concrete Mix Designs: Structural concrete mix designs for the end use will be submitted for each project on a continual basis to the CCDB. Structural concrete mix

designs will be reviewed in accordance with the Concrete Mix Design Review Checklist (Attachment D). Minimum specified average compressive strength of structural concrete at 28 days shall be 2,500 psi as specified by IBC Section 1905.1.1 or as shown on the approved drawings. Sieve analysis included with the mix design shall be based on the latest annual aggregate test results or additional testing performed within the last year.

8.0 RECORDS:

A list of approved concrete suppliers will be maintained by the Clark County Building Division for the current year. Precast Concrete/Ready-Mixed Concrete Fabricator Application Forms and Concrete Supplier Audit Forms will be submitted to Records.

9.0 ATTACHMENTS:

9.1 Attachment A: Concrete Supplier Audit Form (Form 832)

9.2 Attachment B: Pre-cast Concrete/Ready-Mixed Concrete Fabricator Application Form (Form 805)

9.3 Attachment C: NRMCA Plant Certification Check List, Tenth Revision

9.4 Attachment D: Concrete Mix Design Review Checklist (Form 812)

9.5 Attachment E: Pre-cast Concrete Fabricator/Manufacturer Certificate of Compliance

10.0 REVISION HISTORY

Title	Revision/Approved Date	Effective Date
TG 42-10	March 3, 2010	March 15, 2010
TG 42-96	September 10, 1996	September 10, 1996



CLARK COUNTY DEPARTMENT OF BUILDING
 4701 West Russell Road, Las Vegas, NV 89118 ~ (702) 455-3000
Concrete Supplier Audit Form (TG-42)



Plant Name or Location: _____

Company Operating Plant: _____

Verify by inspection that a NRMCA Certification of Conformance for the concrete production facility, current within the last two years, is available at the ready-mixed concrete production site.

Verify by inspection that a PCI, NPCA, CSA or APA Plant Certification for the concrete production facility, current within the last year, is available at the precast concrete production site.

Verify by inspection that a test report from a testing laboratory, approved by the Clark County Department of Building, current within the last year, is available for each concrete aggregate in use at the production facility. The test report shall certify conformance to ASTM Standard C 33, C330 or C 404, whichever is applicable. Test results for C 33 aggregates shall include alkali reactivity.

Verify by inspection of manufacturer's test reports, product data or shipping documents that each cement in use at the production facility conforms to ASTM Standard C 150, C 595, C 845 or C1157, whichever is applicable.

Verify by inspection that mixing water meets the requirements of Section 5.1.3 of ASTM Standard C 94; Section 5.1.3 of ASTM Standard C 685; ASTM Standard C 1602; Sections 3.1.6, A3.1.6 and 6.2.2.3 of PCI Manual 116; or Sections 3.1.6, C4.12 and 6.2.2.3 of PCI Manual 117, whichever is applicable.

Verify by inspection of manufacturer's test reports, product data or shipping documents that each admixture in use at the production facility conforms to ASTM Standard C 260, C 494, C 618, C979, C 989, C 1017, C 1240, C 1582 or D 98, whichever is applicable.

 (Signature of P.E.)

 (Date)

(SEAL)

Attachment A



CLARK COUNTY DEPARTMENT OF BUILDING

4701 West Russell Road, Las Vegas, NV 89118 ~ (702) 455-3000

Pre-Cast Concrete/Ready-Mixed Concrete Fabricator Request For Initial or Renewal of Clark County Approval Application Form (TG-42)



Company Name: _____

QC/QA Contact Name/Title: _____

Contact E-Mail Address: _____

Plant Location Address: _____

Mailing Address: _____

Telephone: _____ Fax: _____

Third Party Audit Agency: _____

CHECK FABRICATION TYPE: (✓ ONLY ONE)

Precast Concrete

Ready Mix Batch Plant

FEEES REQUIRED TO BE SUBMITTED WITH APPLICATION

Initial Listing or Reinstatement (\$800.00) \$ _____	Annual Renewal (\$575.00) \$ _____
--	------------------------------------

INITIAL LISTING: _____ Concrete Supplier Audit Form 832 (TG-42 Approval Process)	ANNUAL RENEWAL: _____ Concrete Supplier Audit Form 832 (TG-42 Approval Process)
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RETURN THIS APPLICATION FORM WITH YOUR CHECK TO THE FOLLOWING ADDRESS:

**Clark County Building Department
Attn: Jim Arnold
4701 W. Russell Road
Las Vegas, NV 89118**

A check or money order shall be submitted, along with the required documentation, with each application.

Applicant Signature: _____ Date: _____

Attachment B

QC MANUAL
SECTION

3

PLANT
CERTIFICATION
CHECK LIST

ENGINEER – PLEASE COMPLETE (PRINT)

(Plant Name, Example: "Plant No. 2")

(Street Address of Plant)

(City, State and Zip of Plant)

(Name of Company Operating the Plant)

FOR NRMCA USE ONLY

	Date	Initial
Received	_____	_____
Checked	_____	_____
Held Up	_____	_____
New Info.	_____	_____
Rechecked	_____	_____
Inspection Date	_____	_____
Expires	_____	_____
Cert. Mailed	_____	_____
Mixing		T C S
Batching	M	S P A
Recording	CM	Agg W Adm
Amt. Paid	_____	Check/CC No.
Date	_____	_____
Wording	YES	NO
Company iMIS ID #:	_____	_____
Plant ID #	_____	No. Trucks _____
Engineer	_____	_____
Contact	_____	_____

Quality Control Manual – Section 3

Certification of Ready Mixed Concrete Production Facilities



TENTH REVISION, DECEMBER 2007

Engineering Division
National Ready Mixed Concrete Association
900 Spring Street
Silver Spring, Maryland 20910
Phone: (301) 587-1400 www.nrmca.org

NRMCA QC MANUAL – SECTION 3 – PLANT CERTIFICATION

FOREWORD

Concrete is a manufactured product, the quality and uniformity of which depend upon control over its manufacture. It must be composed of suitable ingredients accurately combined to specific proportions. These must be thoroughly blended and the finished product delivered without damage. Although success depends upon several factors, a vital prerequisite is the availability of proper, well-maintained equipment.

This publication describes a system for establishing that production facilities of ready-mixed concrete plants are satisfactory. The system permits a qualified plant to display a Certificate of Conformance, which assures the purchaser that the facility is physically capable of furnishing good quality concrete. The delivery vehicles used to furnish concrete to the point of placement are also a component of the certification process for the production facility.

To be eligible for a certificate, the plant must be inspected by a licensed professional engineer for conformance with the check list contained herein. In addition to carrying the signature and seal of the inspecting engineer, the certificate must also be signed by the principal company executive attesting to his/her intention of seeing that all equipment is maintained within requirements of the check list.

With the Eighth Revision, a process was developed for inspection and certification of the delivery vehicles on a nominally 1-year interval. Two options are provided: Option A where the delivery vehicles are inspected for the requirements in this check list, under the supervision of a company official, during a preventative maintenance check of the vehicle followed by an audit of the procedures and records by the inspecting engineer; and Option B where the delivery vehicles are inspected by the inspecting engineer. Inspected vehicles that comply with these requirements should display a certification card.

The system of certification was developed by and is maintained by the Research, Engineering, and Standards Committee of the National Ready Mixed Concrete Association. Expert assistance in developing the check list was provided by representatives of the Truck Mixer Manufacturers Bureau and the Concrete Plant Manufacturers Bureau. Advice on detailed requirements as well as on operational features of the plan was also derived from outside sources variously associated with concrete production and use. The plan was reviewed by the NRMCA Board of Directors and approved without dissenting vote at its meeting of September 28, 1965. The following revisions have been approved by the NRMCA Board of Directors:

Second Revision	January, 1972	Seventh Revision	April, 1999
Third Revision	January, 1976	Eight Revision	October, 2002
Fourth Revision	January, 1984	Ninth Revision	January, 2006
Fifth Revision	March, 1992	Tenth Revision	December, 2007
Sixth Revision	October, 1994		

Certification may be obtained by any producer of ready-mixed concrete in accordance with the procedures and limitations described herein. There is a nominal charge for the Association's service. The company must also engage a licensed professional engineer to conduct or direct the inspection and attest to the plant's conformance with the check list requirements. Since many best qualified for this inspection are already employed in the industry, the licensed engineer conducting the inspection and executing the check list may be an employee of the company owning the plant. It should be noted in this connection that inspecting engineers, in signing the certificate, stake their professional reputation on the evaluation having been objective and thorough. A policy approved by the NRMCA Board of Directors in 2004 requires that the inspecting engineer have a current license from the licensing authority in the state or jurisdiction where the plant is located. In 2007 the NRMCA Board of Directors approved a policy to include additional requirements to qualify inspecting engineers and their assistants to conduct NRMCA inspections of ready mixed concrete production facilities. See Section 10. At any time, a purchaser may compare plant attributes with the check list to verify that the certificate provides valid evidence of production capability. The same prerogative exists with regard to the company official's pledge in Section 7 to maintain the equipment properly.

This booklet is intended to serve a two-fold purpose: first, to acquaint the producer and the inspecting engineer with the mechanics of securing the Certificate of Conformance and provide the forms therefore; and, second, to familiarize concrete purchasers and specifiers with the system and its significance. The requirements in this check list meet, and in some cases exceed, the provisions in Standard Specifications for Ready Mixed Concrete, such as ASTM C 94/C 94M and AASHTO M 157, and the Concrete Plant Standards, CPMB 100, of the Concrete Plant Manufacturers Bureau.

The check list and forms contained herein are intended for use in actual certification. Three copies are required for each plant in order to provide one copy each to NRMCA, the inspecting engineer, and the producer.

A copy with original ink and an original engineer's seal should be submitted to NRMCA. NRMCA reserves the right to accept electronic copies of completed checklists when the identity of the submitting entity can be verified. When the plant is inspected by the Engineer's assistant, each page of this checklist should be initialed by the Engineer of Record who signs and seals Section 10 thereby attesting the inspection. Photocopies can be made for the engineer and producer.

No claim is made that certification of plant facilities will assure delivery of high quality concrete. As indicated above, proper equipment is only one of several factors involved in concrete quality control, although a very essential one. The presence of a Certificate of Conformance should, therefore, be accepted precisely for what it is—evidence that certain capabilities exist. The existence of those capabilities will reduce the likelihood of deficiencies in quality when normal inspection is exercised within requirements of usual sales agreements.

Copies of this booklet can be downloaded from the NRMCA's website at www.nrmca.org or are available from the National Ready Mixed Concrete Association at the address indicated below. For large quantities for general distribution purposes it may be necessary to charge a nominal fee per copy to help offset handling and printing costs.

SUMMARY OF CHANGES TO TENTH REVISION

1. Note 2 was added to clarify that the protection of admixtures from freezing is independent of whether a plant is capable of producing concrete in cold weather (as per section 1.3.2). Section 1.4.1 should be complied with for certification. A statement from the admixture supplier indicating adequacy of admixture storage for the specific plant location and admixture can be used by the inspector.
2. Revision to section 2 on scales. This revision reflects a revision to the scale accuracy requirements of ASTM C 94/C 94M regarding scale accuracy. It further clarifies the requirements for scale calibrations and accuracy checks. Requirements for test weights to monitor the accuracy of scales are also clarified.
3. In section 2.4.4, viscosity modifying admixtures, typically used at large dosages, are exempted from passing through sight bottles for visual checks.
4. A requirement to report admixture type and quantity on the delivery ticket was deleted since it is not mandatory in ASTM C 94/C 94M.
5. A policy change – All inspecting engineers and assistants conducting plant inspections should obtain a copy of the NRMCA Plant Inspector's Guide and answer a set of questions to be submitted to NRMCA. This along with a statement of qualifications shall be used to approve inspectors for the NRMCA certification program. The qualification requirements are addressed in Section 10. The PE does not need to be present for 10% of the inspection when he uses an approved assistant.
6. Title of section 7 was revised to reflect clarifications made in Section 2.



Engineering Division
NATIONAL READY MIXED CONCRETE ASSOCIATION
900 Spring Street, Silver Spring, Maryland 20910
Phone: (301) 587-1400 Fax: (301) 585-4219
www.nrmca.org

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NRMCA QC MANUAL – SECTION 3
CHECK LIST FOR READY MIXED CONCRETE PRODUCTION FACILITIES

TABLE OF CONTENTS

FOREWORD	i
GENERAL	1
1. MATERIAL STORAGE AND HANDLING.....	3
1.1 Cementitious Materials.....	3
1.2 Aggregates	3
1.3 Water.....	3
1.4 Admixtures.....	3
2. BATCHING EQUIPMENT	4
2.1 Scales	4
2.2 Weigh Batchers.....	5
2.3 Volumetric Batching Devices for Water.....	6
2.4 Dispensers for Liquid Admixtures.....	6
2.5 Accuracy of Plant Batching.....	7
2.6 Batching Systems.....	8
2.7 Recorders:	10
3. CENTRAL MIXER.....	11
3.1 Central Mixing Operations	11
3.2 Shrink Mixing Operations	11
4. TICKETING SYSTEM	11
5. DELIVERY FLEET INSPECTION.....	12
General.....	12
5.1 Truck Mixers.....	14
5.2 Agitators.....	14
5.3 Nonagitating Units.....	15
5.4 Option A – Delivery Fleet Inspection by the Company	15
5.5 Option B – Delivery Fleet Inspection by the Inspecting Engineer.....	15
5.6 Summary of Fleet Operating from Plant.....	15
5.7 Inspection Record of Delivery Fleet (for Option A and B in Section 5).....	16
6. VERIFICATION OF INSPECTION AND APPLICATION FOR CERTIFICATE.....	17
7. AGREEMENT TO REGULARLY VERIFY ACCURACY OF SCALES, VOLUMETRIC BATCHING DEVICES AND DISPENSERS AND, IF USED, DEVICES FOR AUTOMATED AGGREGATE MOISTURE MEASUREMENT	18
8. REFERENCES	19
9. QUALIFICATION CHART FOR READY MIXED CONCRETE PLANTS.....	20
10. QUALIFICATION REQUIREMENTS FOR INSPECTING PERSONNEL.....	21
10.1 Qualifications of Inspecting Engineer	21
10.2 Qualifications of Assistant to the Inspecting Engineer, if used.....	21
10.3 Qualifications of Company Personnel conducting Inspections of Delivery Vehicles.....	21
10.4 Engineer Information Form	22
10.5 Statement of Qualifications: Assistant to the Inspecting Engineer	23
10.6 Statement of Qualifications: Company Personnel Conducting Fleet Inspections	24
SAMPLE CERTIFICATE OF CONFORMANCE.....	25

CHECK LIST FOR READY MIXED CONCRETE PRODUCTION FACILITIES

GENERAL

This check list itemizes requirements for plant facilities and equipment used in the production of ready-mixed concrete. During inspection of production facilities and delivery vehicles, it is the responsibility of the inspecting engineer or his/her assistant to be familiar with applicable safe practices and adhere to the safety policies of the concrete producer. A separate check list must be completed and attested to by a licensed professional engineer for each plant inspected. (See Section 5 for requirements for certification of the delivery vehicles).

Each item in the check list shall be checked (**no blank boxes are allowed**) by a licensed professional engineer or by an assistant under his supervision; the appropriate symbol shall be marked in the space provided, as follows:

✓ Put a (check mark) if the requirement is met.

F Put a (F) for failed if the requirement is not met.

An accompanying number may be used to refer to appended explanation where considered desirable.

However, a certificate cannot be issued to a plant not meeting all of the applicable items. Refer to the Qualification Chart in Section 9. Deficiencies should be corrected before the completed check list is submitted to NRMCA.

N Put an “N” if the particular item is not applicable to the type of plant being inspected. (N Only)

No correction fluid changes are accepted. The engineer must initial all changes.

The initials of the Inspecting Engineer of Record should appear on each page on which entries have been made. The Engineer’s initials on each page attest to the validity of the inspection even when conducted by the assistant. Initials of assistants are not acceptable.

The licensed engineer’s signature and seal, and the date of completion of the inspection must be entered on the Verification of Inspection (Section 6).

An official of the producer company must complete the Agreement to Regularly Verify Accuracy of Scales and Volumetric Batching Devices and Dispensers and Automated Moisture Measurement Devices (Section 7).

An original of the check list marked with original ink and the signed Agreement by the producer company official, with payment of the appropriate fees should be submitted to:

**National Ready Mixed Concrete Association
Engineering Division – Plant Certification
900 Spring Street
Silver Spring, Maryland 20910**

Please refer to the www.nrmca.org website for the fee schedule.

A second copy of each should be provided to the owner of the plant for his/her record and for such use as a reference as is appropriate. The third copy is to be retained by the inspecting engineer for his/her files. It is acceptable to make photocopies of the original check list for the files of the engineer and producer. The check list completed with original ink should be submitted to NRMCA. NRMCA reserves the right to accept electronic copies of completed checklists.

The engineer and his/her assistant must also submit once to NRMCA a completed copy of the Engineer Information Form (Section 10). This form should be accompanied with a statement of qualifications for the Engineer and his/her assistant indicating experience with concrete technology and ready mixed production facilities with the detail outlined in Section 10.

The Engineer and his assistant shall have obtained a copy of the NRMCA Plant Inspector’s Guide and have obtained approval from NRMCA to conduct inspections.

The references listed in Section 8 may be of help to the engineer and producer.

Conformance with relevant requirements of the Qualification Chart (Section 9) will make the plant eligible for a Certificate of Conformance furnished by the National Ready Mixed Concrete Association, to be validated by the signature and seal of the inspecting engineer and by the signature of the principal company executive. NRMCA sends the Certificate of Conformance to the Inspecting Engineer who should sign and seal it and forward it the company.

The certificate will carry an expiration date as defined below.

Expiration Date will be:

1. Two years from the “date of inspection” for:
 - a) Plants not previously inspected
 - b) Plants whose previous certification has expired
 - c) All plants serving nuclear facilities
2. When a certified plant is re-inspected in the final 90 days of its current certification, the new certificate expiration date will be 2 years from the expiration of current certification. (This permits a company to realize the full two-year period without experiencing a period of uncertain certification while waiting for approval of a check list). The exception to this general rule appears in (1.c) above.
3. If a certified plant is re-inspected more than 90 days before the expiration of its current certificate, the expiration date of the new certificate will be 2 years from the “date of inspection”.
4. A portable/permanent plant needs to be re-inspected and re-certified if it is relocated to another location before the 2-year period has elapsed.

Date of inspection is the date indicated by the inspecting engineer in (Section 6. *Verification of Inspection and Application for Certificate*).

Certification of the Production Facility is contingent on having at least 90% of the delivery vehicles operating from the plant with current NRMCA certification.

Delivery Vehicles – truck mixers, agitators and non-agitating units – can be inspected by the company followed by an audit by the inspecting engineer; or inspected by the inspecting engineer. Certification expiration dates for delivery vehicles is 14 months from the date of inspection to allow for a nominal annual inspection. Certification cards showing evidence of certification should be placed in the driver side windshield or door of the delivery vehicles. NRMCA will send delivery vehicle certification cards to the submitting entity – either the company or the inspecting engineer, unless otherwise notified.

Precast Concrete Plants – NRMCA occasionally receives requests to certify plants used in the manufacture of precast concrete products. Most precast concrete plants do not print delivery tickets or have the delivery vehicles used in ready mixed concrete facilities. Since these items are lacking in precast concrete plants, NRMCA is not able to issue an NRMCA certificate of conformance for ready mixed concrete production facilities. NRMCA will provide a letter to the company stating, as appropriate, that the facility conforms to the other requirements of the NRMCA Certification Program.

1. MATERIAL STORAGE AND HANDLING

1.1 Cementitious Materials

- 1.1.1 Bins or silos tight and provide for free movement to discharge opening.
- 1.1.2 Where storage is provided for different types of cement or cementitious materials, different materials isolated to prevent intermingling or contamination.

1.2 Aggregates

- 1.2.1 Procedures for unloading aggregate such as to prevent harmful segregation and breakage.
- 1.2.2 Procedures for building stockpiles such as to prevent harmful segregation and breakage.
- 1.2.3 Stockpiles located to prevent contamination; arranged to assure that each aggregate as removed from its stockpile is distinct and not intermingled with others.
- 1.2.4 Intraplant handling and transportation such as to prevent harmful segregation.
- 1.2.5 Separate storage bins or compartments for each size and type of aggregate properly constructed and charged to prevent mixing of different sizes or types.

1.3 Water

- 1.3.1 Adequate supply, with pressures sufficiently constant or regulated to prevent interference with accuracy of measurement.
- 1.3.2 For plants seeking certification to supply concrete in subfreezing weather i.e., where concrete is placed regularly during sub-freezing weather, minimum heating capacity for water and/or aggregate of 15 boiler output horsepower(BHP) per 100 cubic yard average daily cold weather production. (May be reduced to 10 BHP if storage capacity permits round-the-clock operation of heating equipment.) One BHP = 33,500 BTU per hour transferred to the water. See Note 1.

Note 1. If this requirement is not met and the facility is in an area where NOAA weather records show an average of more than 5 days per year when the minimum temperature is 32°F (0°C) or below, the Certificate of Conformance will carry the notation that the “*Facility does not meet all requirements for furnishing concrete in subfreezing weather.*”

1.4 Admixtures

- 1.4.1 Storage and handling system for liquid admixtures sufficiently protected to prevent freezing of admixtures at any time. (Freezing can cause ingredients of some liquid admixtures to separate and, therefore, affect concrete quality control.). See Note 2.
- Note 2:** Protection of admixture from freezing is required even if the plant does not produce concrete in cold weather. The inspector can accept a letter from the admixture supplier indicating that the admixtures that are being stored at the specific plant location do not need protection from freezing.
- 1.4.2 Admixtures protected to prevent damage from contamination.
 - 1.4.3 Agitation provided for liquid admixtures that are not stable solutions.

2. BATCHING EQUIPMENT

2.1 Scales

- 2.1.1 Each scale comprised of a suitable system of levers or load cells which will weigh consistently within the tolerances given in 2.1.2, with loads indicated either by means of a beam with balance indicator, a full-reading dial, or a digital read-out or display. For all types of batching systems, manual through automatic, the batchman must be able to read the load indicating devices from his normal station. Where the controls are remotely located with respect to the batching equipment, monitors or scale-follower devices may be used if they repeat the indication of the master scale within ± 0.2 percent of scale capacity.
- 2.1.2 Each scale accurate (Note 3) within ± 0.15 percent of scale capacity or ± 0.4 percent of net applied load, whichever is greater, throughout the range of use. Scale accuracy shall be verified through a combination of test weights, substitute loads, and strain loads (Note 4). Test weights used for scale accuracy should be at least 10 percent of scale capacity. Test weights should be accurate to ± 0.01 percent of indicated value verified at least once every two years (Note 5). For a digital read-out from a dial scale, the tolerance shall be increased to ± 0.25 percent of capacity to allow for tracking restriction (Note 6)
- Note 3:** The engineer supervising inspection may accept scale calibrations made by state or other agencies if these calibrations demonstrate compliance with the requirements of 2.1 and subsections.
- Note 4:** Substitute and strain loads are defined in the NRMCA Plant Inspector's Guide and in NIST Handbook 44, 2007 edition, Section 2.20, Notes N.1
- Note 5:** Verification of scale accuracy may be made by qualified plant personnel or by outside agencies or scale calibration companies. The required accuracy of standard test weights conforms to NIST Class F defined in NIST Handbook 105-1. Scale accuracy should be verified using certified test weights to not less than 10 percent of the scale capacity, substitute loads to not less than 50 percent of scale capacity, and combination of test weights, substitute loads or strain loads in not less than each of the upper two quarters of the scale capacity up through the normal range of use.
- Note 6:** The purpose of this increased tolerance is to allow for the fact that digital readings from a potentiometer attached to a dial scale are limited to whole-number values which cannot reproduce weight indications closer than ± 0.05 percent of capacity.
- 2.1.3 Company official agrees to verify accuracy of scales not less frequently than every 6 months and arrange for prompt recalibration and correction in accordance with 2.1.2 if the plant is moved or noncompliance is indicated. Signed statement by responsible official is attached. See Agreement in Section 7. Note 7.
- Note 7:** The purpose of the Agreement in Section 7 is to assure awareness by the operator and the company official of the necessity to verify weighing accuracy continuously.
- 2.1.4 At least 500 pounds of suitable test weights readily available for checking accuracy of scales. Note 8.
- Note 8:** The availability of test weights is considered essential to ensure continuous monitoring of weighing accuracy. This requirement is to serve as a quick check of scale accuracy and does not replace the agreement for the more thorough scale accuracy verification once every 6 months in 2.1.3. In lieu of on-site weights a letter from a scale calibration company that provides the calibration service is satisfactory as is one set of company test weights to serve several plants within a reasonable travel distance of each plant served. Test weights used for this purpose do not need to be certified for accuracy as in 2.1.2.
- 2.1.5 *Weighing Container:* The weighing container or hopper shall be designed such that the center of gravity of gross load always lies between load supports.
- 2.1.6 *Load-cell Scales:* Arranged to transmit load to one or more cells, directly or through a system of levers, in such a way that the cell system registers the entire load accurately on the load-indicating device; load cells indicated by the manufacturer to be accurate throughout the range of temperatures to which normally exposed during plant operation.

2.1.7 *Beam-Indicating Scales*

- 2.1.7.1 Provided with zero balance beam, balance indicator, and separate weighing beam for each ingredient of a batch to be weighed on the same scale.
- 2.1.7.2 Beam poises corrosion resistant, equipped with positive and accurate holding devices, and capable of being set to the minimum graduated interval which shall be not greater than 0.1 percent of capacity with a clear interval of not less than 0.03 in. (0.75 mm)
- 2.1.7.3 Balance indicators sufficiently sensitive to show movement when weight corresponding to 0.10 percent of scale capacity is placed in the batch hopper at a load equal to or above 50 percent of scale capacity; pointer travel of balance indicators at least 5 percent of net-rated capacity of largest weigh beam or 200 pounds (90 kg), whichever is less, for underweight and 4 percent or 100 pounds (45 kg), whichever is less, for overweight; provision made for damping oscillation of indicator pointer.

2.1.8 *Dial-Indicating Scales:*

- 2.1.8.1 Dial head mechanism enclosed so as to be dust tight.
- 2.1.8.2 Dials indicate load in batcher continuously from zero balance to full weighing capacity of the scale.
- 2.1.8.3 Dial faces have minimum of 1000 graduations on circular reading line at clear interval of not less than 0.03 in. (0.75 mm)

2.1.9 *Digital-Indicating Scales:*

- 2.1.9.1 Equipped with a digital indicator or display protected from dust with numbers large enough for good readability; minimum numerical increment equal to or less than 0.1 percent of scale capacity.

2.2 Weigh Batcher

- 2.2.1 Batchers for weighing cement, aggregates, and also water or admixtures (if measured by weight) consist of suitable containers freely suspended from a scale, equipped with necessary charging and discharging mechanisms.
- 2.2.2 Cement and other cementitious materials weighed on scales and in weigh hoppers that are independent of scales and weigh hoppers used for non-cementitious ingredients; in cumulative weighing of cementitious materials the portland cement weighed before the supplementary cementitious materials.
- 2.2.3 Batchers capable of receiving rated load without contact of the weighed material with the charging mechanism.
- 2.2.4 Cement batchers provided with dust seal between charging mechanism and hopper, installed in such a way as not to affect weighing accuracy; weigh hopper vented to permit escape of air; hopper self-cleaning and fitted with means to assure complete discharge.
- 2.2.5 Batchers charging mechanism capable of stopping flow of material within batching tolerances specified in 2.5 and preventing loss of material when closed.
- 2.2.6 Vibrators or other appurtenances installed in such a way as not to affect accuracy of weighing.
- 2.2.7 Wind protection sufficient to prevent interference with weighing accuracy.

2.3 Volumetric Batching Devices for Water

2.3.1 *Water Meters:* (items 2.3.1.1 through 2.3.1.3 are applicable)

2.3.1.1 Equipped with a cut-off device capable of stopping the flow within the tolerances specified in 2.5.3; cut-off device free from leaks when closed.

2.3.1.2 Equipped with a volume-setting device capable of being set to increments at least as small as one gallon (3.9 L) or a register capable of being read to one gallon (3.9 L), or both (Note 9).

Note 9: For water-measuring equipment that is graduated in pounds instead of gallons, use 10 pounds (4.5 kg) as the basic increment instead of one gallon (3.9 L).

2.3.1.3 Provide an indication, visible to the batchman, of the volume batched at any point in the metering operation.

2.3.2 *Volumetric Tank Water Batchers:* (items 2.3.2.1 through 2.3.2.3 are applicable)

2.3.2.1 Equipped with necessary filling and discharge valves that are leak-free when closed; fill valve capable of stopping flow within the tolerance specified in Section 2.5.3.

2.3.2.2 Have a gauge or other device in the view of the batchman that indicates the volume of water in the tank from the zero point to capacity of the batcher and which can be read to one gallon (3.9 L) (Note 9); tank equipped with an overflow pipe at batcher capacity level if it is less than tank capacity.

2.3.2.3 Equipped with a valve to remove overloads.

2.4 Dispensers for Liquid Admixtures

Note 10: A dispenser is a device for batching liquid admixtures by weight or volume and must be affixed to the plant. Dispensing methods, which involve hand-carried containers for the measurement and discharge of admixtures, do not qualify. Dispensers that are weigh batchers must meet the applicable requirements of 2.2.

2.4.1 Separate dispenser for each liquid admixture in regular use, except that more than one admixture can be batched through a single dispenser if the admixtures are compatible or if the dispenser is flushed with water after each cycle. See Notes 11 and 12.

Note 11: If more than one admixture is being used through a single dispenser without flushing of the dispenser with water after each cycle, the engineer should ascertain that the admixtures in actual use are compatible with each other and that the mixing of the admixtures prior to introduction into the concrete will not be detrimental.

Note 12: When the company operating the batch plant or delivery units regularly batches an admixture at the job site, the dispenser must comply with the requirements of 2.4 and subsections and 2.5.4. Occasional additions of admixtures at the job site to adjust entrained air content, etc., are not subject to the dispenser requirements of 2.4.

2.4.2 Piping free of leaks and properly valved to prevent backflow or siphoning and to ensure that the measured amount is discharged.

2.4.3 Each dispenser of liquid admixtures provided with an accurately calibrated container in which the admixture may be collected when it is desired to check the accuracy of measurement as in 2.5.4.

2.4.4 For admixtures other than accelerating admixtures, silica fume slurry, corrosion inhibitors and viscosity modifying admixtures, used at less than 25 oz per 100 lb of cement (1630 mL per 100 kg cement), each dispenser of liquid admixtures equipped with a visual or other means of providing a gross check to the batchman of the amount of admixture batched during each cycle, within ± 20 percent. The gross check shall be independent of the accuracy, function, or operation of the primary metering device. See Note 13.

Note 13: This gross check is required to help the batchman prevent large overdoses or deficiencies of admixture due to dispenser malfunction in any batch, which could cause great changes in fresh and/or hardened concrete properties. Following are examples of how the gross check might be provided: (a) collecting the measured quantity of admixture in a calibrated container during each cycle and holding it for a short period to permit a visual check; (b) measuring the dispensed quantity through the use of an independent meter to obtain a rough check on the amount measured by observation of a volumetric indicator. Admixtures used at rates of 25 oz. per 100 lb. (1630 mL per 100 kg) of cement or greater are exempt from the independent

check required in 2.4.4.

- 2.4.5 Dispensers of liquid admixtures provide visible indication of the quantity batched or interlock cut-off when liquid admixture supply is not available to the dispenser. (This is to prevent dispensing air instead of admixture).

2.5 Accuracy of Plant Batching.

Note 14: For weighed ingredients, accuracy of batching is determined by comparison between the desired weight* and the actual scale reading; for volumetric measurement of water and admixtures, accuracy is determined by checking the discharged quantity either by weight on a scale or by volume in an accurately calibrated container.

- 2.5.1 Cement and other cementitious materials measured by weight within ± 1 percent of the desired weight* in individual batchers, or ± 1 percent of the desired intermediate and final cumulative weights* in cumulative batchers, but, in either case, the required accuracy of batching applying to small loads is ± 0.3 percent of scale capacity (which governs for weights below 30 percent of scale capacity).

- 2.5.2 Aggregate measured by weight within ± 2 percent of the desired weight* in individual aggregate batchers, or ± 1 percent of the desired intermediate and final cumulative weights* in cumulative aggregate batchers, but, in either case, the required accuracy of batching applying to small loads is ± 0.3 percent of scale capacity (which governs for weights below 15 percent and 30 percent of scale capacity, respectively). See Notes 15 and 16.

Note 15: If the weight-setting system provides compensation for moisture on aggregates, the tolerance applies to the accuracy of measurement of the corrected weight.

Note 16: In some instances the accurate control of concrete containing lightweight aggregate is more feasible if the lightweight coarse aggregate is batched by bulk volume rather than by weight. When this is judged to be the case, the provisions of 2.5.2 can be waived for lightweight coarse aggregate.

- 2.5.3 Water measured by volume or weight within ± 1.5 percent** of the desired amount*, or ± 1 gallon (3.9 L), whichever is greater. See Note 9. Company official agrees to recheck batching accuracy of volumetric water batching devices (including water meters) not less frequently than every 90 days. See Agreement in Section 7.

- 2.5.4 Admixtures measured to within ± 3 percent of the desired amount* or \pm the minimum dosage rate per 100 lb. of cement, whichever is greater. See Note 17. Company official agrees to recheck batching accuracy of dispensers of liquid admixtures at least every 90 days. See Agreement in Section 7.

Note 17: Liquid admixtures are to be measured by volume or weight and powdered admixtures are to be measured by weight. When it cannot be determined what admixture will normally be used in a dispenser of liquid admixtures, assume that the dosage will be at a rate of at least 1 fl. oz. per 100 lbs of cement (65 mL per 100 kg); admixtures with lower rates can be reconstituted to the point where the rate is 1 fl. oz. per 100 lbs. (65 mL per 100 kg) or more.

2.5.5 Compensation for free moisture on aggregates as it affects aggregate weights and slump control:

- 2.5.5.1 Suitable combination of pre-batching storage and manual or automatic measurement of aggregate moisture to provide aggregate of fairly consistent moisture content to the batcher and to detect changes of 1 percent in the moisture content of aggregate; procedure for adjustment of aggregate batch weights for changes in their moisture content of 1 percent by weight of dry aggregate. Accuracy of devices used for automated measurement of aggregate moisture, if used, is verified not less frequently than every 90 days. See Agreement in Section 7

- 2.5.5.2 Suitable procedures of maintaining control of slump. See Note 18.

Note 18: For central, shrink or truck mixing operations, this can be a visual or other method of estimating the slump of the concrete during mixing with consequent adjustments in added water made by the batchman or truck mixer driver; as an alternative, slump can be controlled by a method based on determination of aggregate free moisture to an accuracy of about $\pm 1\frac{1}{2}$ gallons per cubic yard (7.4 L per cubic meter) of concrete so that the correct amount of added water can be batched to obtain the desired slump.

* As indicated to the batchman, corrected for aggregate moisture, if required.

** This corresponds approximately to an accuracy of ± 1 percent based on total mixing water for typical aggregate moisture levels.

2.6 Batching Systems

2.6.1 Definitions and Requirements of Component Individual Batchers Controls.

Batching controls are the part of the batching equipment that provide means for operating the batching device for an individual material. They may be mechanical, hydraulic, pneumatic, electrical, etc. or a combination of these means. A batching system is a combination of batching devices and batching controls necessary for the accurate and consistent batching of concrete ingredients in the desired proportions. Normally a batching system would include batching devices and controls for cementitious materials, aggregates, water, and admixtures. Some may not include admixtures if they are not used at the plant or may not have batching equipment for water if it is entirely batched through the truck mixer water system.

2.6.1.1 Weigh Batchers Controls (Cementitious materials and aggregates must be batched by weight; water and admixtures may be batched in a weigh batcher or by volume in a volumetric device covered in 2.6.1.2. For lightweight coarse aggregate, see Note 16.)

- (1) *Manual Control* - Manual weigh-batcher control exists when the batching devices are actuated manually, with the accuracy of the batching operation dependent on the operator's observation of a scale. The batching devices may be actuated by hand or by hydraulic, pneumatic, or electrical power assists. See Note 19.

Note 19: Any weigh-batcher control which does not fully meet the requirements for semi-automatic, semi-automatic interlocked, or automatic weigh-batcher controls is considered manual if it can be operated to meet the requirements of this section.

- (2) *Semi-Automatic Control* – When actuated by one or more starting mechanisms a semi-automatic weigh-batcher control shall start the weighing operation of the material and stop the flow automatically when the designated weight has been reached. No interlocks are required.
- (3) *Semi-Automatic Interlocked Control* – When actuated by one or more starting mechanisms a semi-automatic interlocked weigh-batcher control shall start the weighing operation of the material and stop the flow automatically when the designated weight has been reached. It shall be interlocked to assure that the discharge mechanism cannot be opened until the weight is within the tolerance in 2.5.
- (4) *Automatic Control* – When actuated by a single starting signal, an automatic weigh-batcher control shall start the weighing operation of cementitious materials, aggregate, water, or admixture, and stop the flow automatically when the designated weight has been reached. It shall be interlocked to assure that:
 - (a) The charging gate or valve cannot be opened until the scale has returned to zero balance within $\pm 0.3\%$ of the scale capacity;
 - (b) The charging gate or valve cannot be opened if the discharge mechanism is open;
 - (c) The discharge mechanism cannot be actuated if the charging gate or valve is open; and
 - (d) The discharge mechanism cannot be actuated until the weight of material is within the tolerance specified in 2.5.

2.6.1.2 Volumetric Batching Device Controls (This pertains to the controls used for measurement of admixtures in a volumetric admixture dispenser or the measurement of water with a water meter or a volumetric batcher tank.)

- (1) *Manual Control* - Manual volumetric control for water or admixture exists when the volumetric measuring device is actuated manually with the accuracy of the measuring operation being dependent on the operator's visual observation of a volumetric indicator (such as a digital meter display or a sight gauge) and his manual cut-off of the flow at the desired volume. The flow of liquid may be controlled by hand or by pneumatic, hydraulic, or electrical power assists. See Note 20.

Note 20: Any volumetric control which does not fully meet the requirements for automatic volumetric controls is considered manual if it can be operated to meet the requirements of this section.

- (2) *Automatic Control* – When actuated by a single starting signal, an automatic volumetric control shall start the measuring operation and stop the flow automatically when the designated volume has been reached.

2.6.2 System Requirements

2.6.2.1 *Manual System*: A combination of the necessary individual weigh-batchers and volumetric batching devices (if any volumetric measuring of water or admixture is performed at the plant) to proportion concrete properly, the controls of which are all manual with the possible exception of semi-automatic or automatic controls for admixture and/or water.

2.6.2.2 *Partially Automatic System*: A combination of the necessary individual weigh-batchers and volumetric batching devices (if any volumetric measuring of water or admixtures is performed at the plant), the controls of which are a combination of manual, semi-automatic, semi-automatic interlocked, and automatic controls not meeting the requirements of semi-automatic or automatic systems below; at least one of the non-manual controls shall be for controlling the batching of cement or aggregates.

2.6.2.3 *Semi-Automatic System*: A combination of the necessary individual weigh-batchers and volumetric batching devices (if water or admixture is measured volumetrically), the controls of which are either all semi-automatic interlocked, a combination of semi-automatic interlocked and automatic, or all automatic controls [in accordance with 2.6.1.1(3), 2.6.1.1(4), or 2.6.1.2(2)] but not meeting all the system requirements for the automatic system as given below.

2.6.2.4 *Automatic System*: A combination of the necessary individual weigh-batchers and volumetric batching devices (if water or admixture is measured volumetrically in the plant), the controls of which are all automatic [in accordance with 2.6.1.1(4) or 2.6.1.2(2)] and meet the following automatic-system requirements:

- (a) All batching equipment activated by a single starting mechanism, except that a separate starting mechanism is permitted for volumetric batching of water and/or admixture not batched at the time of weighing the other ingredients.
- (b) The discharge of any weighed ingredient in the system may not start unless batching controls for all weigh batchers have been cleared of the previous batch, with scales returning to zero tolerance, and until all weighed ingredients have been weighed within the required tolerances.
- (c) Volumetric admixture dispenser controls (if any) interlocked with volumetric water batching controls or the controls of at least one weigh batcher to prevent the discharge of both admixture and the interlocked ingredient(s) unless both the admixture dispenser and the interlocked batching device(s) have been cleared of the previous batch.

Note 21: Definitions of Batching Controls and Systems conform to those in the standards of the Concrete Plant Manufacturers Bureau, CPMB 100. The inspector should verify the capability of these systems to comply with these requirements. Actual operation during concrete production may vary. In response to needs of increased production efficiency, certain automatic batching systems may conform to the intent of the requirements of 2.6.2.4 but allow for variations in the operating capabilities.

2.7 Recorders:

Devices that provide a permanent record of the quantity of cementitious materials, aggregate, water or admixture measured into a particular batch of concrete.

	Cementitious Materials	Aggregate	Water	Chemical Admixtures
2.7.1 A graphical recorder provides a record on a chart simultaneously with the indication of the scale as the materials are being weighed or measured. A graphical recorder shall register scale readings within ± 2 percent of total scale capacity,	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OR			OR	
A digital recorder provides a printed record of the quantity of material weighed or measured. A digital recorder shall reproduce the scale reading within ± 0.1 percent of scale capacity.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Recorders shall:				
2.7.2 Be properly protected, i.e., provided with effective security to prevent tampering with records. (Graphical recorders must be in a locked housing and capable of being read without unlocking.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.7.3 Provide for identifying the particular batch with the corresponding delivery ticket.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.7.4 Register empty balance or tare to within 0.3% of scale capacity for weighed ingredients.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.7.5 Register the quantity of ingredient or ingredients batched.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. CENTRAL MIXER

Definition: A plant mixer installed at the plant for the purpose of mixing the concrete completely (central mixing) or partially (shrink mixing).

3.1 Central Mixing Operations

The mixer at the plant shall be:

- 3.1.1 Capable of producing uniform concrete (Note 22) in the mixing time regularly employed at the plant or in the time designated in ASTM C 94/C 94M-07 *Specification for Ready Mixed Concrete* (Note 23), whichever is less, when operated with a capacity batch in accordance with the method regularly employed in operation of the plant.

Note 22: The concrete is considered uniform if samples taken after discharge of approximately 15 percent and 85 percent of the load do not differ more than the following: (1) in slump, 1 inch (25 mm) if the average slump is 4 inches (100 mm) or less, 1½ inches (38 mm) if the average slump is 4 to 6 inches (100 to 150 mm); and (2) in coarse aggregate content, 6 percent by weight of the concrete. Procedures for measuring uniformity of mixed concrete are discussed in References 1, 6 and 7.

For plant mixers that bear a performance rating plate of the Concrete Plant Manufacturers Bureau a visual inspection of the mixer can be used in lieu of the mixing uniformity evaluation. The dimensions of the mixing blades shall exceed the minimum dimensions stated by the mixer manufacturer for the minimum mixing time stated on the manufacturer's data plate.

Note 23: The mixing time designated in C 94/C 94M-07 is 1 minute for mixers with capacities of 1 cubic yard (0.76 cubic meter) or less plus 15 seconds for each additional cubic yard (cubic meter) or fraction thereof.

- 3.1.2 Equipped with a timing device that will not permit the batch to be discharged before the predetermined mixing time has elapsed.

3.2 Shrink Mixing Operations

The mixer at the plant shall be:

- 3.2.1 Capable of partially blending the concrete ingredients to reduce their total bulk volume before discharge into a truck mixer.

4. TICKETING SYSTEM

Provision on delivery ticket for the following information

- a. Name of ready-mixed concrete company
- b. Plant designation where batched if company operates more than one plant
- c. Serial number of ticket
- d. Truck number or designation
- e. Name of contractor or other purchaser
- f. Specific designation of job (name and location)
- g. Specific class or designation of concrete identifiable with terminology employed in the job specifications
- h. Amount of concrete in cubic yards
- i. Date
- j. Time when batch was loaded
- k. Extra water added at the request of the receiver of the concrete and his signature or initials

5. DELIVERY FLEET INSPECTION

General

The Company has the following two options for the inspection of the delivery fleet:

Option A – In-house inspection of delivery fleet and review of records and procedures by the Inspecting Engineer

Option B – Inspection of delivery fleet by the Inspecting Engineer

Truck mixers, agitators and nonagitators used to deliver concrete from the plant will be evaluated and qualified as acceptable or unacceptable regarding conformance with the requirements given in 5.1, 5.2 and 5.3 respectively. Agitators and non-agitators units are permitted only for central mixing operations. Certification for the plant will not be granted if:

(1) For a truck-mixing or shrink-mixing operation, 10 percent or more of the total truck mixers are listed as unacceptable;

OR

(2) For a central-mixing operation, 10 percent or more of the total truck mixers, agitators and nonagitators units are listed as unacceptable.

It is assumed that purchasers of concrete will forbid delivery in units that are allowed to remain defective but will permit use of new units added to the fleet or of units restored to acceptable condition subsequent to execution of the check list. It is assumed that units qualifying as truck mixers will also qualify as agitators.

When the company has several production facilities in an area where delivery vehicles are batched from different plants on the same or different days it will be necessary to include all trucks that might be used at the plant in question on any given day in Section 5.6 and in the **Fleet Inspection Reporting Spreadsheet**. See Note 24. When trucks are rented from others they must be inspected prior to use if they are to be batched from the plant in question. This also applies to vehicles owned by others that operate from the plant. If they are to be used for more than 1-month duration they must possess a certification card. NRMCA recognizes that the delivery vehicle is an integral part of the production process and cannot issue certification for production facilities without certified vehicles.

Note 24: If some or all of the trucks have been used in a previously certified plant they will already have been inspected and will have cards with an expiration date.

Inspections of delivery vehicles by State Highway or other agencies may be used as a basis for applying for NRMCA certification cards, if those inspections include all of the items required by this checklist.

Option A – Delivery Fleet Inspection by the Company

This option is provided to allow inspection of the delivery fleet as a part of the routine maintenance and quality control program of the company and to avoid the necessity for the Inspecting Engineer to physically inspect all delivery vehicles in a very short time period. It also helps in situations when delivery vehicles operate from several concrete plants owned by the company. To assure the credibility of the in-house inspection the program must be under the direction and supervision of a responsible **Company Official** who monitors and routinely participates in the vehicle inspection process to ensure that established company policies are followed in the process. The **personnel inspecting delivery vehicles** shall be under the supervision of the company official or on contract with the company.

Personnel inspecting delivery vehicles should be familiar with the requirements of Section 5 in conducting the inspection. A **Statement of Qualifications** shall be maintained for all personnel involved in the delivery vehicle inspection process. See qualification requirements in Section 10.3 and statement of qualifications in 10.6.

The Statement of Qualifications for all personnel involved with delivery vehicle inspection shall be provided to the Inspecting Engineer during the inspection of the production facility. The Inspecting Engineer shall interview the personnel and witness a demonstration of inspection procedures on at least two mixers or agitators that have seen significant use and if previously inspected, in the latter half of their 14-month inspection period. See Note 25.

Note 25: The demonstration of delivery vehicle inspection procedures is an essential requirement to assure the Inspecting Engineer that defective units that adversely affect the quality of delivered concrete are properly identified and corrective actions, if any, are made. The inspecting engineer may waive the demonstration in lieu of previous experience or knowledge of the Company's personnel and procedures.

NRMCA QC Manual – Section 3 – Plant Certification

Designees of the Company Official must evaluate all units of the delivery fleet used to deliver concrete from the plant for conformance with the requirements in Sections 5.1, 5.2 and 5.3, as appropriate. The inspection for each vehicle shall be documented on the **Fleet Inspection Reporting Spreadsheet**. The personnel conducting the inspection shall indicate the date of inspection and initial all pertinent items. The date shall reflect the date of inspection of the specific vehicle. The company official shall also be indicated on this form.

A completed **Fleet Inspection Reporting Spreadsheet** shall be sent to NRMCA for issuance of **Delivery Fleet Certification Card** for each delivery unit. A certification card will be issued by NRMCA with a unique certification number and expiration date indicated. The expiration date on the card will be 14 months from the date of inspection of the specific unit. The card shall be applied to the driver side windshield or door of the delivery unit. See Note 26. The Company shall retain a copy of the Fleet Inspection Reporting Spreadsheet for all delivery units with the certification number and expiration date.

Note 26: The 14 month period is used to allow some flexibility in complying with a nominal 1-year inspection period and to allow for sufficient time to order certification cards. Some companies do not permit items on the vehicle's windshield.

On re-certification of a production facility the Inspector shall ensure that delivery vehicles operating from the plant have maintained current certification or have applied for certification cards.

The company shall maintain a **Fleet Inspection Reporting Spreadsheet** for review by the Inspecting Engineer during the inspection of the production facility. The **Fleet Inspection Reporting Spreadsheet** shall be maintained on file for the period of certification.

At the time of inspecting the production facility, the Inspecting Engineer shall accomplish the following:

- a) Review the records of vehicle inspection, including the Fleet Inspection Reporting Spreadsheet for all units
- b) Review the Statement of Qualifications for the personnel conducting the vehicle inspection
- c) Interview the personnel conducting the vehicle inspection and witness the demonstration of vehicle inspection of at least two units.
- d) Ensure that the company has obtained or has requested cards for each vehicle from NRMCA.
- e) The cards are, or will be, attached to the driver-side door or windshield of the delivery vehicle. The card identifies the truck number and an expiration date, which is not more than 14 months after inspection date of the vehicle.
- f) Complete Sections 5.4 and 5.6 of the check list.

Option B – Delivery Fleet Inspection by the Inspecting Engineer

The Inspecting Engineer shall conduct the inspection of the all units of the delivery fleet used to deliver concrete from the plant for conformance with the requirements of (Sections 5.1, 5.2 and 5.3 as appropriate). Each unit will be listed in the **Fleet Inspection Reporting Spreadsheet**, which shall be returned with a completed check list for the production facility or separately to certify the delivery vehicles. NRMCA will issue a card for each acceptable unit listed with an expiration date indicated. The expiration date on the card will be 14 months from the date of inspection. The company shall attach the card to the driver side windshield or door of the delivery unit.

Since the certification of the concrete production facility is valid for a period of 2 years, the vehicles shall be re-inspected during the certification period of the production facility to maintain its certification status. See Note 26.

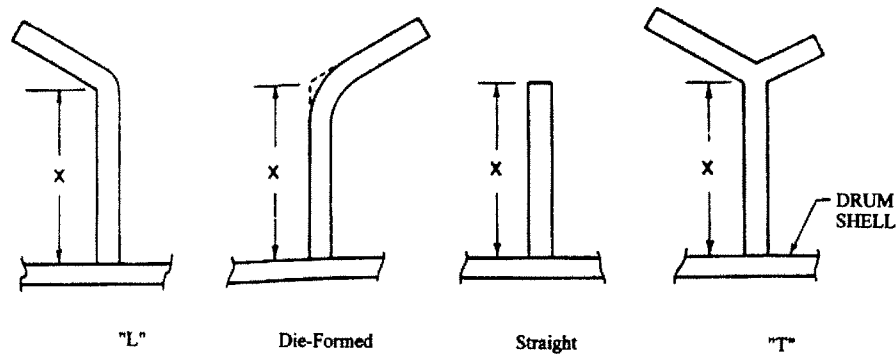
The Inspecting Engineer shall complete Sections 5.5 and 5.6 of this checklist.

5.1 Truck Mixers

Definition: Concrete mixers mounted on trucks or other vehicles, used for the complete mixing of concrete ingredients after they have been batched at the plant.

Each acceptable truck mixer shall conform to the following requirements:

- 5.1.1 Interior condition satisfactory: no appreciable accumulation of hardened concrete; blades free of excessive wear. Blade wear shall be checked at the point of maximum drum diameter nearest to the drum head. When the height of the blade at this point, measured from the drum shell, is less than 90 percent of the original radial height (dimension “X” in sketch of applicable blade type), the blade is considered excessively worn. The manufacturer of the mixer will furnish original blade dimensions on request.
- 5.1.2 Charging and discharge openings and chute in good condition: free from appreciable accumulations of cement or concrete; hopper and chute surfaces clean and smooth.
- 5.1.3 Drum or container of such size that the rating as a mixer (in volume of mixed concrete) does not exceed 63 percent of the gross volume of the mixer, disregarding blades. (This requirement is met by all mixers carrying a rating plate of the Truck Mixer Manufacturer Bureau.)
- 5.1.4 Provided with a plate showing the mixer manufacturer’s recommended operating speed for mixing, which must be in the range of not less than 4 nor more than 22 rpm; demonstrated capability to operate satisfactorily a speed within recommended range.
- 5.1.5 Equipped with a counter in working condition to indicate the number of revolutions of the drum or blades.
- 5.1.6 On units equipped to batch mixing water, equipment to be in proper working condition: gauge glasses or water meters clean and legibly graduated; water pump or injection system in good working order with nozzles unobstructed and without leakage into mixer; water measurement spot-checked and found accurate within ± 1 percent of mixing water capacity or ± 1 gallon, whichever is greater. See Note 9.



MIXER BLADE TYPES

5.2 Agitators

Definition: Drums or containers, mounted on trucks or other vehicles, in which central-mixed concrete is kept sufficiently in motion during delivery to prevent segregation.

Each acceptable agitator shall conform to the following requirements:

- 5.2.1 Interior condition satisfactory: no appreciable accumulation of hardened concrete.
- 5.2.2 Charging and discharge openings and chute in good condition: free from appreciable accumulations of cement or concrete; hopper and chute surfaces clean and smooth.
- 5.2.3 Drum or container of such size that the rating as an agitator (in volume of mixed concrete) does not exceed 80 percent of the gross volume of the container, disregarding blades. (This requirement is met by all units carrying a rating plate of the Truck Mixers Manufacturers Bureau.)
- 5.2.4 Provided with a plate showing the mixer manufacturer’s recommended maximum agitating speed which must not exceed 6 rpm; demonstrated capability to operate satisfactorily at the recommended speed.
- 5.2.5 Equipped with a counter in working condition to indicate the number of revolutions of the drum or blades.

5.3 Nonagitating Units

Definition: Containers, mounted on trucks or other vehicles, for delivering central-mixed concrete, not constructed or equipped to keep the mass of concrete in motion in the container.

Each acceptable nonagitating unit shall conform to the following requirements:

- 5.3.1 Interior surface smooth and watertight, with rounded corners.
- 5.3.2 Gates or other means provided to control the concrete discharge.
- 5.3.3 Interior free from excessive accumulation of hardened concrete and from other obstruction or deterioration sufficient to interfere with proper discharge of concrete.

5.4 Option A – Delivery Fleet Inspection by the Company

- 5.4.1 The delivery fleet inspection records show that not more than one unit or 10 percent of the units, whichever is greater; to be used at the plant fails to meet requirements. Report details in 5.6
- 5.4.2 The delivery fleet used on a normal business day during the period when the plant facilities are being inspected demonstrate compliance with requirements.
- 5.4.3 The Company maintains records that indicate compliance with the requirements of this checklist for the inspection of delivery vehicles
- 5.4.4 Personnel responsible for vehicle inspection have demonstrated knowledge of the required inspection procedures and requirements of (Sections 5.1, 5.2 and 5.3) of this checklist, as appropriate.
- 5.4.5 Personnel responsible for vehicle inspection have demonstrated appropriate judgment of acceptable blade wear and accumulations of hardened concrete.

OR

5.5 Option B – Delivery Fleet Inspection by the Inspecting Engineer

- 5.5.1 The delivery fleet inspection indicates that not more than one unit or 10 percent of the units, whichever is greater; to be used at the plant fails to meet requirements. Report details in 5.6
- 5.5.2 The delivery fleet used on a normal business day during the period when the plant facilities are being inspected demonstrate compliance with requirements.

5.6 Summary of Fleet Operating from Plant

Number of units available for use _____

Number of units certified or submitted for certification _____

Number of Truck Mixers _____ Agitators _____ Nonagitating Units _____

NRMCA QC Manual – Section 3 – Plant Certification

5.7 Inspection Record of Delivery Fleet (for Option A and B in Section 5)

Inspection of delivery fleets should be completed on a **Fleet Inspection Reporting Spreadsheet**. NRMCA provides a spreadsheet format that can be obtained from the NRMCA website or by contacting the NRMCA staff listed below. Inspection of delivery fleet can be submitted on a plant basis or for units operating from several plants.

For Option A in Section 5, the Company shall complete the Fleet Inspection Reporting Spreadsheet to include the name of the person(s) inspecting trucks and the name of the company official with oversight. The completed sheet should be sent to NRMCA when requesting certification cards. Trucks that have previously been certified should include their prior Certification ID. The company shall maintain a current Fleet Inspection Reporting Spreadsheet for all delivery vehicles operating from the production facility with NRMCA certification. This record shall be presented to the Inspecting Engineer during the visit to inspect the production facility.

For Option B in Section 5, the Inspecting Engineer shall complete the Fleet Inspection Reporting Spreadsheet. The completed sheet should be sent to NRMCA when requesting certification cards. Trucks that have previously been certified should include their prior Certification ID.

NRMCA will issue the Delivery Fleet Certification Cards for all units that are acceptable with an expiration date 14 months after the date of inspection. Certification cards will be sent to the submitting entity – either the Company Official or the Inspector, unless otherwise notified.

The following is a sample of the information required on the **Fleet Inspection Reporting Spreadsheet** which can be downloaded from our website: [http://www.nrmca.org/products/certification/NRMCA Delivery Fleet Inspection Spreadsheet.xls](http://www.nrmca.org/products/certification/NRMCA%20Delivery%20Fleet%20Inspection%20Spreadsheet.xls)

Company Name

For Option A: Inspection by Company:

Name of Person Inspecting

Company Official Supervising the Inspection

Mailing Address, Phone, Fax, Email

For Option B: Inspection by Inspector:

Name of Inspector

Mailing Address, Phone, Fax, Email

The following information needs to be inspected and checked with “P” for pass or “F” for fail for each section

See referenced section for details of the requirements.

For Truck Mixers in accordance with Section 5.1 Do not use this to report your units, use the spreadsheet.

Truck #	Prior Cert ID.	Mixer size	Front (F) Rear (R)	5.1.1	5.1.2	5.1.3	5.1.4	5.1.5	5.1.6	Inspection Date
				Internal Condition	Chutes / Hoppers clean	Accuracy of Drum	Mixing Speed conformance	Rev Counter	Water gauge / meter accuracy	

For Agitators in accordance with Section 5.2 Do not use this to report your units, use the spreadsheet.

Truck #	Prior Cert ID.	Size	5.2.1	5.2.2	5.2.3	5.2.4	5.2.5	Inspection Date
			Internal Condition	Chutes / Hoppers clean	Drum Size	Rev Speed conformance	Rev Counter	

For Non-agitating units in accordance with Section 5.3 Do not use this to report your units, use the spreadsheet.

Truck #	Prior Cert ID.	Size	5.3.1	5.3.2	5.3.3	Inspection Date
			Smooth surface / watertight	Control Discharge	Interior Condition	

Complete a copy of the Fleet Inspection Reporting Spreadsheet and mail, email or fax to

NRMCA Engineering Division, 900 Spring Street, Silver Spring, MD 20910. Fax: (240) 485-1172

Contact of NRMCA Staff: Nina Stedman: nstedman@nrmca.org or Karen Bean: kbean@nrmca.org.

6. VERIFICATION OF INSPECTION AND APPLICATION FOR CERTIFICATE.

The undersigned, a licensed professional engineer in _____
 (Please Print: State, Territory, or Jurisdiction)

has conducted the inspection of the ready-mixed concrete plant described as _____

 (Please Print: Specific Designation and Location of Plant)

and asserts that, in his/her professional judgment, the information provided on this check list is accurate and complete. Application is hereby made for the issuance of a certificate for this plant, to be classified as follows:

NOTE: The engineer attesting to this inspection shall be licensed in the state where the production facility is located.

<u>General Operation</u>	<u>Batching System</u>	<u>Recording (if any)</u>
<input type="checkbox"/> Truck Mixing	<input type="checkbox"/> Manual	<input type="checkbox"/> Cementitious Materials
<input type="checkbox"/> Central Mixing	<input type="checkbox"/> Partially Automatic	<input type="checkbox"/> Aggregate
<input type="checkbox"/> Shrink Mixing	<input type="checkbox"/> Semi-Automatic	<input type="checkbox"/> Water
	<input type="checkbox"/> Automatic	<input type="checkbox"/> Chemical Admixtures

See Qualification Chart in Section 9 to determine classification requirements.

A Certificate of Conformance cannot be issued if there is an “F” in any of the required sections.

An “N” is permitted only if the item is not applicable to the particular plant.

PLEASE FILL OUT COMPLETELY AND PRINT CLEARLY!

Failure to do so will hold up the certification!

 (Inspection Date) (PRINT Name of Licensed Professional Engineer)

 (Inspector ID from NRMCA) (SIGNATURE of Licensed Professional Engineer)

 (PRINT Name of Asst. to Engineer Conducting Inspection)

 (Assistant ID from NRMCA) (SIGNATURE of Asst. to Engineer Conducting Inspection)

(SEAL) (PRINT Business Name)

 (PRINT Street Address)

 (PRINT City, State, Zip Code)

 (Phone Number) (Fax Number)

 (PRINT E-mail Address)

7. AGREEMENT TO REGULARLY VERIFY ACCURACY OF SCALES, VOLUMETRIC BATCHING DEVICES AND DISPENSERS AND, IF USED, DEVICES FOR AUTOMATED AGGREGATE MOISTURE MEASUREMENT

(To be completed by ready-mixed concrete Company Official – executive level person)

The undersigned agrees that all scales in the plant described below will be checked at intervals not exceeding 6 months for conformance with Item 2.1.3 of the *Check list for Ready Mixed Concrete Production Facilities*. Any failure to meet the scale tolerance (± 0.20 percent of scale capacity throughout the range of use) will be corrected promptly. If correction is delayed for any reason, batch weights of any concrete delivered will be adjusted to assure positively against a deficiency in unit cement content or excess in water-cement ratio. The undersigned also agrees that the batching accuracy of all volumetric admixture dispensers and all volumetric water batching devices (including water meters) in the plant will be checked at intervals not exceeding 90 days for conformance with the batching accuracy requirements for liquid admixtures and water contained in Items 2.5.3 and 2.5.4 of the check list. Accuracy of devices for automated aggregate moisture measurement, when used, will be checked at intervals not exceeding 90 days (Item 2.5.5.1). Any failure to meet the required batching accuracy will be corrected promptly. (Checks may be made by qualified company personnel, by outside agencies or by scale checking companies.)

**PLEASE FILL OUT COMPLETELY AND PRINT CLEARLY!
Failure to do so will hold up the certification!**

(Signature of Company Official)

(Date)

(PRINT Name and Title of Company Official)

(PRINT Location of Company Official)

(PRINT Plant Name and Street Address)

(PRINT City, State, and Zip Code)

(PRINT Company Name and Street Address)

(PRINT City, State, and Zip Code)

(Phone Number)

(Fax Number)

(PRINT E-mail address)

NRMCA QC Manual – Section 3 – Plant Certification

8. REFERENCES

1. Annual Book of ASTM Standards, Volume 04.02, Concrete and Aggregates, ASTM, 100 Barr Harbor Drive, West Conshohocken, PA, www.astm.org.
2. Concrete Plant Standards, CPMB 100-05, Thirteenth Revision, August 2005, Concrete Plant Manufacturers Bureau, 900 Spring Street, Silver Spring, Maryland 20910, www.cpmc.org.
3. Truck Mixer, Agitator and Front Discharge Concrete Carrier Standards, TMMB 100-05, Seventeenth Revision, March 2005, Truck Mixer Manufacturers Bureau, 900 Spring Street, Silver Spring, Maryland 20910, www.tmmb.org.
4. Guide for Measuring, Mixing, Transporting, and Placing Concrete (ACI 304R), ACI Manual of Concrete Practice, American Concrete Institute, Farmington Hills, Michigan, www.concrete.org.
5. Mixing Concrete in a Truck Mixer by Richard D. Gaynor and Jon I. Mullarky, NRMCA Publication No. 148, January 1975, www.nrmca.org.
6. Ready Mixed Concrete, by C.L. Lobo and R. D. Gaynor, authorized reprint from ASTM STP 169D, NRMCA Publication 2P186, 2006.
7. Concrete Plant Operator's Manual, NRMCA Publication 2P159, 2005.
8. User's Guide to ASTM Specification C 94 on Ready Mixed Concrete, by D. Gene Daniel and Colin Lobo, ASTM MNL 49, available from NRMCA – Publication 2PMNL49.

NRMCA QC Manual – Section 3 – Plant Certification

9. QUALIFICATION CHART FOR READY MIXED CONCRETE PLANTS

Based upon submittal of a properly executed “check list for Ready Mixed Concrete Production Facilities,” a certificate will be furnished by the National Ready Mixed Concrete Association, to be signed by the inspecting engineer and principal company executive, indicating

- (1) The general operating method of the ready-mixed concrete plant as “Truck Mixing,” “Central Mixing,” or “Shrink Mixing.”
- (2) The batching system as “Manual,” “Partially Automatic,” “Semi-Automatic,” or “Automatic.”
- (3) If recording is provided, to what extent.

Certification for a given classification requires a “✓” for items in the check list groups designated on the chart below by “X” except that “N” for “not applicable” is permissible in certain cases where such permissibility is implicit in the item itself. (e.g. “N” would be appropriate for 1.3.2 in a semi-tropical climate since concrete would never be delivered in freezing temperature. Similarly, the requirements for beam-indicating scales in 2.1.6 would not apply in a plant having only dial or digital-indicating scales.)

Check List Items	Truck Mixing				Shrink Mixing				Central Mixing			
	M	PA	SA	A	M	PA	SA	A	M	PA	SA	A
1	X	X	X	X	X	X	X	X	X	X	X	X
2.1	X	X	X	X	X	X	X	X	X	X	X	X
2.2	X	X	X	X	X	X	X	X	X	X	X	X
2.3	X	X	X	X	X	X	X	X	X	X	X	X
2.4	X	X	X	X	X	X	X	X	X	X	X	X
2.5	X	X	X	X	X	X	X	X	X	X	X	X
2.6.2.1	X				X				X			
2.6.2.2		X				X				X		
2.6.2.3			X				X				X	
2.6.2.4				X				X				X
2.7	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
3.1									X	X	X	X
3.2					X	X	X	X				
4.	X	X	X	X	X	X	X	X	X	X	X	X
5.1	X	X	X	X	X	X	X	X				
5.2 and/or 5.3									X	X	X	X

M = Manual; PA = Partially Automatic; SA = Semi-Automatic; A = Automatic
(1) Description on certificate will indicate extent of recording provided, if any

10. QUALIFICATION REQUIREMENTS FOR INSPECTING PERSONNEL

10.1 Qualifications of Inspecting Engineer

- 10.1.1 The Engineer shall have a current license to practice as a professional engineer in the state or jurisdiction where the plant is located. It is permitted for the Engineer to be employed by the company requesting certification.
- 10.1.2 The Engineer shall have requisite knowledge of the concrete technology and production.
- 10.1.3 The Engineer shall obtain and study a copy of the NRMCA Plant Inspection Guide and use it as a reference resource. The Engineer shall complete the Engineer Information Form in Section 10.4 that will serve as an application to inspect concrete production facilities under the NRMCA certification program. The application shall include completion of a questionnaire on details of NRMCA's certification program based on information in the Guide and submitted along with a statement of qualifications to NRMCA. NRMCA reserves the right to request a re-application with subsequent revisions of this check list.
- 10.1.4 The statement of qualifications for the Engineer should include the following information:
 - a) Years since first licensed
 - b) A description of the amount of time or periods of time spent in managing or inspection of concrete construction
 - c) Familiarity or experience in concrete plants and concrete plant operations
 - d) Courses or seminars dealing with concrete technology
 - e) Approximate number of plants inspected for NRMCA Certification

10.2 Qualifications of Assistant to the Inspecting Engineer, if used

- 10.2.1 The Assistant conducting inspections shall be under the employ of the Inspecting Engineer of Record.
- 10.2.2 The Assistant to the Inspecting Engineer shall have requisite knowledge of the concrete technology and production.
- 10.2.3 The Assistant to the Inspecting Engineer shall obtain and study a copy of the NRMCA Plant Inspection Guide and use it as a reference resource. The Assistant shall complete an application that includes a questionnaire on details of NRMCA's certification program based on information in the Guide and submitted along with a statement of qualifications to NRMCA. NRMCA reserves the right to request a re-application with subsequent revisions of this check list.
- 10.2.4 The statement of qualifications of the Assistant to the Inspecting Engineer shall include items listed in 10.5.

10.3 Qualifications of Company Personnel conducting Inspections of Delivery Vehicles

- 10.3.1 Persons conducting delivery fleet inspections conducted by the Company should be under the employ or on contract with the Company and under the supervision of an Executive Level Company Official identified when submitting requests for certification cards for delivery vehicles.
- 10.3.2 Shall be familiar with the requirements for delivery vehicles in Section 5.
- 10.3.3 Shall maintain a statement of qualifications on file and provide this to the inspecting engineer during the inspection of the production facility. The statement of qualifications shall include items listed in 10.6.
Note 27: NRMCA reserves the option to prohibit personnel from inspecting production facilities and delivery vehicles for cause.

NRMCA QC Manual – Section 3 – Plant Certification

10.4 Engineer Information Form

This Engineer Information Form shall accompany a completed questionnaire on details of the Plant Certification Program based on the NRMCA Plant Inspectors Guide. A statement of qualifications for items listed in 10.1.4 shall be included. This application need only be submitted once unless information changes. NRMCA will issue the Engineer an identification number which should be used in Section 6 when submitting completed inspection checklists. **The Engineer shall be licensed in state of plant location.**

Submit the form to:

**National Ready Mixed Concrete Association
Engineering Division – Plant Certification
900 Spring Street, Silver Spring, Maryland 20910**

Name _____

Address _____

Phone Number _____ Fax Number _____ E-Mail _____

State(s) _____ Registration Number _____ Expiration Date _____

State(s) _____ Registration Number _____ Expiration Date _____

State(s) _____ Registration Number _____ Expiration Date _____

Major Branch _____

(Civil, etc., as designated in state directory)

Attach completed questionnaire related to plant inspections based on the NRMCA Plant Inspection Guide

Attach completed statement of qualifications for items listed in 10.1.4.

(Signature of Licensed Professional Engineer)

(Date)

(SEAL)

NRMCA QC Manual – Section 3 – Plant Certification

10.5 Statement of Qualifications: Assistant to the Inspecting Engineer

For Inspection of Concrete Production Facilities – Assistant should be under employ of Engineer of Record

Date:

Printed Name	
Signature	
Title	
Employed by Engineer of Record And NRMCA Identification	
Present Employer Address, City, State, Zip	
Phone/Fax/Email	
Years of service with the present employer and principal responsibilities	
Employment with ready mixed concrete producers and positions held by date	
Familiarity or experience in concrete plants and concrete plant operations	
Employment by laboratories or agencies testing concrete or concrete materials or involved in concrete construction	
Courses or seminars dealing with concrete technology and certifications received	
Experience with industrial scales and familiarity with the computer operations and or personal computers	

Attach completed questionnaire related to plant inspections based on NRMCA Plant Inspector's Guide

Use additional pages if required. This statement of qualifications needs to be submitted once to NRMCA unless information changes.

**10.6 Statement of Qualifications: Company Personnel Conducting Fleet Inspections
For Delivery Fleet Inspection Conducted by the Company**

Date:

Printed Name	
Signature	
Title	
Company Official Supervising Fleet Inspections	
Present Employer Address, City, State, Zip	
Phone/Fax/Email	
Years of service with the present employer and principal responsibilities	
Employment with other ready mixed concrete producers and positions held by date	
Familiarity or experience in maintenance of ready mixed concrete trucks and delivery vehicles	
Employment by laboratories or agencies testing concrete or concrete materials or involved in concrete construction	
Courses or seminars dealing with maintaining ready mix trucks and certifications received	

Use additional pages if required. This statement of qualifications should be maintained on file and provided to the inspector when the production facility is inspected. Do not submit to NRMCA.

SAMPLE CERTIFICATE OF CONFORMANCE

National Ready Mixed Concrete Association



**Certificate of Conformance
For
Concrete Production Facilities**

THIS IS TO CERTIFY THAT

South Avenue Plant, Centerville, CO

ABC Ready Mixed Concrete Company, Inc.

"Facility does not meet all requirements for furnishing concrete in subfreezing weather"

has been inspected by the undersigned licensed professional engineer for conformance with the requirements of the *Check List for Ready Mixed Concrete Production Facilities*. As of the inspection date, the facilities met the requirements for production by

***Truck Mixing with Automatic Batching and Recordings of
Cementitious Materials, Aggregate, Water, and Chemical Admixtures***



William C. Norman

Signature of Licensed Professional Engineer

January 05, 2007

Inspection Date

January 05, 2009

Certification Expiration

This company will maintain these facilities in compliance with the *Check List* requirements and will correct promptly any deficiencies which develop.

R.M. Producer

Signature of Company Official

President

Title of Company Official

NOTICE: The Check List indicates only that plant facilities are satisfactory for the production of concrete when properly operated. Conformance of the concrete itself with specification requirements must be verified by usual inspection methods in accordance with sales agreements.

This certificate is issued by the National Ready Mixed Concrete Association on verification that the production facility conforms to the requirements of the NRMCA Certification of Ready Mixed Concrete Production Facilities, QC3. Unauthorized reproduction or misuse of this certificate may result in legal action.

Plant ID #:800100

© 1965, 1992, 2001, 2002, 2006, 2007

Certification ID #: 7700

National Ready Mixed Concrete Association 900 Spring Street • Silver Spring • Maryland 20910



CLARK COUNTY DEPARTMENT OF BUILDING

Building division

4701 West Russell Road, Las Vegas, NV 89118 ~ (702) 455-3000

Concrete Mix Design Review Checklist



DATE: _____ MIX DESIGN No.: _____ PERMIT No.: _____

PROJECT NAME: _____

The above concrete mix design was reviewed and found to be in non-compliance with the requirements of Clark County Building Department (CCBD-IS). The following information is required on the mix design prior to approval:

- Clark County Building Division Permit Number
- Project name and address
- Total of Three (3) copies must be submitted - one (1) original + two (2) copies
- Use in the structure (i.e., to be used in columns, beams, slabs, etc.)
- Approved Batch Plant
- Stamped by Nevada registered engineer designing the mix (**FIGURE 1**)
- Accepted by the design professional who specified the concrete parameters. Original review stamp is required (**FIGURE 2**)
- Mix design is less than 12 months old
- Concrete aggregates comply with ASTM Standard Methods (C 33, C 330, or C 404)
- Concrete aggregates gradation tests are less than 12 months old
- Backup data and calculations, in accordance with ACI 301 & ACI 318, are required when f'_c is EQUAL TO/GREATER THAN 6000 psi
- Mix is going to be used in adverse weather conditions, special procedures and instructions are noted
- Air-entrainment is required for Mount Charleston environments above an elevation of 5,000 feet per 2006 IBC, Section 1904.2.1
- Slump prior to the addition of water reducing admixtures must be indicate
- Concrete durability shall comply with 2006 IBC, Section 1904 and 2006 ACI 318 4.3 (**FIGURE 3**)
- Other CCBD-IS comments: _____

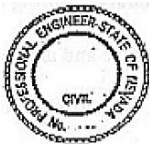


FIGURE 1

Nevada Registered Civil Engineer

Reviewed, no exceptions noted

Reviewed, exceptions noted

Rejected

Reviewed only for general compliance with the design concept and general compliance with the information given in the contract documents. Any action shown is subject to the requirements of the plans and specifications. Contractor's responsibility includes but is not limited to dimensions which shall be confirmed and controlled by Contractor at the job site fabrication processes and techniques of construction coordination of the work with that of all other trades and satisfactory performance of the work.

ENGINEERING

Date _____ By _____

Resubmittal required

Resubmittal NOT required

FIGURE 2 - Structural Engineer's Submittal Review Stamp

TABLE 4.3.1—REQUIREMENTS FOR CONCRETE EXPOSED TO SULFATE-CONTAINING SOLUTIONS

Sulfate exposure	Water soluble sulfate (SO ₄) in soil, percent by weight	Sulfate (SO ₄) in water, ppm	Cement type	Maximum water-cementitious material ratio, by weight, normalweight concrete*	Minimum f'_c , normal-weight and lightweight concrete, psi*
Negligible	$0.00 \leq SO_4 < 0.10$	$0 \leq SO_4 < 150$	—	—	—
Moderate [†]	$0.10 \leq SO_4 < 0.20$	$150 \leq SO_4 < 1500$	II, IP(MS), IS(MS), P(MS), I(PM)(MS), I(SM)(MS)	0.50	4000
Severe	$0.20 \leq SO_4 \leq 2.00$	$1500 \leq SO_4 \leq 10,000$	V	0.45	4500
Very severe	$SO_4 > 2.00$	$SO_4 > 10,000$	V plus pozzolan [‡]	0.45	4500

* When both Table 4.3.1 and Table 4.2.2 are considered, the lowest applicable maximum water-cementitious material ratio and highest applicable minimum f'_c shall be used.

[†] Seawater.

[‡] Pozzolan that has been determined by test or service record to improve sulfate resistance when used in concrete containing Type V cement.

FIGURE 3 - ACI 318-05 Table 4.3.1

ATTACHMENT D

Reviewed by: _____



CLARK COUNTY DEPARTMENT OF BUILDING & FIRE PREVENTION

4701 W. Russell Road • Las Vegas, NV 89118
(702) 455-3000 • Fax (702) 221-0630

Ronald L. Lynn, Director/Building & Fire Official
Samuel D. Palmer, P.E., Assistant Director • Girard W. Page, Fire Marshal

FABRICATOR/MANUFACTURER CERTIFICATE OF COMPLIANCE

Precast Concrete Fabrication

Approved Fabricator: Approved Fabricators are required to submit a CERTIFICATION OF COMPLIANCE for their shop precast concrete construction. Certification is to cover all materials and workmanship supplied by the fabricator/manufacturer, including all products fabricated by others that become part of the total product furnished to the project.

An example of an acceptable product certification is as follows:

FABRICATOR/MANUFACTURER CERTIFICATION OF COMPLIANCE

Project: _____ Date _____

To: Building Official, Clark County Department of Building:

All materials, workmanship and services supplied for use on subject project were purchased, fabricated, manufactured, shipped and/or installed in strict accord with the requirements of the Clark County Code, Technical Codes and Building Division approved plans.

I certify that the above is true and all records pertaining to the above are on file in my office.

Responsible Party

cc: Project Owner
Project Contractor
Project Architect/Engineer

Only approved fabricators may submit product certifications for work performed in their shop.

ATTACHMENT E