

SUMMARY OF CHANGES 2023

Updates for the 16th edition NPCA QC Manual QCM-001

Posting of DATE

During the 2022 NPCA Committee Week, the NPCA QA/QC Committee updated the NPCA Quality Control Manual for Precast Concrete Plants in a number of sections.

The format for notifying members and certified plants of these changes will not change in 2023. Members and certified plants will be notified of changes in Certification Express emails distributed to the designated primary contact and liaison to the auditor. A letter outlining changes also will be mailed to the liaison to the auditor for each certified plant location.

The 16th edition of the Quality Control Manual will include several changes and editorial updates that take effect at the start of the 2023 program year. Please see the posted manual for editorial changes indicated in red highlighted text. Members will have the opportunity to review and comment on the changes during a 60-day comment period from Nov. 2, 2022 to Dec. 31, 2022.

The table of contents has been renumbered as required to accommodate the changes in language throughout the manual as detailed below.

Under FOREWORD:

Updated the Quality Assurance Committee roster to reflect the membership of the 2021 – 2022 committee members. The first edition of the NPCA QC Manual was published in 1987 in consultation with the members of the National Precast Concrete Association, and has been revised regularly since then. The **Sixteenth** edition of the NPCA QC Manual was recommended for approval by NPCA's Quality Assurance/Quality Control Committee to the NPCA Board of Directors in **October** 2022.

NPCA Quality Assurance/Quality Control Committee Members (**2021 - 2022**):

- Richard Alvarado, Western Precast Concrete Inc. (Chairman)
- Sam Lines, Concrete Sealants Inc. (Board Liaison)
- Chad Anderson, Pro-Cast Products Inc.
- Taylor Clark, Maine Department of Transportation
- Jason Cross, Norwalk Concrete Industries
- Charles Curry, Forterra Pipe & Precast
- Joe Fisher, Voeller Mixers
- Scott Grumski, Forney LP
- Marvin Hanks, ParkUSA dba Northwest Pipe Company
- Hugh Martin, Oldcastle Infrastructure
- Stephen Matt McSweeney, Pennsylvania Department of Transportation
- Matt McSweeney, Pennsylvania Department of Transportation

- Mitchell Rainero, Permatile Concrete Products Co.
- Tim Sander, Gainey's Concrete Products Inc.
- Rusty Stever, Jensen Precast
- Jason Tucker, Texas Department of Transportation
- Charles E. Watkins, Advanced Concrete Technologies Inc.
- Todd Whittington, North Carolina Department of Transportation
- Drew Wieser, Wieser Concrete Products Inc.

Under Section 1.1.2 Plant-Specific Quality Control Manual:
Language updates only to this section.

STANDARD

COMMENTARY

1.1.2 Plant-Specific Quality Control Manual

The plant shall have a plant-specific QC manual that details the production and QC policies and procedures used by the plant. The manual shall be compiled in **one notebook or binder a format** for easy review by plant personnel or by an inspector. At a minimum, the manual shall include the requirements of this manual and the following sections:

Under Section 1.1.3 QC Personnel Training:
Language updates only to this section.

STANDARD

COMMENTARY

1.1.3 QC Personnel Training

1. Plant QC Lead and assigned backup **inspectors personnel** shall hold current certificates of completion for:

- a. NPCA Production and Quality School (PQS)

Plant QC Lead and assigned backup **inspectors personnel** shall re-certify in NPCA PQS every five years by retaking PQS Level I Refresher, PQS Level I, or PQS Level II QA/QC, PQS Level II Technical, or PQS Level II Production. Plant QC Lead and assigned backup **inspectors personnel** with expired NPCA PQS must re-take PQS Level I. Plant QC personnel maintaining an active Master Precaster certification are exempt from the five year re-certification of PQS.

2. Plant QC Lead and assigned backup shall hold current certifications for **applicable** concrete testing by:
 - a) the American Concrete Institute (ACI) Concrete Field Testing Technician – Grade 1

OR

b) an industry recognized ACI equivalent

OR

c) an independent third-party professional. Evidence of certification will be in the form of a formal certificate or equivalent document stamped by a professional engineer noting ASTM or equivalent test methods evaluated.

Under Section 1.1.5 Plant Requirements:

Language updates only to this section.

STANDARD

COMMENTARY

1.1.5 Plant Requirements:

1. Maintain a current copy of this NPCA Manual in ready access to inspectors and plant personnel.
2. Develop and periodically update a written **or digital** plant-specific QC manual.
3. Maintain current copies of applicable ASTM International test methods and specifications on file.
4. Maintain files of project specifications and requirements.
5. Maintain employee training records in company files.
6. Designate and train a plant QC **Inspector Lead** for each work shift, with an assigned individual designated as backup. The QC **Inspector Lead** shall report to plant management and not directly to production personnel. In small plants, the designated QC **Inspector Lead** can be included in daily production duties. A designated QC **Inspector Lead, or their backup** shall be present any time the plant is in production.
7. Management or a designated representative shall hold QC meetings with QC and plant personnel a minimum of once every 6 months. A record of the minutes of these meetings and a list of attendees shall be kept in the plant files.
 - a. All NPCA Certified Plants shall discuss and maintain documentation tracking customer complaints and subsequent corrective actions taken by the plant related to product quality issues. Documentation shall be kept on file for a period of three years and made available to the auditor during each plant audit.

Under Section 3.1.1.1 Normal, Heavy Weight, and Mass Concrete:
Commentary language addition this section.

STANDARD

COMMENTARY

3.1.1.1 Normal, Heavyweight, and Mass Concrete

Plants using normal, heavyweight, and mass concrete shall include specific quality control procedures in their plant-specific QC manual, as discussed in 1.1.2. At a minimum, detailed written procedures shall address the steps necessary for initial mix qualification and subsequent daily quality control operations.

Slump values for Normal, Heavy Weight and Mass Concrete have a range of 2 inches to 9 inches.

Initial mix qualifications shall be documented in the plant files. Documentation shall include trial batching and in-depth concrete testing. Mix qualification procedures shall include the establishment of acceptable tolerance ranges for test results of daily quality control testing (See example Mix Qualification Form in appendix B.)

Subsequent daily quality control operations must follow the daily quality control testing acceptance criteria established during the initial mix qualification (see Section 5.2 and 5.3).

Under Section 3.1.1.2 Self-Consolidating Concrete:
Commentary language addition this section.

STANDARD

COMMENTARY

3.1.1.2 Self-Consolidating Concrete

Plants using self-consolidating concrete (SCC) shall include SCC-specific quality control procedures in their plant-specific QC manual, as discussed in 1.1.2. At a minimum, detailed written procedures shall address the steps necessary for initial mix qualification and subsequent daily quality control operations.

The plant should consult with their admixture supplier in developing appropriate quality control operations. The plant may also consider consulting the "NPCA Guide to Implementing SCC", ASTM Standards, ACI and other recognized national standards and guides for the use of Self-Consolidating Concrete. Daily quality control testing does not need to be the same as the more involved initial mix design qualification process.

Initial mix qualifications shall be documented in the plant files. Documentation shall include trial batching and in-depth concrete testing. Mix qualification procedures shall include the establishment of acceptable tolerance ranges for test results of daily quality control testing (See example SCC Mix Qualification Form in appendix B.)

Subsequent daily quality control operations must follow the daily quality control testing acceptance criteria established during the initial mix qualification (see Section 5.2 and 5.3).

Slump Flow values for SCC have a range of 20 inches to 30 inches.

Under Section 3.2.4.3 Dry-Cast Concrete:

Standard added

STANDARD

COMMENTARY

3.2.4.3 Dry-Cast Concrete

For plants that utilize mass batching or a combination of mass and volumetric (for liquid) batching, the equipment must be capable of measuring and batching concrete raw materials within the following tolerances:

Cement	+/- 1% (mass)
Cement plus supplementary	
Cementitious materials	+/- 0.5 lb, or +/- 1% whichever is greater (mass)
Aggregate	+/- 2% (mass) individual or cumulative
Water	+/- 3% (mass or volume)
Admixtures (mass or volume)	+/- 3% of total amount required or plus or minus the amount or dosage required for 100 lbs. of hydraulic cement, whichever is greater.

For plants that utilize volumetric batching and continuous mixing ingredients shall be measured by volume. The equipment must be capable of measuring and batching concrete raw materials within the following tolerances:

Cementitious	0 to +4% (mass)
Fine Aggregate	+/- 2% (mass)
Coarse Aggregate	+/- 2% (mass)
Admixtures	+/- 3% (mass or volume)
Water	+/- 3% (mass or volume)

Under Section 3.2.6 Mixers:

Standard added

STANDARD

COMMENTARY

3.2.6 Mixers

The batch size shall not exceed the capacity recommended by the manufacturer. Mixers shall be capable of producing concrete of uniform consistency and uniform coarse aggregate distribution as required by ASTM C94 for batch mixing, ASTM C685 for continuous mixing, or ASTM C1837 for dry-cast.

The condition of the mixer should be checked daily for mortar or concrete build-up and worn blades. The manufacturer's drawing of the mixer tools

Mixers shall be checked daily for cleanliness, clearances on blades and shoes, proper gate seals, lockout controls.

showing all dimensions should be available so that the amount of wear can be determined. Blades and mixing tools worn more than 10% should be adjusted or replaced. Concrete and mortar build-up should be removed and discarded.

Under Section 4.6.5 Plant Requirements:

Standard added

STANDARD

COMMENTARY

4.6.5 Plant Requirements:

A post-pour inspection shall be made and documented for 1 piece or 3%, whichever is greater, of each precast product produced. The inspections shall document any damage, excessive bugholes or honeycombing, poor dimensional tolerances, or other problems such as exposed reinforcing. A mark shall be made on the product indicating whether it is acceptable, requires repair, or it has been rejected. **or the plant shall have a documented process in place indicating products are acceptable, require repair, or have been rejected.**

Under Section 5.3.1.1 Slump:

Commentary added

STANDARD

COMMENTARY

5.3.1.1 Slump

A slump test of fresh concrete of each mix design shall be performed for each 150 cubic yard (115 cubic meters) of concrete, or once a day, whichever comes first. Slump tests shall be performed in accordance with ASTM C143, "Standard Test Method for Slump of Hydraulic-Cement Concrete." SCC, no-slump, or dry-cast concrete does not need to be tested for slump.

Slump values for Normal, Heavy Weight and Mass Concrete have a range of 2 inches to 9 inches.

Under Section 5.3.1.2 Slump Flow and Visual Stability Index:
Commentary added

STANDARD

COMMENTARY

5.3.1.2 Slump Flow and Visual Stability Index

For SCC mixtures, slump flow and Visual Stability Index (VSI) tests of fresh concrete of each mix design shall be performed each day by testing one of the first two batches of SCC as defined by the initial mix qualification process. Reject the concrete if the upper specification limit is exceeded. If the slump flow test result is less than the lower production range limit reject the concrete unless the mixture has been approved for vibration and is subsequently vibrated. Thereafter, slump flow and VSI testing shall be performed as follows:

- When changing mix designs
- When changing raw materials,
- and
- As required in Section 5.2.2.2

Slump flow and VSI tests shall be performed in accordance with ASTM C1611 "Standard Test Method for Slump Flow of Self-Consolidating Concrete"

Producers using SCC shall follow applicable ASTM test methods for air content, unit weight, and casting compressive strength cylinders. Filling in lifts and rodding are not required when using SCC. The slump test is used to determine the consistency of fresh concrete and the uniformity of concrete from batch-to-batch. If the batch weights of cement, water, and aggregates are reasonably correct, changes in slump are probably due to changes in aggregate moisture or in dispensing of admixtures. However, slump variations can also occur because of changes in aggregate gradations, temperature and air content.

The air content of an SCC mix can affect the desired properties of the mixture and it is recommended that the air content be tested regularly with the Slump Flow and VSI.

Slump Flow values for SCC have a range of 20 inches to 30 inches.

Under Section 6.4.2 Joint Design:
Commentary removed

STANDARD

COMMENTARY

6.4.1 Joint Design

Joints design drawings shall be maintained on file at the plant for each joint design used. Critical dimensions and allowable tolerances shall be clearly indicated on the joint design drawings. As a proof of design, the plant shall maintain documentation on file indefinitely showing that when assembled; the joint gap between any two box culvert sections is not greater than 3/4 inch (19 mm) in any one location.

Proper joint designs are crucial to the performance of installed box culvert structures when infiltration or exfiltration are a factor in the project. In addition, the joint must be capable of transferring loads across the joint from one section to another.

Under Appendix A – Standards Cited in Manual and References:
Standard added

ASTM C1786 “Specification for Segmental Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers Designed According to AASHTO LRFD”

Under Part 4 Plant Terms and Conditions – Grading Schedules:
Editorial – Additions

PART 4

GRADING SCHEDULES

- 4.1 The grading schedules are shown in the section titled “Grading Schedule” in the NPCA Quality Control Manual for Precast Concrete Plants. It can be seen that the items listed specifically refer to sections of the NPCA Quality Control Manual for Precast Concrete Plants.
- 4.2 Sections to be graded have been assigned “points” (A) shown in the first column on the right. The auditor grades each section based on the percentage of compliance with the Quality Control Manual shown in the second column (B). Certain items may not be applicable (NA) to all plants during an inspection. Those items are not graded. For each graded item the number of points (A) is multiplied by the grade percentage (B). The sum of those values is obtained for each chapter. Because some items are not applicable, an adjustment is made.

- 4.3 The grade adjustment consists of multiplying the sum of $A \times (B/100)$ for each chapter by 100 and dividing by the total possible points that are applicable and/or observable. The final plant score represents the percentage of total points earned by the plant versus the total applicable and/or observable points.
- 4.4 Completed grade **sheets schedules** are **made available to plant representatives via the Producer Portal under myNPCA sent to the plant representative**, and a copy is kept on file by the Administrator. No other copies are distributed unless the applicable plant provides consent or instruction to do so in writing to the program Administrators.
- 4.5 Critical sections of the manual are graded with the actual scoring percentage earned by the plant for each specific element and totaled. Plants scoring less than 75% in any critical section will be awarded zero '0' points for that element. New plants scoring less than 75% in any critical section during their initial announced plant inspection will not be considered for certification. Existing plants scoring less than 75% in any critical section or an overall plant score of less than 80% but greater than or equal to 75% during their annual unannounced plant inspection will be subject to probationary status (See part 5.2.1 Probationary Status).

Under Part 5 Plant Terms and Conditions – Grading, Certification Status, and Corrective Actions:

Editorial – Clarifications

PART 5

GRADING, CERTIFICATION STATUS, and CORRECTIVE ACTIONS

5.1 Certified Status

- 5.1.1 A plant qualifies as a certified plant if it achieves a plant score of 75% or greater in each applicable Critical Requirement section of the pertinent grading schedule and achieves an overall score of 80% or greater.
- 5.1.2 A plant fails its audit if it achieves an overall score less than 75%.
- 5.1.3 A new plant that fails its audit and wishes to be considered for Certified Status, must reapply to the program.
- 5.1.4 A certified plant that fails its audit and does not appeal its audit and wishes to be considered for Certified Status, must reapply to the program.
- 5.1.5 A certified plant that fails its audit and wishes to appeal its audit, see section 5.3 below.

- 5.1.6 A plant qualifies for NPCA product listing if it provides a complete and NPCA approved document submittal and passes its initial or annual unannounced audit.
- 5.1.7 A plant is not eligible for product listing if it earns probationary status or fails its annual unannounced audit.
- 5.1.8 Plants with a product listing earning probationary status or failing its annual unannounced audit will lose listing status and must reapply to the product listing program.

5.2 Probationary Certification Status

- 5.2.1 A plant that does not comply with the conditions set forth in section 5.4.1; Corrective Action response, achieves a score of less than 75% for any critical requirement or achieves an overall plant score greater than or equal to 75% and less than 80% **is eligible to will** receive probationary certification status.
- 5.2.2 Probationary Certification status shall remain in effect until such time when the plant pays applicable fees, responds in writing to all deficiencies with corrective action, and passes its unannounced re-audit within a period not to exceed 90 calendar days from the previous audit and the conditions calling for probationary status no longer exist, as determined by the audit agency and/or NPCA or its agent. Plants failing to pay applicable fees within 30 days of the invoice date and receive an unannounced re-audit of the plant within 90 days from the previous audit will not be considered for certification.
- 5.2.3 In no way will the plant listing on the NPCA Web site or anywhere else indicate that a plant has received probationary certification status.
- 5.2.4 The plant must pass their unannounced re-audit and receive an overall score of 80% or greater and must score at least 75% on all Critical Requirements in order to be removed from probationary status.
- 5.2.5 Plants that fail to pass their unannounced re-audit will be required to reapply to the program.

5.3 Provisional Certification Status

- 5.3.1 Provisional Certification Status is effective when a plant that is currently certified in the program, fails **an** its annual unannounced audit, and files an appeal**s**. This period is intended to allow sufficient time to process the appeal, while maintaining Provisional Certification Status.

- 5.3.1.1 A certified plant that fails its annual unannounced audit and files a complete appeal of the results of their audit has 10 days from the date of the plant audit to file the formal appeal documentation with NPCA.
- 5.3.1.2 A complete appeal shall be received by NPCA, from the plant, in writing and in the form of a letter or an email along with all supporting documentation sent to the program Administrator. Supporting documentation shall include items such as, but not limited to, a copy of the preliminary and/or final report grading schedule, photographs, completed inspection form, test results, and copies of material to illustrate compliance to requirements along with corrective action responses to all deficiencies noted in the inspection report. The plant representative shall also supply reasons they believe a scoring appeal is warranted.
- 5.3.1.3 A plant issuing incomplete appeal documentation will not be considered for Provisional Certification Status and will need to reapply to the Certification Program.
- 5.3.1.4 Hearings for appeals will usually be scheduled to coincide with the regularly scheduled monthly meetings of the NPCA Quality Assurance Review Subcommittee, but hearings may be held at other times which are mutually convenient for the Review Subcommittee, management of the plant which filed the appeal, and the inspection agency and may consist of a conference call.
- 5.3.1.5 Hearings for appeals will/shall be closed meetings with only the Quality Assurance Review Subcommittee, the Administrators, management of the appealing plant, and if required the agency representative. The management of the plant which filed the appeal will/shall first present its case orally and the committee may ask questions of the speaker. The agency representative will then orally present its case followed by answering questions raised by the committee. Management of the appealing plant then will/shall make its closing statement and that will/shall be followed by the closing statement of the agency representative. Representatives of the appealing plant and the agency will/shall then be excused so that the Subcommittee can deliberate in executive session.
- 5.3.1.6 If a member of the Quality Assurance Review Subcommittee is a representative of the appealing plant, or it is determined that they have a conflict of interest, that Subcommittee member shall excuse themselves from the deliberations in executive session.

- 5.3.1.7 Decisions of the Quality Assurance Review Subcommittee will/shall be sent to both the plant management and the agency within ten calendar days of the hearing. The Quality Assurance Review Subcommittee's decision(s) will/shall be final, and no further appeals will/shall be considered.
- 5.3.1.8 A plant that appeals the results of the audit and the appeal is approved, the Provisional Certification period ends on the date of the approved appeal. Thereafter, the plant resumes normal certification status.
- 5.3.1.9 For plants that appeal the results of the **ir** audit, and the appeal is denied, the Provisional Certification period ends on the date of the denied appeal and the plant is no longer certified. To re-enter the certification program, the plant must reapply, pay applicable fees, and successfully pass its unannounced audit.
- 5.3.1.10 Plants that do not appeal the results of a failed audit are not eligible for Provisional Certification.

5.4 Corrective Actions

- 5.4.1 All plants passing their audit (regardless of score) must respond in writing indicating corrective action taken for all deficiencies noted in their report. All plants failing to submit a written response with documented evidence within 45 days of the plant audit shall receive and be subject to the conditions set forth in section 5.2.1; Probationary Certification Status. Documented evidence shall be supplied (photographs, completed inspection forms, test results, copies of material certifications) to illustrate compliance to requirements and of the corrective action taken to both NPCA and the agency.

Under Part 6 Plant Terms and Conditions – Appeal Procedure

Editorial – Additions

PART 6

APPEAL PROCEDURE

- 6.1 If plant management disagrees with the grade resulting from a plant audit, the approval of a product submittal or decision on product listing, management may file an appeal for review by the NPCA Quality Assurance Review Subcommittee, or their designees. See section 5.2, Probationary Certification Status or section 5.3, Provisional Plant Certification Status for information on the appeal process.

- 6.2 Plants wishing to file a formal appeal of their audit must do so within 45 calendar days of the plant audit. A complete appeal shall be submitted in the form of a letter or email addressed and sent to the program Administrator. A copy of the Preliminary or Final Report grading schedule shall accompany the letter or email. Individual grades on specific sections with which management disagrees shall be cited and all supporting documentation (photographs, completed inspection forms, test results, copies of material and certification to illustrate compliance to requirements along with corrective action responses to all deficiencies noted in the inspection report) shall be provided along with reasons why management believes each cited grade should be changed. If the plant fails to provide a complete written appeal and all relevant documentation the appeal will be denied.
- 6.3 If necessary, the Review Subcommittee shall request a response from the inspection agency. The agency will respond in writing to the Administrator within 21 calendar days of receipt of notice of appeal by the Administrator.
- 6.3.1 If the agency agrees with the appeal and agrees that the grade should be changed as requested in the appeal, the agency will prepare a revised report and grading schedule.
- 6.3.2 If the inspection agency disagrees with the appeal and believes that the grades originally assigned are appropriate and the plant wishes to have the appeal heard by the Quality Assurance Review Subcommittee (which acts as the appeals board), the chairman (or designated program administrator) of the NPCA Quality Assurance/Quality Control Committee will poll the Review Subcommittee members to determine if they (a) agree with the appeal and disagree with the agency's response, or (b) disagree with the appeal and agree with the agency's response. The chairman (or designated program administrator) shall poll the members to determine if a hearing of the appeal is needed and if so, to establish a date for the hearing. Subcommittee members who have a conflict of interest with regard to the plant must excuse themselves from the polling.
- 6.5 Hearings for appeals will usually be scheduled to coincide with the regularly scheduled monthly meetings of the NPCA Quality Assurance Review Subcommittee, but hearings may be held at other times which are mutually convenient for the Review Subcommittee, management of the plant which filed the appeal, and the inspection agency and may consist of a conference call. **Hearings may also be conducted via email poll at the discretion of the chairman (or designated program administrator) of the NPCA Quality Assurance/Quality Control Committee.**
- 6.6 Hearings for appeals will be closed meetings with only the Quality Assurance Review Subcommittee, the Administrators, management of the appealing plant, and if required

the agency representative. The management of the plant which filed the appeal will first present its case orally and the committee may ask questions of the speaker. The agency representative will then orally present its case followed by answering questions raised by the committee. Management of the appealing plant then will make its closing statement and that will be followed by the closing statement of the agency representative. Representatives of the appealing plant and the agency will then be excused so that the Subcommittee can deliberate in executive session.

- 6.7 If a member of the Quality Assurance Review Subcommittee is a representative of the appealing plant, or it is determined that they have a conflict of interest, that Subcommittee member shall excuse themselves from the deliberations in executive session.
- 6.8 Decisions of the Quality Assurance Review Subcommittee will be sent to both the plant management and the agency within ten calendar days of the hearing. The Quality Assurance Review Subcommittee's decision(s) will be final and no further appeals will be considered.

Should you have any questions about the changes to the NPCA Quality Control Manual for Precast Concrete Plants 15th Edition, changes for program year 2023, please contact Phillip Cutler, P.E., director of quality assurance programs, pcutler@precast.org, (800) 366-7731