

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

www.state.pa.us

P.O. Box 2926
Harrisburg, PA 17105
September 13, 2007



TO: See Initial Distribution Below

Attn.: Quality Control Manager

RE: QCP Requirements

Dear Business Partner:

In January 2003, Document 201 'Specification Guidelines for Precast/Prestressed Concrete Bridge Products' was released by the Prestressed Concrete for Economic Fabrication (PCEF) committee. A CD ROM is enclosed which provides an introduction to the committee and a copy of the specification document.

The PCEF committee is chaired by Lou Triandafilou from FHWA's Mid Atlantic Resource Center. The committee, comprised of members from FHWA, Mid Atlantic DOT's, Industry and Academia, is focused on improving and promoting the use of prestressed concrete structures through standardization, integration and implementation of new technologies.

Continuing efforts by PCEF's Materials and QA-QC subcommittee recently resulted in the finalization of standardized Quality Control guidelines for prestressed concrete members. These guidelines (attached) will be integrated into Document 201 in the near future.

These QC guidelines have been accepted by the following agencies:

- Virginia Department of Transportation
- Delaware Department of Transportation
- Maryland State Highway Administration
- West Virginia Department of Transportation
- District of Columbia Department of Transportation
- Pennsylvania Department of Transportation

We hope you will consider utilizing these guidelines to develop a single Quality Control plan which is accepted for all the owner-agencies you produce for. As indicated in the guidelines, the QC plan must be routed through each agency for approval.

The subcommittee is currently finalizing mix design qualification and testing procedures for the use of self consolidating concrete for prestressed concrete products. These procedures, when completed, will also be integrated into Document 201.

Sincerely,

The image shows two handwritten signatures in black ink. The signature on the left is 'Paul S. Finnerty' written in a cursive style. The signature on the right is 'Robert D. Horwhat' also in a cursive style, with a long horizontal stroke extending to the right.

Paul Finnerty (MDSHA)

Robert D. Horwhat (PENNDOT)

**Co-Chairmen, Materials and QA-QC subcommittee
Prestressed Committee for Economic Fabrication**

Enclosure

QUALITY CONTROL REQUIREMENTS

Each Manufacturer shall have a Quality Control (QC) system in place to ensure the Quality of their products and provide adequate assurance to Agencies that the products purchased will meet the requirements of their specifications.

Each Manufacturer shall establish and maintain a Quality Control Plan (QCP). The QCP is intended to outline the overall internal Quality Control operating procedures of the Manufacturer, document the policies for achieving Quality, and assign responsibility and accountability for QC within the Manufacturer's organization. It also describes the minimum Quality Control requirements expected of other manufacturers or material suppliers from whom component materials are obtained.

The Manufacturer's QCP may be maintained in an electronic format. However, one or more copies must be maintained by the Manufacturer's QC Manager in a printed and bound format (3-ring or other). The QCP shall be available to the Agencies inspector when requested. Each document in the QCP shall indicate its preparation date and all pages of the QCP shall be numbered. If a document is revised, the date of revision shall be indicated on the document and recorded in a table of revisions.

The minimum standard QCP criteria are listed below, along with commentary to clarify the requirements, where appropriate. The Manufacturer's QCP must consist of more than a simple reiteration of the guideline elements, i.e. the QCP must describe how each requirement will be inspected, verified and documented.

The QC plan shall address each criterion as agreed upon by the Agency. The QCP shall be formatted to provide numbered Sections for each item, in the order listed below, unless otherwise agreed to by the Agency.

QCP – Outline of Major Elements

1. Company Org chart
2. Training and certification requirements for QC personnel
3. Sampling/testing/certification requirements for component materials
4. Equipment and calibration
5. Prepour inspection
6. Curing
7. Hot/Cold weather production procedures
8. Stripping/handling and storage of product
9. Product Identification
10. Post pour documentation
11. Repairs
12. Final inspection
13. Resolution of Non-conforming material
14. QC forms and other documentation
15. Additional State Specific Requirements

1.0 Organization

- 1.1 Responsibility and Authority The QCP shall contain a graphical organization chart showing key personnel, their duties, responsibilities,

authorities, and interrelationship structure. Include a general organization chart for the whole company, supplementing it, as required, with more detailed charts that present internal organizations of departments directly concerned with the QC activities.

While a generic unit organizational chart may describe hierarchy and general functional responsibilities, there is also a need to indicate specific personnel within the structure. Details of their responsibilities, authorities, and hierarchy of all functions, which manage, perform, and/or verify work affecting quality, should be provided.

2.0 Training and Certification

2.1 Description

The QCP shall provide a description of the company's overall training and certification program for individuals within the QCP.

The QCP should distinguish between training delivered for new employees and on-going or recertification programs for existing QC personnel.

The QCP must describe the company's system of recording and maintaining individual certification and training records for each employee.

3.0 Sampling/Testing/Certification Requirements for Component Material

3.1 Material Types and Sources of Supply

The QCP shall list the specific types of component materials used for production, applicable AASHTO, ASTM or other standards and governing specification requirements. Frequency of sampling and testing shall meet the minimum requirements as outlined below.

In addition, the QCP shall describe the type and level of certification and/or test reports provided by the suppliers of these materials and the location of where the records will be stored.

Examples of component materials include aggregates, cement, admixtures, reinforcement, strand, studs, inserts or other proprietary items, inserts and other hardware.

Any component materials that are not accepted on the basis of a Certificate of Compliance (COC) must be tested

and approved prior to production.

All component materials should be visually inspected, as appropriate, prior to their use in production.

For material received and accepted solely on the basis of a COC, the Agency may require periodic or random sampling to verify conformance to the specified requirements.

Documentation of material sources, certifications and testing shall be kept for a minimum number of years and accessible upon request per Agency guidelines.

Minimum Sampling and Testing Frequencies

Agg. Sieve Analysis for FA and CA, ASTM C136	Agg. Moisture Analysis	Agg. Temp.	Concrete Strength, ASTM C 39
Each new delivery must be tested, however if two or more storage bins are utilized, multiple deliveries can be stocked/stored together with one sample tested to approve the combined loads.	Beginning of work and thereafter, as required. Allow compensation by moisture meter.	Start of work or if restocking aggregate bins. 40F minimum	Ea. Beam unless beam < 9 cy. If < 6 cy, then cyls. every 3rd beam. If 6 to 9 yds/beam, cyls every 2nd beam.

Concrete Slump, ASTM C 143	Concrete Air, ASTM C 173/C 231	Concrete Temp. ASTM C 1064

1st batch ea. day and 2 consec. thereafter to establish consistency (all w/in action range). Once material control is estab., freq. may be reduced to every 25 c.y.	1st batch ea. day and 2 consec. thereafter to establish consistency (all w/in action range). Once material control is estab., freq. may be reduced to every 25 c.y.	When air and slump are taken
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3.2 Component Material Storage All component materials must be properly stored to prevent damage, contamination or other alteration to their condition prior to use.

The QCP shall describe storage and control procedures for each component material type.

4.0 Equipment and Calibration

4.1 Description Test equipment and the minimum required calibration frequency shall be indicated in the QCP.

All testing equipment shall be calibrated at least annually unless a greater frequency is required by the owner, contract documents or specifications.

Calibration data and equipment repairs shall be documented and retained for a minimum of 5 years and readily accessible to the owner’s representative.

5.0 Pre-Pour Inspection

5.1 Description The QCP shall provide a detailed description of the individual elements reviewed and procedures used during the pre-pour inspections.

Pre-pour inspections generally include, but are not limited to the following: Verification of physical dimensions, form set-up, form cleanliness, size and location of reinforcing steel, inserts, dowels, stress rods, voids, hangers, clip angles, plates, and lifting loops, location of strand, hold-downs, hold-ups, sleeves, drains, and any other miscellaneous items to be cast into the pre-stressed product.

A product specific checklist shall be developed and used

during the pre-pour inspection to ensure that all required items are checked and verified for conformity to approved drawings and governing specifications.

Required documentation should include approved shop drawings, tensioning reports, calibration report, prestressing strand test reports, reinforcing steel certifications, quality control inspection reports, and the pre-pour checklist. A copy of the checklist or other standard forms used to document the pre-pour inspections must be included in the QCP.

6.0 Curing Process

6.1 Standard Curing Practice

The QCP shall clearly define the process(es) used for curing.

Location/spacing of temperature recording devices along the bed must be included.

The QCP shall also outline procedures used for applying the curing materials as well as the types of materials to be used e.g. curing compound, burlap, etc.

6.2 Accelerated Curing Practices

The QCP shall describe methods and procedures used for accelerated curing.

Location/spacing of temperature recording devices along the bed must be included as per 7.1.

Initial (prior to preset), intermediate, and final (following removal of heat or steam) curing phases should be fully described and defined in the QCP.

The amount of temperature increase/decrease per hour shall be defined as well as the maximum allowable temperature. The QCP should indicate whether concrete or enclosure temperatures are recorded.

7.0 Hot/Cold Weather Production Procedure

7.1 Cold Weather Concreting

The QCP should outline in detail, the procedures taken by plant production personnel to protect concrete from extremely low or freezing temperatures.

The Agency shall provide direction as to the lowest permissible temperatures (such as ambient, concrete, water, aggregate, etc) as well as other specifics included

in cold weather concreting.

Proper scheduling of concrete placement is critical because of the reduced time of optimal workability.

7.1 Hot Weather Concreting

The QCP shall include provisions, if necessary, to maintain the temperature of the concrete below a maximum of 90F.

Either flake or crushed ice may be substituted, by mass, for a portion of the mixing water.

Batching procedures must conform to the individual owners specifications.

8.0 Stripping/Handling and Storage of Products

8.1 Stripping

The QCP shall define the procedures for stripping of formwork after achieving minimum strength of concrete, or after completion of minimum number of hours as required by the Agency.

The QCP shall include preventive action(s) taken to avoid damage during detensioning, form removal, and storage.

8.2 Handling and Storage

The QCP shall describe the procedures for properly handling and storing prestressed product.

In the absence of any governing Agency specifications, the QCP shall clearly describe the methods used to store product. Storage areas must be reasonably level, well drained and allow for future inspections.

Storage methods and dunnage locations must address end reactions from dunnage to prevent damage to the product. Dunnage materials must be adequately sized, founded and level to prevent twisting or distortion of the product. The QCP shall address storage of stacked product, if applicable.

9.0 Product Identification

9.1 Description

The QCP shall describe a system to uniquely identify each piece produced to distinguish between similar sized products or other beams produced for the same structure. The product markings must allow for cross-referencing to

prepour, post pour and other quality control records associated with production of the member(s).

The QCP shall state that markings will be either indented into the concrete or shall be painted on with a waterproof paint at a location that is visible during storage, handling and erection but is not visible after construction (i.e. on the end of a beam versus the exposed face).

At a minimum, the following information will be clearly shown on each pre-stressed product:

1. Date of manufacture.
2. Name of the manufacturer.
3. Piece mark designations where such designations are shown on the plans
4. Agency (DOT) contract/project number.

10.0 Post-pour Inspection

10.1 Description

The QCP shall describe the methods, procedures and documentation used to execute post pour inspections.

Post pour inspections shall be made as soon as practical after removal of the forms.

A checklist shall be developed and used during inspection to ensure all required items are verified for conformance to approved shop drawings.

Items to be verified on the check list shall include, but are not limited to, the product's finished surfaces, physical dimensions, including sweep and camber, location of cast-in items, rebar projection, and proper identification. Any defects or damage to the product shall be documented during the post-pour inspection.

A copy of the checklist or other standard forms used to document the post-pour inspections must be included in the QCP.

11.0 Repairs

11.1 Description

The QCP should contain a description of how damage and other types of defects will be documented, resolved and when appropriate, prevented from reoccurring.

The use of 'pre-approved' repair procedures, if accepted by an Agency for common manufacturing defects must be included in the QCP.

12.0 Final Inspection

12.1 Description

The QCP shall describe the activities associated with the final inspection process, including shipping procedures.

The QCP must describe how post pour forms or other records are used to facilitate the final inspection process, particularly where any deficiencies were previously identified for corrective action.

Final inspection activities must address how non-conformances, including any dimensional deviations, cracks, spalls or other types of necessary repairs will be or were addressed prior to shipment.

Some activities associated with final inspection may be performed and documented prior to shipping (especially in advance of long term storage); however, a final walk around inspection for visual confirmation for damage, etc. must be performed just prior to shipment).

13.0 Resolution of Non-Conforming Material

13.1 Description

The QCP must describe the process for identifying and documenting products that do not conform to specification requirements. The identification of non-conforming component materials may occur at any level of inspection, e.g. from receipt with a COC or from additional testing by the manufacturer or Agency.

The QCP must address the procedure(s) used to resolve non-conforming products or test results. If retesting is permitted, a statistically valid method for sampling material from each subplot must be presented to the Agency to ensure sufficient data is available to make a final disposition.

The QCP shall indicate the procedures by which all non-conforming material is segregated, marked or otherwise disposed of.

Final end products which are found to be non-conforming to specification deviations must be documented and submitted to the Agency for final resolution unless rejected and remade by the manufacturer.

Rejected end product must be properly identified to prevent inadvertent acceptance at a future date.

14.0 QC Records and Forms

14.1 Description

The QCP shall include copies and examples of inspection, sampling and testing forms which are utilized.

15.0 Additional State Specific Requirements

The QCP shall address any additional State or other owner /agency specific requirements which are not described in these guidelines. These requirements, when applicable, may be integrated into the other sections as appropriate or contained within a separate section. If the requirements are integrated into other sections, the QCP should clearly denote to which State the variances or additional requirements apply.

15.1 Signature/Acceptance of State or Other Owner

The QCP must contain a section or page with a name, title and date field for each State DOT to sign to acknowledge their acceptance of the QCP. Where QCP's are 'accepted' as noted, with any revisions or remarks by a State DOT or other owner/agency, the comments, revisions or conditions of acceptance must be either incorporated into Section 15 as a revision or otherwise bound to or permanently affixed to the QCP.

DISTRIBUTION TO:

Atlantic Metrocast Incorporated
4264 Washington Ave
La Plata, MD 20646

Bayshore Concrete Products Incorporated
1010 Bells Mill Rd

Chesapeake, VA 23322

Concrete Building Systems Incorporated
9283 Old Racetrack Rd
Delmar, DE 19940

Concrete Precast Systems
2600 Yacht Dr
Chesapeake, VA 23320

J&R Slaw
438 Riverview Road
Leighton, PA 18235

Rockingham Pre-Cast
P.O. Box 1347
Harrisonburg, VA 22803

Rotondo Precast Incorporated
5115 Massaponax Church Rd
Fredericksburg, VA 22407

Schuylkill Products
121 River Street
Cressona, PA 17929

LC Whitford Co.
164 N. Main Street
Wellsville, NY 14895

The Shockey Precast Group
PO Box 2530
219 Stine Lane

Winchester, VA 22603

Carr Concrete
PO Box 265
Waverly, WV 26184-1265

Eastern Vault Company, Inc.
P.O. Box 1134
Princeton, WV 24740

Prestress Services Industries, LLC
P.O. Box 55436
Lexington, KY 40555

Prestress Services Industries, LLC
P.O. Box 211
Melbourne, KY 41059

Prestress Services Industries, LLC
P.O. Box 456
Grove City, OH 43123

NewCrete – A Division of NESL
P.O. Box 34
Roaring Springs, PA 16673

Top Roc Newcrete Products
2210 Manchester Road
Erie, PA 16506

Atlantic Metrocast Incorporated

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