

## Precast Concrete Structures - 23

### SCOPE:

This sub-part provides procedures for being included on the Qualified Manufacturers List (QML) as a manufacturer of precast (**not prestressed**) concrete structures for CDOT projects. The precast concrete structures may include, but are not limited to inlets, manholes, junction boxes, box culverts, modular bridges, pipes, cattle guards, and Type 7 barrier. CDOT will only accept precast concrete structures by a manufacturer listed on the QML. Precast manufacturers of walls and girders will not be required to be on this QML.

### 1. REFERENCED DOCUMENTS

Where applicable, the latest edition of the following standards shall be considered a part of these requirements.

#### 1.1 CDOT Standard Specifications for Road and Bridge Construction:

- Section 106 – Control of Material
- Section 601 – Structural Concrete
- Section 602 – Reinforcing Steel
- Section 603 – Culverts and Sewers
- Section 604 – Manholes, Inlets, and Vaults
- Section 606 – Guardrail
- Section 611 – Cattle Guards
- Section 617 – Culvert Pipe
- Section 624 – Drainage Pipe
- Section 701 – Hydraulic Cement
- Section 703 – Aggregates
- Section 706 – Concrete and Clay Pipe
- Section 709 – Reinforcing Steel and Wire Rope
- Section 711 – Concrete Curing Materials and Admixtures
- Section 712 – Miscellaneous

#### 1.2 CDOT Standard Plans (M&S Standards):

- M-601-1 Single Concrete Box Culvert
- M-601-2 Double Concrete Box Culvert
- M-601-3 Triple Concrete Box Culvert
- M-601-10 Headwalls for Pipes
- M-601-20 Wingwalls for Pipe or Box Culverts
- M-603-2 Reinforced Concrete Pipe
- M-603-3 Precast Concrete Box Culvert
- M-603-10 Concrete and Metal End Sections
- M-604-10 Inlet, Type C
- M-604-11 Inlet, Type D
- M-604-12 Inlet, Type R
- M-604-13 Inlet, Type 13
- M-604-20 Manholes
- M-604-25 Vane Grate Inlet with Frame and Concrete Apron
- M-606-14 Precast Type 7 Concrete Barrier
- M-611-1 Cattle Guard

### 1.3 AASHTO Standards:

- M 6 Specification for Fine Aggregate for Hydraulic Cement Concrete
- M 31 Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
- M 43 Specification for Sizes of Aggregate for Road and Bridge Construction
- M 54 Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
- M 55 Method of Test for Steel Welded Wire Reinforcement, Plain, for Concrete
- M 80 Specification for Coarse Aggregate
- M 85 Specification for Portland Cement
- M 86 Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe
- M 154 Specification for Air-Entraining Admixtures for Concrete
- M 157 Specification for Ready-Mixed Concrete
- M 169 Specification for Steel Bars, Carbon and Alloy, Cold-Finished
- M 170 Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
- M 175 Specification for Perforated Concrete Pipe
- M 176 Specification for Porous Concrete Pipe
- M 194 Specification for Chemical Admixtures for Concrete
- M 195 Specification for Lightweight Aggregates for Structural Concrete
- M 199 Specification for Precast Reinforced Concrete Manhole Sections
- M 206 Specification for Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe
- M 207 Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe
- M 221 Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete
- M 240 Specification for Blended Hydraulic Cement
- M 241 Specification for Concrete Made by Volumetric Batching and Continuous Mixing
- M 242 Specification for Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer Pipe
- M 262 Definitions of Terms Relating to Concrete Pipe and Related Products
- M 295 Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan or Use in Concrete
- M 302 Specification for Slag Cement for Use in Concrete and Mortars
- M 307 Specification for Silica Fume Used in Cementitious Mixtures
- M 315 Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
- R 38 Practice for Quality Assurance of Standard Manufactured Materials
- R 39 Practice for Making and Curing Concrete Test Specimens in the Laboratory
- R 73 Practice for Evaluation of Precast Concrete Drainage Products

## 1.4 ASTM Standards:

- A 36 Specification for Structural Steel
- A 108 Specification for Steel Bars, Carbon and Alloy, Cold-Finished
- A 184 Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
- A 615 Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
- A 706 Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement
- A 767 Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement
- A 775 Specification for Epoxy-Coated Reinforcing Steel Bars
- A 820 Specification for Steel Fibers for Fiber-Reinforced Concrete
- A 884 Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement
- A 934 Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
- A 1064 Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
- C 14 Specification for Nonreinforced Concrete Sewer, Storm Drain and Culvert Pipe
- C 31 Practice for Making and Curing Concrete Test Specimens in the Field
- C 33 Specification for Concrete Aggregates
- C 39 Test Method for Compressive Strength of Cylindrical Concrete Specimens
- C 40 Test Method for Organic Impurities in Fine Aggregates for Concrete
- C 70 Test Method for Surface Moisture in Fine Aggregate
- C 76 Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
- C 94 Specification for Ready-Mixed Concrete
- C 117 Test Method for Materials Finer than 75 -um (No. 200) Sieve in Mineral Aggregates by Washing
- C 118 Specification for Concrete Pipe for Irrigation or Drainage
- C 123 Test Method for Lightweight Particles in Aggregate
- C 136 Test Method for Sieve Analysis of Fine and Coarse Aggregates
- C 138 Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
- C 142 Test Method for Clay Lumps and Friable Particles in Aggregates
- C 143 Test Method for Slump of Hydraulic-Cement Concrete
- C 150 Specification for Portland Cement
- C 172 Practice for Sampling Freshly Mixed Concrete
- C 173 Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
- C 192 Practice for Making and Curing Concrete Test Specimens in the Laboratory
- C 231 Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
- C 260 Specification for Air-Entraining Admixtures for Concrete
- C 330 Specification for Lightweight Aggregates for Structural Concrete
- C 361 Specification for Reinforced Concrete Low-Head Pressure Pipe
- C 403 Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance
- C 443 Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
- C 444 Specification for Perforated Concrete Pipe
- C 478 Specification for Circular Precast Reinforced Concrete Manhole Sections
- C 494 Specification for Chemical Admixtures for Concrete
- C 497 Test Methods for Concrete Pipe, Concrete Box Sections, Manhole Sections, or Tile
- C 505 Specification for Nonreinforced Concrete Irrigation Pipe with Rubber Gasket Joints
- C 506 Specification for Reinforced Concrete Arch Culvert, Storm Drain and Sewer Pipe
- C 507 Specification for Reinforced Concrete Elliptical Culvert, Storm Drain and Sewer Pipe
- C 566 Test Method for Total Evaporable Moisture Content of Aggregate by Drying

- C 595 Specification for Blended Hydraulic Cements
- C 618 Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
- C 642 Test Method for Density, Absorption, and Voids in Hardened Concrete
- C 654 Specification for Porous Concrete Pipe
- C 655 Specification for Reinforced Concrete D-Load Culvert, Storm Drain and Sewer Pipe
- C 666 Test Method for Resistance of Concrete to Rapid Freezing and Thawing
- C 685 Specification for Concrete Made by Volumetric Batching and Continuous Mixing
- C 822 Terminology Relating to Concrete Pipe and Related Products
- C 825 Specification for Precast Concrete Barriers
- C 857 Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures
- C 858 Specification for Underground Precast Concrete Utility Structures
- C 877 Specification for External Sealing Bands for Concrete Pipe, Manholes, and Precast Box Sections
- C 890 Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures
- C 913 Specification for Precast Concrete Water and Wastewater Structures
- C 923 Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals
- C 985 Specification for Nonreinforced Concrete Specified Strength Culvert, Storm Drain and Sewer Pipe
- C 989 Specification for Slag Cement for Use in Concrete and Mortars
- C 990 Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections using Preformed Flexible Joints Sealants
- C 1017 Specification for Chemical Admixtures for Use in Producing Flowing Concrete
- C 1064 Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
- C 1116 Specification for Fiber-Reinforced Concrete
- C 1157 Performance Specification for Hydraulic Cement
- C 1202 Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration
- C 1214 Test Method for Concrete Pipe Sewer Lines by Negative Air Pressure (Vacuum) Test Method
- C 1227 Specification for Precast Concrete Septic Tanks
- C 1240 Specification for Silica Fume Used in Cementitious Mixtures
- C 1417 Specification for Manufacture of Reinforced Concrete Sewer, Storm Drain, and Culvert Pipe for Direct Design
- C 1433 Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers
- C 1504 Specification for Manufacture of Precast Reinforced Concrete Three-Sided Structures for Culverts, and Storm Drains
- C 1602 Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
- C 1603 Test Method for Measurement of Solids in Water
- C 1610 Test Method for Static Segregation of Self-Consolidating Concrete Using Column Technique
- C 1611 Test Method for Slump Flow of Self-Consolidating Concrete
- C 1618 Test Method for Concrete Sanitary Sewer Pipe by Negative (Vacuum) Air Pressure
- C 1619 Specification for Elastomeric Seals for Joining Concrete Structures
- C 1621 Test Method for Passing Ability of Self-Consolidating Concrete by J-Ring

- C 1628 Specification for Joints for Concrete Gravity Flow Sewer Pipe, Using Rubber Gaskets
- C 1677 Specification for Joints for Concrete Box, Using Rubber Gaskets
- C 1712 Test Method for Rapid Assessment of Static Segregation Resistance of Self Consolidating Concrete Using Penetration Test
- C 1758 Practice for Fabricating Test Specimens with Self Consolidating Concrete
- C1776 Specification for Wet-Cast Precast Modular Retaining Wall Units
- C 1778 Guide for Reducing the Risk of Deleterious Alkali-aggregate Reaction in Concrete
- C 1786 Specification for Segmental Precast Reinforced Concrete Box Section for Culverts, Storm Drains, and Sewers Designed According to AASHTO LRFD
- C 1818 Specification for Synthetic Fiber Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
- C 1837 Specification for Production of Dry Cast Concrete Used for Manufacturing Pipe, Box, and Precast Structures
- D 2240 Test Method for Rubber Property – Durometer Hardness
- D 2527 Specification for Rubber Seals – Splice Strength
- D 3665 Practice for Random Sampling of Construction Materials
- E 4 Practice for Force Calibration and Verification of Testing Machines
- G 109 Test Method for Determining the Effects of Chemical Admixtures of Corrosion of Embedded Steel Reinforcement in Concrete Exposed to Chloride Environments

## **2. TERMINOLOGY**

- 2.1 See AASHTO M 262 Standard Terminology Relating to Concrete Pipe.
- 2.2 ACPA – American Concrete Pipe Association.
- 2.3 CDOT M-Standard – Details used in the design and construction of CDOT projects.
- 2.4 Conventional Mix – In this Standard it shall be defined as a Class of concrete in Section 601 of CDOT’s Standard Specifications for Road and Bridge Construction.
- 2.5 Chain of Custody – The chronological documentation recording the sequence of control and transfer of materials.
- 2.6 Dry Cast – In this Standard it shall be defined as very low or zero slump concrete.
- 2.7 Manufacturer – In this Standard it shall be defined as a concrete precast producer which manufactures and supplies Standard Manufactured Materials for the Prime Contractor, Sub-contractor, or CDOT.
- 2.8 NPCA – National Precast Concrete Association.
- 2.9 Prime Contractor – The Company under contract with CDOT to produce products using precast concrete structures.

- 2.10 Quality System Manual (QSM) – A written document that describes the overall internal quality control operating procedures of a Manufacturer. The Quality System M documents the internal policies for achieving quality and the assignment of responsibility and accountability for quality control within the Manufacturer’s organization. It shall describe the minimum quality control requirements expected of material suppliers who are involved with the Manufacturer’s product.
- 2.11 Ready Mixed Concrete – Concrete that is batched for delivery from an offsite plant instead of being mixed at an onsite plant.
- 2.12 Self-Consolidating Concrete (SCC) – In this Standard it shall be defined as a very high slump concrete in which the spread is measured using an inverted slump cone. The spread is usually between 20 to 32 inches in diameter. In addition, the mix usually contains a superplasticizer and a viscosity-modifying admixture (VMA). This product incorporates ASTM Standards C1610 Static Segregation, C1611 Slump Flow, and C1621 J Ring. Additional details concerning this mix can be found in Section 601.05 of the CDOT Standard Specifications Book.
- 2.13 Supplier – In this Standard it shall be defined as one who provides materials used in the manufacturing of precast concrete structures. Cement, fly ash, welded wire reinforcement, and epoxy coated reinforcing bar are among the materials provided to the manufacturer. Some relevant concrete precast suppliers are detailed below.
- 2.13.1 Epoxy Coater – A Supplier which produces coated reinforcing steel including, but not limited to, epoxy coated steel, galvanized steel, and painted steel. Each coating applicator plant constitutes a separate company.
- 2.13.2 Steel Mill – A Supplier which produces reinforcing steel through the initial smelting or melting process.
- 2.13.3 Steel Fabricator – A Supplier which cuts and bends steel reinforcing or assembles products including, but not limited to, dowel bar baskets and steel mesh reinforcing grids.
- 2.14 Manufacturing Process – Any process required to change the raw ore or scrap metal into the finished, in-place steel or iron product. Manufacturing begins with the initial melting and mixing and continues through the coating stage. Any process which modifies the chemical content, the physical size or shape, or the final finish is considered a manufacturing process.
- 2.15 Wet Cast – In this Standard it shall be defined as anything other than zero slump concrete.

### **3. SIGNIFICANCE AND USE**

- 3.1 This procedure specifies requirements that should be followed by the Manufacturer in implementing an effective Quality Control (QC) system. This is accomplished by a certification system that evaluates quality control practices and specification compliance tests performed by the Manufacturer according to their quality control plans.
- 3.2 This Standard specifies requirements and procedures for a certification system that shall apply to all Manufacturers providing precast concrete structures. These provisions initially apply to the plant manufacturing the precast concrete structures. These provisions subsequently apply to the Contractor, after delivery of the precast concrete structure to the Contractor, for use on CDOT projects.

### **4. APPLYING FOR PLANT QUALIFIED STATUS**

- 4.1 A Manufacturer, regardless of their current casting process, which has been certified for the past three (3) consecutive years under the American Concrete Pipe Association (ACPA) or under the National Precast Concrete Association (NPCA) for all pipe products, box culverts, manholes, modular bridges, and other structures will be placed on the Qualified Manufacturers List (QML) upon approval after submitting all of the following:
- The certificate from the current year and the preceding three consecutive years of evaluations from NPCA or ACPA.
  - The score summary sheets inspection reports, deficiencies, and corrective action responses from the current year and the preceding three consecutive years of evaluations from NPCA or ACPA.
  - The Quality System Manual (QSM) as outlined in Section 12 of this Standard.
- 4.2 A Manufacturer, regardless of their current casting process, which has been certified for less than three (3) consecutive years under ACPA or under NPCA for all pipe products, box culverts, manholes, modular bridges, and other structures will be on probation and placed on the QML upon approval after submitting all of the following:
- The certificate from the current year along with any preceding years of evaluations from NPCA or ACPA.
  - The score summary sheets, inspection reports, deficiencies, and corrective action responses from the current year along with any preceding years of evaluations from NPCA or ACPA.
  - The QSM as outlined in Section 12 of this Standard.
- 4.2.1 The probation period will be for three (3) consecutive years after being placed on the QML.

**5. MAINTENANCE OF QUALIFIED PLANT STATUS**

- 5.1 Manufacturers must request plant re-approval annually at the end of the calendar year. The request must be in writing and include any changes that have occurred in the Manufacturer's plant methods, QC program, and certified QC personnel since the last approval. The approval request and Quality System Manual must be submitted for review between January 1 and March 1 each year.
  - 5.1.1 The request must be received by CDOT within one year of the previous submission; otherwise, the approval status is terminated, and the plant will be removed from the CDOT QML.
- 5.2 Within three (3) months after submitting all required information, CDOT will notify the Manufacturer of precast concrete structures if the manufacturing facility's application for the QML has been granted.

**6. CDOT AUDITS AND INSPECTIONS**

- 6.1 The CDOT review team or representative will conduct a thorough review of the Manufacturer on a biennial basis at a minimum.
- 6.2 CDOT reserves the right to conduct random plant inspections to determine a Manufacturer's capability to produce a uniform product in compliance with referenced specifications and to determine the Manufacturer's compliance with either the NPCA Plant Certification Program or the ACPA Plant Certification Program.

6.3 Responsibilities of the CDOT Audit Team are as follows:

- Ensures the Manufacturer's QC manager and inspectors are performing inspections in compliance with the requirements of the Contract Documents and the Manufacturer's accepted QC Plan.
- Reviews the records to ensure all materials meet CDOT's Specification requirements.
- Performs a spot check review of the records of the materials received at the plant or incorporated into the fabrication of the products, including the certified physical property test reports.
- Verifies the concrete meets all applicable CDOT, AASHTO, and ASTM Specifications.
- Verifies that the Manufacturer is complying with Buy America requirements per 49 CFR Part 661 and CDOT Specification 106.11.
- Verifies that the QC personnel maintain the required certification documents.
- Checks the handling and storage of the manufactured products and their material components to ensure they meet the requirements of CDOT Specifications.
- Visually inspects the condition of steel materials at their storage areas and during manufacturing.
- Ensures materials used by the Manufacturer are from CDOT's APL.
- Ensures Suppliers used by the Manufacturer are from CDOT's QML.
- Verifies the equipment has valid calibrations and records of their calibration certificates.
- Performs random spot-checks of the dimensions, appearance, handling, and shipping of the finished products to ensure that they are fabricated in compliance with the requirements of CDOT's current M&S Standards.
- Ensures that all manufactured products are properly stored, and each product is marked legibly with the CDOT M-Standard plan item number, corresponding class as applicable, and cast date that are traceable to project documents and QC records.
- Verifies product deficiencies and ensures that the type of deficiency, its magnitude, and extent have been properly described.
- Inspects delivery, placement, and consolidation process of concrete.
- Inspects the finishing and curing process of concrete.
- Inspects the storage of materials that will be used for the manufacturing of products.

6.4 In the event that the CDOT Audit Team observes a product or action that they feel is in violation of the Specifications or QC plan requirements, CDOT or its representative will notify the Manufacturer of the existence of any infractions.

6.5 Any deficiencies or concerns found during the inspection shall be addressed within thirty (30) days of the plant Audit and shall be approved by CDOT. The Manufacturer shall submit a formal letter on company letter head responding to any deficiencies found during the inspection.

6.5.1 Any deficiencies not addressed and corrected by the Manufacturer may be cause for the facility to be placed on conditional status as described in Section 17 of this Standard.

## **7. PHOTOGRAPHS AND VIDEOS**

- 7.1 CDOT or its representative shall be allowed to take photographs of disputed infractions occurring within the manufacture of products designated for CDOT use. Photographs and videos will be taken for documentation and timely resolution of possible concerns observed and disputed by the facility during CDOT Plant inspections.
- 7.2 CDOT will coordinate with the Manufacturer in advance to arrange for photographs and videos that will be taken for educational or technical publications.

## **8. MANUFACTURING FACILITY CERTIFICATION**

- 8.1 Manufacturing facilities producing precast structures for CDOT shall meet the minimum industry standards and be annually inspected and certified by ACPA or NPCA. A copy of the certification(s) shall be submitted to CDOT, be included in the QSM as part of the QML process and shall list the product categories the facility holds certification(s) for.
- 8.2 Failure to comply with one or more Sections or Sub-sections listed in this Standard may result in an increased inspection frequency. Any additional failures to meet these minimum requirements shall result in the decertification of the plant and the plant will be removed from the QML. The Manufacturer may apply for reinstatement on the QML no sooner than six (6) months after removal from the QML as stipulated in Section 17 of this Standard.
- 8.2.1 Increased inspection frequency may include inspections by CDOT or its representative occurring immediately upon failure to comply or on a more frequent interval than the minimum biennial basis as outlined in Section 6 of this Standard.

## **9. SUPPLIER REQUIREMENTS**

- 9.1 Cement, pozzolans, fiber, curing materials, patching/repair materials, grouts, and concrete admixtures shall be on CDOT's Approved Product List (APL) prior to use by the Manufacturer. The APL along with instructions for completing CDOT Form #595, Pre-Approved Product Evaluation Request & Summary, can be found at <https://apps.codot.gov/apl/AplSearch.cfm>.
- 9.2 Steel mills and epoxy coaters providing reinforcing steel materials shall be on CDOT's Qualified Manufacturers List (QML) prior to use by the Manufacturer. The QML can be found at <https://www.codot.gov/business/apl/qualified-manufacturers-list.html>.
- 9.3 Supplier delivered test reports shall be verified in house or by a certified third-party laboratory at the frequencies specified in all applicable CDOT, AASHTO, and ASTM specifications. The QSM shall list all test report verification procedures and frequencies. Fine and coarse aggregate bins not outfitted with moisture probes or meters used with automatic mix water adjustments shall be tested for moisture a minimum of once per day. Aggregate in bins containing moisture probes shall be tested for moisture verification a minimum of once per week. Fine and coarse aggregate

gradations shall be performed in-house or by a certified third-party laboratory a minimum of once per month.

- 9.4 The Manufacturer must maintain all documentation necessary to substantiate the purchase and use of all approved materials for at least three (3) years. The documentation shall be available to CDOT upon request.
- 9.5 Any change to products, manufacturers, suppliers, proportions, or processes utilized for CDOT projects shall be submitted to CDOT in writing as soon as practical, but no later than two (2) weeks following implementation.
- 9.6 CDOT shall be notified immediately in the case of a halt in plant production due to failing materials or test results.

## **10. CONCRETE MIX DESIGNS**

- 10.1 All mix design information will be for CDOT internal use only and will be subject to the regulations of the Colorado Open Records Act. If the Manufacturer does not want their mix design information to be subject to the Colorado Open Records Act, they shall indicate the proprietary information and acknowledge they are willing to defend it against legal action.
- 10.2 Stripping Strength: Products shall not be removed from the forms until the concrete reaches a compressive strength of 2,000 psi, or as specified in the Contract documents. In addition, stripping compressive strength verification tests shall be performed for each mix design at least monthly in order to confirm that adequate stripping strengths are being attained. Stripping strength verification cylinders shall be cured with the product, or in a like manner. These requirements do not apply to dry-cast products.
- 10.3 Shipping Strength: Products shall not be shipped before the concrete compressive strength meets or exceeds 0.90 f'c. If a product is planned to be shipped prior to obtaining final strength data, additional compressive cylinders shall be tested prior to shipping. Box culverts, arches and other three-sided structures shall not be shipped prior to the final 28-day compressive strength being met.
- 10.4 Acceptance Strength: Acceptance for 28-day compressive strength shall meet the requirements stated in the CDOT M&S Standards or Contract documents. Cylinders shall be tested in accordance with ASTM C 39. The average strength of at least two test cylinders shall be equal to or greater than the specified strength. Cylinders used for 28-day design compressive strength verification shall be cast and cured in accordance with ASTM C 31 or C 497.
- 10.5 Unless otherwise shown in the plans or required by project specifications, the concrete produced for the manufacture of products shall comply with the requirements of CDOT, AASHTO, and ASTM specifications. When the Specifications or drawings reference a class of concrete, the concrete shall meet all requirements for CDOT specifications.
- 10.5.1 Products requiring a specific class of concrete per CDOT M&S Standards or Contract documents shall include an APL verification letter and shall undergo the current CDOT concrete mix design approval process.

**11. SAMPLING AND TESTING REQUIREMENTS**

- 11.1 All test samples required by this Standard shall be obtained using stratified random sampling techniques. The manufacturer shall establish a plan to obtain and track stratified random samples. This plan shall be included in the QSM and approved by CDOT. Stratified random sampling may be performed in accordance with ASTM D 3665. The use of a stratified random sampling procedure is mandatory to the establishment of a valid QC program. All random QC sample locations shall be properly documented.
- 11.2 Testing required for this Standard shall be performed in certified laboratories through appropriate QC Certification programs such as ACPA and NPCA or in laboratories accredited through programs such as AASHTO and CCRL. All testing shall be performed by personnel holding current ACI Concrete Field-Testing Technician Grade I and ACI Concrete Strength Testing certifications. If a third-party laboratory is utilized to perform required testing under this Standard, it shall be accredited and identified in the submitted QSM. The third-party laboratory's accreditation records, current personnel certifications, and equipment calibration records shall be included in the QSM.
- 11.3 At a minimum, the QC certification program(s) as outlined above shall include the following:
- Training in AASHTO, ASTM, and ACI test procedures.
  - Demonstration of proficiency in each required test.
  - Demonstration of ability to properly document test results.
- 11.4 The laboratory performing the required testing under this Standard shall participate in an annual CDOT round robin program for compressive strength testing competency and achieve a rating between 1.0 and 5.0. Scores below a 3.0 will require approved corrective action and possible retesting. Additional information on the round robin procedure can be found in the Inspections section of the FMM.
- 11.5 In the case of a question in material or product quality, CDOT retains the right to test or request the Manufacturer to retest any material or product, at the Manufacturer's expense, for verification purposes.
- 11.6 Testing frequencies shall be in accordance with the NPCA or ACPA certification requirements at a minimum. In the case of a question in material or product quality, CDOT retains the right to require additional tests above the minimum frequencies required by ACPA or NPCA.
- 11.7 Testing procedures shall be in accordance with all CDOT, AASHTO, and ASTM requirements and specifications.

**12. MANUFACTURER'S QUALITY SYSTEM MANUAL (MINIMUM REQUIREMENTS)**

- 12.1 On an annual basis one complete electronic copy of the Manufacturer's QSM shall be submitted in PDF format via email for review and approval to CDOT's Precast Concrete SME at [Hailey.Goodale@state.co.us](mailto:Hailey.Goodale@state.co.us) and the Pavement Design Unit at [cdot\\_pavement.design@state.co.us](mailto:cdot_pavement.design@state.co.us). A complete manual must be submitted for review; submitting only revisions from the previous year's QSM will not be allowed. CDOT's approval of the QSM is intended only to indicate that the QSM is in conformance with the minimum QC requirements set forth in this Standard. Once the Manufacturer is approved and on the QML, the QSM provisions will remain in effect for a maximum period of one calendar year, unless revisions are determined to be necessary by the Quality Control Manager or requested by CDOT, or if the Manufacturer is decertified. If any revisions are made to the current year QSM, such revisions shall be submitted to CDOT in electronic format for review and approval. Additional guidelines for preparing a QSM may be available from ACPA or NPCA, but each QSM must be in accordance with this Standard, at a minimum.
- 12.2 The Manufacturer's QSM shall be maintained in electronic format at a minimum. The QSM shall be available to all of the Manufacturer's employees in the selected format. If the QSM is maintained in a printed and bound format it shall reflect the most current QC procedures. Each document in the QSM shall indicate its preparation date and all pages of the QSM 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.
- 12.3 The QSM shall include the address and telephone numbers of applicable personnel at the manufacturing facility.
- 12.4 The Manufacturer's QSM shall be formatted to provide dated, numbered, and bookmarked sections which meet the following order, format, and content.
- 12.5 The QSM shall contain the Manufacturer's quality policy or mission Statement endorsed by the company's Chief Executive Officer. The quality policy / mission statement shall indicate support of top management to enforce the QC requirements contained in the QSM.
- 12.6 The QSM shall include a listing and description of all the precast products being manufactured at the facility for CDOT. Each product listed shall include the placement method(s) used to manufacture the product (e.g., dry cast or wet cast). The placement method shall ensure dense and consistent material meeting performance requirements and specifications. The placement method shall produce products free of defects and employ all applicable CDOT, AASHTO, and ASTM standards and specifications.
- 12.6.1 For all manufactured items addressed in the QSM, the applicable CDOT, AASHTO, and ASTM specifications shall be identified.
- 12.7 The QSM shall present and define any significant terms used throughout the QSM.

- 12.8 The QSM shall present the personnel structure established to implement the Manufacturer's quality system. The specific roles and responsibilities of all QC personnel shall be documented as follows:
- 12.8.1 The QSM shall contain an organizational chart. The chart shall indicate a clear separation between the QC personnel and the production personnel. The QC Manager shall be allowed direct access to top management, independent from production.
- 12.8.2 Each Manufacturer shall have a Quality Control Manager who has the overall responsibility for implementing the requirements of the QSM. At least one QC Manager or their representative holding equivalent certifications shall be on-site during production. The QC Manager shall review the established QC system annually in order to satisfy this requirement, or if changes in the manufacturing process(s) occur, or whenever technical or CDOT information indicate a trend in reduced quality. The Manufacturer can designate other qualified personnel as QC Managers in the case of the normal QC Manager's absence via the QSM.
- 12.8.3 Each facility shall have at least one Quality Control Technician to perform QC sampling, testing, and inspection who has the authority to stop production. At least one QC Technician shall be on-site during production. The QC Technician shall have full access to the QC Manager during production. The QC Technicians shall be familiar with the tests they perform and have sufficient authority to assure corrective actions are carried out when necessary. The QSM shall indicate the line of authority of the QC Technicians, which shall demonstrate their authority to require corrective action. The QSM shall designate the certified QC Technicians at the facility and laboratory involved in the production or testing of the precast concrete structures.
- 12.8.4 Each facility shall have evidence of having on staff or under contract a licensed Professional Engineer registered in the state where the precast products are manufactured. The licensed Professional Engineer shall not be employed by CDOT.
- 12.9 The QSM shall contain a description and copy of the certifications required and attained and years of experience for each QC Manager and QC Technician. The QSM shall list each certification expiration date. All QC sampling, testing, and inspection personnel shall be certified in ACI Concrete Field-Testing Technician Grade I and ACI Concrete Strength Testing Technician, at a minimum. Each plant shall have at least one QC Manager and at least one QC Technician who have successfully completed the NPCA's Production and Quality School or ACPA's approved equivalent. Recertification shall occur every five (5) years, at a minimum. The QSM shall also include periodic auditing of each QC technician's ability to satisfactorily perform the required tests. Retraining shall be provided when the test method is revised.
- 12.9.1 The QSM shall provide for specific training for frontline production personnel in the safe and correct operating procedures implemented to ensure the required quality of all precast concrete structures.

12.10 The QSM shall contain an inventory of the equipment used for sampling and testing. The QSM shall assign a unique identification number to each piece of testing equipment. The QSM inventory for each piece of equipment shall include the following information, at a minimum:

- Use(s), name, and manufacturer.
- Date placed in service.
- Model and serial number.
- Interval of calibration.
- Calibration procedures.
- Associated calibration equipment.
- Current calibration records.

12.10.1 The QSM shall include the location where the instructions for use and operation of each piece is stored if not included in the QSM. The QSM shall describe the methods for ensuring that the calibration and verification procedures are performed at the specified intervals. Calibrations shall be performed in accordance with all applicable CDOT, AASHTO, and ASTM standards.

12.11 The QSM shall identify all sources and types of supplier delivered materials used for the production of precast concrete structures. The QSM shall contain the following information for each supplier delivered material:

- A list of the products produced with the material.
- A description of the specification requirements for the material.
- A description of the material certifications and test reports delivered by the supplier and the location in which they are stored.
- A list detailing the frequency in which certifications and test reports are received for the material.
- Examples of the QC test reports for the material such as Certified Test Reports, Certificates of Compliance, and verification testing.
- APL and QML verification letters accompanied with the raw material's Form 595, which can be found on the Approved Products List.

12.11.1 The QSM shall contain a statement that no raw materials shall be used unless they are on the APL and they have been tested and meet all appropriate CDOT, AASHTO, and ASTM specifications.

12.11.2 The QSM shall contain APL and QML verification letters stating that the products listed in Section 9.1 of this Standard, and processes above have been verified to be on the CDOT APL and CDOT QML. The Manufacturer shall include in the QSM a copy of CDOT Form #595 for each of the approved materials used in production of CDOT products. Examples of an APL and QML verification letter are in the *Special Notice to Contractors* section in the FMM.

12.11.3 All manufacturing processes occurring on steel and iron materials used in CDOT products shall be listed in the QSM and shall be accompanied by example documentation creating a Chain of Custody.

12.11.4 The QSM shall ensure the methods of compliance with Buy America provisions and include a QC Plan outlining the Manufacturer's:

- Process for tracking and submitting the Mill Test Reports with heat numbers on reinforcing steel permanently incorporated into each product delivered to a CDOT project.
- Methods for tracking the placement of all quantities of non-domestic steel and iron that are not on the exemptions list in the *Special Notice to Contractors* section in the FMM.
- Methods and locations for segregating non-domestic and domestic steel and iron stockpiles.
- Methods for identifying and cataloging finished products containing non-domestic steel and iron.
- Example mill test reports and delivery tickets for each steel supplier, distributor, fabricator, and manufacturer with Buy America compliance statement and dollar amount of non-domestic steel and iron used in the finished products for each delivery as described in Section 14 of this Standard.

12.11.5 All supplier delivered materials shall be properly stored to prevent damage, contamination, or other alterations prior to use in production. The QSM shall include procedures for the adequate storage of supplied materials; including but not limited to materials used in production and the final product.

12.12 All concrete mix designs used for CDOT products shall be listed in the current QSM. The mix designs listed shall include all constituents and their quantities as well as computations and test data to include compressive strength verification. Each concrete mix design shall list the products that will be produced from it. If a CDOT pre-approved concrete mix is being used, then it should be identified as such and a copy of CDOT's Concrete Mix Design Report (Form 1373) shall be included in the QSM.

12.12.1 All mix design information will be for CDOT internal use only and will be subject to the regulations Of the Colorado Open Records Act. The QSM shall contain a statement that if the Manufacturer does not want their mix design information to be subject to the Colorado Open Records Act, they shall indicate the proprietary information and acknowledge they are willing to defend it against legal action.

12.13 The QSM shall describe the procedure and frequency for inspection and selection of material samples and products during production and inspection.

12.13.1 The QSM shall contain an example of a random sampling schedule as outlined in Section 11.1 of this Standard.

12.14 The QSM shall contain descriptions and examples of the test report forms used by the Manufacturer. The QSM shall identify the individual(s) responsible for maintaining all test records and reports along with the location where the reports are stored.

- 12.15 The QSM shall contain a description of the procedures used to identify and document all material or test results that do not conform to specification requirements. The QSM shall contain provisions for resolving non-conforming material or test results.
- 12.16 The QSM shall include drawings of precast products manufactured showing specific details (i.e. reinforcement, concrete cover over reinforcement, reference to CDOT M&S standards, etc.), to produce precast concrete structures for CDOT. All materials used in the manufacturing shall meet the requirements and be in accordance with the dimensions of CDOT's M&S Standards and appropriate ASTM standard such as C 1504. CDOT does not allow any variations to the M&S Standards. In the case of an exception for project specific purposes, a written approval from the Project Engineer shall be submitted. In the case of an exception with significant variations (i.e., a box culvert not meeting the major structure definition), the exception shall be submitted and approved by Staff Bridge. Exceptions shall be submitted to [Hailey.Goodale@state.co.us](mailto:Hailey.Goodale@state.co.us) on a project-by-project basis.
- 12.16.1 Drawings and dimensions for precast modular concrete bridges will not be required in the QSM. However, they shall be submitted to Staff Bridge in accordance with Subsection 105.02 of the Standard Specifications.
- 12.17 Concrete curing products and processes shall be in accordance with applicable curing methods per AASHTO M 170 and CDOT and ASTM specifications. Curing products shall be included as part of the QC plan. All curing procedures shall be listed in the QSM.
- 12.17.1 The Manufacturer shall monitor and record the relative humidity and ambient temperature of all curing environments used at the facility once a week, at a minimum.
- 12.17.2 The QSM shall describe the Manufacturer's production and curing method(s) employed in both extreme cold and extreme heat environments.
- 12.17.3 The QSM shall include the processes used to monitor the highest internal concrete temperature during the initial curing process when applicable.
- 12.18 The QSM shall describe the method(s) used to legibly mark the precast concrete structures in accordance with the appropriate CDOT, AASHTO, and ASTM standards. All products shall remain identifiable until incorporated into the project, including those to receive coatings.
- 12.19 The QSM shall identify the area on the manufacturer's property in which rejected products are stored.
- 12.20 The QSM shall describe the Manufacturing facility's system for evaluating, replacing, and utilizing dunnage for precast concrete product storage and shipping.
- 12.21 The QSM shall describe the procedures in place for proper storage implementation and shall list maximum stack heights for products.
- 12.22 The QSM shall describe procedures used to properly handle and ship precast concrete structures. The plant shall address the shipping policy as part of the QSM.

12.23 Any revisions to an accepted QC Plan or QSM shall be submitted and accepted by CDOT prior to implementation.

### **13. MANUFACTURER'S DOCUMENTATION**

13.1 The QC Manager shall maintain documentation files at each Plant for no less than three (3) years after the last delivery to the project. These files shall include:

- Copy of the approved QC Plan, addenda, and amendments.
- Approved shop drawings (if applicable).
- Applicable ASTM and AASHTO Standards.
- Applicable Specifications and Standards Plans.
- QC personnel training and qualification records.
- Materials certification records for reinforcing steel, welded wire reinforcement, prestressing steel, and any other materials that are used in the manufacturing of CDOT Products.
- Concrete mix designs.
- Equipment calibration/verifications, including, but not limited to, stressing jacks, concrete compression testing machine, laboratory scales, laboratory curing tanks, and plastic concrete test equipment.
- CDOT M-Standard plan item number.
- Test data.
- Record of the delivery tickets of each shipment of the products to the job site.
- Inspections of forms, reinforcement, concrete placement, vibration, finishing, and curing; pre-pour inspection documentation, as defined by ACPA or NPCA.
- Inspection of structures after concrete placement; post-pour inspection documentation, as defined by ACPA or NPCA.
- Record of all structural deficiencies found as a result of QC inspection and testing, or verification inspection and testing and the corrective action(s) taken.
- Record of the deficiency reports from ACPA or NPCA audits.

13.1.1 All records shall be fully accessible to CDOT at all times. Copies of any records requested by CDOT shall be provided.

**14. BUY AMERICA**

- 14.1 The Manufacturer shall be responsible for obtaining and maintaining all Buy America documents for each product produced. The Buy America documentation shall show the chain of custody of steel from the Mill to final production and shall be kept at the precast Manufacturer's plant. A copy of an electronic summary Buy America document containing the chain of custody of the steel (e.g., Heat numbers, Mill test reports, and proof of transfer) in each manufactured product shipped to the project shall be available to the Contractor or CDOT Project upon request. For the current COC (Certificate of Compliance) requirements, additional guidance may be found in the *Special Notice to Contractors* section of the FMM.
- 14.2 The Manufacturer shall maintain on file Buy America certifications that every process from either the original smelting or melting operation, including the application of a coating, performed on steel or iron products either has or has not been carried out in the United States of America. These Buy America certifications apply to every steel and iron product that requires pre-inspection, pretesting, certified test results, or a certificate of compliance. Shipping invoices, bar lists, and mill test reports shall be documented and stored at the Manufacturer's plant and shall be provided to the Contractor if requested. The Manufacturer shall obtain a Buy America certification from each supplier, distributor, fabricator, and manufacturer that has handled each steel or iron product. These Buy America certifications shall create a chain of custody trail and shall include certified mill test reports with heat numbers from either the original smelting or melting operation. Examples of Buy America documentation may be found in the *Special Notice to Contractors* section of the FMM.
- 14.3 At a minimum, the Manufacturer's Buy America process shall demonstrate the ability to track the steel used in all CDOT products which correlates the steel documentation as outlined above to CDOT M-Standard plan item numbers and dates of production.
- 14.4 CDOT will inspect each Manufacturer on a biennial basis, at a minimum, to review plant procedures and verify Buy America documentation for all items supplied to CDOT meet Buy America requirements.

- 14.5 Prior to the use of non-domestic steel or iron materials on a project, the plant must follow the following process:
- Describe in the QC Plan the method of compliance with the Buy America provisions listed in the *Special Notice to Contractors*.
  - Implement an accountable system that tracks the monetary value of non-domestic steel or iron used in each product.
  - In the event of Contract modifications in which the use of non-domestic steel or iron is increased, obtain prior authorization from the Engineer.
  - Each delivery ticket must include the dollar amount of non-domestic steel or iron incorporated in the delivered incidental precast products, as well as a compliance statement with Buy America provisions.
  - The stockpile of non-domestic steel or iron shall be identified and segregated from the domestic steel or iron.
  - The stockpile of product which has non-domestic steel or iron shall be identified and segregated from products containing domestic steel or iron.
  - Note: Exempt products may be found in the *Special Notice to Contractors* in the FMM.

## 15. PRODUCT STORAGE, MARKING, AND LABELING

- 15.1 Precast concrete products shall be stored in a manner that will not damage the product and will allow easy access for inspecting, marking, and handling. Products in storage shall be placed in a manner to ensure that no damage occurs by point loading or stacking. Rejected products shall not be stored in the same area as acceptable products.
- 15.2 The Manufacturer shall mark CDOT products produced in accordance with CDOT M&S Standards with the letters "CDOT", the CDOT M-Standard plan item number, the QC personnel approval mark, and the lot number (or date in lieu of a lot number) on the inside or outside of each precast unit.
- 15.2.1 Products in compliance with specifications shall be marked with an NPCA or ACPA certified stamp, label, or seal prior to shipment. Each piece shall bear the stamp or seal, lot number or cast date, and the Manufacturer's identification (name or logo). The Manufacturer's identification shall be sufficient to clearly indicate the plant of origin. The method used to mark the product shall facilitate the transfer of product information from the Manufacturer to CDOT.
- 15.2.2 Only precast units that bear a stamp, label, or seal as outlined above, shall be allowed for use on CDOT projects.
- 15.3 Only products specifically manufactured by and shipped by a CDOT Qualified Manufacturer can be furnished to a CDOT project in accordance with this agreement.
- 15.3.1 When products covered by this agreement are shipped to a certified intermediate party and then to a Contractor for a CDOT project, a copy of the certified Manufacturer's Certificate of Delivery shall be furnished to the Resident Engineer.

- 15.4 If CDOT determines the products furnished under this agreement are not in compliance with CDOT, AASHTO, and ASTM specifications, either by inspection upon delivery or by inspection at the plant, the specific, individual, non-compliant units may be rejected.
- 15.5 Products specifically made for CDOT not meeting CDOT standards shall be permanently marked with 'CDOT REJECTED' and placed in a designated area within the manufacturer's property or destroyed so as not to be sent to CDOT Projects.

## 16. SHIPMENT AND DOCUMENTATION

- 16.1 The Manufacturer shall prepare a standard Certificate of Compliance (COC) for each precast concrete structure delivered to a CDOT project. The COC shall contain all required information as stipulated in the CDOT *Special Notice to Contractors* in the FMM. The COC shall also certify that the item has been fabricated in compliance with all CDOT, AASHTO, and ASTM specifications and the Manufacturer has all the pertinent documentation available for examination by CDOT or their representative. The COC shall include all necessary information to properly identify each precast concrete structure represented by the COC. The COC shall include a statement as to whether the element(s) being shipped complies with the Buy America Requirements found in Subsection 106.11 of CDOT's Standard Specifications for Road and Bridge Construction via a standard letter as shown in the *Special Notice to Contractors* in the FMM.
- 16.2 The Manufacturer shall ensure that each shipment of precast concrete products to the project site is accompanied by a signed or stamped delivery ticket providing the description and the list of the products.
- 16.2.1 Each COC or delivery ticket shall include the list of products being shipped, be on the Plant's letterhead, and include, as a minimum, the following information:
- Project identification number.
  - CDOT M-Standard plan item number.
  - Date shipped.
  - Cast date.
  - Type of products.
  - Quantity of products.
  - Buy America compliance statement and dollar amount of non-domestic steel and iron used in the finished products for each delivery.
- 16.3 The QC manager or QC personnel working under the direct supervision of the QC manager shall mark each product prior to its shipment to the project site.

## 17. DECERTIFICATION and RECERTIFICATION

- 17.1 If the Manufacturer becomes decertified after being placed on the QML, the Manufacturer will be removed from the QML until successfully completing and submitting the requirements within this Standard to CDOT. The Manufacturer may apply for reinstatement on the QML no sooner than six (6) months after removal from the QML.

- 17.2 If the Manufacturer becomes decertified due to structural failure of a product the Manufacturer will be removed from the QML until successfully completing and submitting to CDOT the requirements within this Standard. A structural failure will be determined by the CDOT Engineer as the loss of the structure's load capacity to meet project and contract requirements. Any failure shall require an engineering investigation in order to determine failure mode and responsible party. The Manufacturer may apply for reinstatement on the QML no sooner than three (3) years after removal from the QML.
- 17.3 Structural defects shall be repaired at the Manufacturing facility before shipment. If structural defects are observed at a project, a repair procedure for each defective product shall be submitted to the CDOT Engineer. CDOT reserves the right to reject any repair procedure or product.
- 17.3.1 Defects requiring a submission of repair procedures include those described as repairable defects in AASHTO R 73.
- 17.4 Recurring structural defects shall be cause for the Manufacturer to be placed on conditional status.
- 17.5 Significant or repeated non-compliance with the contract documentation will warrant a corrective action request being submitted from CDOT to the Manufacturer. The Manufacturer will have ten (10) working days to submit a corrective action plan to CDOT for approval.
- 17.5.1 Production may continue during this ten (10) day period with additional CDOT inspection. If the corrective action plan is not approved, the Manufacturer will be in conditional status for thirty (30) working days.
- 17.5.1.1 During the conditional status the Manufacturer shall hire a CDOT approved independent third-party consultant to inspect the fabrication. Products fabricated during this time will be approved for use based on acceptable consultant reports in conjunction with CDOT review. The CDOT approved independent third-party consultant shall have a minimum of ACI Field Testing Technician – Grade I certification, ACI Concrete Strength Testing Technician certification, five (5) years of knowledge of the precast industry, three (3) years of inspection experience, and not be associated with any NPCA or ACPA certified plant for a minimum twelve (12) month period. The consultant may use criteria stated in Section III, Plant Certification, Audit Expectations of the QCast Plant Certification Manual or Appendix B of the NPCA Quality Control Manual for Precast Plants.
- 17.5.1.2 Continued non-compliance will be considered grounds to remove the Manufacturer from the approved list.
- 17.5.1.3 Conditional status will be withdrawn with a satisfactory report from the consultant and CDOT inspection team at any time during the thirty (30) day period.

17.6 A Manufacturer shall be removed from the QML for any of the following items:

- Loss of ACPA or NPCA plant certification.
- Repeated placement on conditional status (two times in three years).
- Inability to consistently fabricate products meeting specification requirements.
- Lack of maintenance of required records or improper documentation.
- Unwillingness to cooperate during an audit.
- Failure to maintain an approved quality control program.
- Willful misrepresentation by the Manufacturer.
- Intentional shipment of non-approved products to CDOT projects. This does not include project specific items approved through the Project Engineer.
- Failure to satisfactorily resolve deficiencies identified by certification reviews.
- Failure to renew certification prior to expiration date.
- False or fraudulent use of information to secure or renew certification.
- Failure to maintain current ACPA or NPCA certification.
- Using materials that are not on the Department's approved source lists. CDOT can approve otherwise non-approved sources on an emergency basis without full QSM resubmittal.
- Supplying products to a CDOT project produced from concrete which does not conform to the mix design approved by the Department.
- Deviating from the requirements in the Quality Control Plan without the Department's approval.
- Knowingly and willfully falsifies acceptance test results or certifies/stamps products that do not meet acceptance criteria.
- If non-destructive testing and dimensional verification indicates the product manufactured contains a major error per manufacturing tolerances. The process detailed in Section 17.2 of this Standard will be utilized in the determination of the extent and severity of errors.
- Additional verification testing results are unacceptable (such as coring, load testing, etc.).
- Knowingly and willfully falsifying reports, test results, records, etc. will result in permanent disqualification by CDOT and the Manufacturer will not be allowed to supply precast products to a CDOT project.
- Manufacturer is no longer active in the market.

17.7 The Materials and Geotechnical Services Manager authorizes removal of plants from the certified list. The department will provide notification of removal from the list in writing or via email. Items requiring a Manufacturer to be removed will be placed in one of two categories:

- 1) Serious infractions shall be cause for immediate removal within seven (7) days
- 2) Less serious infractions shall be cause for removal within thirty (30) days.

17.7.1 Actions resulting in immediate removal within seven (7) days:

- Inability to consistently fabricate products meeting specification requirements.
- Lack of maintenance of required records or improper documentation.
- Unwillingness to cooperate during an audit.
- Willful misrepresentation by the Manufacturer.
- Failure to maintain an approved quality control program.
- Intentional shipment of non-approved products to CDOT projects. This does not include project specific items approved through the Project Engineer.
- False or fraudulent use of information to secure or renew certification.
- Failure to maintain current ACPA or NPCA certification.
- Using materials that are not on the Department's approved source lists. CDOT can approve otherwise non-approved sources on an emergency basis without full QSM resubmittal.
- Knowingly and willfully falsifying acceptance test results or certifies/stamps products that do not meet acceptance criteria.
- Knowingly and willfully falsifying reports, test results, records, etc. will result in permanent disqualification by CDOT and the Manufacturer will not be allowed to supply precast products to a CDOT project.
- Supplying products to a CDOT project produced from concrete which does not conform to the mix design submitted to CDOT.
- Manufacturer is no longer active in the market.

17.7.2 Actions resulting in removal within thirty (30) days:

- Repeated placement on conditional status (two times in three years) per section 17 of this document.
- Failure to satisfactorily resolve deficiencies identified by certification reviews.
- Failure to renew certification prior to expiration date.
- Deviating from the requirements in the Quality Control Plan without the Department's approval.
- If non-destructive testing and dimensional verification indicates the product manufactured contains a major error per manufacturing tolerances. The process detailed in Section 17.2 of this Standard will be utilized in the determination of the extent and severity of errors.
- Additional verification testing results are unacceptable (such as coring, load testing, etc.).

17.8 If a facility is removed from the QML, CDOT will notify the Manufacturer in writing within seven (7) days directing the Manufacturer not to supply any specific products of any type or size containing the error to CDOT projects. Upon such notice, the Manufacturer shall immediately cease production, shipment, and placement of such product(s) supplied to CDOT projects. After such notice is issued, the Manufacturer reserves the right to enter the appeals process described in Section 17.10 of this Standard.

- 17.8.1 The Manufacturer shall provide CDOT with a list of products supplied to CDOT projects from the date of the last passing CDOT inspection that will include certifications and contract numbers.
- 17.8.2 Installed items shall be left in place, accepted at a reduced cost, or rejected at the discretion of the CDOT Engineer.
- 17.8.3 Uninstalled items on projects are subject to being rejected from the date of the last passing test until the date of the failing test based on further evaluation. All costs incurred specific to items being rejected (not the entire project cost) will be the responsibility of the Manufacturer.
- 17.8.4 Products on the Manufacturer's yard produced from the date of the last passing test until the date of the failing test may not be acceptable for use based on further evaluation. All costs incurred related to the production of the rejected material will be the responsibility of the Manufacturer.
- 17.9 Recertification of a plant will require the plant to meet the original certification requirements listed in this Standard. The Manufacturer shall submit a letter to CDOT requesting reinstatement.
- 17.9.1 The Manufacturer must submit documentation to the Materials and Geotechnical Services Manager identifying the reason(s) decertification occurred and the corrective actions taken by the Manufacturer.
- 17.9.2 Decisions regarding recertification qualification are made by the Materials and Geotechnical Services Manager or Review Board consisting of CDOT representatives including the Materials and Geotechnical Services Manager, Staff Bridge personnel, or higher organizational authority.
- 17.10 If a Manufacturer disagrees with the removal of a precast plant from the QML, the Manufacturer may elect to initiate the appeals process and shall provide such disagreement in writing within seven (7) days.
- 17.10.1 The Manufacturer must request a meeting with CDOT to discuss the disagreement in detail.
- 17.10.2 CDOT will meet with the Manufacturer within fourteen (14) days of receiving this request. Upon the completion of this meeting and within seven (7) days, CDOT shall provide the Manufacturer the written intent to proceed with the removal or reverse the direction and reinstate the Manufacturer for the product for which they were removed.
- 17.10.3 If the removal is not reversed, the Manufacturer may choose to continue the appeals process. The Manufacturer shall provide written notice to the CDOT Chief Engineer (who has the authority to resolve disagreement) within thirty (30) days of the initial notification of removal from the QML.
- 17.10.4 The CDOT Chief Engineer or delegated designee will meet with the Manufacturer within fourteen (14) days of receiving this request to provide final resolution within forty-five (45) days of the initial removal.

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