# Colorado Procedure 11-17

*Standard Practice for*

# Quality Management Plans for the Qualified Manufacturers List or the Approved Products List

## 1. SCOPE

1.1 This Standard specifies requirements and procedures for a certification system that shall be applicable to all referenced manufacturers, as well as suppliers and contractors within certain industries. Certifying a Manufacturer's Quality Management Plan is not an automatic acceptance of any particular product, but an acknowledgement that the Manufacturer has taken steps to ensure that their quality controls meet the applicable Industry standards. A Quality Management Plan, a Quality Control Plan, and a Quality System Manual are deemed synonymous for this standard.

1.2 Manufacturers whose Quality Management Plans are acceptable will be placed on the Qualified Manufacturers List (QML) or their products will be eligible to be placed on the Approved Products List (APL). Only Manufacturers required to be listed on the QML will be eligible to provide the referenced products to a CDOT project. The QML is located within CDOT's Approved Products List (APL) web site, at www.codot.gov/business/APL/ .

## 2. REFERENCED INDUSTRIES

2.1 With respect to this Standard there are two materials classes. This Colorado Procedure will be divided into two parts to correlate to these materials classes. Part I will be Standard Manufactured Materials of which upon acceptance of the manufacturer's Quality Control Plans the individual products submitted will be placed on the APL. Part II will be Fabricated Structural Materials of which upon acceptance of the manufacturer's Quality System Manual the individual production facilities will be placed on the QML. Each Part will be divided into Sub-Parts, which are a grouping of products or Manufacturers that have a certain commonality. Within each Sub-Part of this Colorado Procedure there will be instructions and guidance for the Manufacturers to become certified so that they can submit their manufactured products for inclusion in CDOT projects.

## 3. TABLE OF CONTENTS


Part I. Standard Manufactured Materials

| | | |
|---|---|---|
| Sub-Part 1. | Asphalt Binder | Page 3 |
| Sub-Part 2. | Asphalt Emulsion | Page 13 |
| Sub-Part 3. | Hydraulic Cement | Page 21 |
| Sub-Part 4. | Fly Ash | Page 25 |
| Sub-Part 5. | Hydrated Lime | Page 29 |

Part II. Fabricated Structural Materials

| | | |
|---|---|---|
| Sub-Part 1. | Steel Reinforcing Bars & Steel Dowel Bars | Page 33 |
| Sub-Part 2. | Epoxy Coating for Reinforcing Steel | Page 39 |
| Sub-Part 3. | Precast Concrete Structures | Page 47 |

## 4. PRODUCT ACCEPTANCE

4.1 The majority of materials submitted for inclusion on CDOT projects will fall within one of four levels of product acceptance for their sampling and testing. CDOT always retains the right through its Quality Assurance (QA) Program to obtain samples for additional testing and require supplemental documentation.

4.2 The four levels of product acceptance are: Pre-Inspected (PI), Certified Test Report (CTR), Certificate of Compliance (COC), and Pre-Approved (through the APL).

4.3 A Manufacturer being placed on the QML is a completely separate activity from how their product(s) are accepted on a CDOT project. The specifics on product acceptance are addressed in the Special Notice to Contractors chapter and with additional reference in the Quality Assurance Schedule.

## 5. DECERTIFICATION

5.1 Certification may be withdrawn from suppliers when one or more of the following conditions exist:

5.1.1 Failure to consistently supply material of a specific grade meeting specifications for three (3) acceptance samples as determined by CDOT test results.

5.1.2 Failure to regularly participate in two (2) WCTG or equal "Round-Robins."

5.1.3 Inadequate maintenance of required records.

5.1.4 Improper documentation of shipments.

5.1.5 A visit by CDOT's Representative to a supplier's facility reveals significant quality control problems.

5.1.6 Failure to maintain an acceptable quality control program.

5.1.7 Failure to comply with any additional decertification requirements found in the applicable Sub-Part of this Standard.

5.2 Notification of Decertification will be in writing.

## 6. QUALIFYING FOR RECERTIFICATION

6.1 If a supplier has been decertified and seeks to be recertified, then the Supplier Certification Requirements must be fulfilled, as per Section 6 of the applicable Sub-Part of this Standard.

Part I, Sub-Part 1:

# Asphalt Binder - 15

## (Certifying Suppliers and Contractors)

### 1. REFERENCED DOCUMENTS

1.1 CDOT Standard Specifications

Table 702-1, Superpave Performance Graded Binders

1.2 AASHTO Standards:

R 29 Practice for Grading or Verifying the Performance Grade of an Asphalt Binder
T 40 Method of Sampling Bituminous Materials
R 18 AASHTO Accreditation Program

1.3 ASTM Standards:

D 8 Definitions of Terms Relating to Materials for Roads and Pavements

1.4 WCTG Bylaws

### 2. TERMINOLOGY

2.1 Binder - An asphalt based cement that is produced from petroleum residue either with or without the addition of non-particulate organic modifiers.

2.2 PG - Performance Graded, as in Superpave Performance Graded Binders.

2.3 Refinery Facility - A facility that is a producer of petroleum asphalts by refining the residuum from crude petroleum. The three types of petroleum asphalts refined are; Asphalt Cements, Emulsion Asphalts, Cutback Asphalts.

2.4 Terminal Facility - A facility that can receive, store, and distribute petroleum asphalts. May have the ability to modify petroleum asphalts.

2.5 Storage Facility - A facility that can receive, store, and distribute petroleum asphalts. The facility does not have the ability to modify the petroleum asphalt.

2.6 Supplier - A Supplier shall be defined as one who produces, controls, and supplies the final binder product to satisfy the PG binder grade specified in Table 702-1 of the Standard Specifications and/or other appropriate CDOT specifications. A Supplier shall be a refinery, a terminal, an HMA producer, or any facility that holds product for more than 30 days from the date of delivery for unmodified binders or 7 days from the date of delivery for a modified binder regardless of binder quantity. If no modification is made to the PG binder grade after its initial production at the refinery, the refinery shall be the supplier and must provide certification. If there is any grade modification of the PG binder at the terminal, the terminal becomes the supplier and must provide the certification. If an HMA producer blends binder of different grades or binders from different suppliers at the facility, the HMA producer becomes the supplier and must provide the certification to verify the grade of the stored binder and must meet CP 11 requirements for an approved supplier. No PG binder will be produced or blended to specification at the hot mix asphalt (HMA) plant.

2.7 Contractor – The company who places the HMA on the project under contract with CDOT.

2.8 WCTG – Western Cooperative Test Group, a government / industry association.

### 3. SIGNIFICANCE AND USE

3.1 This Standard specifies requirements and procedures for a certification system that shall be applicable to all suppliers and contractors providing performance graded (PG) binders. The requirements and procedures shall apply to materials that meet the requirements of CDOT specifications for PG binders. These provisions initially apply to the refinery manufacturing the PG binder and/or to terminals where binders are mixed. These provisions subsequently apply to the Contractor, after delivery of the PG binder to the Contractor, for use in hot mix asphalt (HMA) on CDOT projects.

3.2 This Standard specifies procedures intended to minimize disruption of PG binder shipments. This is accomplished by a certification system that evaluates quality control

and specification compliance tests performed by the Supplier and the HMA Contractor according to their quality control plans.

## 4. SAMPLING

4.1 All test samples required by this standard shall be obtained in accordance with AASHTO T 40. A supplier may propose an alternate method of sampling that will ensure the sampling of a non-segregated product.

## 5. TESTING REQUIREMENTS

5.1 All specification compliance testing required for this Standard shall be performed by a laboratory currently covered by AMRL accreditation. Any satellite laboratory of a Supplier that performs required testing under this Standard will be identified in the submitted Supplier Quality Control Plan (Section 7) and shall be approved by CDOT.

5.2 All laboratories performing routine Quality Control testing shall participate in WCTG round robin testing or an approved equal.

## 6. SUPPLIER CERTIFICATION REQUIREMENTS

6.1 The Supplier shall submit to CDOT for approval a complete Quality Control Plan that complies with the requirements of Section 7. If the Quality Control Plan is rejected, the Supplier may modify the plan based on the critique provided and then resubmit it to CDOT for approval.

6.2 Once the Supplier's Quality Control Plan is approved by CDOT, the Supplier shall submit to the CDOT Product Evaluation Coordinator a completed copy of CDOT Form #595 (Pre-Approved Product Evaluation Request & Summary) for each performance graded binder. The Form #595 can be located at: www.codot.gov/business/APL/ within the Notice to Manufacturers. The Form #595 is designed as a PDF Writeable form, which must be completed by the Supplier. The completed form shall be returned to CDOT's Product Evaluation Coordinator as an e-mail attachment.

6.2.1 The Form #595 "Product name" field shall identify the submitted performance grade binder and the construction year of the submittal (i.e. "*PG 76 -28 (2011)*").

6.2.2 The Form #595 will serve as the request to CDOT for authorization to ship PG binder as referenced within this Colorado Procedure.

6.3 The Supplier shall forward to CDOT the initial testing data for the performance grade binder identified in the Form #595 and a copy of the MSDS. The Supplier shall also obtain and provide a split sample for the CDOT Central Laboratory from the first production run of the performance graded binder identified on the Form #595. This will be concurrent with the first shipments of the construction season when the performance graded binder is being made for the first time that season.

6.3.1 If the submitted sample required in Subsection 6.3 fails the verification testing and is rejected by CDOT, then the Supplier may submit to CDOT a new test sample with a new CDOT Form #595, updated initial test data, and an MSDS. If CDOT rejects this second submittal then the Supplier may resubmit again. However, this third submittal for the same Product name (binder grade for that calendar year) shall include, in addition to all requirements in Subsection 6.3, a test report from an independent AMRL accredited laboratory.

6.4 The Supplier shall allow CDOT to visit the production and/or shipping site during normal business hours to perform an audit by observing the Supplier's quality control activities, to inspect the facilities, and to obtain samples for test.

6.5 The Supplier shall follow the procedures described in the CDOT approved quality control plan.

6.6 The Supplier shall establish a continuing test record for every test required for each PG binder included in the written request as prepared to satisfy the requirements of Subsection 6.1.

6.7 The Supplier shall submit to CDOT all reports required by this standard in a format approved by CDOT.

6.8 The Supplier shall have a satisfactory record of compliance with CDOT project specifications. Decisions by CDOT concerning this requirement shall be based on the test results furnished by the supplier and satisfactory results when the splits and field tests are compared with supplier tests.

## 7. SUPPLIER QUALITY CONTROL PLAN (MINIMUM REQUIREMENTS)

7.1 The Supplier's Quality Control Plan shall identify the following:

7.1.1 Facility type (refinery, terminal, HMA producer).

7.1.2 Facility location (actual physical address).

7.1.3 Name and telephone number of the person responsible for quality control at the facility.

7.1.4 Quality control tests and testing frequency to be performed on each PG binder.

7.1.5 Name and location of the laboratory performing quality control tests on the PG binder that is shipped.

7.2 The Supplier's Quality Control Plan shall include a declaration stating that if a test result indicates that a shipment of PG binder is not in compliance with the purchase specifications, the Supplier shall:

(1) Identify the material in the shipment,
(2) Immediately cease the shipment until the material complies with the specification,
(3) Immediately notify CDOT regarding the shipment in question,
(4) Immediately notify the Contractors scheduled to use the material from the shipment in question,
(5) Notify CDOT prior to resuming shipment; and
(6) Implement any mutually agreed upon procedures for the disposition of the material.

7.3 The Supplier's quality control plan shall describe method and frequency for initial testing, specification compliance testing, and quality control testing for guiding the manufacturer.

7.3.1 **Initial Testing** - For each grade of PG binder to be supplied, specification compliance testing shall be initially performed and the results of that testing provided to CDOT, accompanied by a sample of the material represented by the test results. Specification compliance testing shall confirm that the PG binder conforms to all requirements of Table 702-1 of the Standard Specifications. This will be concurrent with the first shipments of the construction season when the performance grade binder is being made for the first time that season. If, during the course of a construction project, the binder used changes such that future binder supply to a project will come from a different refinery, different terminal, or be a different formulation that could potentially affect mix properties, the Supplier shall notify the Contractor and CDOT Project Engineer in writing at least 5 working days before shipment. If the Supplier is changing terminal location and both locations utilize the same formulation, the Supplier shall notify the Contractor and CDOT Project Engineer prior to use on the project and the one point check per CP 52 may be waived with concurrence from the RME.

7.3.2 **Specification Compliance Testing** - Specification compliance testing shall be run on a routine basis and the results submitted to CDOT at a minimum of once per month.

7.3.3 **Quality Control Testing for Guiding the Manufacturer** – Tests to determine conformance with Table 702-1 of the Standard Specifications tests shall be conducted as needed for quality control. The Quality Control Plan shall indicate the frequency of this testing. Non-Table 702-1 tests, of the Standard Specifications, may be used for guiding the manufacturer. The use of non-Table 702-1 tests does not preclude the need to meet Table 702-1 requirements or to run complete Table 702-1 tests as indicated in the Quality Control Plan.

7.4 The Supplier's quality control plan shall include a statement that the Supplier will prepare and maintain summary reports for all quality control and specification compliance tests performed, and will submit them to CDOT on request.

7.5 The Supplier’s quality control plan shall provide an outline of the procedure to be followed for checking transport vehicles before loading to prevent contamination of shipments. The outline shall include a statement that the Transport Vehicle Inspection Report, signed by the designated inspector, shall be maintained in the Supplier's records and will be made available to CDOT on request.

7.6 If the supplier’s facility has the capability of introducing any additives to the binder at the point of load-out, then the QC plan shall outline the procedures to control, monitor, and report on the exact amount of additive. Only CDOT approved additives shall be allowed at load-out.

7.7 If the Supplier's facility has acid, alkaline, or recycled engine oil bottom modification equipment in place for producing acid, alkaline, or recycled engine oil bottom modified binders for sale in non-CDOT markets, the Supplier's Quality Control Plan shall include a description of the precautions that will be taken to prevent acid, alkaline, or recycled engine oil bottom modified binders from being inadvertently shipped to CDOT.

## 8. CDOT EVALUATION PROCEDURE

8.1 CDOT will verify that the Supplier's quality control plan is adequate. CDOT may visit the shipping site when required.

8.2 CDOT will notify the Supplier whether or not the Supplier's application for Certified Binder Supplier status has been granted. The notification shall include a list of the PG binder(s) covered.

8.3 CDOT may verify that the Supplier's specification compliance testing laboratory is currently covered by AASHTO accreditation.

8.4 CDOT may verify that the Supplier's specification compliance testing laboratory participates in the WCTG round robin testing program or an equal program.

8.5 CDOT may perform split sample testing in accordance with Section 10.

8.6 CDOT will perform quality assurance testing.

8.7 CDOT may inspect the operations of the Supplier's facility including those related to the PG binder shipments if required.

8.8 CDOT will post the Supplier's approved binder type with the associated Supplier's facility name on CDOT's Approved Products List. Reference to the web site is at www.codot.gov/business/APL/ .

## 9. REQUIREMENTS FOR SHIPPING PG BINDER BY AN APPROVED SUPPLIER

9.1 The Supplier's Quality Control Plan as approved by CDOT (Section 8) shall be implemented.

9.2 Each shipment shall be accompanied by two copies of the bill of lading, which shall include:

(1) The name and location of the Supplier, as stated in the Supplier's Quality Control Plan,
(2) The performance grade of material,
(3) The quantity of material shipped,
(4) The type and quantity of any approved additive introduced at load-out,
(5) The date of shipment,
(6) A certificate of compliance (COC) certifying the material meets specification requirements. The COC statement will certify the material was manufactured and tested in accordance with CDOT's approved Quality Control Plan (Section 7) and, therefore meets State requirements and,
(7) A statement certifying that the transport vehicle was inspected before loading and was found acceptable for the material shipped. The COC statement will certify the material was manufactured and tested in accordance with the CDOT approved Quality Control Plan (Section 7) and, therefore, meets State requirements.

9.3 If the specification compliance test results do not conform to PG binder specifications, the Supplier shall remove the non-compliant material from the shipping queue as per Subsection 7.2.

## 10. SPLIT SAMPLE TESTING

10.1 CDOT may request split sample testing. The test results will be exchanged as soon as they are available.

10.2 If the split sample test data is not within the precision specified for that particular test a review of both sampling and testing procedures will be conducted by both the supplier and CDOT. If precision statements are not available, the test results should not differ by more than two standard deviations of the latest available WCTG Round Robin test results for that test.

## 11. REPORT AND DATA SHEETS

11.1 Supplier Reports - The Supplier shall prepare the reports described in Subsections 6.1, 6.2, 6.3, 6.6, 6.7, 7.2, 7.4, 7.5, 9.2, and 9.3.

## 12. DECERTIFICATION

12.1 Certification may be withdrawn from suppliers when one or more of the following additional conditions exist:

12.1.1 Acid, alkaline, or recycled engine oil bottom modification are discovered in the binder.

## 13. FIELD QUALITY CONTROL OF PERFORMANCE GRADED ASPHALT BINDER(S)

13.1 The field quality control of the binder shall be the responsibility of the Contractor. Prior to accepting deliveries of binder, the Contractor shall submit a Field Quality Control (FQC) Plan for binder addressing all key elements as listed in Section 14. This FQC Plan will be included within the Contractor's quality control plan for asphalt concrete. The FQC Plan shall be submitted at least 10 days prior to commencing paving operations. The purpose of the FQC Plan is to describe proper handling techniques for the binder to maintain specification conformance of binder properties during transportation, storage, and production operations. The Engineer will review the FQC Plan, and paving operations will not begin until the FQC Plan has been approved in writing.

13.2 The contents of the binder FQC Plan shall be project specific and shall be kept current to the production and mixture operations employed at any time. Prior to executing any change to binder handling, the FQC Plan shall be revised to incorporate the change. Engineer approval of the revised FQC Plan, in writing, will be required before the change is made to binder handling. Failure to keep the FQC Plan current may affect subsequent decisions by the Engineer, such as those made to address correction of failed material.

13.3 The Contractor shall confirm and document that the Supplier that manufactures the binder and the specific binder is on CDOT's Approved Products List as referenced in Subsection 8.8.

13.4 The Contractor shall indicate, in writing, what steps will be taken to ensure that the FQC Plan is followed and what action will be taken to correct the situation if it is found that the plan is not being followed.

## 14. MINIMUM REQUIREMENTS FOR THE CONTRACTOR'S BINDER FIELD QUALITY CONTROL PLAN

14.1 The FQC Plan shall identify all subcontractors responsible for handling the binder. This will include the firm hauling the binder unless that firm is the binder supplier or is employed by the binder supplier.

14.2 The responsibilities of each party having a role in executing the FQC Plan shall be identified.

14.3 The FQC Plan shall describe how changes in grade or supplier of the binder, used in the paving mix, will be implemented. The change must not result in mixing of different binders. If mixing does occur, the mixed binder shall not be incorporated into the paving mix placed on the project. The Contractor shall inform the Engineer in advance of any change in grade or supplier of the binder.

14.4 The anticipated mode of binder delivery shall be described. The process of tank inspection, prior to initial filling, will be described. The tanks on the project site must be completely empty and free of contaminants to avoid contamination of the binder delivered to the project.

14.5 Any special handling or storage requirements of the binder shall be fully described. These shall comply with the manufacturer's recommendations for that grade of binder. The FQC Plan shall conform to these special requirements.

14.6 As detailed by the binder supplier, based on the type of asphalt used to produce the specific grade (i.e. Blended asphalt, Modified asphalt, etc.), any potential limitations of the binder relative to prolonged storage, exposure to prolonged and/or elevated heating, susceptibility to stratification and/or separation, etc. shall be fully described. The Contractor's FQC Plan shall describe how these limitations of the binder shall be addressed.

14.7 If agitation is used in binder storage tanks, the capacity and methods of agitation within the storage tank(s) shall be described.

14.8 Provisions to avoid damage to binder during the suspension of paving operations shall be described. These provisions will detail limits to storage times and corresponding temperature limits.

14.9 The binder rotation FQC Plan shall be described. (i.e. First-in / First-out basis).

14.10 Any on-site sampling and testing shall be described with respect to sampling location, tests to be conducted, and control limits for test results. On-site sampling methods and facilities shall be fully described. It is a good practice for the Contractor to obtain and retain samples of binder when delivered to the project. These samples can be tested if binder problems occur. These test results can help isolate the cause of problems with binder properties. Binder performance test requirements are contained in Table 702-1 of the Standard Specifications.

14.11 The FQC Plan shall describe methods for identifying the binder contained in each storage tank. Clear and consistent labeling of each tank shall be included in these methods.

14.12 The binder temperatures in the tanks shall be routinely monitored, at a minimum of once per day. Procedures and equipment for this monitoring shall be described. Results of this monitoring shall be made available to the Engineer upon request.

# CP 11, Asphalt Binder Supplier Certification Checklist - 2016

Supplier Name: _____ Date:_____
Refinery Name:_____ Refinery Location:_____
Supplier Lab:_____ Supplier Lab Location:_____
PG Binder:_____

Yes / No

Subsection

5.1 Does supplier's lab have current AMRL accreditation?..... _____
5.2 Do the labs performing routine QC testing participate in WCTG Round Robin testing or equal?..... _____
6.1 QC Plan submitted to CDOT?..... _____
6.2 Completed CDOT Form #595 sent to CDOT as an e-mail attachment?..... _____
6.3 Initial test data supplied?..... _____
6.3 MSDS supplied?..... _____
6.3 Split sample provided to CDOT once per construction season?..... _____

**SUPPLIER QC PLAN:**

Subsection

7.1.1 Facility type listed?..... _____
7.1.2 Facility location listed?..... _____
7.1.3 Name of person responsible for QC at the facility listed?..... _____
7.1.4 List of QC tests and frequency to be used on PG binder?..... _____
7.1.5 Name & location of lab performing these tests listed?..... _____
7.2 Does Plan state that, if a shipment is not within specification, the supplier shall:
(1) Identify the material in the shipment?..... _____
(2) Immediately cease shipment until material complies with the specification?..... _____
(3) Immediately notify CDOT regarding the shipment in question?..... _____
(4) Immediately notify the Contractors scheduled to use the material from the shipment in question?..... _____
(5) Notify CDOT prior to resuming shipment?..... _____
(6) Implement any mutually agreed upon procedures for the disposition of the material?..... _____
7.3 Does plan describe the method and frequency for initial testing, QC testing, and specification compliance testing?..... _____
7.3.1 Results of specification compliance testing supplied to CDOT along with a sample?..... _____
7.3.1 Results confirm that the PG binder conforms to Table 702-1?..... _____
7.3.2 Plan states that specification compliance testing is performed routinely and results submitted to CDOT monthly?..... _____
7.3.3 Plan indicates frequency of testing to determine conformance with Table 702-1?..... _____
7.4 Plan states that supplier will maintain summary reports for all QC & Spec Compliance tests performed, and will submit to CDOT upon request?..... _____

[Continued on the next page.]

| Subsection | | Yes / No |
|---|---|---|
| 7.5 | Plan contains an outline of the procedure for checking transport vehicles before loading to prevent contamination? | _____ |
| 7.5.1 | Outline includes statement that the transport vehicle inspection report, signed by the designated inspector, shall be maintained in the supplier's records, and will be made available to CDOT upon request? | _____ |
| 7.6 | If the Supplier has equipment in place for acid, alkaline, or recycled engine oil bottom modification of binder, are precautions described that will be taken to prevent acid, alkaline, or recycled engine oil bottom modified binders from being shipped to CDOT? | _____ |

# CP 11, Asphalt Contractor Field Quality Control Checklist - 2016

Contractor Name:_____ Date:_____
Contract ID:_____
Project Number:_____
Project Location:_____

**FIELD QUALITY CONTROL OF PERFORMANCE GRADED ASPHALT BINDER (S)**

| Subsection | | Yes / No |
|---|---|---|
| 13.1 | Was the Contractor's Field Quality Control (FQC) Plan submitted 10 days prior to paving? | _____ |
| 13.2 | Is the binder FQC plan specific to this Project? | _____ |
| 13.2 | Does the binder FQC plan apply to current binder handling? | _____ |

**Does the Contractor's Binder Field Quality Control Plan Address the Following:**

| Subsection | | |
|---|---|---|
| 14.1 | List of the subcontractors handling the binder? | _____ |
| 14.2 | Responsibilities of the parties executing the binder FQC Plan? | _____ |
| 14.3 | How grade changes will be handled? | _____ |
| 14.4 | Delivery mode and tank inspection before filling? | _____ |
| 14.5 | Special handling and suppliers recommended handling? | _____ |
| 14.6 | Limitations on the type of binder with respect to handling? | _____ |
| 14.7 | Method of agitating binder in the tank (if any)? | _____ |
| 14.8 | Binder handling during paving delays? | _____ |
| 14.9 | Binder rotation plan (i.e. First-in / First-out)? | _____ |
| 14.10 | On-site sampling plan (if any)? | _____ |
| 14.11 | Binder identification plan (tank labeling)? | _____ |
| 14.12 | Binder temperature monitoring (minimum once per day)? | _____ |

{This page was intentionally left blank.}

Part I, Sub-Part 2:

# Asphalt Emulsion - 15

## (Certifying Suppliers and Contractors)

### 1. REFERENCED DOCUMENTS

1.1 CDOT Standard Specifications:

Section 702, Bituminous Materials
Table 702-2 to Table 702-7

1.2 AASHTO Standards:

T 40 Method of Sampling Bituminous Materials
R 18 AASHTO Accreditation Program

1.3 ASTM Standards:

D 8 Definitions of Terms Relating to Materials for Roads and Pavements

### 2. TERMINOLOGY

2.1 Emulsion – A binder that is emulsified with water in a colloid mill.

2.2 Supplier - A Supplier shall be defined as one who produces the final product or who makes the blend or modification that alters the properties of the emulsion specified in Section 702 of the Standard Specifications and/or other appropriate CDOT specifications. A Supplier shall be a refinery, a terminal, or an emulsion producer. If no modification is made to the emulsion after its initial production at the refinery, the refinery shall be the supplier and must provide certification. If there is any modification of the emulsion at the terminal, the terminal becomes the supplier and must provide the certification. No emulsion will be produced or blended to specification at the hot mix asphalt (HMA) plant.

2.3 Refinery Facility - A facility that is a producer of petroleum asphalts by refining the residuum from crude petroleum. The three types of petroleum asphalts refined are; Asphalt Cements, Emulsion Asphalts, Cutback Asphalts.

2.4 Terminal Facility - A facility that can receive, store and distribute petroleum asphalts. May have the ability to modify petroleum asphalts.

2.5 Storage Facility- A facility that can receive, store and distribute petroleum asphalts. The facility does not have the ability to modify the petroleum asphalt.

2.6 Contractor – The company who places the emulsion on the project under contract with CDOT.

### 3. SIGNIFICANCE AND USE

3.1 This standard specifies requirements and procedures for a certification system that shall be applicable to all suppliers and contractors providing asphalt emulsions. The requirements and procedures shall apply to materials that meet the requirements of CDOT specifications for emulsions. These provisions initially apply to the refinery manufacturing the emulsion and/or to the terminals where emulsions are modified. These provisions subsequently apply to the Contractor, after delivery of the emulsion to the Contractor, for use on CDOT projects.

3.2 This standard specifies procedures intended to minimize disruption of emulsion shipments. This is accomplished by a certification system that evaluates quality control and specification compliance tests performed by the Supplier and the Contractor according to their quality control plans.

### 4. SAMPLING

4.1 All test samples required by this standard shall be obtained in accordance with AASHTO T 40. A supplier may propose an alternate method of sampling that will ensure the sampling of a non-segregated product.

### 5. TESTING REQUIREMENTS

5.1 All certification testing required for this standard shall be performed by a laboratory currently covered by AMRL accreditation. Any satellite laboratory of a Supplier that performs

required testing under this standard will be identified in the submitted Supplier Quality Control Plan (Section 7) and shall be approved by CDOT.

## 6. SUPPLIER CERTIFICATION REQUIREMENTS

6.1 The Supplier shall submit to CDOT for approval a complete Quality Control Plan that complies with the requirements of Section 7. If the Quality Control Plan is rejected, the Supplier may modify the plan based on the critique provided and then resubmit it to CDOT for approval.

6.2 Once the Supplier's Quality Control Plan is approved by CDOT, the Supplier shall submit to the CDOT Product Evaluation Coordinator a completed copy of CDOT Form #595 (Pre-Approved Product Evaluation Request & Summary) for each emulsion. The Form #595 can be located within Notice to Manufacturers at: www.codot.gov/business/APL/ . The Form #595 is designed as a PDF Writeable form, which must be completed by the Supplier. The completed form shall be returned to CDOT's Product Evaluation Coordinator as an e-mail attachment.

6.2.1 The Form #595 "Product name" field shall identify the submitted emulsion and the construction year of the submittal (i.e. "CRS-2P *(2011)*").

6.2.2 The Form #595 will serve as the request to CDOT for authorization to ship emulsion as referenced within this Colorado Procedure.

6.3 The Supplier shall forward to CDOT the initial testing data for the emulsion identified on the Form #595 and a copy of the MSDS. The Supplier shall also obtain and provide a split sample for the CDOT Central Laboratory from the first production run of the emulsion identified on the Form #595. This will be concurrent with the first shipments of the construction season when the emulsion is being made for the first time that season.

6.3.1 If the submitted sample required in Subsection 6.3 fails the verification testing and is rejected by CDOT, then the Supplier may submit to CDOT a new test sample with a new CDOT Form #595, updated initial test data, and an MSDS. If CDOT rejects this second submittal then the Supplier may resubmit again. However, this third submittal for the same Product name (emulsion type for that calendar year) shall include, in addition to all requirements in Subsection 6.3, a test report from an independent AMRL accredited laboratory.

6.4 The Supplier shall allow CDOT to visit the production and/or shipping site during normal business hours to perform an audit by observing the Supplier's quality control activities, to inspect the facilities, and to obtain samples for test.

6.5 The Supplier shall follow the procedures described in the CDOT approved quality control plan.

6.6 The Supplier shall establish a continuing test record for every test required for each emulsion included in the written request as prepared to satisfy the requirements of Subsection 6.1.

6.7 The Supplier shall submit to CDOT all reports required by this standard in a format approved by CDOT.

6.8 The Supplier shall have a satisfactory record of compliance with CDOT project specifications. Decisions by CDOT concerning this requirement shall be based on the test results furnished by the supplier and satisfactory results when the splits and field tests are compared with supplier tests.

## 7. SUPPLIER QUALITY CONTROL PLAN (MINIMUM REQUIREMENTS)

7.1 The Supplier's Quality Control Plan shall identify the following:

7.1.1 Facility type (refinery, terminal).

7.1.2 Facility location (actual physical address).

7.1.3 Name and telephone number of the person responsible for quality control at the facility.

7.1.4 Quality control tests and testing frequency to be performed on each type of emulsion.

7.1.5 Name and location of the laboratory performing quality control tests on the emulsion that is shipped.

7.2 The Supplier's Quality Control Plan shall include a declaration stating that if a test result indicates that a shipment of emulsion is not in compliance with the purchase specifications, the Supplier shall:

(1) Identify the material in the shipment,
(2) Immediately cease the shipment until the material complies with the specification,
(3) Immediately notify CDOT regarding the shipment in question,
(4) Immediately notify the Contractors scheduled to use the material from the shipment in question,
(5) Notify CDOT prior to resuming shipment; and
(6) Implement any mutually agreed upon procedures for the disposition of the material.

7.3 The Supplier's quality control plan shall describe method and frequency for initial testing, specification compliance testing, and quality control testing for guiding the manufacturer.

7.3.1 **Initial Testing** - For each type of emulsion to be supplied, specification compliance testing shall be initially performed and the results of that testing provided to CDOT, accompanied by a sample of the material represented by the test results. Specification compliance testing shall confirm that the emulsion conforms to all requirements of Section 702 of the Standard Specifications. This will be concurrent with the first shipments of the construction season when the emulsion is being made for the first time that season.

7.3.2 **Specification Compliance Testing** - Specification compliance testing shall be run on a routine basis and the results submitted to CDOT at a minimum of once per month.

7.3.3 **Quality Control Testing for Guiding the Manufacturer** – Tests to determine conformance with Section 702 of the Standard Specifications tests shall be conducted as needed for quality control. The Quality Control Plan shall indicate the frequency of this testing. Non-Section 702 tests, of the Standard Specifications, may be used for guiding the manufacturer. The use of non-Section 702 tests does not preclude the need to meet Section 702 requirements or to run complete Section 702 tests as indicated in the Quality Control Plan.

7.4 The Supplier's quality control plan shall include a statement that the Supplier will prepare and maintain summary reports for all quality control and specification compliance tests performed, and will submit them to CDOT on request.

7.5 The Supplier's quality control plan shall provide an outline of the procedure to be followed for checking transport vehicles before loading to prevent contamination of shipments. The outline shall include a statement that the Transport Vehicle Inspection Report, signed by the designated inspector, shall be maintained in the Supplier's records and will be made available to CDOT on request.

## 8. CDOT EVALUATION PROCEDURE

8.1 CDOT will verify that the Supplier's quality control plan is adequate. CDOT may visit the shipping site when required.

8.2 CDOT will notify the Supplier whether or not the Supplier's application for Certified Emulsion Supplier status has been granted. The notification shall include a list of the types of emulsions covered.

8.3 CDOT may verify that the Supplier's specification compliance testing laboratory is currently covered by AASHTO accreditation.

8.4 CDOT may verify that the Supplier's specification compliance testing laboratory participates in a round robin testing program.

8.5 CDOT may perform split sample testing in accordance with Section 10.

8.6 CDOT will perform quality assurance testing.

8.7 CDOT may inspect the operations of the Supplier's facility including those related to the emulsion shipments if required.

8.8 CDOT will post the Supplier's approved emulsion type with the associated Supplier's facility name on CDOT's Approved Products List. Reference to the web site is at www.codot.gov/business/APL/.

## 9. REQUIREMENTS FOR SHIPPING EMULSIONS BY AN APPROVED SUPPLIER

9.1 The Supplier's Quality Control Plan as approved by CDOT (Section 8) shall be implemented.

9.2 Each shipment shall be accompanied by two copies of the bill of lading, which shall include:

(1) The name and location of the Supplier, as stated in the Supplier's Quality Control Plan,
(2) The type of emulsion,
(3) The quantity of material shipped,
(4) The date of shipment,
(5) A certificate of compliance (COC) certifying the material meets specification requirements. The COC statement will certify the material was manufactured and tested in accordance with the CDOT approved Quality Control Plan (Section 7) and, therefore, meets state requirements (example in Chapter 400), and,
(6) A statement certifying that the transport vehicle was inspected before loading and was found acceptable for the material shipped. The COC statement will certify the material was manufactured and tested in accordance with CDOT's approved Quality Control Plan (Section 7) and, therefore, meets state requirements.

9.3 If the specification compliance test results do not conform to emulsion specifications, the Supplier shall remove the non-compliant material from the shipping queue as outlined in Subsection 7.2.

## 10. SPLIT SAMPLE TESTING

10.1 CDOT may request split sample testing. The test results will be exchanged as soon as they are available.

10.2 If the split sample test data is not within the precision specified for that particular test a review of both sampling and testing procedures will be conducted by both the supplier and CDOT.

## 11. REPORT AND DATA SHEETS

11.1 Supplier Reports - The Supplier shall prepare the reports described in Subsections 6.1, 6.2, 6.3, 6.6, 6.7, 7.2, 7.4, 7.5, 9.2, and 9.3.

## 12. RECERTIFICATION

12.1 If a supplier has been decertified and seeks to be recertified, the supplier must fulfill the requirements for certification, as per Section 6.

## 13. FIELD QUALITY CONTROL OF EMULSION(S)

13.1 The field quality control of the emulsion shall be the responsibility of the Contractor. Prior to accepting deliveries of emulsion, the contractor shall submit a Field Quality Control (FQC) Plan for emulsion addressing all key elements as listed in Section 14. This FQC Plan will be included within the Contractor's quality control plan for asphalt concrete. The FQC Plan shall be submitted at least 10 days prior to commencing paving operations. The purpose of the FQC Plan is to describe proper handling techniques for the emulsion to maintain specification conformance of emulsion properties during transportation, storage, and production operations. The Engineer will review the FQC Plan, and the paving operations will not begin until the FQC Plan has been approved in writing.

13.2 The contents of the emulsion FQC Plan shall be project specific and shall be kept current to the production and mixture operations employed at any time. Prior to executing any change to emulsion handling, the FQC Plan shall be revised to incorporate the change.

Engineer approval of the revised FQC Plan, in writing, will be required before the change is made to emulsion handling. Failure to keep the FQC Plan current may affect subsequent decisions by the Engineer, such as those made to address a correction of failed material.

13.3 The Contractor shall confirm and document that the Supplier that manufactures the emulsion and the specific emulsion is on CDOT's Approved Products List as referenced in Subsection 8.8.

13.4 The Contractor shall indicate, in writing, what steps will be taken to ensure that the FQC Plan is followed and what action will be taken to

correct the situation if it is found that the plan is not being followed.

## 14. MINIMUM REQUIREMENTS FOR THE CONTRACTOR'S EMULSION FIELD QUALITY CONTROL PLAN

14.1 The FQC Plan shall identify all subcontractors responsible for handling the emulsion. This will include the firm hauling the emulsion unless that firm is the emulsion supplier or is employed by the emulsion supplier.

14.2 The responsibilities of each party having a role in executing the FQC Plan shall be identified.

14.3 The FQC Plan shall describe how changes in type or supplier of the emulsion, used on the paving job, will be implemented. The change must not result in mixing of different emulsions. If mixing does occur, the mixed emulsion shall not be incorporated in the project. The Contractor shall inform the Engineer in advance of any change in type or supplier of the emulsion.

14.4 The anticipated mode of emulsion delivery shall be described. The process of tank inspection, prior to initial filling, will be described. The tanks on the project site must be completely empty and free of contaminants to avoid contamination of the emulsion delivered to the project.

14.5 Any special handling or storage requirements of the emulsion shall be fully described. These shall comply with the manufacturer's recommendations for that type of emulsion. The FQC Plan shall conform to these special requirements.

14.6 As detailed by the emulsion supplier, based on the type of materials used to produce the specific emulsion, any potential limitations of the emulsion relative to prolonged storage, exposure to prolonged and/or elevated heating, susceptibility to stratification and/or separation, etc. shall be fully described. The Contractor's FQC Plan shall describe how these limitations of the emulsion shall be addressed.

14.7 If agitation is used in emulsion storage tanks, the capacity and methods of agitation within the storage tank(s) shall be described.

14.8 Provisions to avoid damage to emulsion during the suspension of paving operations shall be described. These provisions will detail limits to the storage times and corresponding temperature limits.

14.9 The emulsion rotation FQC Plan shall be described. (First-in / First-out basis, for example).

14.10 Any on-site sampling and testing shall be described with respect to sampling location, tests to be conducted, and control limits for test results. On-site sampling methods and facilities shall be fully described. It is a good practice for the Contractor to obtain and retain samples of emulsion when delivered to the project. These samples can be tested if emulsion problems occur. These test results can help isolate the cause of emulsion problems. Emulsion performance test requirements are contained in Section 702 of the Standard Specifications.

14.11 The FQC Plan shall describe methods for identifying the emulsion contained in each storage tank. Clear and consistent labeling of each tank shall be included in these methods.

14.12 The emulsion temperatures in the tanks shall be routinely monitored, at a minimum of once per day. Procedures and equipment for this monitoring shall be described. Results of this monitoring shall be made available to the Engineer upon request.

{This page was intentionally left blank.}

# CP 11, Asphalt Emulsion Supplier Certification Checklist - 2015

Date:_____

Supplier Name: _____ Supplier Location:_____

Supplier Lab:_____ Supplier Lab Location:_____

Emulsion Type:_____

| Subsection | | Yes/ No |
|---|---|---|
| 5.1 | Does supplier's lab have current AMRL accreditation? | _____ |
| 6.1 | QC plan submitted to CDOT? | _____ |
| 6.2 | Completed CDOT Form #595 sent to CDOT as an e-mail attachment? | _____ |
| 6.3 | Initial test data supplied? | _____ |
| 6.3 | MSDS supplied? | _____ |
| 6.3 | Split sample provided to CDOT once per construction season? | _____ |

**SUPPLIER QC PLAN:**

| Subsection | | |
|---|---|---|
| 7.1.1 | Facility type listed? | _____ |
| 7.1.2 | Facility location listed? | _____ |
| 7.1.3 | Name of person responsible for QC at the facility is listed? | _____ |
| 7.1.4 | List of QC tests & frequency to be used on emulsion? | _____ |
| 7.1.5 | Name & location of lab performing these tests is listed? | _____ |
| 7.2 | Does Plan state that, if a shipment is not within specification, the supplier shall: | |
| | (1) Identify the material in the shipment? | _____ |
| | (2) Immediately cease shipment until material complies with the specification? | _____ |
| | (3) Immediately notify CDOT regarding the shipment in question? | _____ |
| | (4) Immediately notify the Contractors scheduled to use the material from the shipment in question? | _____ |
| | (5) Notify CDOT prior to resuming shipment? | _____ |
| | (6) Implement any mutually agreed upon procedures for the disposition of the material? | _____ |
| 7.3 | Does plan describe the method and frequency for initial testing, QC testing, and specification compliance testing? | _____ |
| 7.3.1 | Results of specification compliance testing supplied to CDOT along with a sample? | _____ |
| 7.3.1 | Results confirm that the Emulsion conforms to Section 702? | _____ |
| 7.3.2 | Plan states that specification compliance testing is performed routinely and results are submitted to CDOT monthly? | _____ |
| 7.3.3 | Plan indicates frequency of testing to determine conformance with Section 702? | _____ |
| 7.4 | Plan states that supplier will maintain summary reports for all QC and Spec Compliance tests performed, and will submit to CDOT upon request? | _____ |
| 7.5 | Plan contains an outline of the procedure for checking transport vehicles before loading to prevent contamination? | _____ |
| 7.5.1 | Outline includes statement that the transport vehicle inspection report, signed by the designated inspector, shall be maintained in the supplier's records, and will be made available to CDOT upon request? | _____ |

# CP 11, Asphalt Contractor Field Quality Control Checklist - 2015

Contractor Name:_____ Date:_____
Contract ID:_____
Project Number:_____
Project Location:_____

**FIELD QUALITY CONTROL OF EMULSION(S)**

| Subsection | | Yes/ No |
|---|---|---|
| 13.1 | Was the Contractor's Field Quality Control (FQC) Plan submitted 10 days prior to paving? | _____ |
| 13.2 | Is the emulsion FQC plan specific to this Project? | _____ |
| 13.2 | Does the emulsion FQC plan apply to current emulsion handling? | _____ |

**Does the Contractor's Emulsion Field Quality Control Plan Address the Following:**

| Subsection | | |
|---|---|---|
| 14.1 | List of the subcontractors handling the emulsion? | _____ |
| 14.2 | Responsibilities of the parties executing the emulsion FQC Plan? | _____ |
| 14.3 | How emulsion type changes will be handled? | _____ |
| 14.4 | Delivery mode and tank inspection before filling? | _____ |
| 14.5 | Special handling and suppliers recommended handling? | _____ |
| 14.6 | Limitations on the type of emulsion with respect to handling? | _____ |
| 14.7 | Method of agitating emulsion in the tank (if any)? | _____ |
| 14.8 | Emulsion handling during paving delays? | _____ |
| 14.9 | Emulsion rotation plan (i.e. First-in / First-out)? | _____ |
| 14.10 | On-site sampling plan (if any)? | _____ |
| 14.11 | Emulsion identification plan (tank labeling)? | _____ |
| 14.12 | Emulsion temperature monitoring (minimum once per day)? | _____ |

Part I, Sub-Part 3:

# Hydraulic Cement – 12

## 1. REFERENCED DOCUMENTS

1.1 ASTM Standards:

ASTM C 150 Standard Specification for Portland Cement

ASTM C 183 Standard Practice for Sampling and the Amount of Testing of Hydraulic Cement

ASTM C 219 Standard Terminology Relating to Hydraulic Cement

ASTM C 595 Standard Specification for Blended Hydraulic Cement

ASTM C 1157 Standard Performance Specification for Hydraulic Cement

## 2. TERMINOLOGY

2.1 See ASTM C 219 Standard Terminology Relating to Hydraulic Cement.

2.2 Supplier – In this Standard, a *Cement Supplier* shall be defined as one who manufactures hydraulic cement.

2.3 Supplier – In this Standard, a *Concrete Supplier* shall be defined as one who manufactures concrete mix. Among the ingredients of a concrete mix is hydraulic cement.

2.4 Contractor – The company under contract with CDOT to produce products using hydrated cement.

## 3. SIGNIFICANCE AND USE

3.1 This Standard specifies requirements and procedures for a certification system that shall be applicable to all Cement Suppliers providing hydraulic cement. These provisions apply to the plant manufacturing the hydraulic cement. These provisions apply to the Contractor, after delivery of the hydraulic cement to the Contractor, for use on CDOT projects.

3.2 This Standard specifies procedures intended to minimize disruption of hydraulic cement shipments. This is accomplished by a certification system that evaluates quality control and specification compliance tests performed by the Cement Supplier according to their quality control plans.

## 4. SAMPLING

4.1 All test samples shall be obtained in accordance with ASTM C 183. The use of a random sampling procedure is mandatory to the establishment of a valid quality assurance program.

## 5. TESTING REQUIREMENTS

5.1 Testing shall be performed by a laboratory currently accredited by the Cement and Concrete Reference Laboratory (CCRL). Any satellite laboratory of a Cement Supplier that performs required testing under this Standard shall be identified in the submitted Quality Control Plan (Section 7).

## 6. SUPPLIER CERTIFICATION REQUIREMENTS

6.1 Cement Suppliers shall submit to the CDOT Product Evaluation Coordinator (PEC), CDOT Form #595, Pre-Approved Product Evaluation Request & Summary for each type of hydraulic cement intended for use on CDOT projects. Instructions for completing and submitting the CDOT Form #595 can be located within the Notice to Manufacturers at: www.codot.gov/business/APL/.

6.2 In addition to completing CDOT Form #595, the following shall be supplied to the PEC:

6.2.1 A brief outline of the procedures used to evaluate the finished product including sampling and testing frequency and the sample preparation employed, including chemical analysis methods used such as X-ray, atomic absorption spectroscopy, and/or wet chemistry.

6.2.2 The results of all applicable chemical and/or physical tests required by ASTM C 150, C 595, or C 1157 on the most recent 40 samples (20 pairs) tested. The results shall be submitted in the format outlined in ASTM C 183, in particular the table entitled “Test Data” with the critical limits calculated as described.

6.2.3 A copy of the CCRL certification for the laboratory performing testing.

6.2.4 A copy of the Cement Supplier’s Quality Control Plan, which complies with the requirements of Section 7, if one has not been supplied to CDOT for previously submitted products.

6.3 A sample of the proposed hydraulic cement shall be shipped to the PEC at the Materials and Geotechnical Branch, 4670 North Holly Street, Unit A, Denver, Colorado 80216-6408.

6.4 The Cement Supplier shall allow CDOT to visit the production and/or shipping site during normal business hours to observe the Cement Supplier’s quality control activities, to inspect the facilities, and to obtain samples for tests.

6.5 The Cement Supplier shall follow the procedures described in the CDOT approved quality control plan.

6.6 The Cement Supplier shall establish a continuing test record for every test required and for each Type of hydraulic cement included in the written request as prepared to satisfy the requirements of Subsection 6.1.

6.7 The Cement Supplier shall submit to CDOT all reports required by this standard in a format approved by CDOT.

6.8 The Cement Supplier shall have a satisfactory record of compliance with CDOT project specifications. Decisions by CDOT concerning this requirement shall be based on the test results furnished by the Cement Supplier’s tests.

## 7. SUPPLIER QUALITY CONTROL PLAN (MINIMUM REQUIREMENTS)

7.1.1 The Cement Supplier's Quality Control Plan shall identify the following:

7.1.1 Facility location (actual physical address).

7.1.2 Name and telephone number of a person at each production facility, responsible for quality control of the material shipped to CDOT projects.

7.1.3 Quality control tests and testing frequency to be performed on each hydraulic cement.

7.1.4 Name and location of the laboratory performing quality control tests on the hydraulic cement.

7.2 The Cement Supplier's Quality Control Plan shall include a declaration stating that if a test result indicates that a shipment of hydraulic cement does not comply with the purchase specifications, the Cement Supplier shall:

7.2.1 Identify the material in the shipment,

7.2.2 Immediately cease the shipment until the material complies with the specification,

7.2.3 Immediately notify CDOT regarding the shipment in question,

7.2.4 Immediately notify the Contractors and Concrete Suppliers scheduled to use the material from the shipment in question, notify CDOT prior to resuming shipment; and implement any mutually agreed upon procedures for the disposition of the material.

7.3 The Cement Supplier's Quality Control Plan shall describe method and frequency for initial testing and quality control testing.

7.3.1 **Initial Testing** - For each type of hydraulic cement to be supplied, testing shall be performed and the results provided to CDOT, accompanied by a sample of the material represented by the test results.

7.3.2 **Quality Control Testing** – Tests to determine conformance with applicable ASTM standards shall be conducted as needed for quality control. The Cement Supplier’s Quality Control Plan shall indicate the frequency of this testing.

7.4 The Cement Supplier's Quality Control Plan shall include a statement that the Cement Supplier will prepare and maintain summary reports for all quality control tests performed, and will submit them to CDOT on request.

7.5 The Cement Supplier's Quality Control Plan shall provide an outline of the procedure to be followed for checking transport vehicles before loading to prevent contamination of shipments. The outline shall be maintained in the Cement Supplier's records and will be made available to CDOT on request.

## 8. CDOT EVALUATION PROCEDURE

8.1 CDOT will verify that the Cement Supplier's Quality Control Plan is adequate. CDOT may visit the shipping site when required.

8.2 CDOT will notify the Cement Supplier whether or not the Cement Supplier's application has been granted.

8.3 CDOT may verify that the Cement Supplier's testing laboratory is currently CCRL accredited.

8.4 CDOT may perform split sample testing in accordance with Section 10.

8.5 CDOT may sample and perform testing on random samples.

8.6 CDOT may inspect the operations of the Cement Supplier's facility, including those related to shipments if required.

8.7 Products approved for use will be posted on the CDOT APL.

## 9. REQUIREMENTS FOR SHIPPING HYDRAULIC CEMENT BY AN APPROVED SUPPLIER

9.1 The Cement Supplier's Quality Control Plan as approved by CDOT (Section 7) shall be implemented.

9.2 Each shipment shall be accompanied by two copies of the bill of lading, which shall include:

9.2.1 The name and location of the Cement Supplier,

9.2.2 The Type of hydraulic cement shipped,

9.2.3 The quantity of material shipped,

9.2.4 The date of shipment,

9.2.5 A certificate of compliance (COC) certifying that the material meets specification requirements and,

9.2.6 A statement certifying that the transport vehicle was inspected before loading, and was found acceptable for the material shipped.

9.3 If the test results do not conform to the applicable ASTM standards, the Cement Supplier shall remove the non-compliant material from the shipping queue as outlined in Subsection 7.2.

## 10. SPLIT SAMPLE TESTING

10.1 CDOT may request split sample testing. The test results will be exchanged as soon as they are available.

10.2 If the split sample test data is not within the precision specified for that particular test a review of both sampling and testing procedures will be conducted by both the Cement Supplier and CDOT.

## 11. REPORT AND DATA SHEETS

11.1 Cement Supplier Reports - The Cement Supplier shall prepare the reports described in Subsections 6.1, 6.2, 9.2, and 9.3.

{This page was intentionally left blank.}

Part I, Sub-Part 4:

# Fly Ash - 12

## 1. REFERENCED DOCUMENTS

1.1 ASTM Standards:

ASTM C 219 Standard Terminology Relating to Hydraulic Cement

ASTM C 311 Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland Cement Concrete.

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

## 2. TERMINOLOGY

2.1 See ASTM C 219 Standard Terminology Relating to Hydraulic Cement.

2.2 Supplier, Fly Ash – In this Standard, a *Fly Ash Supplier* shall be defined as one who provides fly ash for use on CDOT projects.

2.3 Supplier, Concrete – In this Standard, a *Concrete Supplier* shall be defined as one who manufactures concrete mix. Fly ash may be among the ingredients of a concrete mix.

2.4 Contractor – The company under contract with CDOT to produce products using fly ash.

## 3. SIGNIFICANCE AND USE

3.1 This Standard specifies procedures intended to minimize disruption of fly ash shipments. This is accomplished by a certification system that evaluates quality control and specification compliance tests performed by the Fly Ash Supplier according to their quality control plans.

3.2 This Standard specifies requirements and procedures for a certification system that shall be applicable to all fly ash suppliers providing fly ash. The requirements and procedures shall apply to materials that meet the requirements of CDOT specifications for fly ash. These provisions apply to the plant producing the fly ash. These provisions apply to the Contractor, after delivery of the concrete mix to the Contractor, for use on CDOT projects.

## 4. SAMPLING

4.1 All test samples shall be obtained in accordance with ASTM C 311. The use of a random sampling procedure is mandatory to the establishment of a valid quality assurance program.

## 5. TESTING REQUIREMENTS

5.1 Testing shall be performed by a laboratory currently accredited by the Cement and Concrete Reference Laboratory (CCRL). Any satellite laboratory of a Fly Ash Supplier that performs required testing under this Standard shall be identified in the submitted Quality Control Plan (Section 7).

## 6. SUPPLIER CERTIFICATION REQUIREMENTS

6.1 Fly Ash Suppliers shall submit to the CDOT Product Evaluation Coordinator (PEC), the CDOT Form #595, Pre-Approved Product Evaluation Request & Summary for each source and Class of fly ash intended for use on CDOT projects. Instructions for completing CDOT Form #595 can be found at www.codot.gov/business/APL/ within the Notice to Manufacturers.

6.2 In addition to completing the CDOT Form #595, the following shall be supplied to the PEC:

6.2.1 A brief outline of the procedures used to evaluate the finished product including; sampling and testing frequency and the sample preparation employed, including chemical analysis methods used such as X-ray, atomic absorption spectroscopy, and/or wet chemistry.

6.2.2 The results of all applicable chemical and/or physical tests required by ASTM C 618 on the most recent 40 samples (20 pairs) tested. The results shall be submitted in the format outlined in ASTM C 311, in particular the table entitled "Test Data" with the critical limits

calculated as described.

6.2.3 A copy of the CCRL certification for the laboratory performing testing.

6.2.4 A copy of the Fly Ash Supplier's Quality Control Plan, which complies with the requirements of Section 7, if one has not been supplied to CDOT for previously submitted products.

6.3 A sample of the proposed fly ash shall be shipped to the PEC at the Materials and Geotechnical Branch, 4670 North Holly Street, Unit A, Denver, Colorado 80216-6408.

6.4 The Fly Ash Supplier shall allow CDOT to visit the production and/or shipping site to observe the Fly Ash Supplier's quality control activities, to inspect the facilities, and to obtain samples for tests.

6.5 The Fly Ash Supplier shall follow the procedures described in the CDOT approved quality control plan.

6.6 The Fly Ash Supplier shall establish a continuing test record for every test required for each Type of fly ash included in the written request as prepared to satisfy the requirements of Subsection 6.1.

6.7 The Fly Ash Supplier shall submit to CDOT all reports required by this standard in a format approved by CDOT.

6.8 The Fly Ash Supplier shall have a satisfactory record of compliance with CDOT project specifications. Decisions by CDOT concerning this requirement shall be based on the test results furnished by the Fly Ash Supplier and satisfactory results when the splits and field tests are compared with Fly Ash Supplier tests.

## 7. SUPPLIER QUALITY CONTROL PLAN (MINIMUM REQUIREMENTS)

7.1 The Fly Ash Supplier's Quality Control Plan shall identify the following:

7.1.1 Facility location.

7.1.2 Name and telephone number of a person at each production facility, responsible for quality control of material shipped to CDOT projects.

7.1.3 Quality control tests and testing frequency to be performed on each fly ash.

7.1.4 Name and location of the laboratory performing quality control tests on the fly ash.

7.2 The Fly Ash Supplier's Quality Control Plan shall include a declaration stating that if a test result indicates that a shipment of fly ash does not comply with the purchase specifications, the Fly Ash Supplier shall:

7.2.1 Identify the material in the shipment,

7.2.2 Immediately cease the shipment until the material complies with the specification,

7.2.3 Immediately notify CDOT regarding the shipment in question,

7.2.4 Immediately notify the Contractors and Concrete Suppliers scheduled to use the material from the shipment in question,

7.2.5 Notify CDOT prior to resuming shipment; and

7.2.6 Implement any mutually agreed upon procedures for the disposition of the material.

7.3 The Fly Ash Supplier's Quality Control Plan shall describe method and frequency for initial testing and quality control testing.

7.3.1 **Initial Testing** – For each fly ash product to be supplied, testing shall be performed and the results of that testing provided to CDOT, accompanied by a sample of the material represented by the test results.

7.3.2 **Quality Control Testing** – Tests to determine conformance with ASTM C 618 shall be conducted as needed for quality control. The Supplier's Quality Control Plan shall indicate the frequency of this testing.

7.4 The Fly Ash Supplier's Quality Control Plan shall include a statement that the Fly Ash Supplier will prepare and maintain summary reports for all quality control tests performed, and will submit them to CDOT on request.

7.5 The Fly Ash Supplier's Quality Control Plan shall provide an outline of the procedure to be followed for checking transport vehicles before loading to prevent contamination of shipments. The outline shall be maintained in the Fly Ash

Supplier's records and will be made available to CDOT on request.

**8. CDOT EVALUATION PROCEDURE**

8.1 CDOT will verify that the Fly Ash Supplier's Quality Control Plan is adequate. CDOT may visit the shipping site when required.

8.2 CDOT will notify the Fly Ash Supplier whether or not the Fly Ash Supplier's application has been granted.

8.3 CDOT may verify that the Fly Ash Supplier's testing laboratory is currently CCRL accredited.

8.4 CDOT may perform split sample testing in accordance with Section 10.

8.5 CDOT may sample and perform testing on random samples.

8.6 CDOT may inspect the operations of the Fly Ash Supplier's facility including those related to shipments if required.

8.7 Products approved for use will be posted on the CDOT APL.

**9. REQUIREMENTS FOR SHIPPING FLY ASH BY AN APPROVED SUPPLIER**

9.1 The Fly Ash Supplier's Quality Control Plan as approved by CDOT (Section 7) shall be implemented.

9.2 Each shipment shall be accompanied by two copies of the bill of lading, which shall include:

9.2.1 The name and location of the Fly Ash Supplier and the plant producing the fly ash,

9.2.2 The class of fly ash,

9.2.3 The quantity of material shipped,

9.2.4 The date of shipment,

9.2.5 A statement certifying the material meets specification requirements (COC) and,

9.2.6 A statement certifying that the transport vehicle was inspected before loading and was found acceptable for the material shipped.

9.3 If the test results do not conform to ASTM C 618 specifications, the Fly Ash Supplier shall remove the non-compliant material from the shipping queue as outlined in Subsection 7.2.

**10. SPLIT SAMPLE TESTING**

10.1 CDOT may request split sample testing. The test results will be exchanged as soon as they are available.

10.2 If the split sample test data is not within the precision specified for that particular test a review of both sampling and testing procedures will be conducted by both the Fly Ash Supplier and CDOT.

**11. REPORT AND DATA SHEETS**

11.1 Fly Ash Supplier Reports - The Fly Ash Supplier shall prepare the reports described in Subsections 6.1, 6.2, and 9.2.

{This page was intentionally left blank.}

Part I, Sub-Part 5:

# Hydrated Lime - 12

## 1. REFERENCED DOCUMENTS

1.1 AASHTO Standards:

AASHTO M 303 - Lime for Asphalt Mixtures

AASHTO R 38 – Quality Assurance of Standard Manufactured Materials

1.2 ASTM Standards:

ASTM C 25 - Standard Test Methods for Chemical Analysis of Limestone, Quicklime, and Hydrated Lime

ASTM C 50 - Standard Practice for Sampling, Inspection, Packing, and Marking of Lime and Limestone Products

ASTM C 110 - Standard Test Methods for Physical Testing of Quicklime, Hydrated Lime, and Limestone

ASTM C 207 - Standard Specification for Hydrated Lime for Masonry Purposes

ASTM C 977 - Standard Specification for Hydrated Lime for Soil Stabilization

## 2. TERMINOLOGY

2.1 See ASTM C 51 Standard Terminology Relating to Lime and Limestone (as used by the Industry).

2.2 Supplier – In this Standard, a *Supplier* shall be defined as one who manufactures hydrated lime.

2.3 Contractor – The company under contract with CDOT to produce products using hydrated lime.

## 3. SIGNIFICANCE AND USE

3.1 This Standard specifies procedures intended to minimize disruption of hydrated lime shipments. This is accomplished by a certification system that evaluates quality control and specification compliance tests performed by the Supplier on samples obtained prior to shipment.

3.2 This Standard specifies requirements and procedures for a certification system that shall be applicable to all Suppliers providing hydrated lime. These provisions apply to the plant manufacturing the hydrated lime. These provisions apply to the Contractor, after delivery of the hydrated lime to the Contractor, for use on CDOT projects.

## 4. SAMPLING

4.1 All test samples required by this Standard shall be obtained in accordance with ASTM C 50. The use of a random sampling procedure is mandatory to the establishment of a valid quality assurance program.

## 5. TESTING REQUIREMENTS

5.1 Laboratories that perform the required testing under this Standard shall list qualifications in the submitted Supplier Quality Control Plan. Any satellite laboratory of a Supplier that performs required testing under this Standard shall be identified in the submitted Supplier Quality Control Plan (Section 7).

## 6. SUPPLIER REQUIREMENTS

6.1 Suppliers shall submit to the CDOT's Product Evaluation Coordinator (PEC) the CDOT Form #595, Pre-Approved Product Evaluation Request & Summary for each source of hydrated lime intended for use on CDOT projects. Instructions for completing the Form #595 can be found in Notice to Manufacturers at www.codot.gov/business/APL/ .

6.2 In addition to completing CDOT Form #595, the following shall be supplied to the PEC:

6.2.1 A brief outline of the procedures used to evaluate the finished product including; sampling and testing frequency, and the sample preparation employed, including chemical analysis methods used.

6.2.2 The results of all applicable chemical and/or physical tests required by AASHTO M 303, ASTM C 110, ASTM C 207 or ASTM C 977 on the most recent 20 samples tested. The results shall be submitted in a tabular format with the critical limits indicated.

6.2.3 A copy of the Supplier's Quality Control Plan, which complies with the requirements of Section 7. Any changes to the supplier's Quality Control plans shall require an updated plan sent to the PEC.

6.3 A sample of the proposed hydrated lime shall be shipped to the PEC at the Materials and Geotechnical Branch, 4670 North Holly Street, Unit A, Denver, Colorado 80216-6408.

6.4 During normal business hours, the Supplier shall allow CDOT to visit the production and/or shipping site to observe the Supplier's quality control activities, to inspect the facilities, and to obtain samples for tests.

6.5 The Supplier shall follow the procedures described in the CDOT approved quality control plan.

6.6 The Supplier shall establish a continuing test record for every test required for hydrated lime included in the written request as prepared to satisfy the requirements of Subsection 6.2.

6.7 The Supplier shall submit to CDOT all reports required by this standard in a format approved by CDOT.

6.8 The Supplier shall have a satisfactory record of compliance with CDOT project specifications. Decisions by CDOT concerning this requirement shall be based on the test results furnished by the Supplier and satisfactory results when the splits and field tests are compared with Supplier tests.

## 7. SUPPLIER QUALITY CONTROL PLAN (MINIMUM REQUIREMENTS)

7.1 The Supplier's Quality Control Plan shall identify the following:

7.1.1 Facility location.

7.1.2 Name and telephone number of a person at each production facility, responsible for quality control of material shipped to CDOT projects.

7.1.3 Quality control tests and testing frequency to be performed on each hydrated lime product.

7.1.4 Name and location of the laboratory performing quality control tests on the hydrated lime.

7.2 The Supplier's Quality Control Plan shall include a declaration stating that if a test result indicates that a shipment of hydrated lime does not comply with the purchase specifications, the Supplier shall:

7.2.1 Identify the material in the shipment,

7.2.2 Immediately cease the shipment until the material complies with the specification,

7.2.3 Immediately notify CDOT regarding the shipment in question,

7.2.4 Immediately notify the Contractors scheduled to use the material from the shipment in question,

7.2.5 Notify CDOT prior to resuming shipment; and

7.2.6 Implement any mutually agreed upon procedures for the disposition of the material.

7.3 The Supplier's Quality Control Plan shall describe method and frequency for initial and quality control testing.

7.3.1 **Initial Testing** - For each hydrated lime product to be supplied, testing shall be initially performed by the supplier and the results of those tests shall be provided to CDOT, accompanied by a sample of the material represented by the test results.

7.3.2 **Quality Control Testing** – Tests to determine conformance with Subsection 712.03 of the Standard Specifications shall be conducted as needed for quality control. The Supplier's Quality Control Plan shall indicate the frequency of this testing.

7.4 The Supplier's Quality Control Plan shall include a statement that the Supplier will prepare and maintain summary reports for all quality control tests performed, and will submit them to CDOT on request.

7.5 The Supplier's Quality Control Plan shall provide an outline of the procedure to be

followed for checking transport vehicles before loading to prevent contamination of shipments. The outline shall be maintained in the Supplier's records and will be made available to CDOT on request.

## 8. CDOT EVALUATION PROCEDURE

8.1 CDOT will verify that the Supplier's Quality Control Plan is adequate. CDOT may visit the shipping site when required.

8.2 CDOT will notify the Supplier whether or not the Supplier's application has been granted.

8.3 CDOT may perform split sample testing in accordance with Section 10.

8.4 On a random basis, CDOT may request a sample for testing the supplier's product.

8.5 CDOT may inspect the operations of the Supplier's facility including those related to shipments if required.

8.6 CDOT will post the Supplier's approved hydrated lime with the associated Supplier's facility name on CDOT's Approved Products List. Reference to the web site is at: www.codot.gov/business/APL/ .

## 9. REQUIREMENTS FOR SHIPPING HYDRATED LIME BY AN APPROVED SUPPLIER

9.1 The Supplier's Quality Control Plan as approved by CDOT (Section 7) shall be implemented.

9.2 Each shipment shall be accompanied by two copies of the bill of lading, which shall include:

9.2.1 The name and location of the Supplier,

9.2.2 The Type of material shipped,

9.2.3 The quantity of material shipped,

9.2.4 The date of shipment,

9.2.5 A certificate of compliance (COC) certifying the material meets specification requirements. The COC statement will certify the material was manufactured and tested in accordance with CDOT's approved Quality Control Plan (Section 7) and, therefore meets State requirements and,

9.2.6 A statement certifying that the transport vehicle was inspected before loading and was found acceptable for the material shipped.

9.3 If the test results do not conform to Standard Specification Subsection 712.03, the Supplier shall remove the non-compliant material from the shipping queue as outlined in Subsection 7.2.

## 10. SPLIT SAMPLE TESTING

10.1 CDOT may request split sample testing. The test results will be exchanged as soon as they are available.

10.2 If the split sample test data is not within the precision specified for that particular test a review of both sampling and testing procedures will be conducted by both the Supplier and CDOT.

## 11. REPORT AND DATA SHEETS

11.1 Supplier Reports - The Supplier shall prepare the reports described in Subsections 6.1, 6.2 and 9.2.

{This page was intentionally left blank.}

Part II, Sub-Part 1:

# Steel Reinforcing Bars and Steel Dowel Bars – 16

**SCOPE:** This sub-part provides procedures for being included on the Qualified Manufacturer List (QML) as a Fabricator of steel reinforcing bars and dowel bar for CDOT projects. CDOT will only accept steel reinforcing bars and dowel bars from a Fabricator on the QML.

CDOT will only accept steel reinforcing bar suppliers who have both participated in AASHTO's NTPEP (National Transportation Product Evaluation Program) audit program of steel rebar and have received evaluation results deemed acceptable to CDOT. A letter must be addressed to CDOT's Product Evaluation Coordinator (PEC) requesting that the facility be placed on the CDOT's QML. A copy of the NTPEP Audit Report as well as any applicable documentation from the audit reports is required. CDOT may request additional information if necessary and may decertify a supplier for failing to meet CDOT expectations.

## 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 412.13 – Joints
Section 602 – Reinforcing Steel
Section 709.01 – Reinforcing Steel
Section 709.03 – Dowel Bars and Tie Bars

1.2 AASHTO Standards:

AASHTO M 31 – Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement

AASHTO R 38 – Standard Practice for Quality Assurance of Standard Manufactured Materials

AASHTO T 244 – Standard Method of Test for Mechanical Testing of Steel Products

AASHTO M 55 – Standard Method of Test for Steel Welded Wire Reinforcement, Plain, for Concrete

AASHTO M 221 – Standard Method of Test for Steel Welded Wire Reinforcement, Deformed, for Concrete

1.3 ASTM Standards:

ASTM A 184 – Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement

ASTM A 370 – Standard Test Methods and Definitions for Mechanical Testing of Steel Products

ASTM A 615 – Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

ASTM A 706 – Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement

ASTM A 996 – Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement

ASTM D 3665 – Standard Practice for Random Sampling of Construction Material

1.4 NTPEP Documents:

- Reinforcing Steel and Welded Wire Reinforcement Audit Program http://www.ntpep.org/Pages/REBAR_WWR.aspx
- NTPEP Committee Work Plan for Evaluation of Reinforcing Steel Manufacturers; REBAR 01-15 http://www.ntpep.org/Documents/Technical_Committee/REBAR_WWR/Documents/Rebar_WWR%20Work%20Plan.pdf

## 2. TERMINOLOGY

2.1 See AASHTO M 31 and ASTM A 370 for terminology related to steel reinforcing bars and dowel bars.

2.2 Coating Application Plant – The one who produces a protective coated steel reinforcing bar and a protective coated dowel bar.

2.3 Deformed bar – Steel bar with protrusions; a bar that is intended for use as reinforcement in reinforced concrete construction.

2.4 Fabricator – The company, which cuts and bends steel reinforcing bars either coated or uncoated and/or assembles dowel bar baskets. The company may also provide uncut lengths of steel bar to the construction project site. Each plant constitutes a separate company.

2.5 Plain bar – Steel bar without protrusions; a bar that is intended for use as a dowel bar in transverse joints of concrete pavement construction.

2.6 Supplier – In this sub-part supplier shall be defined as one who produces or mills uncoated deformed steel reinforcing bars and steel plain bars used by the Fabricator.

2.7 Uncoated bar – Steel bar without protective coating.

## 3. SIGNIFICANCE AND USE

3.1 This Standard specifies requirements that shall be followed by the Supplier to be included on CDOT's QML.

3.2 This Standard specifies requirements and procedures for a certification system that shall be applicable to all Suppliers providing steel reinforcing bars and dowel bars.

3.2.1 This Standard covers the responsibilities of the Supplier from point of delivery of steel reinforcing bars and dowel bars to the Fabricators plant, construction project site, and/or Coating Application Plant.

## 4. Deleted

## 5. Deleted

## 6. SUPPLIER REQUIREMENTS

6.1 Uncoated bar Suppliers shall be on CDOT's Qualified Manufacturers List (QML) prior to use by the Fabricator. The QML can be found at the following web address www.codot.gov/business/APL/ .

## 7. CERTIFICATION

7.1 This section details the required documentation to be submitted to the CDOT by the Supplier requesting to be added to the QML.

7.2 The most recent NTPEP audit report shall be submitted to the PEC at least 6 months prior to the steel product being incorporated onto a CDOT project. The NTPEP audit report may not be more than 2 years old.

7.3 Shall provide documentation that the supplier is scheduled for an audit or has been audited in the current calendar year.

## 8. DECERTIFICATION

8.1 CDOT may decertify the Fabricator when conditions exist as specified on page 2 of CP 11 (Section 5 – Decertification).

**NOTE 2**: The term Supplier and Fabricator are interchangeable when reading Section 5 – Decertification on page 2.

8.2 CDOT may decertify a supplier when they fail to comply with the requirements of the NTPEP audit, or have not participated in an audit in the past two years following certification.

## 9. Deleted

## 10. CDOT EVALUATION PROCEDURE

10.1 Suppliers producing steel reinforcing bars and dowel bars shall meet the minimum industry standards.

10.2 Suppliers shall submit the required documentation described in Section 7.

10.3 Within two months after submitting all required information, CDOT will notify the Supplier whether or not the manufacturing

facility's application for the Qualified Manufacturer List has been granted.

10.4 CDOT may perform quality assurance testing.

10.5 CDOT will post the Fabricator's name and approved plant on CDOT's Qualified Manufacturer List (QML) in the web site at www.codot.gov/business/APL/ .

10.6 Failure in one or more Sections or Sub-sections listed in this Standard may result in decertification of the plant and the plant will be removed from the QML. The Supplier may apply for reinstatement on the QML.

**11. Deleted**

**12. REQUIREMENTS FOR SHIPPING STEEL REINFORCING BARS AND DOWEL BARS BY AN APPROVED FABRICATOR**

12.1 The steel reinforcing bars and dowel bars Supplier's QSM as approved by CDOT shall be implemented.

12.2 Each shipment shall be accompanied by two copies of the bill of lading, which shall include:

12.2.1 The name and location of the steel reinforcing bars and dowel bars Fabricator and the Supplier producing the steel reinforcing bars and dowel bars,

12.2.2 The size and grade of steel reinforcing bars and dowel bars conforming to specified specification,

12.2.3 Bars shall be separated and tagged with the Supplier's heat identification number,

12.2.4 The quantity of material shipped,

12.2.5 The date of shipment,

12.2.6 A copy of the mill test reports.

12.3 If the specification compliance test results do not conform to Subsection 709.01 and 709.03 of the CDOT Standard Specifications, the Fabricator shall remove the non-compliant material from the shipping queue.

{This page was intentionally left blank.}

Part II, Sub-Part 2:

# Epoxy Coating for Reinforcing Steel - 17

**SCOPE:** This sub-part provides procedures for being included on the Qualified Manufacturers List (QML) as a producer of epoxy-coated steel reinforcing bars and epoxy-coated steel dowel bars for CDOT projects. CDOT will only accept epoxy-coated steel reinforcing bars and epoxy-coated steel dowel bars by a Manufacturer on the 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 412.13 – Joints
Section 602 – Reinforcing Steel
Section 709.01 – Reinforcing Steel
Section 709.03 – Dowel Bars and Tie Bars

1.2 AASHTO Standards:

AASHTO M 31 – Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement

AASHTO M 254 – Standard Specification for Corrosion-Resistant Coated Dowel Bars

AASHTO M 284 – Discontinued

AASHTO M 317 – Discontinued

AASHTO R 38 – Standard Practice for Quality Assurance of Standard Manufactured Materials

AASHTO T 253 – Standard Method of Test for Coated Dowel Bars

1.3 ASTM Standards:

ASTM A 615 – Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

ASTM A 775 – Standard Specification for Epoxy-Coated Steel Reinforcing Bars

ASTM D 3665 – Standard Practice for Random Sampling of Construction Material

ASTM D 3963 – Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars

1.4 Concrete Reinforcing Steel Institute (CRSI):

Epoxy Coating Plant Certification Manual

## 2. TERMINOLOGY

2.1 See ASTM A 775 for terminology related to epoxy-coated steel reinforcing bars.

2.2 Coated bar – Steel bar with protective epoxy coating applied by the electrostatic spray method.

2.3 Contractor – The company under contract with CDOT to produce products using epoxy-coated steel reinforcing bars and epoxy-coated steel dowel bars.

2.4 Deformed bar – Steel bar with protrusions; a bar that is intended for use as reinforcement in reinforced concrete construction.

2.5 Fabricator – The company, which cuts and bends steel reinforcing bars either coated or uncoated and/or assembles dowel bar baskets.

2.6 Manufacturer – The company, which produces epoxy-coated steel reinforcing bars and epoxy-coated steel dowel bars. Each epoxy-coated applicator plant constitutes a separate company.

2.7 Plain bar – Steel bar without protrusions; a bar that is intended for use as a dowel bar in transverse joints of concrete pavement construction.

2.8 Supplier – In this sub-part it shall be defined as one who provides materials used in the manufacturing of epoxy-coated steel reinforcing bars and epoxy-coated steel dowel bars. Uncoated steel reinforcing bars, uncoated dowel bars, and powder coating are among the materials provided to the Manufacturer.

2.9 Uncoated bar – Steel bar without protective epoxy coating.

## 3. SIGNIFICANCE AND USE

3.1 This Standard 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 be applicable to all Manufacturers providing epoxy-coated steel reinforcing bars and epoxy-coated steel dowel bars. These provisions initially apply to the plant manufacturing the epoxy-coated steel reinforcing bars and epoxy-coated steel dowel bars.

3.2.1 This Standard covers the responsibilities of the Manufacturer from point of delivery of uncoated deformed or plain bars at the applicator plant to point of delivery on the construction project site and/or Fabricator plant.

3.3 This Standard applies to Fabricators that use epoxy-coated bars. The Fabricator shall conform to the requirements of ASTM D 3963 for fabrication of bars and dowel bar assemblies after the application of the epoxy-coating.

3.3.1 This Standard covers the responsibilities of the Fabricator from point of delivery of epoxy-coated steel reinforcing bars and epoxy-coated steel dowel bars at the Fabricators plant to point of delivery on the construction project site.

3.3.2 This Standard covers the responsibilities of the Fabricator from point of delivery of uncoated bars to point of delivery of the Manufacturers application site.

3.3.3 This Standard subsequently covers epoxy-coated steel reinforcing bars and epoxy-coated steel dowel bars for use on CDOT projects. The Contractor shall conform to the requirements of ASTM D 3963 for job site handling of epoxy-coated bars.

## 4. SAMPLING

4.1 All number and frequency of test samples required by this Standard shall be in accordance with ASTM A 775 (as a minimum) and the enhanced Manufacturer QC program. It is expected the QC tests are to be tied to critical production processes as well as to the final product.

**NOTE 1:** ASTM A 775 specifies the number and frequency of tests for coating thickness, continuity, flexibility, and adhesion. For example, an enhanced Manufacturer QC program that exceeds the minimum set forth in ASTM A 775 would document the method of determination of an additional randomly selected bar to test the bar surface temperature before applying the coating.

4.2 In addition, the QC program required by this Standard shall use stratified random sampling techniques. Stratified random sampling should 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.

**NOTE 2:** Determination of random locations (or timing) is universally applied to a construction site or to a Manufacturer's production line. ASTM D 3665 covers a flowing stream of material that can be applied to the production line of epoxy-coated bars.

## 5. TESTING REQUIREMENTS

5.1 An internal designated testing location and/or facility of a Manufacturer that performs the required testing under this Standard shall be identified in the submitted Quality System Manual (QSM) (per Section 9).

5.2 Testing required for this Standard shall be performed by qualified Manufacturers personnel through appropriate QC programs or appropriate training programs.

5.3 As a minimum, the Manufacturers programs used shall include the following;

5.3.1 Training in AASHTO, ASTM, or CRSI test procedures.

5.3.2 Demonstration of proficiency in each Manufactures QC test.

5.3.3 Demonstration of ability to properly document Manufactures QC test results.

5.3.4 Demonstrate the ability to interpret all the test results.

## 6. SUPPLIER REQUIREMENTS

6.1 Uncoated bar Suppliers shall be on CDOT's Qualified Manufacturers List (QML) prior to use by the Manufacturer. The QML can be found at the following web address: www.codot.gov/business/APL/ .

6.2 Uncoated bar Suppliers shall follow the procedures described in the CDOT approved quality control plan as required in CP 11 Part I, Sub-Part 6.

6.3 The uncoated bar Supplier shall provide an annual certification that all steel products delivered to the Manufacturer and permanently incorporated in the work shall have occurred in the United States of America.

6.4 Suppliers of epoxy powder shall be on CDOT's Approved Product List (APL). The APL along with instruction for completing CDOT Form #595, Pre-Approved Product Evaluation Request & Summary, can be found at the web address: www.codot.gov/business/APL/ .

## 7. CURRENTLY CERTIFIED MANUFACTURERS

7.1 A Manufacturer, which has been certified for the past three consecutive years under the Concrete Reinforcing Steel Institute (CRSI) certification plant program, will be placed on CDOT's QML after submitting all of the following:

- The certificate from the current year and the preceding three consecutive years of evaluations from CRSI,
- The inspection report from the current year and the preceding three consecutive years of evaluations from CRSI,
- The Quality System Manual as outlined in Section 9 of this Standard.

7.2 A Manufacturer, which has been certified for less than three consecutive years under the CRSI certification plant program will be on probation and placed on the QML after submitting all of the following:

- The certificate from the current year along with any preceding years of evaluations from CRSI,
- The inspection report from the current year along with any preceding years of evaluations from CRSI,
- The Quality System Manual as outlined in Section 9 of this Standard.

7.2.1 The probation period will be for three consecutive years after being placed on the QML.

## 8. DECERTIFICATION

8.1 This section applies to Manufacturers that are classified under Subsection 7.1. If the Manufacturer becomes decertified by CRSI certification plant program after being placed on the QML, the Manufacturer will be removed from the QML until successfully completing and submitting to CDOT the requirements within this Standard. Decertification is the final ruling after the CRSI dispute process has been completed. The Manufacturer may apply for reinstatement on the QML no sooner than six months after removal from the QML. The probationary period will be for one year after being placed back on the QML with Subsections 7.2, 8.2, and 8.3 of this Standard being applied.

8.2 This section applies to Manufacturers that are classified under Subsection 7.2. If the Manufacturer becomes decertified by CRSI certification plant program after being placed on the QML, the Manufacturer will be removed from the QML until successfully completing and submitting to CDOT the requirements within this Standard. The Manufacturer may apply for reinstatement on the QML no sooner than three years after removal from the QML.

8.3 CDOT may decertify the Manufacturer when conditions exist as specified in Section 5 - Decertification within the Introduction of the CP 11 Page 2.

**NOTE 3:** The term Supplier and Manufacturer are interchangeable when reading Section 5 – Decertification from page 2.

## 9. MANUFACTURER'S QUALITY SYSTEM MANUAL (MINIMUM EQUIREMENTS)

9.1 On an annual basis, at a minimum of two months prior to producing epoxy-coated steel reinforcing bars and epoxy-coated steel dowel bars for a CDOT project, one copy of the Manufacturer's Quality System Manual (QSM) shall be submitted for review and approval to CDOT's Product Evaluation Coordinator (303) 398-6566 within the Staff Materials & Geotechnical Branch at 4670 North Holly Street, Unit A, Denver, Colorado 80216-6408. In lieu of a hard copy QSM, a PDF format document may be submitted. The PDF manual submittal must be complete and whole. 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 Qualified Manufacturers List (QML), the QSM provisions will remain in effect for a period of one 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 changes are made to the QSM, an updated copy shall be submitted to CDOT for review and approval. In lieu of a full updated copy, submittals of updates are acceptable. Updates shall be in the same format as the manual and are to be inserted into the manual to replace outdated pages. The updates may to be in PDF format. The updated pages will have the date of update issuance and is to be recorded in a table of revisions. Guidelines for preparing a QSM may be available from the Concrete Reinforcing Steel Institute (CRSI). Guidelines are also documented in AASHTO R 38.

9.2 The Manufacturer's QSM shall include the latest edition of CRSI Plant Certification Manual.

9.3 The Manufacturer's QSM may be maintained in electronic format. However, one or more copies of the QSM shall be maintained by the Manufacturer's QC Manager in a printed and bound format (3-ring or other). The QSM shall be available to all of the Manufacturer's employees. 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.

9.4 The Manufacturer's QSM shall be formatted to provide numbered sections which meet the following order, format, and content:

9.4.1 Manufacturer's quality policy or mission Statement endorsed by the company's Chief Executive Officer.

9.4.1.1 The quality policy / mission statement shall indicate support of top management to enforce the QC requirements contained in the QSM.

9.4.2 The QSM shall include the address and telephone numbers of applicable personnel at the manufacturing facility. If applicable, the QSM shall include the address and telephone numbers of responsible personnel of the Fabricators.

9.4.3 The QSM shall include a brief listing and description of all the epoxy-coated deformed and plain bars being manufactured at the facility.

9.4.4 The QSM shall present and define any significant terms used throughout the QSM.

9.4.5 For all manufactured items addressed in the QSM, the applicable AASHTO, ASTM, or CDOT specification shall be identified.

9.4.6 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:

9.4.6.1 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. The names of personnel shall be placed on the chart.

9.4.6.2 Each facility shall have a Quality Control Manager who has the overall responsibility for implementing the requirements of the QSM. 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.

9.4.6.3 Each facility shall have at least one Quality Control Technician to perform QC sampling, testing, and inspection. At least one QC Technician shall be on-site 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 QC Technicians at the facility and laboratory involved in the production or testing of the epoxy-coated steel reinforcing bars and epoxy-coated steel dowel bars.

9.5 The QSM shall contain a description of the qualifications required and attained, and years of experience for each QC Manager and QC Technician. All QC sampling, testing, and inspection personnel shall be trained. Plants certified by CRSI shall have at least one QC Manager and at least one QC Technician who are capable of performing and correctly interpreting all the tests required by CRSI Plant Certification Manual. 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.

9.6 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 epoxy-coated steel reinforcing bars and epoxy-coated steel dowel bars.

9.7 The Manufacturer shall maintain its own qualified internal designated testing location and/or facility to perform QC testing. The Manufacturer shall provide backup QC testing personnel and any necessary backup laboratory equipment. The QSM shall include the address and telephone numbers of a designated backup personnel. The Manufacturer's internal designated testing location and/or facility shall meet the minimum accreditations or qualifications obtained through one or more of the following programs:

9.7.1 The manufacturing industry's Concrete Reinforcing Steel Institute Certification Plant Program.

9.7.2 National accreditation programs such as AASHTO Accreditation Program or American Association for Laboratory Accreditation.

9.8 The QSM shall contain an inventory of the necessary equipment used for sampling and testing along with associated calibration equipment used for each required test procedure. The QSM shall assign a unique identification number to each piece of testing equipment. The QSM inventory for each necessary piece of equipment shall include the following information:

9.8.1 The name of each necessary piece of equipment, date placed in service, Manufacturer, model and serial number. The QSM shall include the location where the instructions for use and operation of each necessary piece is stored if not included in the QSM.

9.8.1.1 For each necessary piece of equipment, the QSM shall include the interval of calibration or verification, a reference to the calibration or verification procedures used, and the location where the current calibration or verification records are stored. The QSM shall describe the methods of calibration and verification procedures that are performed at the specified intervals.

9.9 The QSM shall identify all types of Supplier delivered materials used for the production of epoxy-coated steel reinforcing bars and epoxy-coated steel dowel bars.

9.9.1 The QSM shall contain a copy of the signed certification from the steel Supplier that all steel products permanently incorporated into the manufactured product shall have occurred in the United States of America.

9.9.2 The QSM shall contain a description of the specification requirements for all Supplier delivered materials.

9.9.3 The QSM shall contain a description of the certification and test reports delivered by the Supplier and a location where these records are stored.

9.9.4 The QSM shall include all QC testing of the supplied materials and shall contain a statement that no raw materials shall be used unless they are on the APL or they have been tested and meet all appropriate CDOT, AASHTO, or ASTM specifications.

9.9.5 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.

9.10 The QSM shall describe the procedure and frequency for inspection and selection of material samples during production. Sampling shall be performed on a stratified random procedure in accordance with ASTM D 3665. All random QC sample locations shall be properly documented and these procedures shall be included in the QSM.

9.11 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.

9.11.1 The test reports shall be maintained and available for inspection for a minimum of three years.

9.12 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.

9.13 The QSM shall describe procedures used to properly handle, store, and ship epoxy-coated steel reinforcing bars and epoxy-coated steel dowel bars.

## 10. CDOT EVALUATION PROCEDURE

10.1 Manufacturing facilities producing epoxy-coated steel reinforcing bars and epoxy-coated steel dowel bars shall meet the minimum industry standards, and be annually inspected and certified by CRSI. A copy of the certification shall be submitted to CDOT as part of the QML process.

10.2 Initially the Manufacturer shall submit a representative sample of epoxy-coated steel reinforcing bars and epoxy-coated steel dowel bars, test result documentation, and QSM to CDOT's Product Evaluation Coordinator (303) 398-6566 within the Staff Materials & Geotechnical Branch at 4670 North Holly Street, Unit A, Denver, Colorado 80216-6408.

10.2.1 A representative sample of an epoxy-coated steel reinforcing bar at least 3 foot in length and an epoxy-coated steel dowel bar 18 inches long shall be shipped.

10.2.2 The results of all applicable chemical and/or physical tests required by ASTM A 775 on the most recent 20 samples tested. The results shall be submitted in the format outlined in ASTM A 775 and as documented in the Manufacturer's QSM.

10.2.3 One copy of the Manufacturer's Quality System Manual shall be submitted.

10.3 CDOT will verify that the Manufacturer's QSM is adequate.

10.4 Within two months after submitting all required information, CDOT will notify the Manufacturer whether or not the manufacturing facility's application for the Qualified Manufacturers List has been granted.

10.5 CDOT may perform split sample testing in accordance with Section 11.

10.6 CDOT may perform quality assurance testing.

10.7 CDOT may visit the Manufacturer's site when required. CDOT may inspect the operations of the Manufacturer's facility including those related to shipments if required.

10.8 CDOT will post the Manufacturer's name and approved plant on CDOT's Qualified Manufacturers List in the web site: www.codot.gov/business/APL/ .

10.9 Failure in one or more Sections or Sub-sections listed in this Standard may result in an accelerated inspection program. 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 stipulated in Section 8 of this Standard.

## 11. SPLIT SAMPLE TESTING

11.1 CDOT may request split sample testing. A split sample is a sample taken and evenly divided to be tested by two or more individuals or laboratories. The test results will be exchanged as soon as they are available.

11.2 If the split sample test data is not within the agreed to precision for that particular test a review of both sampling and testing procedures will be conducted by both the Manufacturer and CDOT.

## 12. REQUIREMENTS FOR SHIPPING EPOXY-COATED STEEL REINFORCING BARS AND EPOXY-COATED STEEL DOWEL BARS BY AN APPROVED MANUFACTURER

12.1 The epoxy-coated steel reinforcing bars and epoxy-coated steel dowel bars Manufacturer's QSM as approved by CDOT shall be implemented.

12.2 Each shipment shall be accompanied by two copies of the bill of lading, which shall include:

12.2.1 The name and location of the epoxy-coated steel reinforcing bars and epoxy-coated steel dowel bars Manufacturer and the plant producing the epoxy-coated steel reinforcing bars and epoxy-coated steel dowel bars,

12.2.2 The size and grade of epoxy-coated steel reinforcing bars and epoxy-coated steel dowel bars conforming to CDOT specification,

12.2.3 Certifications for the powder coating,

12.2.4 The quantity of material shipped,

12.2.5 The date of shipment,

12.2.6 A copy of the mill test reports.

12.3 If the specification compliance test results do not conform to Subsection 709.01 and 709.03 specifications, the Manufacturer shall remove the non-compliant material from the shipping queue.

## 13. FABRICATION AND JOBSITE HANDLING

13.1 The coated bars to be fabricated by the Fabricator or field fabricated by the Contractor after application of the coating shall meet the following:

13.1.1 Contact points, such as drive rollers, shear contacts, mandrels and backup barrels on benders shall be protected with a suitable covering to minimize damage during the fabrication process.

13.1.2 The Fabricator shall be responsible for repair to the coating due to damage during shipment, storage, or fabrication at the Fabricator's facility.

13.1.3 The Contractor shall be responsible for repair to the coating due to damage during shipment, storage, fabrication, or placement at the construction jobsite.

13.2 Coating damaged due to fabrication or handling shall be repaired with patching material. The patching or repairing shall be performed in accordance with the written recommendations of the patching material Supplier.

13.3 Patching or repair material shall be compatible with the coating, inert in concrete, and feasible for repairs. The patching or repair material shall conform to ASTM D 3963.

{This page was intentionally left blank.}

Part II, Sub-Part 3:

# Precast Concrete Structures - 15

**SCOPE:** This sub-part provides procedures for being included on the Qualified Manufacturers List (QML) as a fabricator 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 (3-sided box culvert), pipes, cattle guards, and Type 7 barrier. CDOT will only accept precast concrete structures by a manufacturer 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 601 – Structural Concrete
Section 603 – Culverts and Sewers
Section 604 – Manholes, Inlets, and Vaults
Section 606 – Guardrail
Section 611 – Cattle Guards
Section 617 – Culvert Pipe
Section 701 – Hydraulic Cement
Section 703 – Aggregates
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 Pipe 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 Fine Aggregate for Portland Cement Concrete
M 43 Sizes of Aggregate for Road and Bridge Construction
M 55 Steel Welded Wire Reinforcement, Plain, for Concrete
M 86 Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe
M 157 Ready-Mixed Concrete
M 170 Standard Practice for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
M 206 Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe
M 207 Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe
M 221 Steel Welded Wire Reinforcement, Deformed, for Concrete
M 242 Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer Pipe
M 284 Discontinued
R 38 Quality Assurance of Standard Manufactured Materials

1.4 ASTM Standards:

A 775 Standard Specification for Epoxy-Coated Steel Reinforcing Bars
C 361 Standard Specification for Reinforced Concrete Low-Head Pressure Pipe
C 923 Standard Specification for Resilient Connectors between Reinforced Concrete Manhole Structures, Pipes, and Laterals
C 936 Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections using Preformed Flexible Joint Sealants
C 1017 Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
C 1478 Standard Specification for Storm Drain Resilient Connectors between Reinforced Concrete Storm Sewer Structures, Pipes, and Laterals
D 3665 Standard Practice for Random Sampling of Construction Materials

## 2. TERMINOLOGY

2.1 See AASHTO M 262 Standard Terminology Relating to Concrete Pipe.

2.2 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.

2.3 Dry Cast – In this Standard it shall be defined as zero slump concrete most often used for pipes, box culverts, and manholes.

2.4 Manufacturer – A company which manufactures and supplies Standard Manufactured Materials for the Prime Contractor, Sub-contractor, or CDOT.

2.5 Prime Contractor – The company under contract with CDOT to produce products using precast concrete structures.

2.6 Quality System Manual (QSM) – A written document that describes the overall internal quality control operating procedures of a Manufacturer. The QSM 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.

2.7 Self-Compacting (leveling) Concrete – In this Standard it shall be defined as a very high slump concrete where the spread is measured using a slump cone. The spread is usually between 22 to 32 inches in diameter. In addition, the mix usually contains a superplasticizer and a viscosity-modifying admixture (VMA). This concrete is usually used for manholes and inlets

2.8 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 (WWR), and epoxy coated reinforcing bar are among the materials provided to the manufacturer.

2.9 Wet Cast – In this Standard it shall be defined as anything other than zero slump concrete. This concrete is usually used for manholes and inlets.

## 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 be applicable 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. SAMPLING

4.1 All test samples required by this Standard shall be obtained using stratified random sampling techniques. Stratified random sampling should 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.

## 5. TESTING REQUIREMENTS

5.1 Testing required for this Standard shall be performed by certified personnel or in accredited laboratories through appropriate QC Certification programs. Any satellite laboratory of a Manufacturer that performs required testing under this Standard shall be identified in the submitted Quality System Manual (QSM) (Section 9).

5.2 As a minimum, the certification program used shall include the following;

5.2.1 Training in AASHTO, ASTM, or ACI test procedures.

5.2.2 Demonstration of proficiency in each required test.

5.2.3 Demonstration of ability to properly document test results.

## 6. SUPPLIER REQUIREMENTS

6.1 Cement, fly ash, and concrete admixture

suppliers shall be on CDOT's Approved Product List (APL) prior to use by the manufacturer. The APL along with instruction for completing CDOT Form #595, Pre-Approved Product Evaluation Request & Summary, can be found at: www.codot.gov/business/APL/. The Form #595 is designed as a PDF Writeable form, which must be completed by the supplier or their Product Representative. The completed form shall be returned to CDOT's Product Evaluation Coordinator as an e-mail attachment.

6.2 The cement and fly ash suppliers shall follow the procedures described in the CDOT approved quality control plan as required in CP 11 Part I, Sub-Part 3 and 4 respectively.

6.3 The steel supplier shall provide an annual certification that all steel products delivered to the manufacturer and permanently incorporated in the work shall have occurred in the United States of America.

## 7. CURRENTLY CERTIFIED MANUFACTURERS

7.1 A manufacturer, regardless of their current casting process, which has been certified for the past three consecutive years under the American Concrete Pipe Association (ACPA) for all pipe products, dry cast box culverts, and manholes, or under the National Precast Concrete Association (NPCA) for all pipe products, manholes, modular bridges, and other wet cast products, will be placed on the QML 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 from the current year and the preceding three consecutive years of evaluations from NPCA or ACPA,
- The Quality System Manual as outlined in Section 9 of this Standard.

7.2 A manufacturer, regardless of their current casting process, which has been certified for less than three consecutive years under the American Concrete Pipe Association (ACPA) for all pipe products, dry cast box culverts, and manholes or under the National Precast Concrete Association (NPCA) for manholes, modular bridges, and other wet cast products will be on probation and placed on the QML 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 from the current year along with any preceding years of evaluations from NPCA or ACPA,
- The Quality System Manual as outlined in Section 9 of this Standard.

7.2.1 The probation period will be for three consecutive years after being placed on the QML.

## 8. DECERTIFICATION

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

8.2 If the manufacturer becomes decertified due to a structural failure of a product during the probationary period, 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 Engineer in accordance with the FHWA Report Number FHWA-IP-86-2 "Culvert Inspection Manual." The manufacturer may apply for reinstatement on the QML no sooner than three years after removal from the QML.

## 9. MANUFACTURER'S QUALITY SYSTEM MANUAL (MINIMUM REQUIREMENTS)

9.1 On an annual basis, at a minimum of one month prior to producing any precast concrete structure for a CDOT project, one copy of the Manufacturer's Quality System Manual (QSM) shall be submitted for review and approval to CDOT's Product Evaluation Coordinator (303) 398-6566 within the Staff Materials & Geotechnical Branch at 4670 North Holly Street, Unit A, Denver, Colorado 80216-6408. 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 Qualified Manufacturers List (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 changes are made to the QSM, an updated copy shall be submitted to CDOT for review and approval. Guidelines for preparing a QSM may be available from the National Precast Concrete Association (NPCA) or the American Concrete Pipe Association (ACPA).

9.2 The Manufacturer's QSM may be maintained in electronic format. However, one or more copies of the QSM shall be maintained by the Manufacturer's QC Manager in a printed and bound format (3-ring or other). The QSM shall be available to all of the Manufacturer's employees. 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.

9.3 The Manufacturer's QSM shall be formatted to provide numbered sections which meet the following order, format, and content:

9.3.1 Manufacturer's quality policy or mission Statement endorsed by the company's Chief Executive Officer.

9.3.1.1 The quality policy / mission statement shall indicate support of top management to enforce the QC requirements contained in the QSM.

9.3.2 The QSM shall include the address and telephone numbers of applicable personnel at the manufacturing facility.

9.3.3 The QSM shall include a brief listing and description of all the precast products being manufactured at the facility.

9.3.4 The QSM shall present and define any significant terms used throughout the QSM.

9.3.5 For all manufactured items addressed in the QSM, the applicable AASHTO, ASTM, or CDOT specification shall be identified.

9.3.6 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:

9.3.6.1 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.

9.3.6.2 Each facility shall have a Quality Control Manager who has the overall responsibility for implementing the requirements of the QSM. At least one QC Manager 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.

9.3.6.3 Each facility shall have at least one Quality Control Technician to perform QC sampling, testing, and inspection. At least one QC Technician shall be on-site 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.

9.4 The QSM shall contain a description of the certifications required and attained and years of experience for each QC Manager and QC Technician. All QC sampling, testing, and inspection personnel shall be certified by ACI Concrete Field Technician Level 1 or higher. Plants certified by NPCA shall have at least one QC Manager and at least one QC Technician who has successfully completed the NPCA's Production and Quality School or ACPA's approved equivalent. 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.

9.5 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.

9.6 The Manufacturer shall maintain its own accredited or qualified laboratory to perform QC testing. The QSM shall include the address and telephone numbers of a designated backup

accredited or qualified laboratory. The laboratory shall meet the minimum accreditations or qualifications obtained through one or more of the following programs depending on the casting process:

9.6.1 For “dry” cast plant laboratories:

9.6.1.1 National accreditation programs such as AASHTO Accreditation Program or American Association for Laboratory Accreditation.

9.6.1.2 Either the Manufacturing industry’s American Concrete Pipe Association’s Q-Cast program or the National Precast Concrete Association Certification program.

9.6.2 For “conventional”, “wet”, or “Self-Compacting” cast plant laboratories:

9.6.2.1 National accreditation programs such as AASHTO Accreditation Program or American Association for Laboratory Accreditation.

9.6.2.2 The Manufacturing industry’s National Precast Concrete Association Certification program.

9.7 The QSM shall contain an inventory of the major equipment used for sampling and testing along with associated calibration equipment used for each required test procedure. The QSM shall assign a unique identification number to each piece of testing equipment. The QSM inventory for each major piece of equipment shall include the following information:

9.7.1 The name of each major piece of equipment, date placed in service, manufacturer, model and serial number. The QSM shall include the location where the instructions for use and operation of each major piece is stored if not included in the QSM.

9.7.1.1 For each major piece of equipment, the QSM shall include the interval of calibration or verification, a reference to the calibration or verification procedures used, and the location where the current calibration or verification records are stored. The QSM shall describe the methods for ensuring that the calibration and verification procedures are performed at the specified intervals.

9.8 The QSM shall identify all types of supplier delivered materials used for the production of precast concrete structures.

9.8.1 The QSM shall contain a copy of the signed certification from the steel supplier that all steel products permanently incorporated into the manufactured product shall have occurred in the United States of America.

9.8.2 The QSM shall contain a description of the specification requirements for all supplier delivered materials.

9.8.3 The QSM shall contain a description of the certification and test reports delivered by the supplier and a location where these records are stored.

9.8.4 The QSM shall include all QC testing of the supplied materials and shall contain a statement that no raw materials shall be used unless they are on the APL or they have been tested and meet all appropriate CDOT, AASHTO, or ASTM specifications.

9.8.5 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.

9.9 The QSM shall describe the procedure and frequency for inspection and selection of material samples during production. Sampling shall be performed on a stratified random procedure in accordance with ASTM D 3665. All random QC sample locations shall be properly documented and these procedures shall be included in the QSM.

9.10 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.

9.10.1 The test reports shall be maintained and available for inspection for a minimum of three years.

9.11 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.

9.12 The QSM shall include drawings, with dimensions, of the forms used to produce precast concrete structures for CDOT.

9.12.1 Drawings and dimensions for precast modular concrete bridges will not be required with the QSM. However, they shall be submitted to Staff Bridge in accordance with Subsection 105.02 of the Standard Specifications.

9.13 The QSM shall describe the method used to permanently mark the precast concrete structure in accordance with the appropriate AASHTO or ASTM standard.

9.14 The QSM shall describe procedures used to properly handle, store, and ship precast concrete structures.

## 10. CERTIFICATE OF COMPLIANCE

10.1 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 of the required information as stipulated in the CDOT Special Notice to Contractors. The COC shall include all necessary information to properly identify each precast concrete structure represented by the COC.

## 11. MANUFACTURING FACILITY INSPECTION AND CERTIFICATION

11.1 Manufacturing facilities producing precast pipe and box culvert shall meet the minimum industry standards, and be annually inspected and certified by the ACPA. Manufacturing facilities producing manholes shall meet the minimum industry standards, and be annually inspected and certified by either the ACPA or the NPCA. Manufacturing facilities producing precast pipe, modular bridges, and other precast concrete structures shall meet the minimum industry standards, and be annually inspected and certified by the NPCA. A copy of the certification shall be submitted to CDOT as part of the QML process.

11.2 Failure in one or more Sections or Sub-sections listed in this Standard may result in an accelerated inspection program. 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 months after removal from the QML as stipulated in Section 8 of this Standard.

11.3 Within two months after submitting all required information, CDOT will notify the manufacturer of precast concrete structures whether or not the manufacturing facility's application for the Qualified Manufacturers List has been granted.

11.4 At any time, CDOT may inspect the operations or perform quality assurance testing.