

Colorado Procedure 59-21

Standard Practice for

Warm Mix Asphalt Approval

1. SCOPE

- 1.1 This practice describes the procedures for submitting Warm Mix Asphalt (WMA) technologies.
- 1.2 This procedure was originally included in the 2012 FMM and was referred to as the Contractor Non-Standard Asphalt Mix (NSM) Approval.

2. REFERENCED DOCUMENTS

- 2.1 *CDOT Procedural Directives:*
 - PD 1401.1 Product Evaluation and Experimental Features
- 2.2 *Colorado Procedures:*
 - CP 52 Contractor Asphalt Mix Design Approval Procedures
- 2.3 AASHTO Procedure:
 - AASHTO R35 (Appendix to) *Special Mixture Design Considerations and Methods for Warm Mix Asphalt (WMA)*

3. APPROVAL OF Warm Mix Asphalt (WMA) TECHNOLOGIES

- 3.1 WMA technologies shall be in conformance with CP 52, CDOT Specifications, and other specified Colorado, AASHTO, and ASTM procedures. Significant variances from these specifications will require an Experimental Feature per PD 1401.1.
- 3.2 For WMA mixtures using proposed aggregate blends with total absorption equal to or less than 1.3% mix designs shall be conducted without additives for approval and setting of production targets. For WMA mixtures using proposed aggregate blends with total absorption greater than 1.3%, the mix designs shall be conducted per the Appendix to R35 referenced in Subsection 2.3 above. Regardless of the mix design method, all WMA mixture and binder acceptance testing will be conducted according to existing CDOT HMA procedures, including established mixing and compaction temperatures. Proposed modifications to production properties and handling processes for WMA mixtures shall be detailed. Binder grade selection shall be per existing CDOT SuperPave criteria. WMA shall not be produced at plant temperatures more than 100°F below existing Hot Mix Asphalt (HMA) Superpave mixing temperatures.

- 3.4 WMA approval is required for each WMA Technology and/or each Contractor intending to use WMA. If the WMA Technology is already approved for use by CDOT each Contractor must receive approval to supply WMA based on their submittal before placement on a CDOT project.
- 3.5 Changes in WMA properties or formulations that result in changes to mixture properties will require new WMA Technology submittal and approval.
- 3.6 Only approved WMA technologies will be allowed on CDOT Projects.

4. WMA SUBMITTAL REQUIREMENTS

- 4.1 All WMA requests for approval shall be submitted electronically, using the format and numbering of this CP, to CDOT's Asphalt Program Manager. Acceptable formats include pdf, MS Excel, MS Word, PowerPoint, jpg, and other compatible formats. Requests shall be submitted in the order listed below. WMA must conform to the current CDOT HMA acceptance criteria.

4.2.1 WMA Technology Supplier - Submittals shall include:

(1) A summary of the WMA Technology:

- A. Process controls.
- B. A detailed list of additive types and quantities.
- C. Description of additives' influence on asphalt mixture.
- D. Benefits of the WMA technology.
- E. Equipment and plant requirements.
- F. SDS for the additives

(2) Performance History:

- A. Product history.
- B. Other projects, if available including those within Colorado, utilizing the WMA technology. Include site conditions, environmental conditions, traffic, lab data, and in-service pavement performance data.
- C. Research data on the WMA technology.
- D. Sample specifications, best practices, or guidelines from other agencies.
- E. WMA Approvals from other agencies.

(3) Design Considerations:

- A. Lab design practices with WMA technology.
- B. Conformities and deviations from CDOT design and acceptance criteria. See CP 52 and Specifications for Road and Bridge Construction.

(4) Production Considerations:

- A. Provide a summary of anticipated differences in volumetric mix properties between the mix design values and the production target values.
- B. Sampling and testing requirements, including temperatures, laboratory handling, and variances from standard CDOT testing procedures. Detailed design, production, and testing requirements for use of the WMA shall be provided.
- C. Acceptance criteria and justification if different than CDOT Superpave requirements. A significant deviation from these criteria will require an experimental feature per PD 1401.1. Note: CDOT acceptance testing and criteria will follow conventional HMA requirements.

(5) Contacts:

- A. WMA product manufacturer's representative name, email, and phone number.
- B. Name, email, and phone number of WMA product manufacturer's representative who will be available during construction.

4.2.2 WMA Technology Contractor -Submittals shall include:

(1) Summary of Contractor's WMA

Experience, if any. Contact names and contact information shall be included for agency owners of past projects placed. The contractor shall summarize equipment and plant requirements to control WMA production.

(2) Contractor Design Considerations:

- A. Lab design practices with WMA technology if different from HMA procedures.
- B. Conformities and deviations from CDOT design and acceptance criteria. See CP 52 and Specifications for Road and Bridge Construction. A significant deviation from these criteria will require an experimental feature per PD 1401.1.

4.2.3 Contractor- Submittal Considerations for WMA Use at Region / Project Level

- (1) In addition to all the requirements outlined in CP 59 Section 4.2.3, the submittal shall meet all requirements outlined in CP 59 Sections 1 to 4.2.2.

- (2) For all WMA submittals, the Contractor shall submit a mix design for conventional HMA following CP 52. Concurrently, the Contractor shall inform the Project Engineer of their intent to utilize WMA technology and shall submit the following information.

For WMA asphalt submittals: The Contractor shall provide a four (4) point verification of the WMA. The four-point verification shall be presented in a manner that facilitates a comparison between the HMA mix and the WMA mix. The Region Materials Engineer (RME) may at their discretion elect to reduce the number of points required and/or forgo "point verification" altogether for production verification as described in Section 4.2.3 (3).

- (3) Production Considerations: All WMA will be tested for acceptance by existing HMA procedures.
 - A. For WMA mixtures with aggregate absorption of 1.3% or less, provide a summary of anticipated differences in volumetric mix properties between the HMA mix design values and the WMA production values. The Contractor shall provide necessary data to support field volumetric targets that are different from the HMA mix design values. At a minimum, three full volumetric samples will be produced with WMA additive at HMA design optimum AC and compared to the HMA design properties to document the anticipated impact on field volumetric properties. WMA volumetric acceptance targets may be adjusted as approved by the Region Materials Engineer (RME).
 - B. For WMA mixtures with aggregate absorption greater than 1.3%, provide a summary of anticipated differences between mix design, WMA volumetric mix properties, and anticipated WMA production and acceptance values. The Contractor shall provide data to support field volumetric targets that are different from the WMA mix design values. At a minimum, three (3) full volumetric samples will be produced with WMA additive at design optimum AC tested by the acceptance test procedures to document the anticipated impact on field volumetric acceptance properties. WMA volumetric acceptance targets may be adjusted as approved by the RME.
 - C. If the WMA produced on a project fails mixture verification, goes into condition red, or if the asphalt plant fails to satisfy the WMA production controls outlined in the submittal for WMA approval, WMA production shall cease, a written explanation shall be provided for the failures, and production may be required to revert to conventional HMA.

- (4) Contacts:

- A. Contractor representative name, email, and phone number.
 - B. WMA product manufacturer's representative name, email, and phone number.
 - C. Name, email, and phone number of WMA product manufacturer's representative who will be available during construction.
 - D. Mix Designer name, email, and phone number.
- (5) An approved CDOT Form 43 for both the conventional HMA and the HMA with WMA additive shall be required before production commences.

5. PRELIMINARY CDOT REVIEW PROCESS

- 5.1 Preliminary review of Contractor's WMA proposal will be performed by the CDOT Asphalt Program, in conjunction with Region Material Engineers as needed.
- 5.2 CDOT may request additional information from the Applicant.
- 5.3 Incomplete submittals may be rejected as unacceptable.
- 5.4 CDOT Asphalt Program will notify the Material Advisory Committee (MAC) of all WMA submittals processed.
- 5.5 If the submittal package is not rejected during the preliminary review, and when the submittal package is deemed complete by the CDOT Asphalt Program, the WMA submittal will be sent to the MAC for formal review.
- 5.6 Preliminary review is estimated to take two weeks, depending upon the completeness of the initial WMA submittal.

6. CDOT REVIEW PROCESS

- 6.1 Formal review of WMA submittals will be performed by the MAC. The review may take place at a regularly scheduled MAC meeting (MAC meetings are scheduled once every other month) or at a separate formal meeting, depending upon the schedule.
- 6.2 The MAC, via the CDOT Asphalt Program, may request additional information from the Contractor.
- 6.3 Submittal may be rejected by the MAC as unacceptable under WMA procedures.
- 6.4 The MAC will determine if the WMA submittal falls under the jurisdiction of PD 1401.1. If so, the MAC will approve the WMA with recommendations for the experimental feature process. If the WMA submittal is not under the jurisdiction of PD 1401.1, then it will be approved with recommendations on the scope of allowed project use.
 - 6.4.1 Approval and usage limitations will be based on the quality and level of documentation for field pavement performance. The sites monitored for field performance will ideally have traffic and climate conditions similar to typical Colorado state highways. Specifically, the performance data provided shall document rutting, cracking, and raveling/weathering as measured by established field performance data gathering methods. HMA Control sections or similar HMA comparison sections shall be provided when available.
 - 6.4.1a Less than 18 months of successful documented field performance will have a project placement limit of 5,000 tons of WMA.

- 6.4.1b 18 to 36 months of successful documented field pavement performance will have a project placement limit of 10,000 tons of WMA.
- 6.4.1c Successful documented field pavement performance over 36 months will have no tonnage limit on projects.
- 6.5 For WMA mixtures, existing HMA bid items will be used.
- 6.6 The Materials Advisory Committee will itemize any limitations to the use of the WMA submittal on CDOT projects.
- 6.7 Materials Advisory Committee review is estimated to take six weeks upon receipt of a complete WMA submittal.
- 6.8 If the WMA technology submittal is approved, both the conventional HMA and the conventional HMA with WMA additive / WMA utilizing foaming technology will be reviewed at the Region / Project level per CP 52.

7. SCHEDULE

- 7.1 Notification of WMA technology approval/rejection from CDOT may take a minimum of 8 weeks. This time frame may be significantly increased if additional information is requested from the Contractor, or if the submittal is delivered during the peak construction/production season. Approval of a WMA technology does not constitute approval for use of WMA on a Region / Project level. Additional time should be allotted to follow the requirements outlined in CP 52.

8. RECORD

- 8.1 All requests for WMA information shall be made under the Colorado Open Records Act (CORA) and shall follow CDOT Procedural Directives 25.1.

The Colorado Department of Transportation is subject to the provisions of the Colorado Open Records Act (C.R.S. 24-72-201, et seq.). Unless specifically excluded by the language of the act, all documents provided to or maintained by CDOT are considered to be a matter of public record.

Contractors submitting a WMA proposal to CDOT must identify the proposal as “Confidential” or “Available for Release”. If, at any future date, a CORA request is made for any proposal identified as “Confidential”, CDOT will notify the entity or individual requesting that the information is not available.

By identifying a proposal as “Confidential”, the Contractor agrees to indemnify and hold harmless the Department and its employees from any legal action resulting from this decision to deny the documents and to provide any necessary legal defense.

The WMA submittals shall include the following signed and checked statement:

Available for Release

Confidential

With this signature, I _____ (Name) with _____ (Business Name) agrees to indemnify and hold harmless the Colorado Department of Transportation and its employees from any legal action which may result from its decision to withhold this document in response to requests made under the Colorado Open Records Act, and to provide any legal defense necessary if this decision is appealed.

8.2 All approved WMA technologies will be posted on the CDOT website.

8.3 All approved contractor users of an approved WMA technology will be posted on the CDOT website.

<https://www.codot.gov/business/apl/asphalt-warm-mix.html>

CP 59, WMA Technology Supplier - Submittal Checklist

Supplier Name: _____

Date: _____

Contact Name: _____

Contact Phone Number: _____

Contact Email: _____

Technology Type: _____

Technology Name: _____

Yes/ No

Subsection

- 4.1 All material submitted electronically..... _____
- 4.2.1 (1) Summary of the WMA technology _____
 - Process controls _____
 - A detailed list of additive types and quantities..... _____
 - Description of additives influence _____
 - WMA benefits _____
 - Equipment and plant requirements _____
 - SDS for additives _____
- 4.2.1 (2) Performance history _____
 - Product history _____
 - Other projects utilizing WMA (includes site conditions and performance data) _____
 - Research data _____
 - Specifications used on other projects _____
 - Approvals from other agencies _____
- 4.2.1 (3) Design considerations..... _____
 - Lab design practices _____
 - Conformities and deviations from CDOT criteria _____
- 4.2.1 (4) Production considerations..... _____
 - Summary of anticipated differences between mix design values and production targets..... _____
 - Sampling and testing requirements _____
 - Acceptance criteria and justification _____
- 4.2.1 (5) Contacts _____
 - Manufacturer representative name, email, and phone number _____
 - On-site manufacturer representative name, email, and phone number _____
- 8.1 Confidentiality statement _____

CP 59, WMA Contractor - Submittal Checklist

Contractor Name: _____

Date: _____

Contact Name: _____

Contact Phone Number: _____

Contact Email: _____

Technology Type: _____

Technology Name: _____

Yes/ No

Subsection

4.1 All material submitted electronically..... _____

4.2.2 (1) Summary of contractor's experience with this technology including plant controls _____

4.2.2 (2) Design considerations..... _____

 Lab design practices _____

 Conformities and deviations from CDOT criteria _____

4.2.3 (1) Compliance with Section 1 thru Subsection 4.2.3 _____

4.2.3 (2) Mix design for conventional HMA & communicating with PE _____

 Four-point verification to facilitate comparison _____

4.2.3 (3) Production considerations..... _____

 Summary of anticipated differences between mix design values and production targets _____

 Sampling and testing requirements, including design and production methods _____

 Contingency plan if WMA fails during production _____

4.2.3 (4) Contacts _____

 Contractor representative name, email, and phone number _____

 WMA manufacturer representative name, email, and phone number _____

 On-site WMA manufacturer representative name, email, and phone number _____

 Mix designer name, email, and phone number..... _____

4.2.3 (5) Form 43 for Conventional HMA & HMA with WMA additive..... _____

8.1 Confidentiality statement _____

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