

Colorado Response for RMAUPG State Discussion Topics – 2003

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1. What is the status of Superpave implementation for both binder and mixtures?
Colorado continues to specify 100% Superpave binder and mixture.

2. What are the primary PG binder grades being used? Does your state use any SHRP plus tests and the reason for their use? Do you have any plans to implement AASHTO MP1a?

CDOT currently specifies five binder grades: PG76-28, PG64-28, PG58-34, PG64-22 and PG58-28. Colorado has maintained several modifications to the national Superpave materials specifications to help ensure polymer modification:

- PG64-28 binder requires Ductility, Toughness and Tenacity
- PG76-28 requires elastic recovery

CDOT has no current plans to fully implement MP1a (DTT).

3. There has been much recent discussion on the affects of acid modification of binders. Is your state concerned with the issue of chemical modification? Does your state have any specifications to address chemical modification of PG binders?

CDOT had two primary concerns with acid/alkali modified binders in their pavements:

- The effect of modification is transient (rut resistance disappears).
- Acid modification will react (neutralize) lime and antistrips resulting in immediate loss of high-end performance and stripping resistance.

Ongoing studies as well as experience in other states were compiled. Data and performance examples illustrate that acid modification yields poorer performance in an HMA pavement than polymer modification. CDOT modified its specifications to ban acid/alkali modification and to conduct testing during each supplier certification and randomly during project construction. Changes to the specifications were made to prohibit acid or alkali modification of binders, provide for a test procedure, and prescribe actions if acid or alkali modification is used on binder supplied to CDOT.

4. There has been a concern that Superpave mixtures may be over compacted, resulting in low binder contents and reduced durability and fatigue life. Is your state doing any testing, other than gyratory compaction, do determine if the mixture has adequate binder? Has your state taken any action or modified the Superpave procedures to insure adequate binder in the mixture?

CDOT has completed a study that determined in-place pavement voids after four years service is on average 1.2% higher than the 4% anticipated in mix design. See study CDOT DTD R2002-11, *In-Place Voids Monitoring of Hot Mix Asphalt Pavements*. CDOT now requires that Superpave designs be optimized to 4% as historically, but that production targets for the mix be established at up to 1% lower voids. In the first year this change has resulted in an average percent AC increase between 0.2% and 0.3% in all HMA placed.

5. What procedures does your state use to specify aggregate durability for HMA (sodium sulfate, magnesium sulfate, freeze thaw, or other)? Have you done any research with Micro Deval and do you have any plans to replace your present specifications with Micro Deval?

CDOT Currently specifies LA Abrasion and has begun to specify Micro Deval for all HMA mix designs. Future implementation will pilot the Micro Deval on selected projects with price reductions for failure. Subsequent years will complete implementation with likely incorporation of Micro Deval into the full incentive/disincentive program during asphalt production. LA Abrasion will likely be eliminated for HMA aggregates. CDOT has conducted a mini-study in house to verify the full NCAT research. Results largely confirmed the capability of Micro Deval to qualify Colorado aggregates.

6. Does your state routinely specify Stone Mastic Asphalt (SMA) mixtures? Approximately how many tons of SMA is placed each year? Do you use AASHTO MP2 and PP41 for specifications and design or what significant modification to these have you made? Do you have any construction quality issues and how are SMA mixture performing?

CDOT's current specification allows that SMA be designed by either Marshall (50 blow) or Superpave (100 gyration) methods. Colorado has had excellent performance on over 360,000 tons (+/- 20 projects) placed to date (approx. 140,000 tons in 2003). Colorado's SMA specification can be acquired under the "Project Special Provision Work Sheets" link at

<http://www.dot.state.co.us/DesignSupport/Construction/Index.htm>

CDOT requires PG76-28 binder. The majority of existing Colorado SMA pavements were constructed without fibers. However, fibers are now often used to help prevent drain down during placement. Their use is at the option of the contractor.

7. Has the performance of longitudinal joints been an issue? What type of joint is required or generally constructed by contractors? Do you require any QC or QA procedures such as density or permeability at the joint?

CDOT had historic joint quality concerns and implemented full QC/QA specifications beginning in 2003 based on core density directly over the joint. Data indicates approximately 2% increase in average joint density and slight reduction in the variability of joint density since implementation of the QC/QA specification. A study is underway to compare joint performance before and after construction with the new joint density QC/QA specification.

8. Do you regularly see paver related segregation (linear streaks either at or just below the mat surface) and do you have a specification to address it? Do feel temperature segregation is a problem and do you have a specification to address it?

CDOT had a early pavement failure on Interstate 25 north of Denver after two years. The predominant failure mode was longitudinal top-down cracking in the wheel paths and a contributing factor was shown to be hidden segregation in narrow streaks. A follow-up study of pavements statewide showed that nearly 50 percent of longitudinal cracking was associated with linear pavement segregation that was most likely induced by paver slat conveyors. CDOT is currently working to develop a specification to require paver modifications that eliminate segregation caused by the paver. Please see reports:

CDOT-DTD-R-2001-10, *Forensic Investigation of Early Cracking on I-25 in Denver, CO*
CDOT-DTD-R-2003-7, *Extent of Top-Down Cracking in Colorado*

CDOT is investigating density profiling for segregation and does not currently have a temperature segregation specification.

9. Are there any recent or pending rule changes by your state EPA that may impact specifications or changes to products? Has there been any recent legislation that will impact the refining or HMA paving industries?

I am unaware of any recent significant EPA rule changes that impact the asphalt industry in Colorado. However, the Colorado Asphalt Pavement Association has worked closely with the Colorado Department of Public Health and Environment – Air Pollution Control Division to establish programs to improve air quality and to reduce emissions from hot mix asphalt production facilities in Colorado. Please see the CDPHE website for further information:

http://www.cdphe.state.co.us/el/cross_media/asphalt/hmahom.asp

10. What is the single most concerning issue with the quality of HMA in your state?

Longitudinal joint quality is still the second concern in Colorado. However, the recent joint density specifications are anticipated to improve joint quality beginning this 2003 season. See question #7 above.

A recent survey showed that paving experts and engineers at CDOT consider pavement segregation and associated pavement deterioration to be the single most concerning issue with HMA quality.