Paver Segregation

TIM ASCHENBRENER, P.E. SENIOR ASPHALT PAVEMENT ENGINEER PAVEMENT MATERIALS TEAM OFFICE OF PRECONSTRUCTION, CONSTRUCTION AND PAVEMENTS FHWA

ILLINOIS ASPHALT CONFERENCE CHAMPAIGN, ILLINOIS DECEMBER 12, 2018



Disclaimer

- FHWA does not endorse any one particular entity and that any entity's name or mention of any proprietary product does not indicate FHWA endorsement and is merely shared for information exchange purposes only.
- All photos and schematics courtesy of Colorado DOT

Presentation Overview

3

I-25 Forensic Investigation

- 2003 Top-Down Cracking Study
- CDOT's 2004 Direction



Asphalt Paver







I-25 Forensic Study Conclusions

Cracking was:

- Predominantly top-down
- Segregation related
- Induced by paver

Presentation Overview

- I-25 Forensic Investigation
- 2003 Top-Down Cracking Study
- CDOT's 2004 Direction

2003 Top-Down Cracking Study

8

• Identify Extent and Cause



2003 Top-Down Cracking Study 9 North Platte R. Green R. South Platte R 380 Sterling, Fort Collins r Nat. Mon. Crai Steamboat Springs 34 Loveland Greelev 40 Yampa R 76 Rocky Mountain Estes Park 34 National Park 85 28 Fort Morgan Arabaho Nat, Rec. Area Granba 64 34 401 Boulder 40 (71) Brighton Vinter Park (97) Westminster® Thornton Colorado R. DENVER 36 Eagle Avon Silversome La wood Aurora alewood Lit25 Kewstone. Beaver 385 slenwood Springs Creek (2) Breckenridge Parker 85 Castle Rock Burington 285 Snowmass Village Leadville S. Platte 24 24 lorado COLORADO 24 (13)and 3unction 40 Manitou Springs Florissan * Crested Butte Pikes Peak . Colorado Springs 501 60 Delta Cripple Creek* Security-Widefield Black Canyon of the Gunnisor 285 Nat. Park Gunnison Salida Royal Gorge Bridge sn. Montrose Canon City (so) Curecanti 50 Pueblo Nat. Rec. Area 285 220 Bent's Old Fort (0) 50 Lamar Ourat John Martin Res. La Junt Ark Telluride Great Sand Dunes 285 Nat, Park Walsenburg 150 350 Rio Grande Purgatoire R SAN JUAN MTS. (9)60 160 Alamosa 460 euse = 3000 Pagosa Springs 205 150 Mon- NOT 460 lat, Park 287 San Juan R 1004 1550

First Question

10



Top-Down Crack?

Reflective Crack or



Sampling Plan







Top-Down or Reflective?				
Distress	Percent (of 25 Sites)			
Reflective Cracking	28%			
Top-Down Cracking (Segregation)	48%			
Top-Down Cracking (No Segregation)	24%			

For Sites with Paver Segregation

• Measuring distance from the joint to the crack





Crack Location						
Site No.	Paver Manufacturer/ Model	First Crack*	Second Crack*	Third Crack*		
3	1 / A	38"	73"	No Crack		
6	1 / B	18"	No Crack	102"		
13	2 / E	37"	No Crack	97"		
17	1 / C	46"	No Crack	109"		
19	1 / D	69"	No Crack	128"		
20	3 / ?	58"	87"	No Crack		
23	2 / ?	41"	70"	99"		

*Distance from longitudinal construction joint

Asphalt Paver







2003 Top-Down Study Conclusions

- Need to Core
- Segregation not always apparent during construction
- More than one paver manufacturer/model



CDOT Research Report CDOT-DTD-R-2003-7

Presentation Overview

- I-25 Forensic Investigation
- 2003 Top-Down Cracking Study
- CDOT's 2004 Direction

Peer Review Meeting

- Jim Scherocman moderated
- Caterpillar
- Cedarapids/Terex
- Ingersoll-Rand/Blaw-Knox
- Roadtec

Recommendations

- Asphalt Mixture Design
- Asphalt Paver Operation
- Asphalt Paver
 - Chain curtain
 - Deflector plates
 - Scraper plates
 - Reverse auger
 - Smaller diameter auger (first flight)

Paver Modifications – Man. 1











Paver Modifications – Man. 1











Method Specification

23

Method Specification

Standard Specification 401.10

Construction Bulletin

Dated March 22, 2004

End-Result Specification

24

• Follow-up Research

- Density profiling
- Paver-mounted thermal profiler

References

- Extent of Top-Down Cracking in Colorado
 CDOT Research Report CDOT-DTD-R-2003-7
- Forensic Investigation of Early Cracking on I-25 in Denver, Colorado
 - o CDOT Research Report CDOT-DTD-R-2001-10
- Longitudinal Thermal Cracking Related to Asphalt Concrete Pavement Construction
 - TRB Paper No. 18-00159

Thank You

 $\mathbf{26}$

Questions/Comments:

Tim Aschenbrener, P.E. FHWA

Senior Asphalt Pavement Engineer Pavement Materials Team Office of Preconstruction, Construction and Pavements Lakewood, Colorado (720) 963-3247 timothy.aschenbrener@dot.gov



Pixabay