




Oklahoma's Perpetual Pavements

SEAUPG Annual Meeting - Little Rock, AR
November 15, 2023

David Vivanco - ODOT Larry Patrick - OAPA Jay Lemon - Haskell-Lemon

Outline

- ▶ APA's Perpetual Pavement Awards projects in Oklahoma (Larry Patrick)
 - ▶ By conversion: I-40, Caddo Co.
 - ▶ By design: Kickapoo Turnpike
- ▶ Oklahoma DOT (David Vivanco)
 - ▶ Background-NCAT test sections at 2006 Track construction
 - ▶ Application of the learnings from the test track
- ▶ Contractor's perspective (Jay Lemon)
 - ▶ Observations
 - ▶ What would you have done differently?
- ▶ Wrap-up/Comments and Questions

Background - 2006 NCAT Test Track

- ▶ Several new highway construction projects coming up (e.g., SH 152)
- ▶ ODOT was interested in testing the Perpetual Pavement concept, and invested in two test sections (N8, N9) during the 2006 construction
 - ▶ Danny Gierhart, Jeff Dean
- ▶ To represent subgrade support conditions in central Oklahoma, the embankment underlying Sections N8 and N9 were removed and replaced with softer materials

NCAT 2006 Construction, Sections N8 and N9

- ▶ ODOT tested the perpetual pavement concept in anticipation of building SH 152 near OKC
 - ▶ Reconstructed embankment to simulate central OK conditions
- ▶ 14-inch pavement (N9) performed very well over three full cycles, with around 0.25" rutting and minimal change in IRI after 50 million ESAL
- ▶ As expected, N8 failed due to fatigue damage from the bottom-up

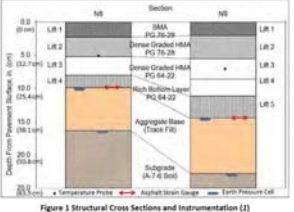


Figure 1 Structural Cross Sections and Instrumentation (1)

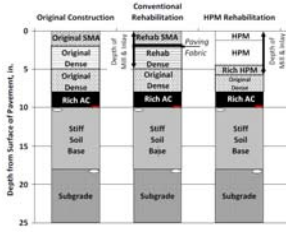
N8 After Conventional Mill and Inlay

- ▶ First rehabilitation attempt:
 - ▶ Milled 5 in, replacing with similar materials as before (as per typical ODOT rehab strategy).
 - ▶ Included a geotextile interlayer on top of the dense-graded leveling course
- ▶ This failed after 4.6 million ESAL, requiring another approach to rehabilitate



Section N8 Rehabilitations

- ▶ Based on observed performance on adjacent test section N7, decided to mill and replace with mixtures using HiMA (PG76-28E)
 - ▶ Included a 1½ in, "rich intermediate layer" to resist reflection cracking from underlying pavement



Rehabilitation Results

- ▶ Roughness and rutting stabilized after the second rehabilitation
- ▶ Provided an approach to consider for I-40 rehabilitation in Caddo County, OK

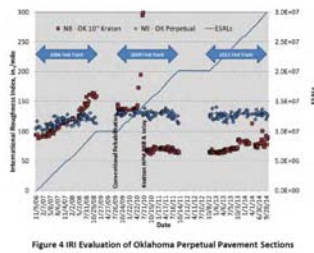


Figure 4 IRI Evaluation of Oklahoma Perpetual Pavement Sections

Oklahoma I-40, Caddo County - Work History

Year	Work Description
1962	Original construction, consisting of: 4.5 in, asphalt concrete 8 in, sand asphalt 6 in, stabilized base
1975	1.5 in, asphalt concrete overlay
1980	OGFC (probably 0.75 in) Petromat (paving fabric) Asphalt concrete leveling course (probably around 1.5 in)
1991	3 in, asphalt concrete, Type B Cold milling (no thickness indicated)
1996	2.5 in, asphalt concrete Type B, polymer-modified asphalt binder 2 in cold milling (outside lanes)
2007	Novachip (typically 0.5-0.75 in) 2 in hot in-place recycling
2012	Major rehabilitation project

I-40 Structural Rehabilitation, Caddo County

- ▶ Milled 5 in, replaced with 8 in
 - ▶ Did NOT remove all of the cracked pavement
- ▶ Construction took place February-April 2012

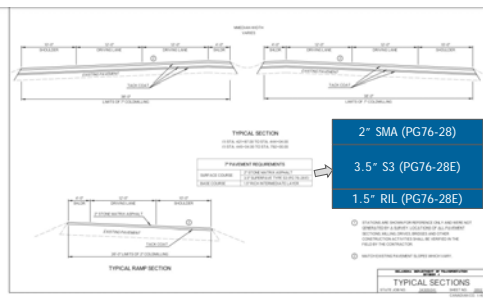


I-40 Caddo County Performance

- ▶ Avg. 2021 IRI: 49.97 in/mi (EB), 47.81 in/mi (WB)*
- ▶ 2021 AADT = 29,600 with 36% trucks (7% single-unit, 29% combination)
- ▶ Recognized in 2022 as a "Perpetual Pavement by Conversion" by the Asphalt Pavement Alliance



I-40, Canadian County



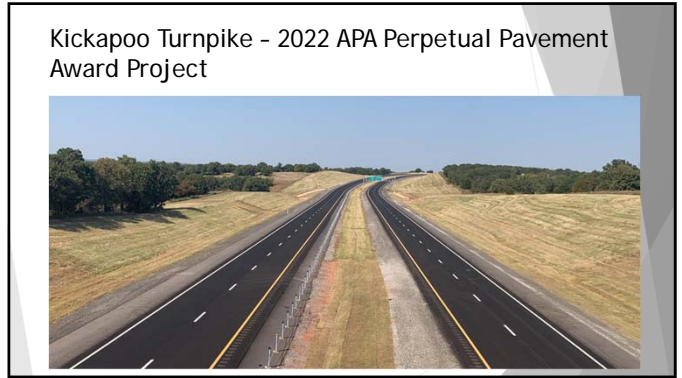
Perpetual Pavements by Design

- ▶ SH 152
 - ▶ New highway alignment, SW of OKC
 - ▶ Replicated in Section N9 during NCAT 2006 construction
 - ▶ Completed in 2006
- ▶ Kickapoo Turnpike (award-winning project)
 - ▶ Connects I-44 (Turner Turnpike) with I-40, east of Oklahoma City
 - ▶ Completed in 2021
- ▶ I-40, Okfuskee Co.
 - ▶ Reconstruction
 - ▶ Completed in 2022



Typical Sections - New Construction / Reconstruction Perpetual Pavement Designs

SH 152	I-40, Okfuskee	Kickapoo Turnpike
2" SMA (PG76-280K)	2" SMA (PG76-280K)	2" SMA (PG76-280K)
3.25" S3 (PG76-280K)	3" S3 (PG76-280K)	3" S3 (PG76-280K)
3" S3 (PG64-220K)	3" S3 (PG64-220K)	3" S3 (PG64-220K)
3" S3 (PG64-220K)	3" S3 (PG64-220K)	3" S3 (PG64-220K)
3" RBL (PG64-220K)	3" RBL (PG64-220K)	3" RBL (PG64-220K)
8" Fly Ash Stab.	12" Agg. Base, Ty. A	8" Agg. Base, Ty. A
Subgrade		8" Stab. Subgrade



Contractor's Perspective - Perpetual Pavements

- ▶ Our goal is to provide the owner (OTA,ODOT...) with the best project now that will last beyond their expectations, provide a pavement with a maintenance plan, and then recognize owners who have had successes with this strategy.

Contractor's Perspective, Perpetual Pavement Projects

<ul style="list-style-type: none"> ▶ Estimating/bidding: <ul style="list-style-type: none"> ▶ Higher risk, expected less competition ▶ Talked to owners prior to bid to get expectations ▶ Looked for VE opportunities to meet those expectations ▶ Pre-Construction: <ul style="list-style-type: none"> ▶ Relocated portable plant close to location ▶ Cleaned AC tanks thoroughly ▶ Made agreements with AC suppliers ▶ Looked for the best weather opportunities 	<ul style="list-style-type: none"> ▶ Construction: <ul style="list-style-type: none"> ▶ Used our best equipment (transfer vehicles, compaction...) ▶ Minimized any risks we could (don't pave on marginal weather days) ▶ We had QC on site every day ▶ Staffed with extra people to make sure all details were monitored <p>PAY ATTENTION TO EVERY DETAIL!!!</p>
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Project Locations

1. I-40, Caddo County*
2. I-40, Canadian County
3. SH 152, Oklahoma County
4. Kickapoo Turnpike*
5. I-40, Okfuskee County

* APA 2022 Award Winning Projects

Thank you

Questions?



Potential questions/commentary

- ▶ Jay-What difference in time of construction would you estimate if the Okfuskee County project had used CRCP instead of a Perpetual Asphalt Pavement design?
- ▶ Jay-Would there have been any difference in how traffic would have been managed during construction?
- ▶ David/Larry-Do you anticipate more rehab projects like in Caddo and Canadian Counties?
- ▶ David-Is ODOT considering using PG76-28E in future SMA and PFC projects?