Oklahoma’s Use of Fabric in Overlays and Full Depth Concrete Pavements

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What Is It?

• Geotextile (Fabric)
  – Meets AASHTO M288, Class 1
  – Non-woven
  – ≈ 5mm (about ¼ in)
  – 13-15 oz/sy
How is it Being Used?

• Bulk of Use for Separator Layer between Concrete Pavement & CTB
• Limited use as Separator Layer between Existing Concrete & UBCO
Why is it Being Using Fabric?

- Idea Came from SCAN Tour
  - Sponsored by FHWA
  - Toured Europe in 2006
  - Germans using thick fabric as bond breaker between PC and CTB
2006 SCAN Team

• Industry Groups
• Academia
• FHWA
• Contractors

http://international.fhwa.dot.gov/pubs/pl07027/
German Use of Thick Fabric

5 mm Fabric Interlayer
German Research

• University of Munich Study
  – Provides Drainage
  – Prevents Erosion of CTB
  – Prevents Reflective Cracking
  – Provides Uniform Bearing Support During Curling/Warping
• Separator Layer for UBCO
  – Less Expensive
  – Faster Construction
Unbonded Concrete Overlay

Separation interlayer used to separate new overlay and existing concrete.
Unbonded Overlay on Concrete

Separation Layer used to prevent cracks/joints in existing pavement from reflecting up through the new concrete overlay.
Separation Layer

Key

Overlay

Old Pavement

Smooth Slip Plane

Overlay

Old Pavement

Thick Interlayer (> 2 in.)
UBCO Projects

• Route D in Missouri
  – 22 year old 8” PCCP
  – Severe D-Cracking
  – Construction Summer 2008
UBCO Projects

• Interstate 40 in Yukon
  – (West edge of Oklahoma City)
• ARRA (Stimulus) Project
• High Profile
• 100,000 + ADT
Existing Pavement

• Original Section Built 1969
  – 9” PCCP
  – 4” FABB
  – 6” Lime Treated Subgrade
Design Traffic

- 30 year Design Life
- 28% Trucks
- Rigid Design ESAL’s – 232 million
Project Description

- Additional Lanes
- Variable Sections
  - New Grade
  - Overlay
- 9.5” Thick DJCP
- Bond Breaker = 15 oz, Non Woven Geotextile
- Replaced Shattered Slabs
Fabric Notes

• Mirafi 1160N by Tencate Geosynthetics
• AASHTO M288, Class 1
• 15 ounce/sy

• Fasteners
  – Hilti System
  – \( \frac{3}{4} \)” Galvanized Nail
  – 1 7/16” Galvanized Washer
Further Research
Transtec Report

- Sponsored by FHWA
- Material Specifications
- Best Practices
- Case Studies
Nonwoven Geotextile Interlayers for Separating Cementitious Pavement Layers: German Practice and U.S. Field Trials

International Technology Scanning Program

Sponsored by
U.S. Department of Transportation
Federal Highway Administration

In cooperation with
American Association of State Highway and Transportation Officials
National Cooperative Highway Research Program

May 2009
University of Minnesota Study
‘Drainage Capabilities of a Non Woven Fabric Interlayer in an Unbonded Concrete Overlay’

Lederle, Hoegh, Burnham, and Khazanovich

- Built Slab in ALF
- Applied Simulated 18 kip Loads
- Drainage Exceeded Requirement
Drainage Test Setup

**FIGURE 4 Elevation of the drainage test layout.**

- 5" PCC
- Water Inlet pipe
- Fabric Interlayer
- Embedded flashing
- 12" base + subgrade
- 1% slope
- Collection gutter
Drainage Test

Lederle, Hoegh, Burnham, and Khazanovich
North Dakota Push Off Test

- Measure Axial Restraint
- Constructed Slabs on:
  - CTB
  - CTB with Fabric Separation Layer
  - Compacted Aggregate Base
Push Off Test Setup

Figure 2.1 Push off test setup [Rasmussen and Rozycki]
Slab on Fabric Separator
Slab Directly on CTB
Cement Treated Base
US 287
CRL 1

18'  10'  12'  12'  10'  18'
SHOULDER
8'

2'
6:1

(1)
PRIME COAT TO HERE

6:1

PRIME COAT (4) TO HERE

54'-0" LIMITS OF STABILIZED SUBGRADE

58'-0" LIMITS OF GRADING SECTION

TYPICAL SECTION NO. 1
US-287

3" A.C. TYPE S3
(PG 64-22 OK)

9.5" DOWEL JOINTED P.C. CONCRETE

8" STABILIZED SUBGRADE (8)

12" CALICHE MATERIAL

54'-0" LIMITS OF STABILIZED SUBGRADE

58'-0" LIMITS OF GRADING SECTION
ODOT Price Index for PG 64-22

ODOT Liquid Asphalt Price Index

- January 2007
- February 2007
- March 2007
- April 2007
- May 2007
- June 2007
- July 2007
- August 2007
- September 2007
- October 2007
- November 2007
- December 2007

- January 2008
- February 2008
- March 2008
- April 2008
- May 2008
- June 2008
- July 2008
- August 2008
- September 2008
- October 2008
- November 2008
- December 2008

- January 2009
- February 2009
- March 2009
- April 2009
- May 2009
- June 2009

Series 1
Cement Treated Base

• Standard Practice HMA Beneath PC as Non-Erodible Layer
  – Time Issues
  – Cost Issues

• Industry Proposed CTB
  – Accepted With Fabric Provision
SECTION 317
CEMENT TREATED BASE

317.01 DESCRIPTION
This work consists of constructing a cement-treated base (CTB) using a soil, aggregate, and cement mixture.

317.02 MATERIALS
Provide material in accordance with the following subsections:

<table>
<thead>
<tr>
<th>Material</th>
<th>Subsection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portland Cement</td>
<td>701.02</td>
</tr>
<tr>
<td>Water</td>
<td>701.04</td>
</tr>
<tr>
<td>Fly Ash</td>
<td>702.01</td>
</tr>
<tr>
<td>Curing Agents</td>
<td>701.07.D</td>
</tr>
<tr>
<td>Aggregates</td>
<td>703.02</td>
</tr>
</tbody>
</table>

(Provide a separator fabric in accordance with Section 712.05, “Geotextiles for Bases,” except ensure the fabric meets the requirements of AASHTO M298, Class 1 and weighs at least 15 oz/yd² [500 g/m²].)

317.03 EQUIPMENT
Use equipment for producing and placing the CTB in accordance with Subsection 304.03, “Equipment,” except, only use stationary plants and equipment that combines placement and initial compaction.

317.04 CONSTRUCTION METHODS
A. Mix Design and Proportioning

Submit the mix design, in accordance with OHD L-53, to the Materials Engineer for approval before placing the CTB.

Submit to the Resident Engineer a single-point gradation for the combined aggregates with a plus and minus tolerance for each sieve.

Ensure cementitious materials consist of at least 75 percent portland cement, and no more than 25 percent fly ash.

Test the compressive strength in accordance with OHD L-53.
Provide a separator fabric in accordance with Section 712.05, “Geotextiles for Bases” except ensure the fabric meets the requirements of AASHTO M288, Class 1 and weighs at least 15 oz/yd² [500 g/m²].
ODOT Typical Section

**Diagram Details:**
- **4" Cement Treated Base W/ Separator Fabric (15 Oz/Sy)**
- **51'-0" of 8" Cementitious Stabilized Subgrade with Fly Ash @ 15% for 100% of the Project**
- **59'-0" Grading Section**
- **Limits of Prime Coat**

**Sections:**
- **Existing Slope**
- **Approx. 6:1**
- **Westbound**
Placing Fabric on CTB
CTB Construction
CTB Construction
High Density Pavers
Arkansas

- HMA replacement btw CTB and DJCP
- Test section constructed at Texarkana in December 2011
- Early Joint Performance Normal
- Final Report Due Spring 2015
Was it Worth it?
CTB vs HMA Cost Comparison

- First Project Let November 2008
- Though February 2013
  - Over 4.1 million Square Yards
  - Does Not Include UBCO Uses
CTB vs HMA Cost Comparison

- Use Low Bid for CTB Price
- HMA Ave Cost by District
  - CTB Saved $9,153,000
- HMA Ave Cost by County
  - CTB Saved $11,726,000
Conclusions

• Simple Installation
• Reduced Contract Time
• Reduced Cost
• Early Joint Performance
  – As expected
• Long Term Performance
  – No anticipated Problems
  – Time will tell
The End!

Thank you.

www.concreteroads.org