Performance of Ultra-Thin Whitetopping

District 58

Neal West, P.E.
State Project 026-03-0036

FERRIDAY - RED GUM

ROUTE US 65

CONCORDIA PARISH
Contractors

Prime Contractor:

D&J Construction Co., Inc.

Ultra-thin Whitetopping Contractor:

James Construction, Inc.
State Project 026-03-0036
TYPICAL EXISTING SECTION
Applies To Station 10+00 to Station 97+91

A  Existing Base and Surfacing (Shoulders)
B  Existing Base and Surfacing (Roadway - Southbound)
C  Existing Base and Surfacing, Composite Pavement (Roadway - Northbound)
Existing Section Example
Pavement Distress

Roadway section just north of completed project
Existing Section Example
Pavement Distress

Roadway section just north of completed project
Existing Section Example
Surrounding Terrain
Typical Finished Section

TYPICAL FINISHED SECTION
Applies to Station 10+00 to Station 97+91

A. Existing Base and Surfacing To Remain After Cold Planing 2" Avg. Depth @ Roadway Edge.
B. Existing Base and Surfacing To Remain After Cold Planing 4" Avg. Depth @ Roadway Edge.
Maintain 2.5% Slope.
C. Required 2" Superpave Asphalitic Concrete Binder Course (Level 2).
D. Required 2" Superpave Asphalitic Concrete Wearing Course (Level 2F).
E. Required 4" Depth Ultra-Thin Whitetopping. Mix Design Will Be Adjusted To Provide A
Modulus Of Rupture/Flexural Strength Equal To At Least 700 PSI As Determined By
ASTM C 78-94 Or AASHTO T 97-97.
F. Required Ground-In Rumble Strips.

NOTE: 20yrs. ESAL loading = 4,071,096 ESAL’s
Typical Finished Section
Ultra-Thin Section
S-002 Ultra-thin Whitetopping Placement UTW (4” thick):

$16.00/sq. yd.

S-003 Ultra-thin Whitetopping Concrete (4” thick):

$130.00/cu. yd.
# Contract Materials

<table>
<thead>
<tr>
<th>Material</th>
<th>LaDOTD 2000 Specs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portland Cement: Type I or II</td>
<td>- 1001.01</td>
</tr>
<tr>
<td>Fly Ash: Class C or F</td>
<td>- 1018.15</td>
</tr>
<tr>
<td>Ground Iron Blast Furnace Slag</td>
<td>- 1018.28</td>
</tr>
<tr>
<td>Aggregates</td>
<td>- 1003.01 &amp; 1003.02</td>
</tr>
<tr>
<td></td>
<td>(≤ 1/3 pvmt. thickness)</td>
</tr>
<tr>
<td>Admixtures</td>
<td>- 1011.02</td>
</tr>
<tr>
<td>Water</td>
<td>- 1018.01</td>
</tr>
<tr>
<td>Synthetic Fibers</td>
<td>- ASTM C1116</td>
</tr>
<tr>
<td></td>
<td>(Type III)</td>
</tr>
</tbody>
</table>
Design Requirements

- Synthetic Fibers added at rate of 3 lbs./cu. yd.

- Slump – 4” w/o water reducers
  (+/- 1”) 8” with super-plasticizer
  2” if slip formed

- Air Content – 3% to 5%
Design Requirements

- Minimum Flexural Design Strength of 700 psi in 28 days testing by ASTM C 78
  - Open to traffic – 500 psi

- For accelerated early strength projects, 500 psi in 24 hours.
  - Pay adjustments apply if 24 hr. strength not met.
Contractor Mix Designs

Portland Cement – Siam Cement, Thailand
(6.0, 6.5, & 7.0 bags/cu. yd.)

Fine Aggregate (42%) – Concrete Sand, Settoon Construction, Natchez, MS

Coarse Aggregate (58%) – Grade P, Martin Marietta Smithland, KY
Contractor Mix Designs

Admixtures – (within Mfg.’s recommended rate)

• WRNS – Master Builders 220N
• AE – Master Builders MBAE 90

Fibers -  SI Concrete Systems

Inforce Fiber Mesh e3 (3 lb./cu. yd.)
Inspection Team
Ferriday & Jena P.E. Offices
Concrete Production
Concrete Plant
MMC Vidalia, LA
Addition of Fibers
Night work Considerations
Concrete Delivery

AUG 13 2003
Ultra-thin Whitetopping Placement
Concrete Paver
Concrete Paver
Straightedging
Straighchedging
Tine Finish
Curing Compound Application

- Subsection 601.10
- 1.5x the recommended rate (1.5 gals/100 sq. ft.)
# Joint Spacing Table

<table>
<thead>
<tr>
<th>UTW Pavement Thickness, inches (mm)</th>
<th>Maximum Spacing of Joints, feet (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 (50)</td>
<td>2 (0.6)</td>
</tr>
<tr>
<td>2 1/2 (65)</td>
<td>2 1/2 (0.75)</td>
</tr>
<tr>
<td>3 (75)</td>
<td>3 (0.9)</td>
</tr>
<tr>
<td>4 (100)</td>
<td>4 (1.2)</td>
</tr>
</tbody>
</table>

Notes:

1. **Largest Dimension of panel less than 125% of the smallest dimension** (150% with the Engineer’s approval).
2. **Minimum angle between any two intersection joints** 80°.
3. **Joints intersect pavement edges at 90°** and extend a minimum of 1.5 feet from pavement edge.
Joint Sawing
Sawed Joint

- 1/3 depth of the pavement thickness
Construction Inspection
Construction Inspection
Construction Inspection
Construction Inspection
Construction Inspection
Completed Lane
Completed Roadway
Quality Control & Acceptance
- Flexural Strength -
Construction Inspection
Making Beams

• Lot size is 100 cu. yds.
• 4 beams per lot
Flexural Beams
Weight Comparison

Flexural Beams

= 60 lbs.

vs.

Compression Cylinders

= 30 lbs.
Lime Curing Vats
Flexural Specimens

Cleaning specimen prior to testing
Rainhart Series 416
RECORDING BEAM TESTERS
(Flexural Strength of Concrete)
Flexural Specimens

Flexural concrete beam placed into breaking device
Flexural Beam Breaking Device
Flexural Test Video
Early Break
481 psi
Flexural Beam - Tested
Flexural Beam Failure Plane
Flexural Beams
Fiber Additive Close-up
Flexural Beams
Fiber Additive Close-up
QC Flexural Testing Results

- Specification – remove and replace < 700 psi
- Lot 9 - Change order to accept @ 80% pay
Quality Control & Acceptance
- Ride Quality -
## Lot Layout

For QC/QA Surface Tolerance

<table>
<thead>
<tr>
<th>Lot #</th>
<th>Location</th>
<th>Station From</th>
<th>Station To</th>
<th>sq. yds.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rt. Rdwy./Lt. Lane</td>
<td>10+00</td>
<td>40+00</td>
<td>4000</td>
</tr>
<tr>
<td>2</td>
<td>&quot;</td>
<td>40+00</td>
<td>70+00</td>
<td>4000</td>
</tr>
<tr>
<td>3</td>
<td>&quot;</td>
<td>70+00</td>
<td>97+22*</td>
<td>3629.3</td>
</tr>
<tr>
<td>4</td>
<td>Rt. Rdwy./Rt. Lane</td>
<td>10+00</td>
<td>40+00</td>
<td>4000</td>
</tr>
<tr>
<td>5</td>
<td>&quot;</td>
<td>40+00</td>
<td>70+00</td>
<td>4000</td>
</tr>
<tr>
<td>6</td>
<td>&quot;</td>
<td>70+00</td>
<td>97+22*</td>
<td>3629.3</td>
</tr>
</tbody>
</table>

*End of Whitetopping

Total Length of Ultra-thin Whitetopping - 8,722 ft., 23,259 sq. yds.
## Profilograph Results

### Specification (subsection 601.11), Category I, < 6 in./mi., Bumps < 0.3 in. per 25 ft.

<table>
<thead>
<tr>
<th>Lot</th>
<th>Location</th>
<th>Profile Index (in./mi.)</th>
<th>Accept.</th>
<th>Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Left Lane</td>
<td>2.4</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>“ ”</td>
<td>2.9</td>
<td>1.6</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>“ ”</td>
<td>2.3</td>
<td>1.9</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Right Lane</td>
<td>1.5</td>
<td>7.9</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>“ ”</td>
<td>0.8</td>
<td>8.4</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>“ ”</td>
<td>1.6</td>
<td>8.8</td>
<td></td>
</tr>
</tbody>
</table>

**Average:** 1.9 5.2
Construction Problems
Pavement Cracking
Delayed Sawing
Pavement Cracking
Delayed Sawing
Very Early Traffic
Patching Traffic Damage
Patching Traffic Damage
Questions