Polymer Overlays in Kansas

Midwest Bridge Preservation Partnership Conference

Kansas City, Missouri

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OUTLINE

• Preservation Goals
• Preservation/Bridge Maintenance Funding
• Polymer Overlays Placed in Kansas
  ▫ Statistics
  ▫ Trends
• Polymer Overlay Specifications
  ▫ Multi-Layer
  ▫ Single Layer Repair
• Polymer Overlay Problems
  ▫ Cracking, Peeling, Delaminations
• Surface Preparation and Protection
• Application of Overlay
• Questions
Flow Chart of Bridge Preservation

- **Bridge Management’s Goal**
  - To monitor and continually improve the condition of the State’s bridge system.
  - To continually improve the condition of the State’s bridge system.
  - To achieve this goal, it is necessary to perform maintenance activities and to replace those bridges that can no longer be economically maintained.

Excerpt from: FHWA-HIF-11042 (August 2011)  
“Bridge Preservation Guide”
Polymer Overlays = Bridge Preservation

1. Prep
2. Epoxy
3. Aggregate
4. Product
Bridge Maintenance Funding

TOTAL PROJECT COST (In Millions)

FISCAL YEAR

2004: $18.0
2005: $28.5
2006: $25.1
2007: $27.5
2008: $19.5
2009: $12.0
2010: $14.7
2011: $24.0
2012: $26.3
2013: $16.6
2014: $27.9
2015: $28.3
Number of Polymer Overlays Placed

(306 placed under Bridge Maintenance funding in this time period)
Square Feet of Polymer Overlays Placed

(in Millions of Square Feet)


0.09 0.07 0.03 0.22 0.17 0.36 0.20 0.34 0.55 1.26 0.42 0.76 0.62
Money Spent on Polymer Overlays

(in Millions of dollars)


$0.4 $0.3 $0.2 $1.0 $0.9 $1.8 $1.0 $1.6 $2.3 $5.0 $2.9 $2.3

$0 M $1 M $2 M $3 M $4 M $5 M $6 M
Average Unit Bid Cost

(per Square Yard)
Summary of Statistics

- **Average Unit Bid Cost ($ per Sq. Ft.)**
- **# of Polymer Overlays Placed (in 10's)**
- **Total $ Spent (in Millions)**
- **Deck Area (Sq. Ft.) (in Millions)**

Graph showing trends from 2003 to 2015.
Taking Advantage of Low Bid Prices

K-96
NE Wichita
Sedgwick County
96-87 KA-3317-01
July 2013 letting
FY 2014

$3.33 / Sq. Ft.  Unit Bid Price
211,400  Square Feet Placed
$704,000  Total Bid Item Cost
26  # of Bridges
All bridges built between 1992 and 1994
Average Age around 20 years
Polymer Overlay Specifications

The following specifications are available on the KDOT webpage at the following link:

- 729 – Multi-Layer Polymer Concrete Overlay
- 740 – Polymer Concrete Overlay Repair

Those specs also employ the following material specs:

- 1730 – Polymer Resins for Polymer Concrete Overlay Systems
- 1102 – Aggregates for Concrete Not Placed on Grade

The 2015 edition of the Specifications became effective with the July letting.

- Note: These specs do not include a warranty.
- Response to the Maryland inquiry from July.
729 – Multi-Layer Polymer Concrete Overlay

SECTION 729

MULTI-LAYER POLYMER CONCRETE OVERLAY

729.1 DESCRIPTION
Prepare the surface of the reinforced concrete bridge deck and construct a multi-layer polymer concrete overlay (overlay) as shown on the Contract Documents.

Provide an overall combination of labor and equipment with the capability of proportioning and mixing the polymer resin components and placing the primer and aggregate, in accordance with this specification and the manufacturer/supplier’s recommendations.

<table>
<thead>
<tr>
<th>BID ITEM</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-Layer Polymer Concrete Overlay</td>
<td>Square Yard</td>
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</table>

j. Weather Limitations.
(1) Epoxy. Do not place the overlay if the air temperature is expected to drop below 55°F within 8 hours of placement.

(2) Polyester. Do not place any component of the overlay if the air or substrate temperature is at or expected to drop below 40°F during installation.

(3) General. Do not place the overlay when the deck temperature will exceed 90°F. Do not place the overlay if gel time is less than 10 minutes.

The overlay may be placed outside the specified temperature ranges with the approval of the Engineer and the material manufacturer/supplier. Discuss changes to temperature limitations at the preconstruction conference.
SECTION 740

POLYMER CONCRETE OVERLAY REPAIR

740.1 DESCRIPTION

Repair the existing polymer concrete overlay surface.
Provide an overall combination of labor and equipment with the capability of preparing the surface, proportioning and mixing the polymer components, and placing the polymer material and aggregate in accordance with this specification and the manufacturer/supplier’s recommendations.
When specified, construct a single coat polymer concrete overlay according to this specification.

<table>
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<th>BID ITEMS</th>
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<tr>
<td>Polymer Concrete Overlay Repair</td>
<td>Square Yard</td>
</tr>
<tr>
<td>Single-Layer Polymer Concrete Overlay</td>
<td>Square Yard</td>
</tr>
</tbody>
</table>

c. Preparation For Polymer Concrete Overlay Repair.
(1) When specified, repair unsound bridge deck concrete according to SECTION 731 and cure repairs prior to performing the polymer concrete overlay repair.

(6) Removal area should extend a minimum of 6 inches beyond the edges of the unsound, damaged or delaminated polymer concrete overlay or 6 inches beyond patching of the concrete bridge deck.

(7) Shot blast/sand blast or bush hammer portland cement concrete patch surfaces to produce an acceptable surface for placement of the polymer concrete overlay patch. Produce a surface relief equal to the International Concrete Repair Institute (ICRI) Surface Preparation Level 6 to 7 or ASTM E 965 Pavement Macrotexture Depth of 0.04 to 0.08 inch.
Polymer Concrete Overlay Repair

• The polymer overlay repair spec and bid item has been officially used on the following 2 projects:

Project No. 70-89 KA-3169-01
Shawnee County
Bridge No. 027
   I-70 over SE 3rd St.
   Location: 39.05503,-95.66813, at milepost 361.75
Bridge No. 028
   I-70 over SE 4th St.
   Location: 39.183434,-94.794382, at milepost 361.86

Project No. 177-9 KA-3155-01
Chase County
Bridge No. 050
   K-177/Walnut St. over the Cottonwood River
   Location: 38.37456,-96.53897, north end of Cottonwood Falls

• The bids for those projects came in at the following prices:
  ▫ $18.50 and $29.50 per Square Yard

• Compared to the average bid price for a Multi-Layer Overlay:
  ▫ Between $32 - $36 per Square Yard over the last few years
Problems – Cracking / Delaminations
Problems – Cracking / Delaminations
Problems – Peeling / Delaminations
Problems – Peeling / Delaminations
Surface Preparation
Surface Protection
Surface Protection – Fancy Footwear
Epoxy Application
Aggregate Application
QUESTIONS?

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