To: Diane M. O'Keefe  
Attn: District One

From: Scott E. Stitt

Subject: Pavement Design

Date: January 5, 2012

FAP Route 330 US 12/45 (Mannheim Road)  
Section 0105-WRS-1 & 0105-WRS  
Cook County  
From IL Route 19 (Irving Park Road) to IL Route 72 (Higgins Road)

We have reviewed the pavement analysis for the project, submitted to BDE by memorandum dated November 14, 2011. Revisions were submitted by email on January 4, 2012. The life cycle cost analysis favors a rigid pavement design. The I-190 ramps and side streets will match the Mannheim Road design. Mannheim Road south of this project was recently constructed using a rigid design. The Balmoral Avenue underpass ramp will be designed to match the northbound Mannheim Road to Balmoral Avenue exit ramp.

The approved pavement design for this project is as follows:

US 12/45 (Mannheim Road)  
10.75 inches of Jointed PCC pavement with Tied PCC Shoulder  
4.5 inches of Stabilized Sub-Base  
12 inches of Aggregate Subgrade  
Geotechnical Fabric

I-190 (ramps), Higgins Rd., Zemke Blvd., Montrose Ave., & Lawrence Ave.  
10.75 inches of Jointed PCC pavement with Tied PCC Shoulder/Curb & Gutter  
4.5 inches of Stabilized Sub-Base  
12 inches of Aggregate Subgrade  
Geotechnical Fabric

Balmoral Avenue Underpass Ramp  
10 inches of Jointed PCC pavement with Tied PCC Shoulder  
4.5 inches of Stabilized Sub-Base  
12 inches of Aggregate Subgrade  
Geotechnical Fabric

If you have any questions, please contact Paul Niedernhofer at (217) 524-1651.
To: Scott Stitt

From: Diane O'Keefe

Subject: Pavement Analysis*

Date: November 14, 2011

Route: FAP 330

*Location: Mannheim IL-19 to IL-72
Contract No.: 60G37/60P35
Letting: 06CY12

Section: 0105-WRS-1 & 0105-WRS
County: Cook
Job No.: D-31-399-09 & D-91-518-11

We are submitting the pavement analysis for the above captioned location for your review and approval. Please note that the total pavement area for reconstruction exceeds 4,750 Square Yards. The improvement involves the following scope of work:

a.) Pavement reconstruction of US 12/US 45 (Mannheim Road) between IL 19 (Irving Park) and IL 72 (Higgins) for a total length of approximately 16,219 ft to accommodate six 12ft lanes.

b.) Pavement reconstruction of Higgins Rd., Zemke Blvd./Bessie Coleman Dr., Montrose Ave., and Lawrence Ave. up to 500 ft to the east and west of their intersections with Mannheim.

c.) Pavement reconstruction of several hundred feet of each of the I-190 ramps and their associated C-D roads as an advance to future I-190 improvements.*

d.) Construction of Balmoral underpass ramp connecting SB Mannheim Road to Balmoral Avenue for a total length of approximately 2,100 ft to accommodate one 16ft lane.*

A 30 year pavement analysis was performed on the above segment. We recommend a mechanistic-rigid pavement design for the following reasons:

- The life cycle cost analysis favors PCC pavement by 25.7%
- Mannheim Road south of IL 19 was recently reconstructed using PCC pavement
- This is a high stress area with heavy truck traffic
Scott Stitt  
November 14, 2011  
Page Two  

a.) Mannheim Road  
Pavement Reconstruction  
Tied PCC Shoulder  
   10 ¾” PCC Pavement (Jointed)  
   4 ½” Stabilized Subbase.  
   12” Aggregate Subgrade  
   Geotechnical Fabric  

The side streets and ramps should match the mainline Mannheim Road pavement design. District 1 recommends a rigid pavement design for these locations.

b. c.) I-190 Ramps, Higgins, Zemke**, Montrose**, and Lawrence**  
Pavement Reconstruction  
Tied PCC Shoulder/Curb & Gutter  
   10 ¾” PCC Pavement (Jointed)  
   4 ½” Stabilized Subbase.  
   12” Aggregate Subgrade  
   Geotechnical Fabric  

There was no traffic data available for the proposed Balmoral fly-under ramp. We recommend a mechanistic-rigid pavement design to match the PCC pavement thickness used on the nearby NB Mannheim to Balmoral Avenue exit ramp.

d.) Balmoral Avenue Underpass Ramp**  
Pavement Construction  
Tied PCC Shoulder  
   10” PCC Pavement (Jointed)  
   4 ½” Stabilized Subbase.  
   12” Aggregate Subgrade  
   Geotechnical Fabric  

*Designer Note 1: A longitudinal centerline joint is recommended for all 16ft single lane ramp sections in order to prevent longitudinal cracking.

**Designer Note 2: Zemke Blvd./Bessie Coleman Dr., Montrose Ave., Lawrence Ave. and the Balmoral Ave. Exit Ramp Underpass are all subject to local jurisdictional approval.

If you have any questions or need additional information, please contact Mr. Tom Matousek at (847)705-4255.

By: [Signature]  
Jose A. Dominguez, P.E.  
Project Support Engineer
Year = 2009

ADT = 41,000
TRUCK = 4,500
MU = 1600 = 3.9%
SU = 2700 = 7.1%
# Traffic Analysis Calculations - REVISED

**Project:** Mannheim Road from Irving Park to Higgins

**Element:** Traffic Analysis Calculations

<table>
<thead>
<tr>
<th>Comp. by:</th>
<th>Date:</th>
<th>Sheet of:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chkd. by:</td>
<td>Date:</td>
<td>Job No.</td>
</tr>
</tbody>
</table>

**Construction Year:** 2012
**Design Year:** 2027 (30 Years)

### Current AADT
- **4,100** in 2009
- **8,900** in 2030

### Future AADT
- **7,565** in 2009
- **5,704** in 2027
- **5,133** in 2030

|  
| # Lanes = 6
| Other Marked State Route
| Urban |

#### Flexible

TF = \( DP \left[ \frac{(0.15 \cdot P \cdot PV) + (1.35 \cdot S \cdot SU) + (0.65 \cdot M \cdot MV)}{1 \times 10^6} \right] \)

\[= 30 \left[ \frac{(0.15 \cdot 102 \cdot 73.505) + (1.35 \cdot 91.81 \cdot 5.704) + (0.65 \cdot 75.28 \cdot 5.133)}{1 \times 10^6} \right] \]

\[= \frac{35.35}{1} \]

#### Rigid

TF = \( DP \left[ \frac{(0.15 \cdot P \cdot PV) + (1.35 \cdot S \cdot SU) + (0.65 \cdot M \cdot MV)}{1 \times 10^6} \right] \)

\[= 30 \left[ \frac{(0.15 \cdot 102 \cdot 73.505) + (1.35 \cdot 91.81 \cdot 5.704) + (0.65 \cdot 75.28 \cdot 5.133)}{1 \times 10^6} \right] \]

\[= \frac{25.20}{1} \]
Note: Use of untied shoulder design requires BDE approval.

RIGID PAVEMENT DESIGN CHART
(Mechanistic Design: SSR = Poor)

Figure 54-4.E

HARD COPIES UNCONTROLLED
Note: The minimum design HMA mixture temperature will be 73°F.

HMA MIXTURE TEMPERATURE
(Mechanistic Design: Flexible Pavement)

Figure 54-5.C
DESIGN HMA STRAIN
(Mechanistic Design: Flexible Pavement)

Figure 54-5.E
MECHANISTIC PAVEMENT DESIGN

Date: JANUARY 4, 2012

Calculations by: TMC

Checked by: ______________________

Class: I Roads and Streets

Urban X Rural

Limits of Analysis

Station 28+00 to Station 196+15

Length 1629 Feet 3.07 Miles

Structural Design Traffic

PV = 71.50s
SU = 5.704
MU = 3.133

Percent of S.D.T. in Design Lane

P = 8 %
S = 37 %
U = 37 %

MINIMUM SUBGRADE SUPPORT RATING = "Poor"

Flexible Pavement Design

Actual TFF = 27.28 Minimum TFF = 5.69

Selected Design AC Type 20

Design AC Mixture Temp. 74° F.

Design EAC 725 KSI

Design AC Microstrain 46

AC Thickness 14.5 Inch

Rigid Pavement Design

Actual TFR = 36.04 Minimum TFR = 8.04

Extended Lane 10.75 Inch

15' Panel PCC Thickness for: Tied Shoulder 10.75 Inch

Untied Shoulder — Inch

Figure 5.05
RIGID PAVEMENT

Date: **November 10, 2011**

**Net Length** 16219 Lin. Ft. 3.07 Miles

**Number Lanes** 6 Urban X Rural

**ITEMIZED CONSTRUCTION COST**

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Unit</th>
<th>Item</th>
<th>Unit Cost</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>129752</td>
<td>Sq. Yds.</td>
<td>0.75 - Inch Jointed PCC</td>
<td>$43.66</td>
<td>$564,972</td>
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<tr>
<td>14555</td>
<td>Sq. Yds.</td>
<td>4.5&quot; (Stabilized/Granular Subbase)</td>
<td>$15.00</td>
<td>$218,495</td>
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<tr>
<td>72084</td>
<td>Sq. Yds.</td>
<td>10.75 - Inch PCC Shoulders</td>
<td>$40.00</td>
<td>$2,883,360</td>
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<tr>
<td></td>
<td>Lin. Ft.</td>
<td>Pipe Underdrains</td>
<td>$-</td>
<td>$-</td>
</tr>
<tr>
<td></td>
<td>Lin. Ft.</td>
<td>Subbase Gran. Mat., Type C</td>
<td>$-</td>
<td>$-</td>
</tr>
<tr>
<td>64876</td>
<td>Lin. Ft.</td>
<td>100% Shoulder Joint Seal</td>
<td>$2.00</td>
<td>$129,752</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>$-</td>
<td>$-</td>
</tr>
</tbody>
</table>

Total Cost of Original Pavement Construction $10,786,559

**ITEMIZED MAINTENANCE AND REHABILITATION ACTIVITY COST**

**REHABILITATION ACTIVITY 1 - YEAR 10**

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Unit</th>
<th>Item</th>
<th>Unit Cost</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>130</td>
<td>Sq. Yds.</td>
<td>0.1% Full-Depth PCC Pavement Patching</td>
<td>$60</td>
<td>$7800</td>
</tr>
</tbody>
</table>

Total Cost of Rehabilitation Activity 1 $7800

FIGURE 5.05a(1)
REHABILITATION ACTIVITY 2 - YEAR 15

260 Sq. Yds. 0.2% Full-Depth PCC Pavement Patching  8 $ 60 = $ 15,600

Total Cost of Rehabilitation Activity 2 $ 15,600

REHABILITATION ACTIVITY 3 - YEAR 20

2595 Sq. Yds. 2% Full-Depth PCC Pavement Patching  8 $ 60 = $ 155,700

360 Sq. Yds. 0.5% Full-Depth PCC Shoulder Patching  8 $ 50 = $ 18,000

64,876 Lin. Ft. 100% Longitudinal/Shoulder Joint Routing & Sealing  8 $ 2 = $ 129,752

64,876 Lin. Ft. 100% Centerline Joint Routing & Sealing  8 $ 2 = $ 129,752

Total Cost of Rehabilitation Activity 3 $ 453,204

FIGURE 5.05a(2)
### Rigid Pavement (Cont.)

**Route:** 330  
**Section:** 0105-425-1  
**County:** Cook

#### Rehabilitation Activity 4 - Year 25

<table>
<thead>
<tr>
<th>Sq. Yds.</th>
<th>Description</th>
<th>Unit Price</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,893</td>
<td>3.0% Full-Depth PCC Pavement Patching</td>
<td>$60</td>
<td>$233,980</td>
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<tr>
<td>721</td>
<td>1.0% Full-Depth PCC Shoulder Patching</td>
<td>$50</td>
<td>$36,050</td>
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**Total Cost of Rehabilitation Activity 4:** $269,630

#### Rehabilitation Activity 5 - Year 30

<table>
<thead>
<tr>
<th>Sq. Yds.</th>
<th>Description</th>
<th>Unit Price</th>
<th>Total Cost</th>
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<tbody>
<tr>
<td>5,190</td>
<td>4.0% Full-Depth PCC Pavement Patching</td>
<td>$60</td>
<td>$311,400</td>
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<tr>
<td>1,081</td>
<td>1.5% Full-Depth PCC Shoulder Patching</td>
<td>$50</td>
<td>$54,050</td>
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<td>129,522</td>
<td>Policy HMA Overlay - Pavement</td>
<td>$11</td>
<td>$1,427,272</td>
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<td>72,084</td>
<td>Policy HMA Overlay - Shoulder</td>
<td>$11</td>
<td>$792,924</td>
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**Total Cost of Rehabilitation Activity 5:** $2,285,646

#### Rehabilitation Activity 6 - Year 35

<table>
<thead>
<tr>
<th>Lin. Ft.</th>
<th>Description</th>
<th>Unit Price</th>
<th>Total Cost</th>
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<tbody>
<tr>
<td>64,876</td>
<td>100% Longitudinal Shoulder Joint Routing &amp; Sealing</td>
<td>$2</td>
<td>$129,752</td>
</tr>
<tr>
<td>64,876</td>
<td>100% Centerline Joint Routing &amp; Sealing</td>
<td>$2</td>
<td>$129,752</td>
</tr>
<tr>
<td>44,657</td>
<td>50% Random Crack Routing and Sealing - Assume 100 ft/Station</td>
<td>$2</td>
<td>$97,314</td>
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<td>31,140</td>
<td>40% Reflective Transverse Crack Routing &amp; Sealing</td>
<td>$2</td>
<td>$62,280</td>
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**Total Cost of Rehabilitation Activity 6:** $425,598

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**Figure 5.05a(3)**

38
**RIGID PAVEMENT (Cont.)**

**FAP Route** 330  
**Section** 0106-425-1  
**County**

**REHABILITATION ACTIVITY 7 - YEAR 40**

<table>
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<th>Description</th>
<th>Quantity</th>
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<th>Total</th>
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<tr>
<td>649 Sq. Yds. 0.5% Full-Depth PCC Pavement Patching</td>
<td></td>
<td>$60</td>
<td>$38,940</td>
</tr>
<tr>
<td>649 Sq. Yds. 0.5% Partial-Depth Pavement Patching</td>
<td></td>
<td>$50</td>
<td>$32,450</td>
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<tr>
<td>(Mill &amp; Fill Surface - Interstates; Mill &amp; Fill 2.5 in. Non-Interstates)</td>
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<tr>
<td>46,711 Lin. Ft. 60% Reflective Transverse Crack Routing and Sealing</td>
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<td>$93,422</td>
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<td>48,387 Lin. Ft. 50% Random Crack Routing &amp; Sealing - Assume 100ft/Station</td>
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<td>$2</td>
<td>$97,374</td>
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<tr>
<td>64,876 Lin. Ft. 100% Longitudinal/Shoulder Joint Routing &amp; Sealing</td>
<td></td>
<td>$2</td>
<td>$128,752</td>
</tr>
<tr>
<td>64,876 Lin. Ft. 100% Centerline Joint Routing &amp; Sealing</td>
<td></td>
<td>$2</td>
<td>$129,752</td>
</tr>
</tbody>
</table>

**Total Cost of Rehabilitation Activity 7 $ 521,632**
ANNUAL COST DETERMINATION

Present Worth Calculation:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Present Worth</th>
<th>CRF</th>
<th>Annual Cost/Year-Mile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Cost of Original Pavement Construction</td>
<td>$ 10,786,559</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present Worth of Rehabilitation Activity 1</td>
<td>$ 7800</td>
<td>0.7441</td>
<td>$ 5804</td>
</tr>
<tr>
<td>Present Worth of Rehabilitation Activity 2</td>
<td>$ 15,600</td>
<td>0.6419</td>
<td>$ 10,014</td>
</tr>
<tr>
<td>Present Worth of Rehabilitation Activity 3</td>
<td>$ 473,204</td>
<td>0.5537</td>
<td>$ 261,965</td>
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<tr>
<td>Present Worth of Rehabilitation Activity 4</td>
<td>$ 269,630</td>
<td>0.4776</td>
<td>$ 128,775</td>
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<tr>
<td>Present Worth of Rehabilitation Activity 5</td>
<td>$ 2385,646</td>
<td>0.4120</td>
<td>$ 1,005,286</td>
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<tr>
<td>Present Worth of Rehabilitation Activity 6</td>
<td>$ 475,598</td>
<td>0.3554</td>
<td>$ 151,258</td>
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<tr>
<td>Present Worth of Rehabilitation Activity 7</td>
<td>$ 521,530</td>
<td>0.3066</td>
<td>$ 159,832</td>
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</tbody>
</table>

Total Life Cycle Cost (Present Worth) $ 12,517,493

Annual Cost Per Mile Calculation

\[
\text{Annual Cost/Year-Mile} = \frac{\text{Total pw} \times \text{CRF}}{\text{Length}}
\]

\[
(\$ 12,517,493 \times 0.04074 \text{\$/mi.}) = \$ 516,314 \text{\$/Yr.-Mi.}
\]
**FLEXIBLE PAVEMENT**

**Date:** November 10, 2014

**FAP Route:** 330

**Section:** 0105-W85-1

**County:** COOK

**Net Length:** 16,219 Lin. Ft. 8.07 Miles

**Number Lanes:** 6 Urban

**Single Lane Paving:** X Dual Lane Paving

### ITEMIZED CONSTRUCTION COST

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Unit</th>
<th>Item</th>
<th>Unit Cost</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>127,752</td>
<td>Sq. Yds.</td>
<td>2&quot; SMA Surface Course</td>
<td>@ $ 10.65</td>
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<tr>
<td>127,752</td>
<td>Sq. Yds.</td>
<td>2&quot; SMA Binder Course</td>
<td>@ $ 9.52</td>
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</tr>
<tr>
<td>78,084</td>
<td>Sq. Yds.</td>
<td>14.5&quot; Inch Stabilized Shoulders</td>
<td>@ $ 40.44</td>
<td>$ 3,115,077</td>
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<td></td>
<td>Lin. Ft.</td>
<td>Pipe Underdrains</td>
<td>@ $</td>
<td></td>
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<tr>
<td></td>
<td>Lin. Ft.</td>
<td>Subbase Gran. Matl., Type C</td>
<td>@ $</td>
<td></td>
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<tr>
<td>127,752</td>
<td>Lin. Ft.</td>
<td>10.5&quot; H70 Binder Course</td>
<td>@ $ 38.22</td>
<td>$ 5,766,179</td>
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</table>

Total Cost of Original Pavement Construction $ 16,988,701

### ITEMIZED MAINTENANCE AND REHABILITATION ACTIVITY COST

**REHABILITATION ACTIVITY 1 - YEAR 5**

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Unit</th>
<th>Item</th>
<th>Unit Cost</th>
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<tbody>
<tr>
<td>51,273</td>
<td>Lin. Ft.</td>
<td>50% Thermal Crack Routing &amp; Sealing</td>
<td>@ $ 2</td>
<td>$ 109,046</td>
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<tr>
<td>64,876</td>
<td>Lin. Ft.</td>
<td>100% Longitudinal Shoulder Joint Routing &amp; Sealing</td>
<td>@ $ 2</td>
<td>$ 129,752</td>
</tr>
<tr>
<td>64,876</td>
<td>Lin. Ft.</td>
<td>100% Centerline Joint Routing &amp; Sealing</td>
<td>@ $ 2</td>
<td>$ 129,752</td>
</tr>
<tr>
<td>130</td>
<td>Sq. Yds.</td>
<td>0.1% Pavement Patching</td>
<td>@ $ 38</td>
<td>$ 4,940</td>
</tr>
</tbody>
</table>

Total Cost of Rehabilitation Activity 1 $ 371,490

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**FIGURE 5.05b(1)**

40
Rehabilitation Activity 2 - Year 10

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
<th>Rate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5% Perforated-Depth HMA Pavement Patching</td>
<td>679 Sq. Yds</td>
<td>$38</td>
<td>$24,662</td>
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<tr>
<td>Random</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50% Thermal Crack Routing &amp; Sealing (Assume 110 ft/station)</td>
<td>53,823 Lin. Ft</td>
<td>$2</td>
<td>$107,646</td>
</tr>
<tr>
<td>100% Longitudinal Shoulder Joint Routing &amp; Sealing</td>
<td>64,876 Lin. Ft</td>
<td>$2</td>
<td>$129,752</td>
</tr>
<tr>
<td>100% Centerline Joint Routing &amp; Sealing</td>
<td>64,876 Lin. Ft</td>
<td>$2</td>
<td>$129,752</td>
</tr>
</tbody>
</table>

Total Cost of Rehabilitation Activity 2 $391,212

Rehabilitation Activity 3 - Year 15

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
<th>Rate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.00 in. Milling - Pavement &amp; Shoulder</td>
<td>201,936 Sq. Yds</td>
<td>$2</td>
<td>$454,131</td>
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<tr>
<td>1.0% Partial-Depth Pavement Patching (Mill &amp; Fill Additional 2.00 in.)</td>
<td>1498 Sq. Yds</td>
<td>$30</td>
<td>$49,324</td>
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<tr>
<td>2.00 in. HMA Overlay Pavement &amp; Shoulder</td>
<td>22,806 Tons</td>
<td>$74</td>
<td>$1,673,844</td>
</tr>
</tbody>
</table>

Total Cost of Rehabilitation Activity 3 $1,673,844

Figure 5.05d(2)
REHABILITATION ACTIVITY 4 - YEAR 20

64,876 Lin. Ft. 100% Longitudinal Shoulder Joint Routing and Sealing
0 $ 2 = $ 129,752

64,876 Lin. Ft. 100% Centerline Joint Routing & Sealing
0 $ 2 = $ 129,752

53,523 Lin. Ft. 50% Thermal Crack Routing & Sealing
(assume 110 ft/station)
0 $ 2 = $ 107,046

130 Sq. Yds. 0.1% Partial-Depth HMA Pavement Patching (mill & fill surface)
0 $ 30 = $ 4,940
Total Cost of Rehabilitation Activity 4 $ 341,478

REHABILITATION ACTIVITY 5 - YEAR 25

64,876 Lin. Ft. 100% Longitudinal Shoulder Joint Routing and Sealing
0 $ 2 = $ 129,752

64,876 Lin. Ft. 100% Centerline Joint Routing & Sealing
0 $ 2 = $ 129,752

53,523 Lin. Ft. 50% Thermal Crack Routing & Sealing
(assume 110 ft/station)
0 $ 2 = $ 107,046

549 Sq. Yds. 0.50% Partial-Depth Pavement Patching (mill & fill surface)
0 $ 30 = $ 38,712
Total Cost of Rehabilitation Activity 5 $ 186,843

REHABILITATION ACTIVITY 6 - YEAR 30

129,752 Sq. Yds. 2.00 in. Milling (Pavement Only - Standard Design; 0 $ 2 = $ 249,312
Pavement & Shoulder - Limiting Strain Criterion Design)

2,595 Sq. Yds. 2.00% Partial-Depth HMA Pavement
Patching (mill & fill additional 2.00 in. All Design)
0 $ 30 = $ 78,610

721 Sq. Yds. 1.00% Full-Depth HMA Shoulder Patching
(mill & fill surface - standard design
(mill & fill additional 2.00 in. - limiting strain criterion design)
0 3 50 = $ 38,050

27,298 Tons HMA Overlay (3.75 in. - standard design
2.00 in. - limiting strain criterion design) 0 $ 74 = $ 2,016,352

7,064 Tons HMA Overlay - Shoulder (1.75 in. - standard design; 2.00 in. - limiting strain criterion design)
0 $ 74 = $ 522,736

Total Cost of Rehabilitation Activity 6 $ 2,765,690

FIGURE 5.05b(3)
REHABILITATION ACTIVITY 7 - YEAR 35

<table>
<thead>
<tr>
<th>Description</th>
<th>Units</th>
<th>Rate ($/unit)</th>
<th>Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100% Longitudinal Shoulder Joint Routing and Sealing</td>
<td>64,876</td>
<td>$2</td>
<td>129,752</td>
</tr>
<tr>
<td>100% Centerline Joint Routing &amp; Sealing</td>
<td>64,876</td>
<td>$2</td>
<td>129,752</td>
</tr>
<tr>
<td>50% Thermal Crack Routing &amp; Sealing Random/Assume 110 ft/Station</td>
<td>53,523</td>
<td>$2</td>
<td>107,046</td>
</tr>
<tr>
<td>0.10% Partial-Depth Pavement Patching Mill &amp; Fill Surface</td>
<td>130</td>
<td>$28</td>
<td>4,940</td>
</tr>
<tr>
<td><strong>Total Cost of Rehabilitation Activity 7</strong></td>
<td></td>
<td><strong>371,490</strong></td>
<td></td>
</tr>
</tbody>
</table>

REHABILITATION ACTIVITY 8 - YEAR 40

<table>
<thead>
<tr>
<th>Description</th>
<th>Units</th>
<th>Rate ($/unit)</th>
<th>Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100% Longitudinal Shoulder Joint Routing and Sealing</td>
<td>64,876</td>
<td>$2</td>
<td>129,752</td>
</tr>
<tr>
<td>100% Centerline Joint Routing &amp; Sealing</td>
<td>64,876</td>
<td>$2</td>
<td>129,752</td>
</tr>
<tr>
<td>50% Thermal Crack Routing &amp; Sealing Random/</td>
<td>53,523</td>
<td>$2</td>
<td>107,046</td>
</tr>
<tr>
<td>Single lane and dual lane paving</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.50% Partial-Depth Pavement Patching Mill &amp; Fill Surface</td>
<td>49</td>
<td>$28</td>
<td>24,662</td>
</tr>
<tr>
<td><strong>Total Cost of Rehabilitation Activity 8</strong></td>
<td></td>
<td><strong>291,212</strong></td>
<td></td>
</tr>
</tbody>
</table>
ANNUAL COST DETERMINATION

Present Worth Calculation:

<table>
<thead>
<tr>
<th>Present Worth of Rehabilitation Activity</th>
<th>Present Worth</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$ 374,476 X 0.8426 = $ 320,447</td>
</tr>
<tr>
<td>2</td>
<td>$ 311,212 X 0.7441 = $ 231,101</td>
</tr>
<tr>
<td>3</td>
<td>$ 276,639 X 0.6419 = $ 179,666</td>
</tr>
<tr>
<td>4</td>
<td>$ 257,140 X 0.5557 = $ 143,674</td>
</tr>
<tr>
<td>5</td>
<td>$ 381,217 X 0.4776 = $ 183,947</td>
</tr>
<tr>
<td>6</td>
<td>$ 265,590 X 0.4120 = $ 108,684</td>
</tr>
<tr>
<td>7</td>
<td>$ 371,170 X 0.3554 = $ 132,028</td>
</tr>
<tr>
<td>8</td>
<td>$ 311,212 X 0.3046 = $ 94,946</td>
</tr>
</tbody>
</table>

Total Cost of Original Pavement Construction $ 11,864,672

Total Life Cycle Cost (Present Worth) $ 14,363,590

Annual Cost Per Mile Calculation

\[
\text{Annual Cost/Year-Mile} = \frac{\text{Present Worth Total Cost} \times \text{CRF}_n/\text{Length}}{\text{Length (Mi.)}}
\]

\[
\frac{199,844 - 166,714}{166,714} = 0.145
\]

Favors PCC by 14.5%