



Illinois Department of Transportation

To: Diane M. O'Keefe Attn: District One
From: Scott E. Stitt *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.



Illinois Department of Transportation

Memorandum

To: Scott Stitt

Attn: Paul R. Niedernhofer

From: Diane O'Keefe

By: Jose Dominguez

Subject: Pavement Analysis*

Date: November 14, 2011

RECEIVED

NOV 17 2011

BUREAU OF
DESIGN & ENVIRONMENT

Route: FAP 330

Section: 0105-WRS-1 &
0105-WRS

*Location: Mannheim IL-19 to IL-72

County: Cook

Contract No.: 60G37/60P35

Job No.: D-31-399-09 &

Letting: 06CY12

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.

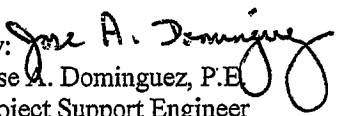
12" Aggregate Subgrade

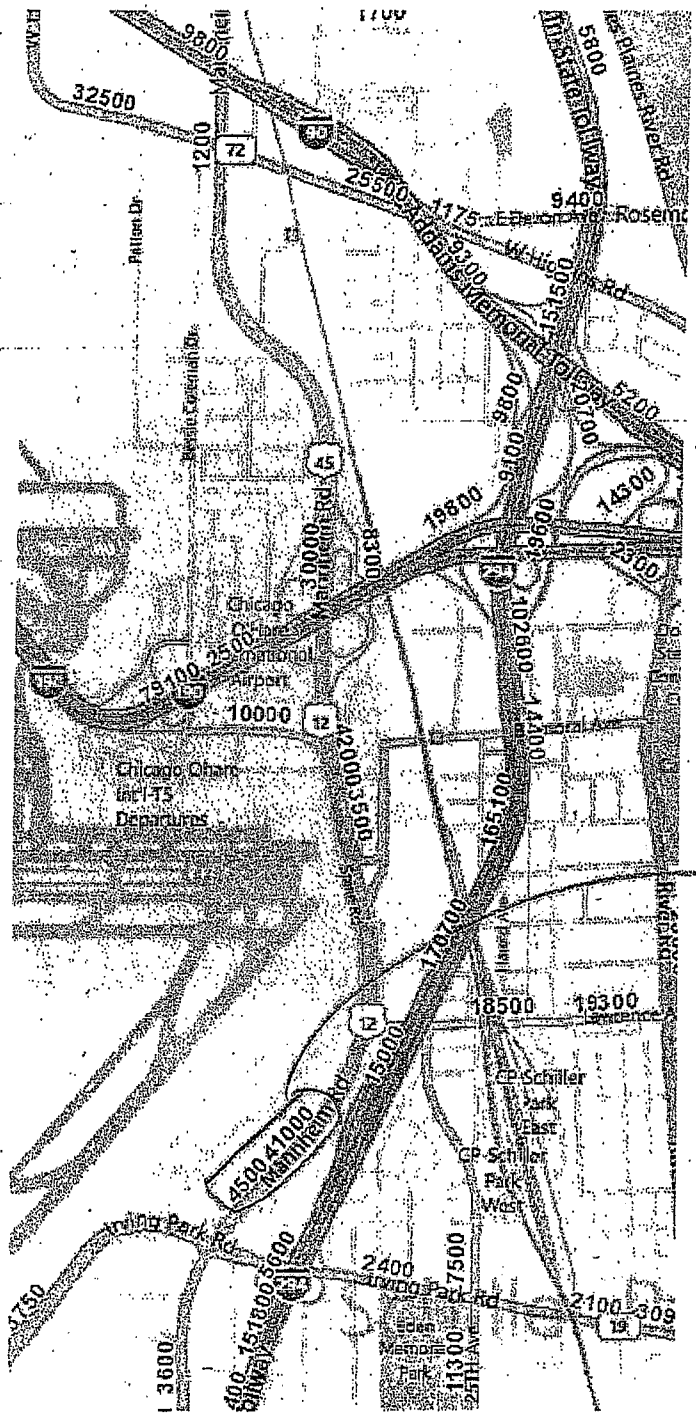
Geotechnical Fabric

*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: 
Jose A. Dominguez, P.E.
Project Support Engineer



Year = 2009
 ADT = 41000
 TRUCK = 4500
 MU = 1600 = 3.9%
 SU = 2900 = 7.1%



Comp. by: _____ Date: _____ Sheet _____ of _____

Chkd. by: _____ Date: _____ Job No. _____

Project: MANNHEIM ROAD FROM IRVING PARK TO HIGGINS

Element: TRAFFIC FACTOR CALCULATIONS - REVISED

	ADT	YEAR
CURRENT	41000	2009
FUTURE	86900	2030

CONSTRUCTION YEAR: 2012
DESIGN YEAR: 2027 (30 YEARS)

	MIN ADT	ACTUAL ADT	ACT % TOTAL	% ADT IN DESIGN LANE
# LANES = 6	PV = 0	71505	89%	8%
OTHER MARKED STATE ROUTE	SU = 250	5704	7.1%	37%
URBAN	MV = 750	3133	3.9%	37%

RIGID

$$TF = DP \left[\frac{(0.15 \cdot P \cdot PV) + (143.81 \cdot S \cdot SU) + (696.42 \cdot M \cdot MV)}{1 \times 10^6} \right]$$

$$= 30 \left[\frac{(0.15 \cdot .08 \cdot 71,505) + (143.81 \cdot 0.37 \cdot 5,704) + (696.42 \cdot 0.37 \cdot 3,133)}{1 \times 10^6} \right]$$

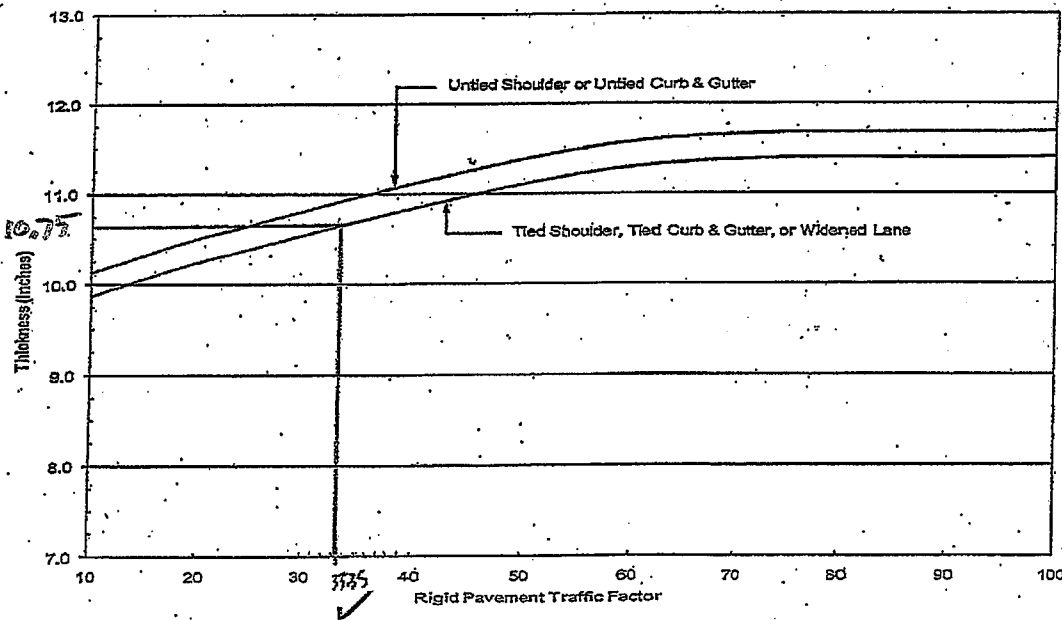
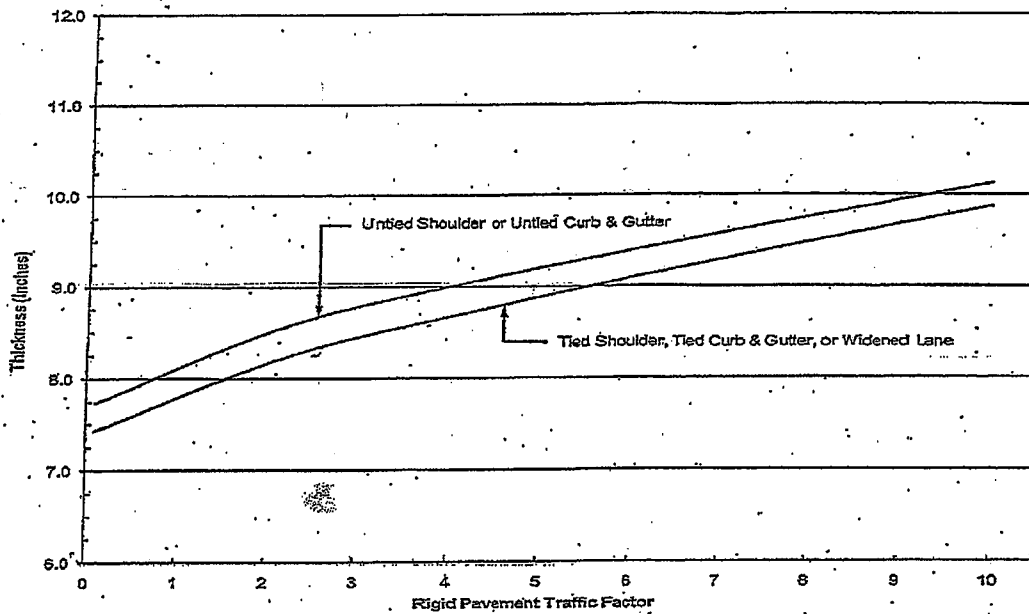
33.35 ✓

FLEXIBLE

$$TF = DP \left[\frac{(0.15 \cdot P \cdot PV) + (132.56 \cdot S \cdot SU) + (482.53 \cdot M \cdot MV)}{1 \times 10^6} \right]$$

$$= 30 \left[\frac{(0.15 \cdot .08 \cdot 71,505) + (132.56 \cdot 0.37 \cdot 5,704) + (482.53 \cdot 0.37 \cdot 3,133)}{1 \times 10^6} \right]$$

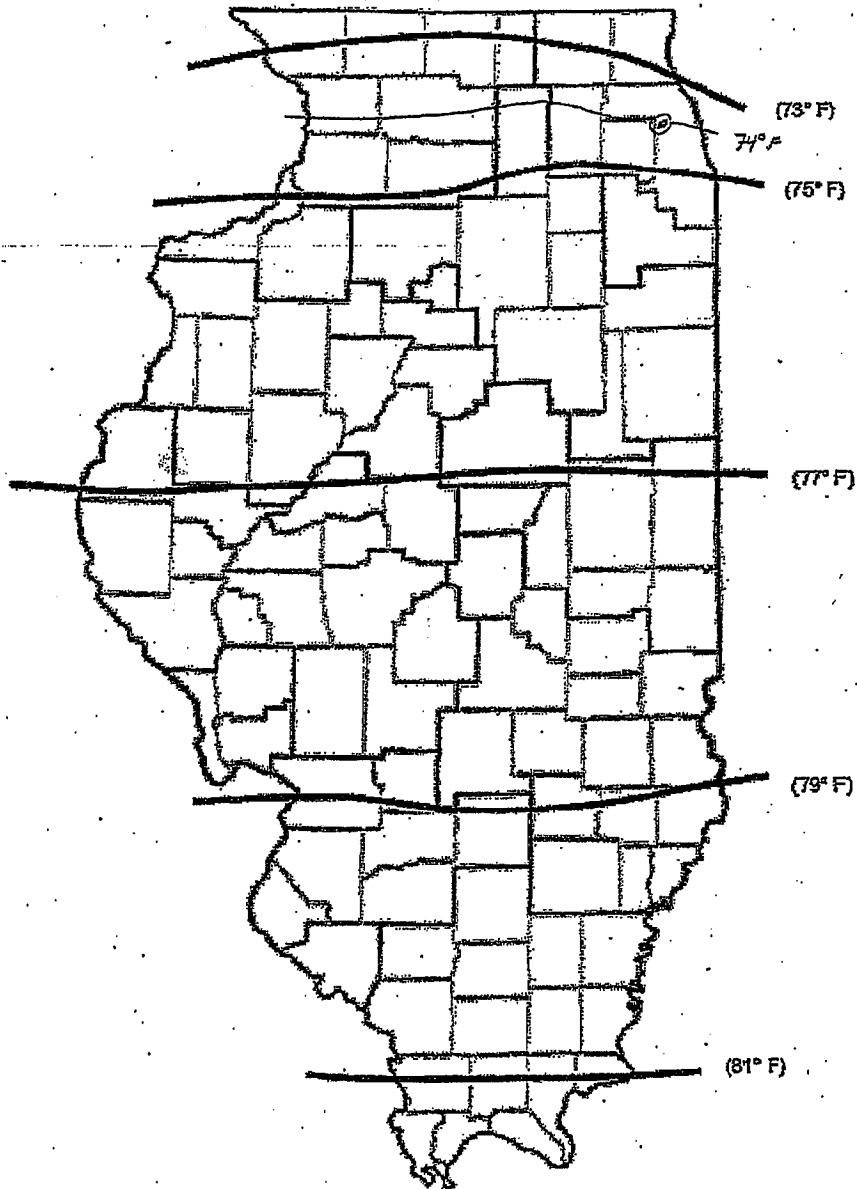
25.20 ✓



Note: Use of untied shoulder design requires BDE approval.

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

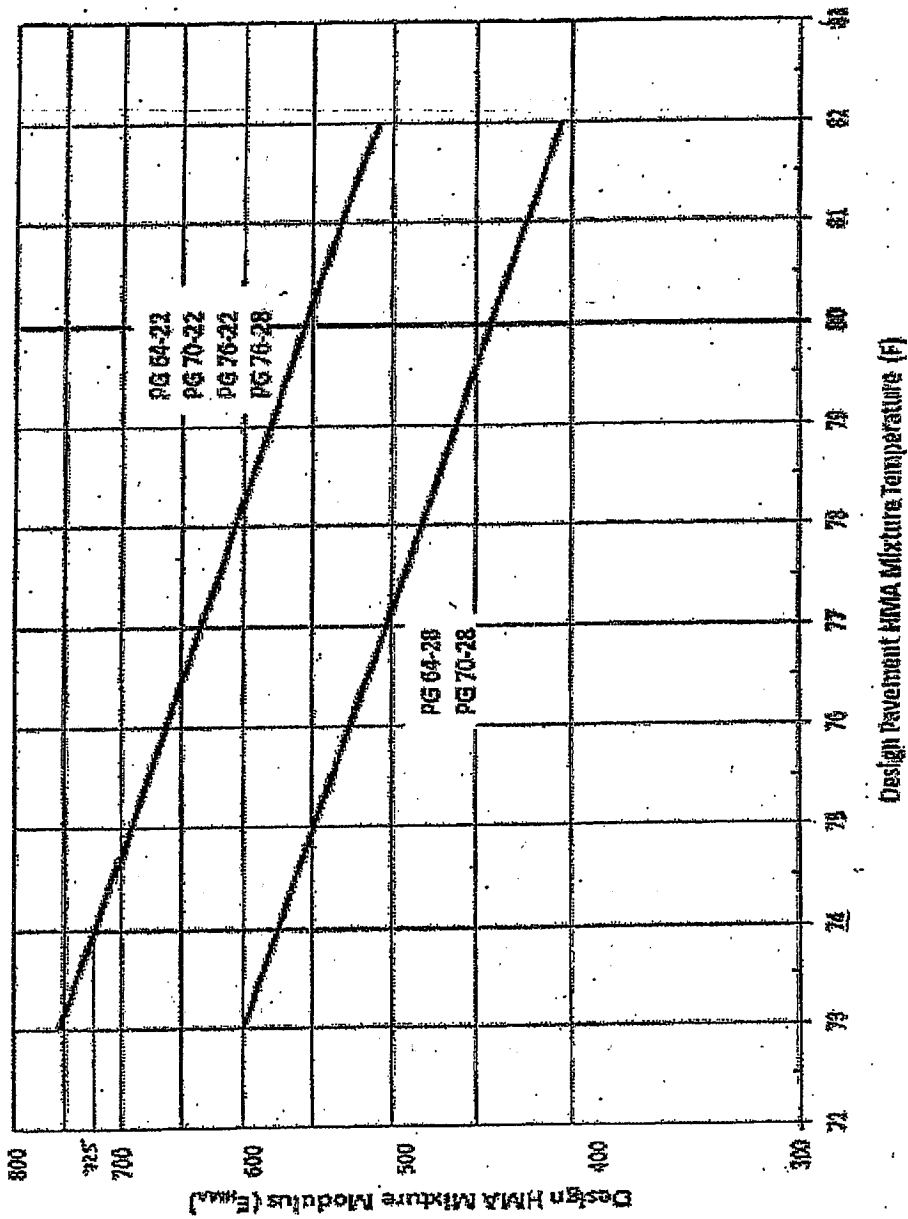
Figure 54-4.E



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

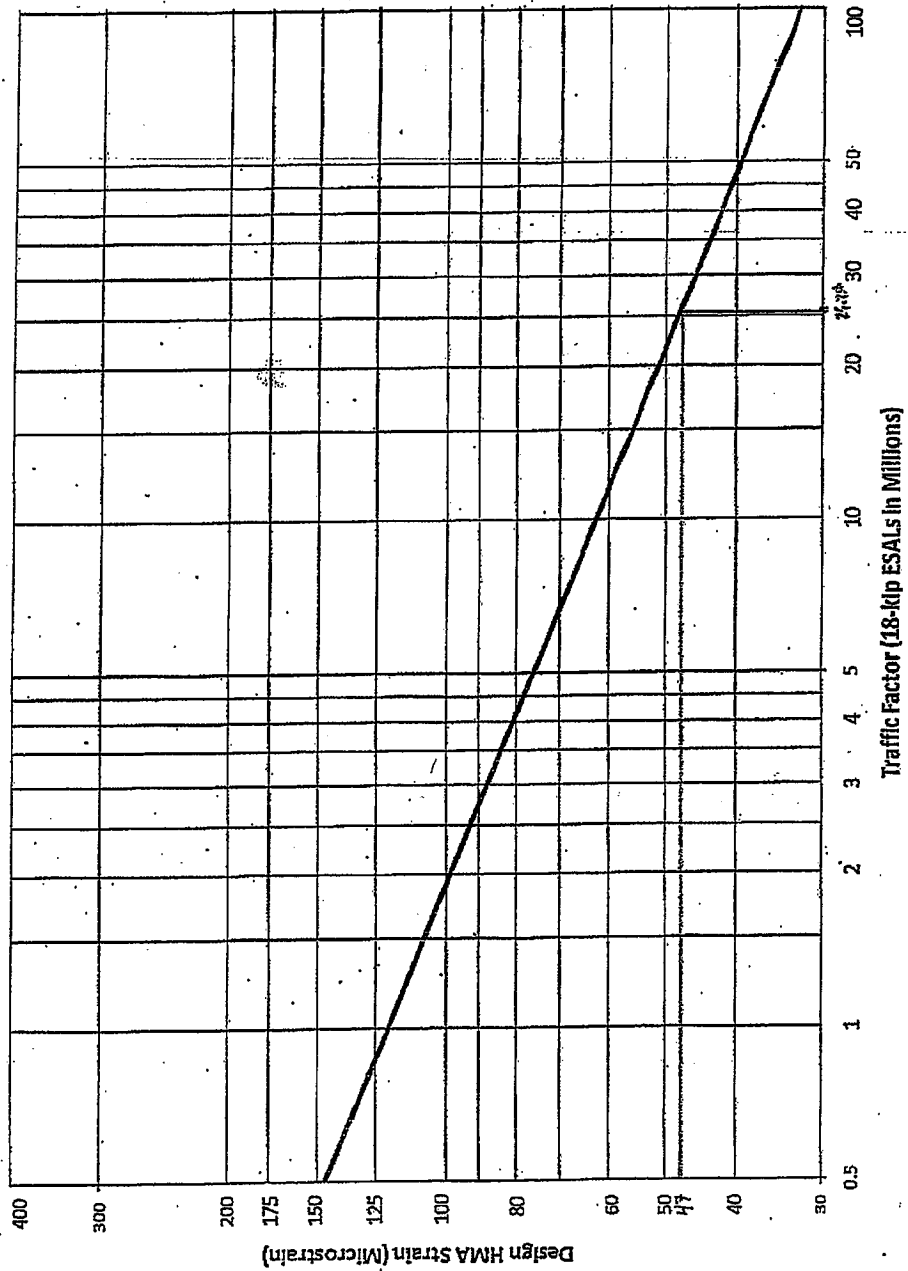
**HMA MIXTURE TEMPERATURE
(Mechanistic Design: Flexible Pavement)**

Figure 54-5.C



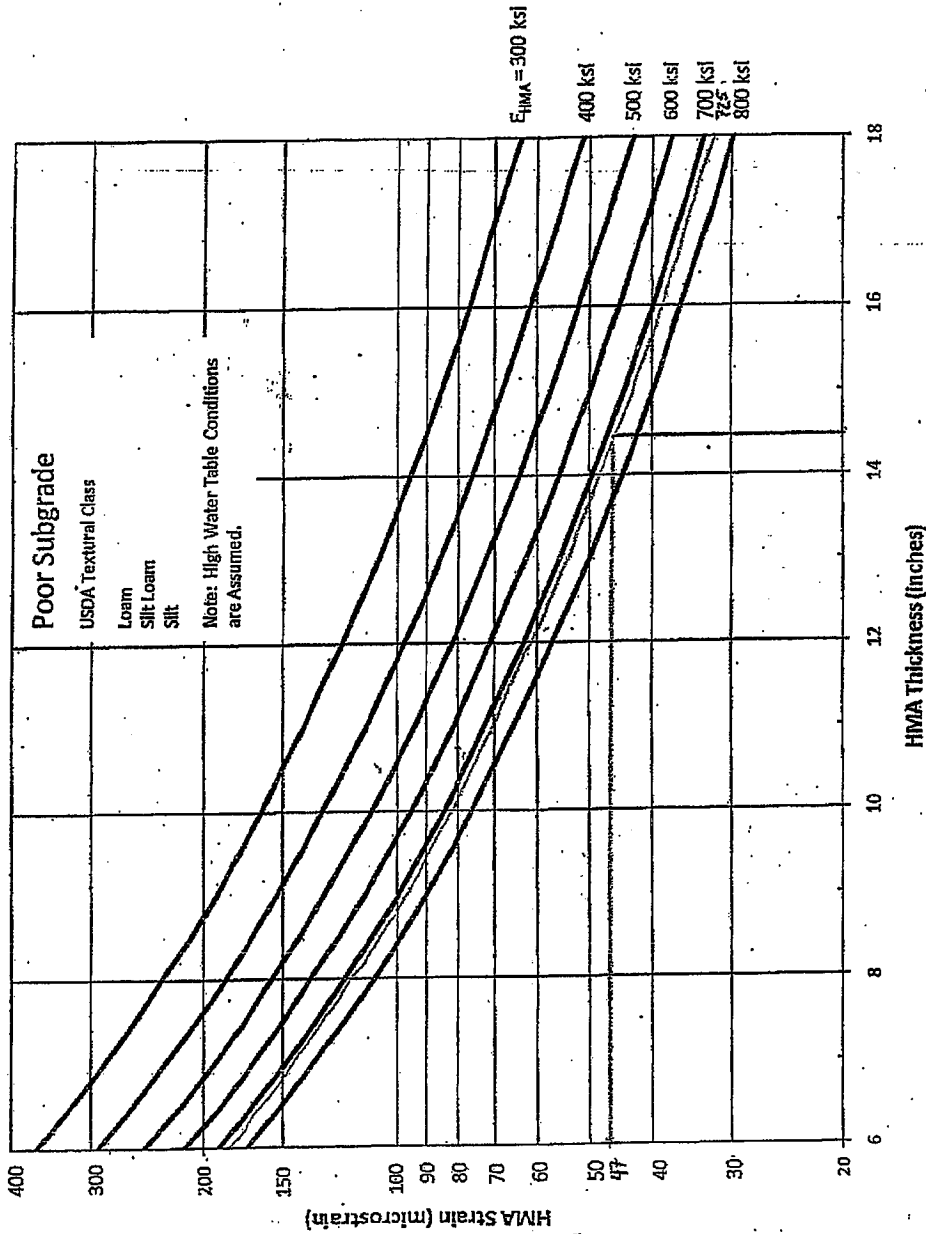
HMA MIXTURE MODULUS (E_{HMA})
(Mechanistic Design: Flexible Pavement)

Figure 54-5.D



DESIGN HMA STRAIN
(Mechanistic Design: Flexible Pavement)

Figure 54-5.E



HMA THICKNESS DESIGN CHART
(Mechanistic-Design: Flexible Pavement: SSR = Poor)

Figure 54-5.F

✓ 1 1/2" Full Depth HMA

REVISED

Revised July 1, 1991

MECHANISTIC PAVEMENT DESIGN

Date JANUARY 4, 2012

FAP Route 330

Calculations by: TMC

Section 010S-WRS-1

Checked by: _____

COOK County

Class I Roads and Streets

Location MANNHEIM - IL19 TO IL72

Urban X Rural _____

Limits of Analysis

Station 28+00 to Station 196+15

Length 16,219 Feet 307 Miles

Structural Design Traffic

Percent of S.D.T. in Design Lane

PV = 71,503

P = 8 %

SU = 5,704

S = 37 %

MU = 3,133

U = 37 %

MINIMUM SUBGRADE SUPPORT RATING - "POOR"

Flexible Pavement Design Actual TF_F = 27.28 Minimum TF_F = 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 TF_R = 36.09 Minimum TF_R = 8.04

Extended Lane 10.75 Inch

15' Panel PCC Thickness for: Tied Shoulder 10.75 Inch

Untied Shoulder — Inch

Figure 5.05

Revised July 1, 1991

Sheet 1 of 5

RIGID PAVEMENT

Date: NOVEMBER 10, 2011

FAP Route 330

Quantities by: TMC Checked by: _____

Section 0105-423-1

Unit Prices by: _____ Checked by: _____

COOK County

Net Length 16219 Lin. Ft. 3.07 Miles

Number Lanes 6 Urban X Rural _____

ITEMIZED CONSTRUCTION COST

Quantity	Unit	Item	Unit Cost	Total Cost
<u>127752</u>	Sq. Yds.	<u>10.75</u> -Inch Jointed PCC	@ \$ <u>43.66</u>	= \$ <u>5,664,972</u>
<u>146565</u>	Sq. Yds.	<u>4.5"</u> <u>4</u> -Inch (Stabilized/Granular Subbase)	@ \$ <u>15.00</u>	= \$ <u>2,198,475</u>
<u>72084</u>	Sq. Yds.	<u>10.75</u> -Inch PCC Shoulders	@ \$ <u>40.00</u>	= \$ <u>2,883,360</u>
<u>-</u>	Lin. Ft.	Pipe Underdrains	@ \$ <u>-</u>	= \$ <u>-</u>
<u>-</u>		Subbase Gran. Mat., Type C	@ \$ <u>-</u>	= \$ <u>-</u>
<u>64876</u>	Lin. Ft.	100% Shoulder Joint Seal	@ \$ <u>2.00</u>	= \$ <u>129,752</u>
			@ \$ _____	= \$ _____
			@ \$ _____	= \$ _____

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

ITEMIZED MAINTENANCE AND REHABILITATION ACTIVITY COST

REHABILITATION ACTIVITY 1 - YEAR 10

130 Sq. Yds. 0.1% Full-Depth PCC Pavement Patching @ \$ 60 = \$ 7800

Total Cost of Rehabilitation Activity 1 \$ 7800

Revised July 1, 1991
Sheet 2 of 5
RIGID PAVEMENT (Cont.)

FAP Route 330

Section 0103-WR 3-1

COOK County

REHABILITATION ACTIVITY 2 - YEAR 15

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

Total Cost of Rehabilitation Activity 2 \$ 15,600

REHABILITATION ACTIVITY 3 - YEAR 20

2,575 Sq. Yds. 2% Full-Depth PCC Pavement Patching @ \$ 60 = \$ 155,700

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

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

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

Total Cost of Rehabilitation Activity 3 \$ 433,204

FIGURE 5.05a(2)

RIGID PAVEMENT (Cont.)
FAP Route 330
Section 0105-WRS-1
COOK County

REHABILITATION ACTIVITY 4 - YEAR 25

<u>3,893</u> Sq. Yds.	3.0% Full-Depth PCC Pavement Patching	@ \$ <u>60</u>	= \$ <u>233,580</u>
<u>721</u> Sq. Yds.	1.0% Full-Depth PCC Shoulder Patching	@ \$ <u>50</u>	= \$ <u>36,050</u>
Total Cost of Rehabilitation Activity 4			\$ <u>269,630</u>

REHABILITATION ACTIVITY 5 - YEAR 30

<u>5,190</u> Sq. Yds.	4.0% Full-Depth PCC Pavement Patching	@ \$ <u>60</u>	= \$ <u>311,400</u>
<u>1,081</u> Sq. Yds.	1.5% Full-Depth PCC Shoulder Patching	@ \$ <u>50</u>	= \$ <u>54,050</u>
<u>129,752</u> Sq. Yds.	Policy HMA Overlay - Pavement	@ \$ <u>11</u>	= \$ <u>1,427,272</u>
<u>72,084</u> Sq. Yds.	Policy HMA Overlay - Shoulder	@ \$ <u>11</u>	= \$ <u>792,924</u>
Total Cost of Rehabilitation Activity 5			\$ <u>2,585,646</u>

REHABILITATION ACTIVITY 6 - YEAR 35

<u>64,876</u> Lin. Ft.	100% Longitudinal Shoulder Joint Routing & Sealing	@ \$ <u>2</u>	= \$ <u>129,752</u>
<u>64,876</u> Lin. Ft.	100% Centerline Joint Routing & Sealing	@ \$ <u>2</u>	= \$ <u>129,752</u>
<u>48,657</u> Lin. Ft.	50% Random Crack Routing and Sealing - Assume 100 ft/Station	@ \$ <u>2</u>	= \$ <u>97,314</u>
<u>31,140</u> Lin. Ft.	40% Reflective Transverse Crack Routing & Sealing	@ \$ <u>2</u>	= \$ <u>62,280</u>
<u>130</u> Sq. Yds.	0.1% Partial-Depth Pavement Patching <small>(Mill & Fill Surface - Interstates; Mill & Fill 2.5 in. - Non-Interstates)</small>	@ \$ <u>50</u>	= \$ <u>6,500</u>
Total Cost of Rehabilitation Activity 6			\$ <u>425,598</u>

Revised July 1, 1991
Sheet 4 of 5

RIGID PAVEMENT (Cont.)

FAP Route 330

Section 0105-W25-1

COOK County

REHABILITATION ACTIVITY 7 - YEAR 40

<u>649</u>	Sq. Yds.	0.5% Full-Depth PCC Pavement Patching	@ \$ <u>60</u>	= \$ <u>38,940</u>
<u>649</u>	Sq. Yds.	0.5% Partial-Depth Pavement Patching (Mill & Fill Surface - Interstates; Mill & Fill 2.5 in. Non-Interstates)	@ \$ <u>50</u>	= \$ <u>32,450</u>
<u>46,711</u>	Lin. Ft.	60% Reflective Transverse Crack Routing and Sealing	@ \$ <u>2</u>	= \$ <u>93,422</u>
<u>40,657</u>	Lin. Ft.	50% Random Crack Routing & Sealing - Assume 100ft/Station	@ \$ <u>2</u>	= \$ <u>97,314</u>
<u>64,876</u>	Lin. Ft.	100% Longitudinal/Shoulder Joint Routing & Sealing	@ \$ <u>2</u>	= \$ <u>129,752</u>
<u>64,876</u>	Lin. Ft.	100% Centerline Joint Routing & Sealing	@ \$ <u>2</u>	= \$ <u>129,752</u>
Total Cost of Rehabilitation Activity 7				\$ <u>521,630</u>

Revised July 1, 1991
Sheet 5 of 5

RIGID PAVEMENT (Cont.)

FAP Route 380
Section 0105-WRS-1
COOK County

ANNUAL COST DETERMINATION

Present Worth Calculation:

	Total Cost of Original Pavement Construction	\$	<u>10,726,559</u>
Present Worth of Rehabilitation Activity 1	\$ <u>7800</u>	X 0.7441 =	\$ <u>5804</u>
Present Worth of Rehabilitation Activity 2	\$ <u>15,000</u>	X 0.6419 =	\$ <u>10,014</u>
Present Worth of Rehabilitation Activity 3	\$ <u>433,204</u>	X 0.5537 =	\$ <u>239,865</u>
Present Worth of Rehabilitation Activity 4	\$ <u>269,630</u>	X 0.4776 =	\$ <u>128,775</u>
Present Worth of Rehabilitation Activity 5	\$ <u>2,585,646</u>	X 0.4120 =	\$ <u>1,065,286</u>
Present Worth of Rehabilitation Activity 6	\$ <u>425,598</u>	X 0.3554 =	\$ <u>151,258</u>
Present Worth of Rehabilitation Activity 7	\$ <u>521,630</u>	X 0.3066 =	\$ <u>159,932</u>

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

Annual Cost Per Mile Calculation

$$\begin{aligned} \text{Total pw} \times \text{CRF}_n / \text{Length} &= \text{Annual Cost/Year-Mile} \\ (\$ \underline{12,517,493} \times 0.04679 / \underline{3.07} \text{ Mi.}) &= \$ \underline{166,714} \text{ /Yr.-Mi.} \end{aligned}$$

FLEXIBLE PAVEMENT

Date: NOVEMBER 10, 2011

FAP Route 350

Quantities by: TMC Checked by: _____

Section 0105-NRS-1

Unit Prices by: _____ Checked by: _____

COOK County

Net Length 16,219 Lin. Ft. 3.07 Miles

Number Lanes 6 Urban X Rural _____

Single Lane Paving X Dual Lane Paving _____

ITEMIZED CONSTRUCTION COST

Quantity	Unit	Item	Unit Cost	Total Cost
<u>129,752</u>	Sq. Yds.	2" Class I Surface Course <i>SMA SURFACE COURSE</i>	@ \$ <u>10.63</u>	= \$ _____
<u>129,752</u>	Sq. Yds.	2" Class I Binder Course <i>SMA BINDER COURSE</i>	@ \$ <u>9.52</u>	= \$ _____
<u>72,084</u>	Sq. Yds.	<u>14.5"</u> -Inch Stabilized Shoulders	@ \$ <u>40.44</u>	= \$ <u>2,915,077</u>
_____	Lin. Ft.	Pipe Underdrains	@ \$ _____	= \$ _____
_____	_____	Subbase Gran. Matl., Type C	@ \$ _____	= \$ _____
<u>129,752</u>	_____	<u>10.5"</u> <i>A90 BINDER COURSE</i>	@ \$ <u>38.22</u>	= \$ <u>5,766,179</u>
_____	_____	_____	@ \$ _____	= \$ _____
Total Cost of Original Pavement Construction				\$ <u>10,488,701</u>

ITEMIZED MAINTENANCE AND REHABILITATION ACTIVITY COST

REHABILITATION ACTIVITY 1 - YEAR 5

<u>53,523</u>	Lin. Ft.	^{Random/} 50% Thermal Crack Routing & Sealing (Assume 110ft/station)	@ \$ <u>2</u>	= \$ <u>107,046</u>
<u>64,876</u>	Lin. Ft.	100% Longitudinal Shoulder Joint Routing & Sealing	@ \$ <u>2</u>	= \$ <u>129,752</u>
<u>64,876</u>	Lin. Ft.	100% Centerline Joint Routing & Sealing	@ \$ <u>2</u>	= \$ <u>129,752</u>
<u>130</u>	Sq. Yds.	0.1% Partial-Depth Pavement Patching - Mill & Fill Surface	@ \$ <u>38</u>	= \$ <u>4,940</u>
Total Cost of Rehabilitation Activity 1				\$ <u>371,490</u>

Revised July 1, 1991
Sheet 2 of 5

FLEXIBLE PAVEMENT (Cont.)

FAP Route 330
Section 0105-WRS-1
Coor _____ County _____

REHABILITATION ACTIVITY 2 - YEAR 10

<u>649</u> Sq. Yds.	0.5% Partial-Depth HMA Pavement Patching - Mill & Fill Surface	@ \$ <u>38</u>	= \$ <u>24,662</u>
<u>53,523</u> Lin. Ft.	50% ^{Random} Thermal Crack Routing & Sealing (Assume 110 Ft/Station)	@ \$ <u>2</u>	= \$ <u>107,046</u>
<u>64,876</u> Lin. Ft.	100% Longitudinal Shoulder Joint Routing & Sealing	@ \$ <u>2</u>	= \$ <u>129,752</u>
<u>64,876</u> Lin. Ft.	100% Centerline Joint Routing & Sealing	@ \$ <u>2</u>	= \$ <u>129,752</u>
Total Cost of Rehabilitation Activity 2 \$			<u>391,212</u>

REHABILITATION ACTIVITY 3 - YEAR 15

<u>201,836</u> Sq. Yds.	2.00 in. Milling - Pavement & Shoulder	@ \$ <u>2</u>	= \$ <u>454,131</u>
<u>1,298</u> Sq. Yds.	1.0% Partial-Depth Pavement Patching (Mill & Fill Additional 2.00 in.)	@ \$ <u>38</u>	= \$ <u>49,324</u>
<u>22,606</u> Tons	2.00 in. HMA Overlay Pavement & Shoulder	@ \$ <u>74</u>	= \$ <u>1,672,844</u>
Total Cost of Rehabilitation Activity 3 \$			<u>2,176,299</u>

FAP Route 330
 Section 0105-WRS-1
COOK County

REHABILITATION ACTIVITY 4 - YEAR 20

<u>64,876</u>	Lin. Ft.	100% Longitudinal Shoulder Joint Routing and Sealing	@ \$	<u>2</u>	= \$	<u>129,752</u>
<u>64,876</u>	Lin. Ft.	100% Centerline Joint Routing & Sealing	@ \$	<u>2</u>	= \$	<u>129,752</u>
<u>53,523</u>	Lin. Ft.	50% ^{Random/} Thermal Crack Routing & Sealing (Assume 110 ft/Station)	@ \$	<u>2</u>	= \$	<u>107,046</u>
<u>130</u>	Sq. Yds.	0.1% Partial-Depth HMA Pavement Patching (Mill & Fill Surface)	@ \$	<u>38</u>	= \$	<u>4,940</u>
						Total Cost of Rehabilitation Activity 4 \$ <u>371,490</u>

REHABILITATION ACTIVITY 5 - YEAR 25

<u>64,876</u>	Lin. Ft.	100% Longitudinal Shoulder Joint Routing and Sealing	@ \$	<u>2</u>	= \$	<u>129,752</u>
<u>64,876</u>	Lin. Ft.	100% Centerline Joint Routing & Sealing	@ \$	<u>2</u>	= \$	<u>129,752</u>
<u>53,523</u>	Lin. Ft.	50% ^{Random/} Thermal Crack Routing & Sealing (Assume 110 ft/Station)	@ \$	<u>2</u>	= \$	<u>107,046</u>
<u>649</u>	Lin. Ft. Sq. Yds.	0.50% Partial-Depth Pavement Patching (Mill & Fill Surface)	@ \$	<u>38</u>	= \$	<u>391,212</u>
						Total Cost of Rehabilitation Activity 5 \$ <u>186,843</u>

REHABILITATION ACTIVITY 6 - YEAR 30

<u>129,752</u>	Sq. Yds.	2.00 in. Milling (Pavement Only - Standard Design Pavement & Shoulder - Limiting Strain Criterion Design)	@ \$	<u>2</u>	= \$	<u>291,942</u>
<u>2,595</u>	Sq. Yds.	2.0% Partial-Depth HMA Pavement Patching (mill & Fill Additional 2.00 in. All Designs)	@ \$	<u>38</u>	= \$	<u>98,610</u>
<u>721</u>	Sq. Yds.	1.0% Full-Depth HMA Shoulder Patching (Mill & Fill Surface - Standard Design (Mill & Fill Additional 2.00 in. - Limiting Strain Criterion Design))	@ \$	<u>50</u>	= \$	<u>36,050</u>
<u>27,248</u>	Tons	HMA Overlay ^{Pavement} (3.75 in. - Standard Design 2.00 in. - Limiting Strain Criterion Design)	@ \$	<u>74</u>	= \$	<u>2,016,352</u>
<u>7,064</u>	Tons	HMA Overlay - Shoulder (1.75 in. Standard Design; 2.00 in. - Limiting Strain Criterion Design)	@ \$	<u>74</u>	= \$	<u>522,736</u>

Total Cost of Rehabilitation Activity 6 \$ 2,965,690

FIGURE 5.05b(3)

Revised July 1, 1991
Sheet 4 of 5

FLEXIBLE PAVEMENT (Cont.)

FAP Route 330
Section 0105-WRS-1
COOK County

REHABILITATION ACTIVITY 7 - YEAR 35

<u>64,876</u>	Lin. Ft.	100% Longitudinal Shoulder Joint Routing and Sealing	@ \$	<u>2</u>	= \$	<u>129,752</u>
<u>64,876</u>	Lin. Ft.	100% Centerline Joint Routing & Sealing	@ \$	<u>2</u>	= \$	<u>129,752</u>
<u>53,523</u>	Lin. Ft.	50% ^{Random/} Thermal Crack Routing & Sealing (Assume 110 ft/Station)	@ \$	<u>2</u>	= \$	<u>107,046</u>
<u>130</u>	Sq. Yds.	0.10% Partial-Depth Pavement Patching (mill & Fill Surface)	@ \$	<u>38</u>	= \$	<u>4,940</u>
Total Cost of Rehabilitation Activity 7						\$ <u>371,490</u>

REHABILITATION ACTIVITY 8 - YEAR 40

<u>64,876</u>	Lin. Ft.	100% Longitudinal Shoulder Joint Routing and Sealing	@ \$	<u>2</u>	= \$	<u>129,752</u>
<u>64,876</u>	Lin. Ft.	100% Centerline Joint Routing & Sealing (Single lane and dual lane paving)	@ \$	<u>2</u>	= \$	<u>129,752</u>
<u>53,523</u>	Lin. Ft.	50% ^{Random/} Thermal Crack Routing & Sealing	@ \$	<u>2</u>	= \$	<u>107,046</u>
<u>149</u>	Sq. Yds.	0.50% Partial-Depth Pavement Patching (mill & Fill Surface)	@ \$	<u>38</u>	= \$	<u>24,662</u>
Total Cost of Rehabilitation Activity 8						\$ <u>391,212</u>

Revised July 1, 1991
Sheet 5 of 5

FLEXIBLE PAVEMENT (Cont.)

FAP Route 330
Section 0105-WRS-1
COOK County

ANNUAL COST DETERMINATION

Present Worth Calculation:

				Present Worth
				\$ <u>11,864,672</u>
	Total Cost of Original Pavement Construction			
Present Worth of Rehabilitation Activity 1	\$ <u>371,470</u>	X 0.8626 =	\$ <u>320,447</u>	
Present Worth of Rehabilitation Activity 2	\$ <u>371,212</u>	X 0.7441 =	\$ <u>291,101</u>	
Present Worth of Rehabilitation Activity 3	\$ <u>2,176,299</u>	X 0.6419 =	\$ <u>1,396,966</u>	
Present Worth of Rehabilitation Activity 4	\$ <u>371,470</u>	X 0.5537 =	\$ <u>205,674</u>	
Present Worth of Rehabilitation Activity 5	\$ <u>371,217</u>	X 0.4776 =	\$ <u>176,843</u>	
Present Worth of Rehabilitation Activity 6	\$ <u>2,765,690</u>	X 0.4120 =	\$ <u>1,121,864</u>	
Present Worth of Rehabilitation Activity 7	\$ <u>371,470</u>	X 0.3554 =	\$ <u>132,028</u>	
Present Worth of Rehabilitation Activity 8	\$ <u>371,212</u>	X 0.3066 =	\$ <u>119,946</u>	

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

Annual Cost Per Mile Calculation

$$\text{Present Worth Total Cost} \times \text{CRF}_n / \text{Length} = \text{Annual Cost/Year-Mile}$$

$$(\$ \underline{14,363,590}) \times 0.04070 / (\underline{3.07} \text{ Mi.}) = \$ \underline{190,844} / \text{Yr.-Mi.}$$

$$\frac{190,844 - 166,714}{166,714} = 0.145$$

FAVORS PCC BY 14.5%