Illinois Department of Transportation

To:	Diane M. O'Keefe	Attn: District One
From:	John D. Baranzelli	
Subject:	Pavement Design	
Date:	February 22, 2012	

FAP Route 326 (IL Route 47)
Kane County
At Plato Road [Roundabout]

We have reviewed the pavement selection for the project, which was submitted to BDE by memo dated January 3, 2012. The project will reconstruct IL 47 and Plato Road using a roundabout design. The design meets the warrants for a "high stress" intersection with MU ADT exceeding 200 vehicles. For this project, all legs of the roundabout will use the thicker pavement design for IL 47. This project meets the requirements for the alternate bidding process and the approved pavement design for this project is as follows:

<u>IL Route 47 and Plato Road (Pavement Reconstruction)</u>

Option 1:

10.5 inches of HMA pavement
2 inches of Polymerized HMA surface course, Mix "F", N90
2.25 inches of Polymerized HMA binder course, IL-19.0, N90
6.25 inches of HMA binder course, IL-19, N90
12 inches of Aggregate Subgrade
Geotechnical Fabric

Option 2:

9.25 inches of 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 Domi[illegible]

RECEIVED
JAN 09 2012
BUREAU OF
DESIGN & ENVIRONMENT

Subject: Pavement Analysis

Date: January 3, 2011

Route: FAP 326 (IL 47)
Location: IL 47 at Plato Road
Contract No.: 12357
Letting: N/A

Section: N/A
County: Kane
Job No.: P-91-448-09

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

a) Installation of a roundabout which will require pavement reconstruction of IL 47 from Sta. 494+00 to Sta. 506+00 for a length of 1,200 feet to accommodate one lane in each direction with width varying from 13 feet to 22 feet. Plato Road will be reconstructed from Sta. 194+00 to Sta. 206+00 for a length of 1,200 feet to accommodate one lane in each direction with width varying from 13 feet to 23 feet.

b) Installation of a traffic signal which will require pavement reconstruction of IL 47 from Sta. 490+00 to Sta. 510+00 for a length of 2,000 feet to accommodate one 12 foot thru lane in each direction. Plato Road will be reconstructed from Sta. 192+00 to Sta. 208+00 for a length of 1,600 feet to accommodate one 12 foot thru lane in each direction.

A 20 year mechanistic pavement design was performed on IL 47 at Plato Road. This intersection is considered "high stress" as the design lane MU ADT exceeds 200 vehicles for the traffic signal option and the turning movement traffic exceeds 200 MU vehicles for the roundabout option. We recommend using the same pavement design for both IL 47 and Plato Road.

IL 47 and Plato Road*

Pavement Reconstruction

Option 1:

HMA Shoulders
10 ½" Full Depth HMA Pavement**
2" Polymerized HMA Surface Course, MIX "F", N90
2 ¼" Polymerized HMA Binder Course, IL-19.0, N90
6 ¼" HMA Binder Course, IL-19.0, N90
12" Aggregate Subgrade
Geotechnical Fabric

Option 2:

Tied PCC Shoulders
9 ¼" PCC Pavement (Jointed)
4 ½" HMA Stabilized Subbase
12" Aggregate Subgrade
Geotechnical Fabric

The life cycle cost analysis favored HMA pavement by 3.7%, therefore an alternate bid consideration with review by the pavement selection committee will be required according to the flowchart in Figure 54-1.A of Chapter 54 of the BDE manual.

*Designer Note 1: Plato Road is subject to local jurisdictional concurrence.

Designer Note 2: Use pay item "40701891 – HOT-MIX ASPHALT PAVEMENT (FULL-DEPTH), 10 ½""** if flexible pavement is selected in order that it will be paid for in square yards instead of tons.

***Designer Note 3: Use pay item "**42000406 – PORTLAND CEMENT CONCRETE PAVEMENT 9 ¼" (JOINTED)**" if rigid pavement is selected.

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

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

benesch
engineers · scientists · planners

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

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

Project: IL 47 @ PLATO RD

Element: PAVEMENT DESIGN - TRAFFIC SIGNAL INSTALLATION, ROUNDABOUT

IL 47 @ PLATO RD

- MECHANISTIC FLEXIBLE
  - HMA SHOULDERS
  - 10½" FULL DEPTH HMA PAVEMENT
    - 2" POLY HMA SURFACE COURSE, MIX "F", N90
    - 2¼" POLY HMA BINDER COURSE, IL-19.0, N90 → "HIGH STRESS" INTERSECTION
    - 6¼" HMA BINDER COURSE, IL-19.0, N90
  - 12" AGGREGATE SUBGRADE
  - GEOTECHNICAL FABRIC

- TRAFFIC SIGNAL: DESIGN LANE MU ADT > 200
- ~~ROUNDABOUT: TURNING MOVEMENT MU ADT > 200~~
- ROUNDABOUT - TURNING MOVEMENT MU ADT > 200

- MECHANISTIC RIGID
  - TIED PCC SHOULDERS
  - 9¼" JOINTED PCC PAVEMENT
  - 4½" HMA STABILIZED SUBBASE → NO ENCLOSED DRAINAGE
  - 12" AGGREGATE SUBGRADE
  - GEOTECHNICAL FABRIC

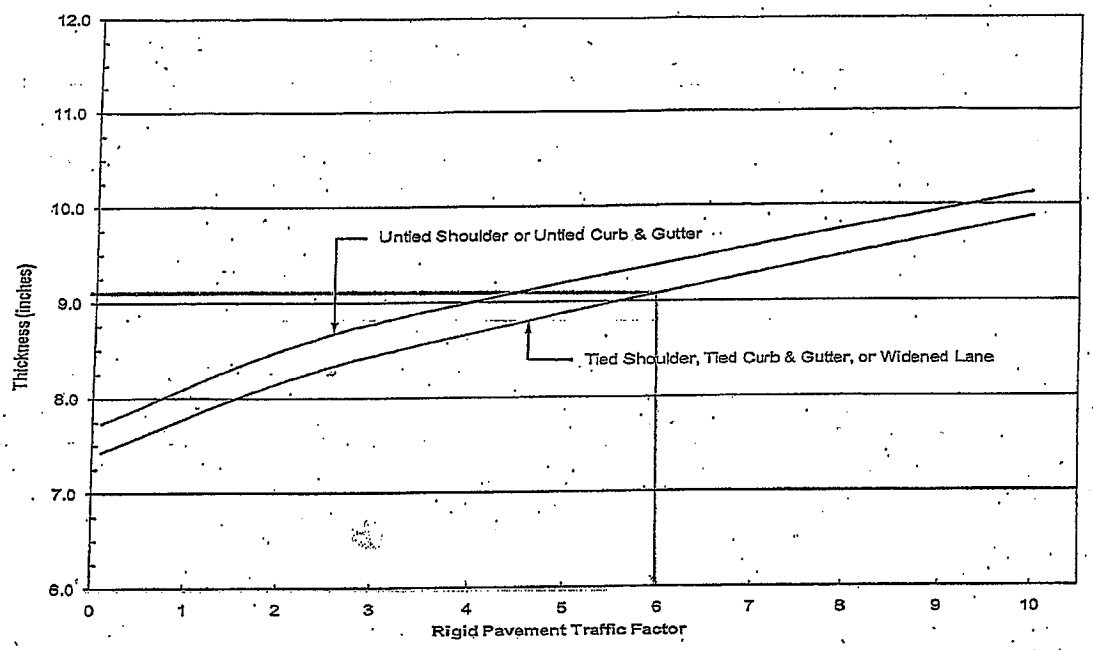
PLATO RD @ IL 47

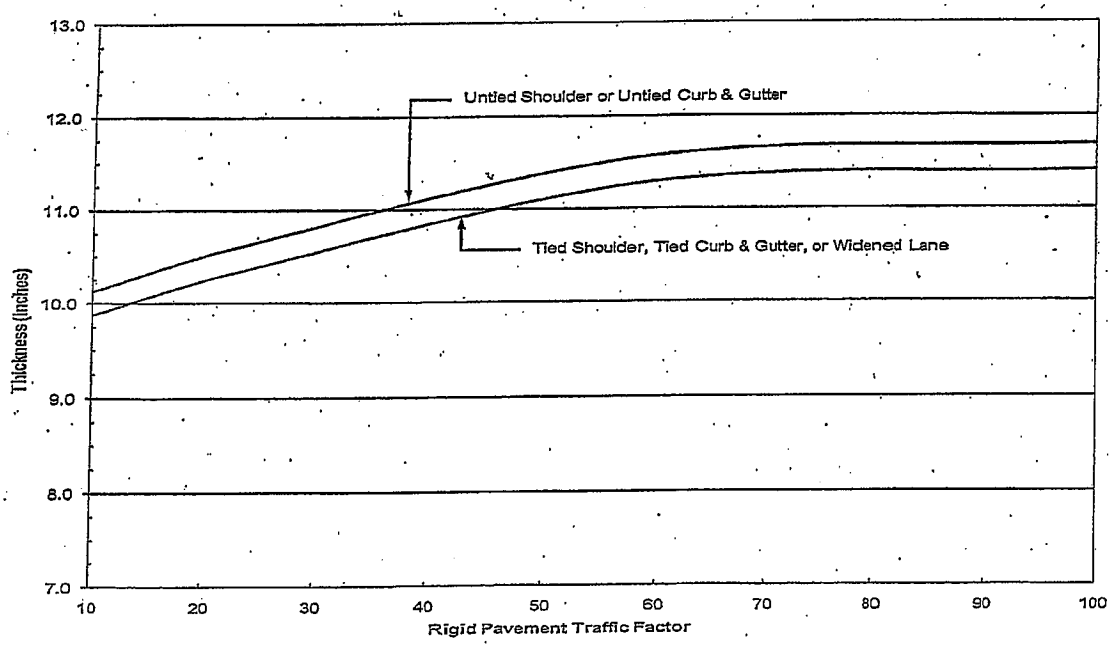
- MECHANISTIC FLEXIBLE
  - HMA SHOULDERS
  - 7½" FULL DEPTH HMA PAVEMENT
    - 2" POLY HMA SURFACE COURSE, MIX "F", N90 → "HIGH STRESS" INTERSECTION
    - 2¼" POLY HMA BINDER COURSE, IL-19.0, N90
    - 3¼" HMA BINDER COURSE, IL-19.0, N90
  - 12" AGGREGATE SUBGRADE
  - GEOTECHNICAL FABRIC

- TRAFFIC SIGNAL: DESIGN LANE MU ADT > 200

- MECHANISTIC RIGID
  - TIED PCC SHOULDERS
  - 7¾" JOINTED PCC PAVEMENT
  - 4½" HMA STABILIZED SUBBASE → NO ENCLOSED DRAINAGE
  - 12" AGGREGATE SUBGRADE
  - GEOTECHNICAL FABRIC

IL 47 @ PLATO RD





Note: Use of untied shoulder design requires BDE approval.

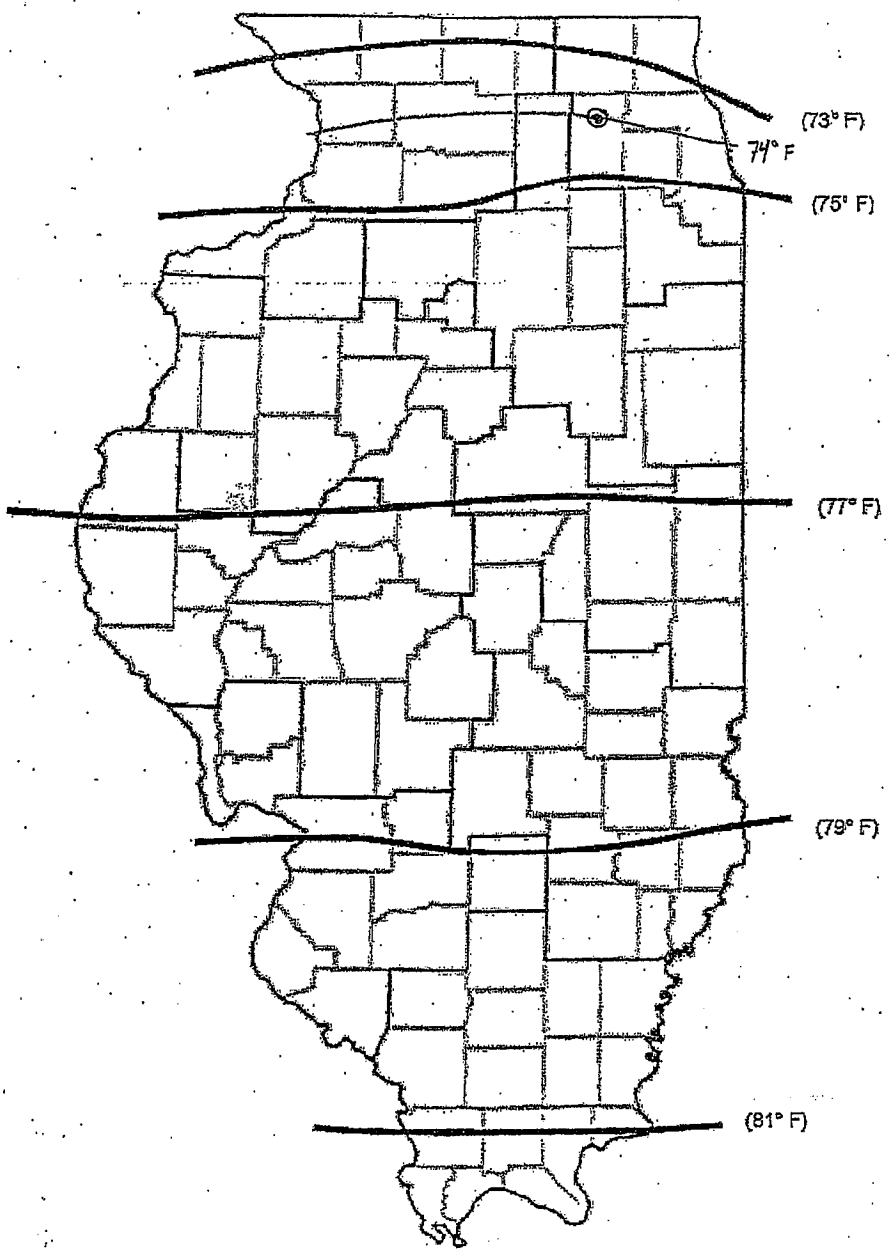
RIGID PAVEMENT DESIGN CHART
(Mechanistic Design: SSR = Poor)

9/4" JOINTED PCC PAVEMENT

Figure 54-4.E

HARD COPIES UNCONTROLLED

IL 47 @ PLATO RD

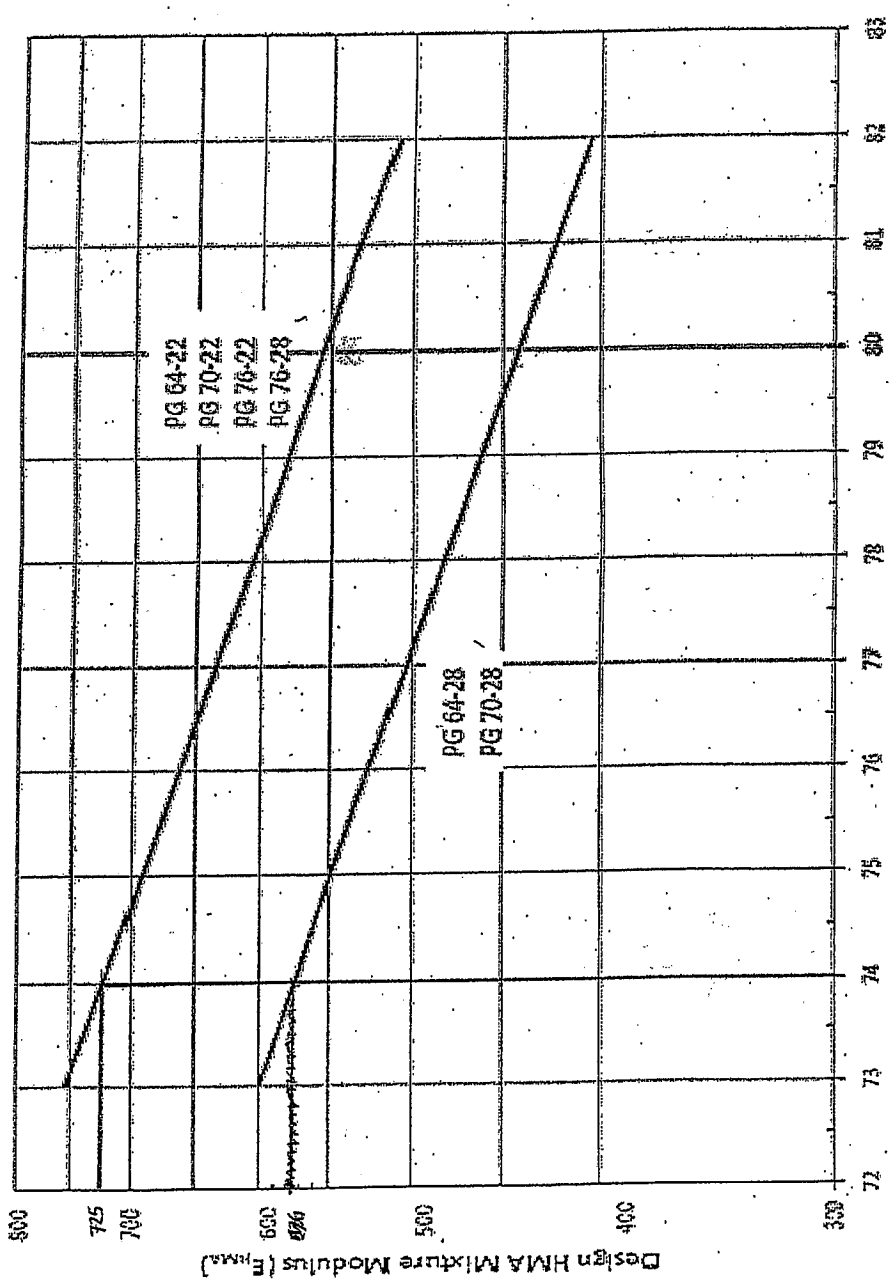


Note: The minimum design HMA mixture temperature will be 73°F.

HMA MIXTURE TEMPERATURE
(Mechanistic Design: Flexible Pavement)

Figure 54-5.C

HARD COPIES UNCONTROLLED



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

Figure 54-5.D

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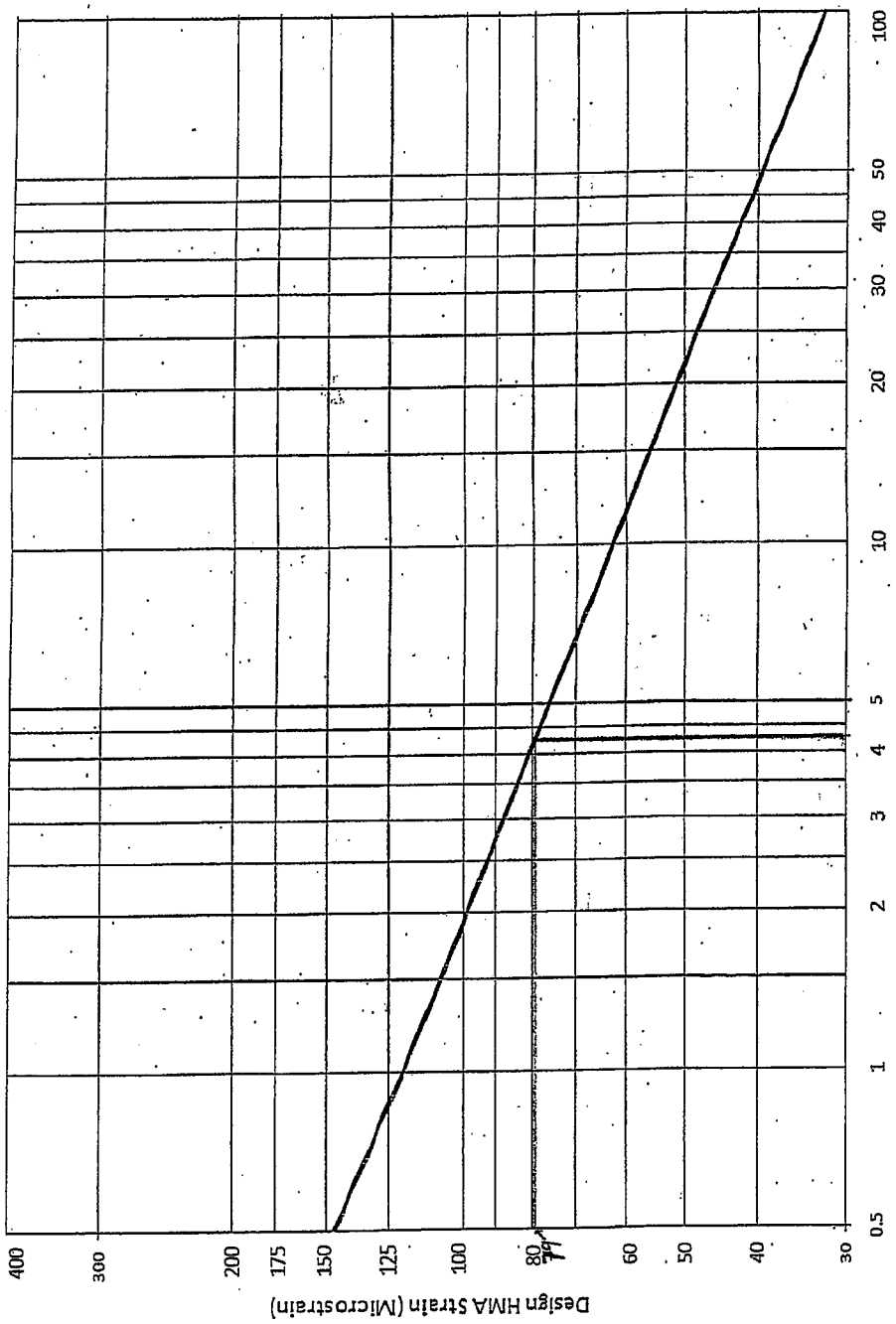
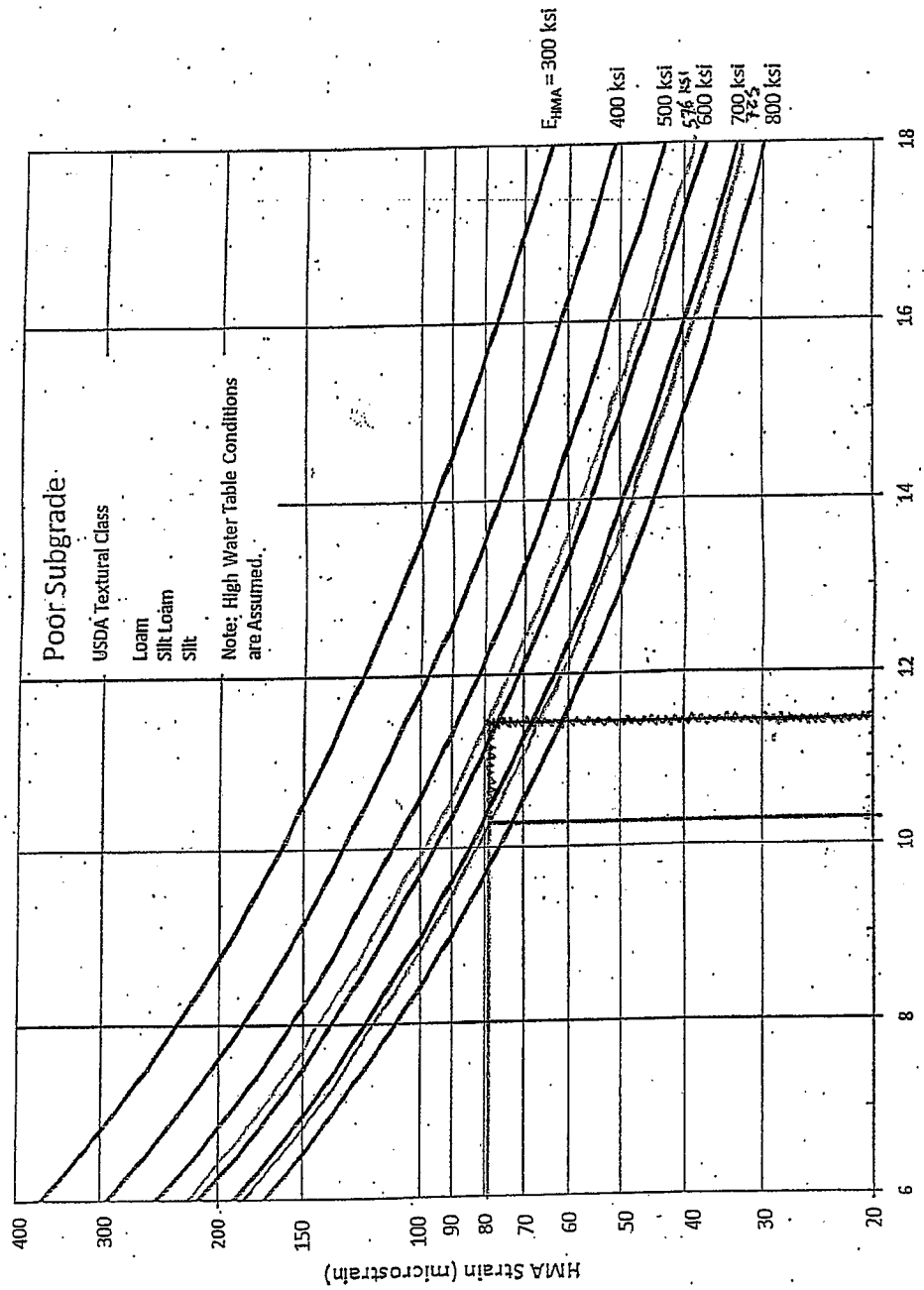


DESIGN HMA STRAIN
(Mechanistic Design: Flexible Pavement)

Figure 54-5.E



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

Figure 54-5.F

11½" FULL DEPTH HMA

10½" FULL DEPTH HMA

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USE FOR TF ONLY

Spreadsheet by Uehle - Rev. 11/02

MECHANISTIC PAVEMENT DESIGN

Date: 11/16/11

INPUT (Enter Data in Gray Shaded Cells)

Route: FAP 326 (IL 47 at Plato Rd)
Section:
County: Kane
Location: IL 47 at Plato Rd

Comments: IL 47 Pavement Design

Designer: TMC

	ADT	Year
Current:	5918	2008
Future:	14000	2040

Facility Type: Other Marked State Route

# of Lanes = 2 or 3
Part of future 4 lanes or more ? No
One Way Street ? No
Road Class: II

Subgrade Support Rating (SSR): Poor
Construction Year: 2014
Design Period (DP) = 20 years

	Minimum ADT	Structural Design Traffic: Actual ADT	Actual %of Total ADT	% of ADT in Design Lane	
PV =	0	8,435	84.7%	P =	50%
SU =	250 ~~300~~	617	6.2%	S =	50%
MU =	750 ~~900~~	906	9.1%	M =	50%
Struct. Design ADT =		9959	(2024)		

FLEXIBLE & RIGID PAVEMENT CALCULATIONS AND ADDITIONAL INPUT

Flexible Pavement

Cpv =	0.15	
Csu =	112	
Cmu =	385	
TF flexible (Actual)=	4.20	(Actual ADT)
TF flexible (Min)=	3.81	(Min ADT Fig 54-2C)
Use TF flexible =	4.20	
AC Type =	20	
AC Mixture Tempurature =		deg. F (Figure 54-5C)
Design AC Mixture Modulus (Eac)=		ksi (Figure 54-5D)
Design Asphalt Concrete Microstrain =	~~66.6~~	(Figure 54-5E)
Asphalt Concrete Thickness =		in. (Figure 54-5F)

Rigid Pavement

Cpv =	0.15	
Csu =	136	
Cmu =	567	
TF rigid (Actual)=	5.99	(Actual ADT)
TF rigid (Min)=	5.51	(Min ADT Fig 54-2C)
Use TF rigid =	5.99	
	Tied	Shoulder or C. &G.
Rigid Pavt Thick =	~~9.50~~	in. (Figure 54-4D)

DESIGN TABLES FROM BD&E PAVEMENT DESIGN CH. 54 AND PAVEMENT DESIGN MANUAL

Class I Roads	Class II Roads	Class III Roads	Class IV Roads
4 lanes or more Part of a future 4 lanes or more One-way Streets with ADT > 3500	2 lanes with ADT > 2000 One way Street with ADT <= 3500	2 Lanes (ADT 750 -2000)	2 Lanes (ADT < 750)

Facility Type	Min. Str. Design Traffic (Fig 54-2C): PV	SU	MU
Interstate or Supplemental Freeway	0	500	1500
Other Marked State Route	0	300	900
Unmarked State Route	No Min	No Min	No Min

Class Table for One-Way Streets

ADT	Class
0 - 3500	II
>3501	I

Class	Traffic Factor ESAL Coefficients: Rigid (Fig. 54-4C) Csu	Rigid Cmu	Flexible (Fig. 54-5B) Csu	Flexible Cmu
I	143.81	696.42	132.50	482.53
II	135.78	567.21	112.06	385.44
III	129.58	562.47	109.14	384.35
IV(ADT>400)	127.75	555.90	109.14	384.35
IV(ADT<=400)	127.75	555.90	9.86	78.84

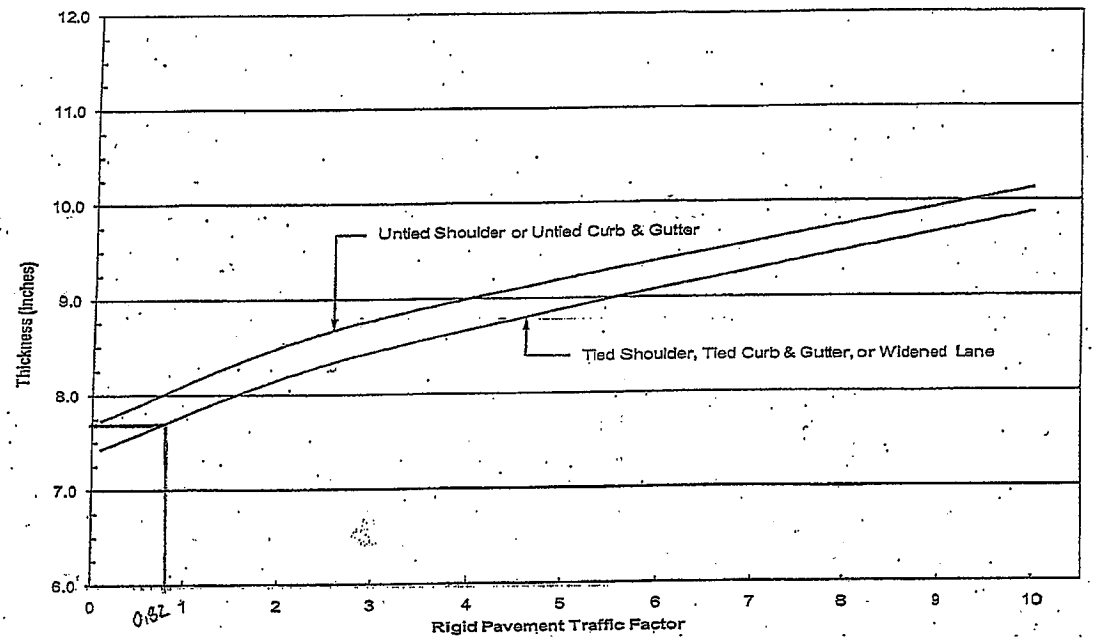
Class Table for 2 or 3 lanes (not future 4 lane & not one-way street)

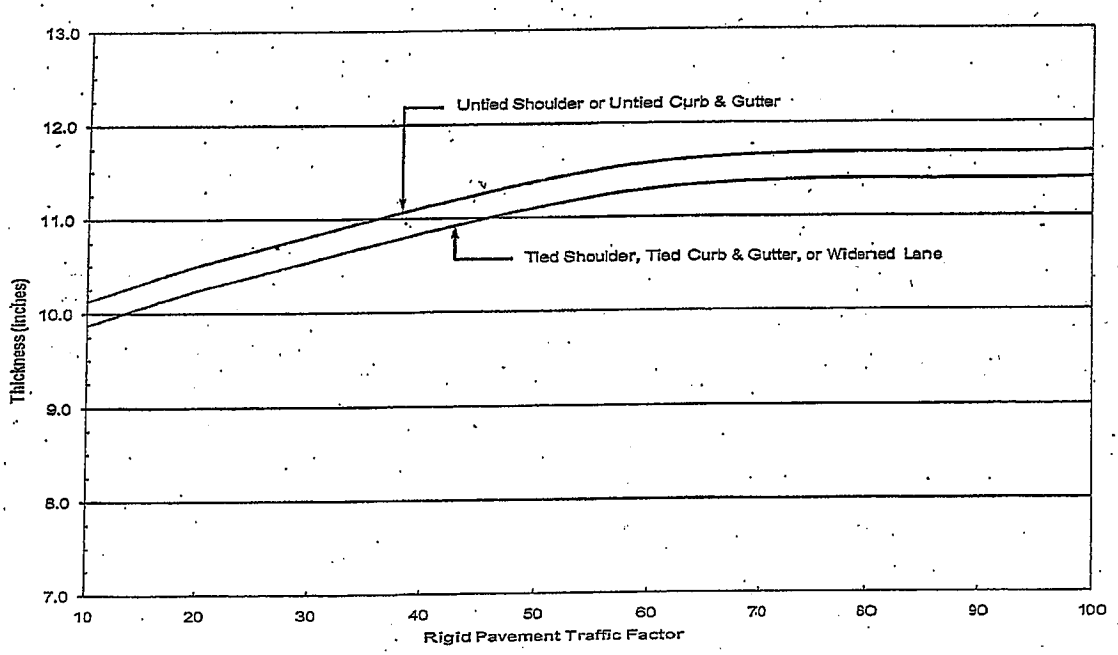
ADT	Class
0 - 749	IV
750 - 2000	III
>2000	II

Figure 54-2B Percentage of ADT in Design Lane

Number of Lanes	Rural P	Rural S	Rural M	Urban P	Urban S	Urban M
1 Lane Ramp	100%	100%	100%	100%	100%	100%
2 or 3	50%	50%	50%	50%	50%	50%
4	32%	45%	45%	32%	45%	45%
6 or more	20%	40%	40%	8%	37%	37%

PLATO RD @ IL 47





Note: Use of untied shoulder design requires BDE approval.

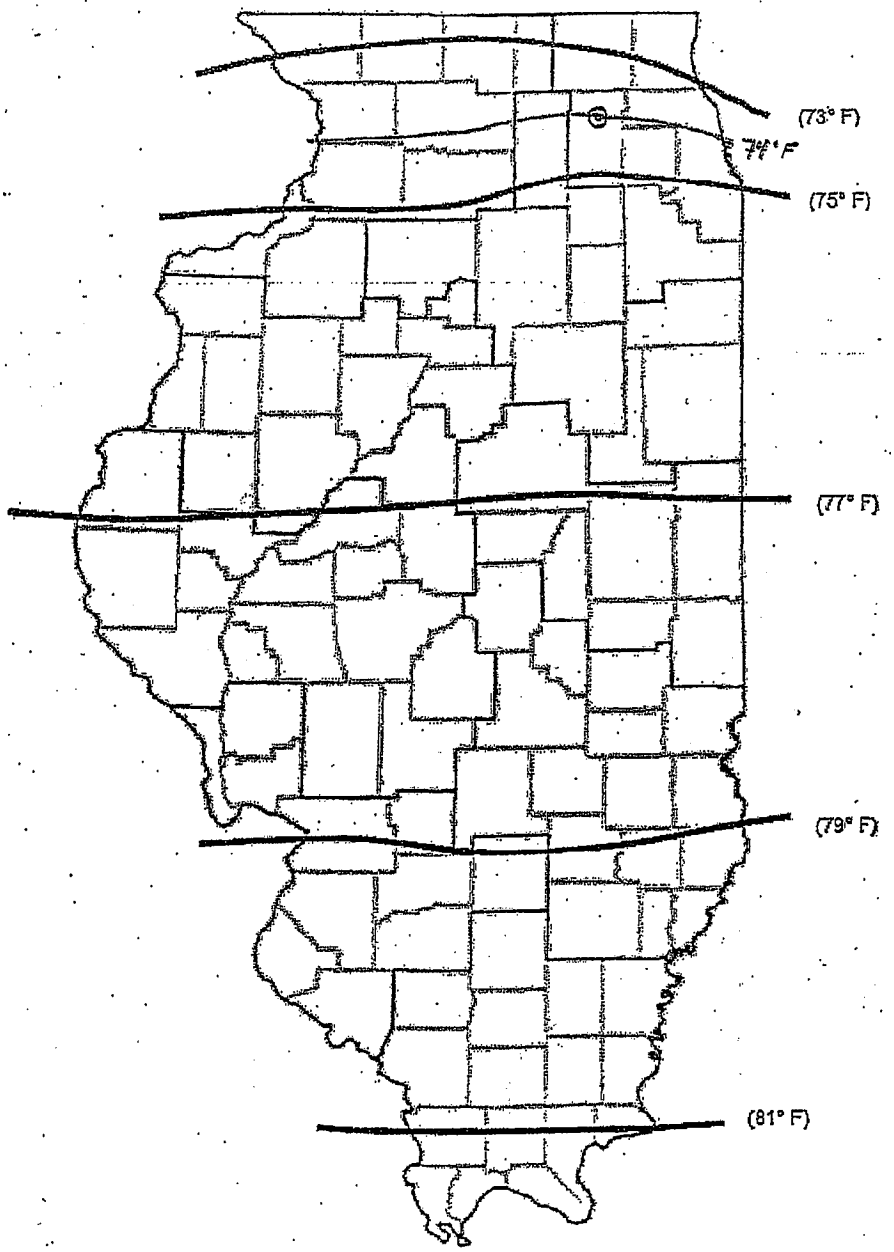
RIGID PAVEMENT DESIGN CHART
(Mechanistic Design: SSR = Poor)

7 3/4" JOINTED PCC PAVEMENT

Figure 54-4.E

HARD COPIES UNCONTROLLED

PLATO RD @ IL 47

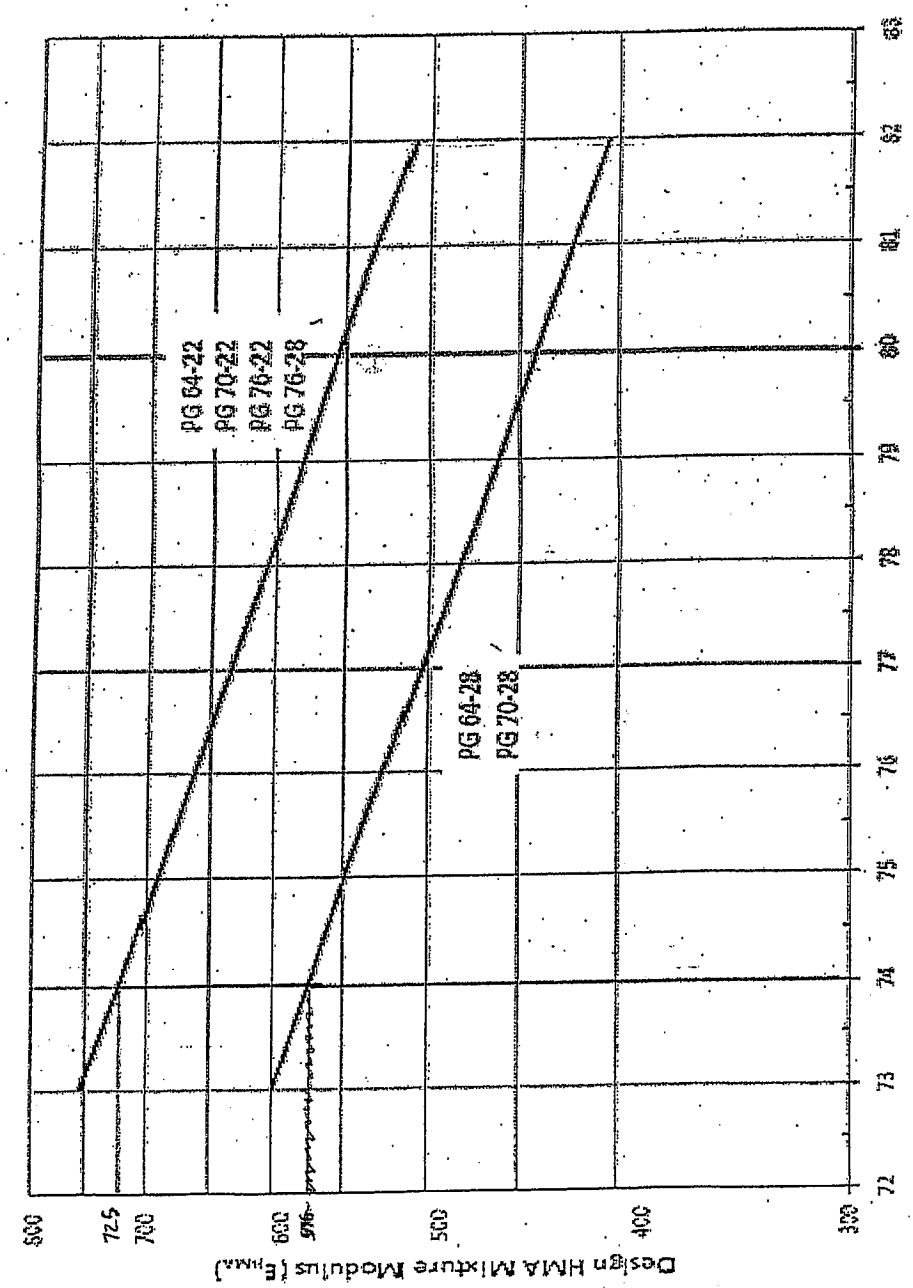


Note: The minimum design HMA mixture temperature will be 73 °F.

HMA MIXTURE TEMPERATURE
(Mechanistic Design: Flexible Pavement)

Figure 54-5.C

HARD COPIES UNCONTROLLED

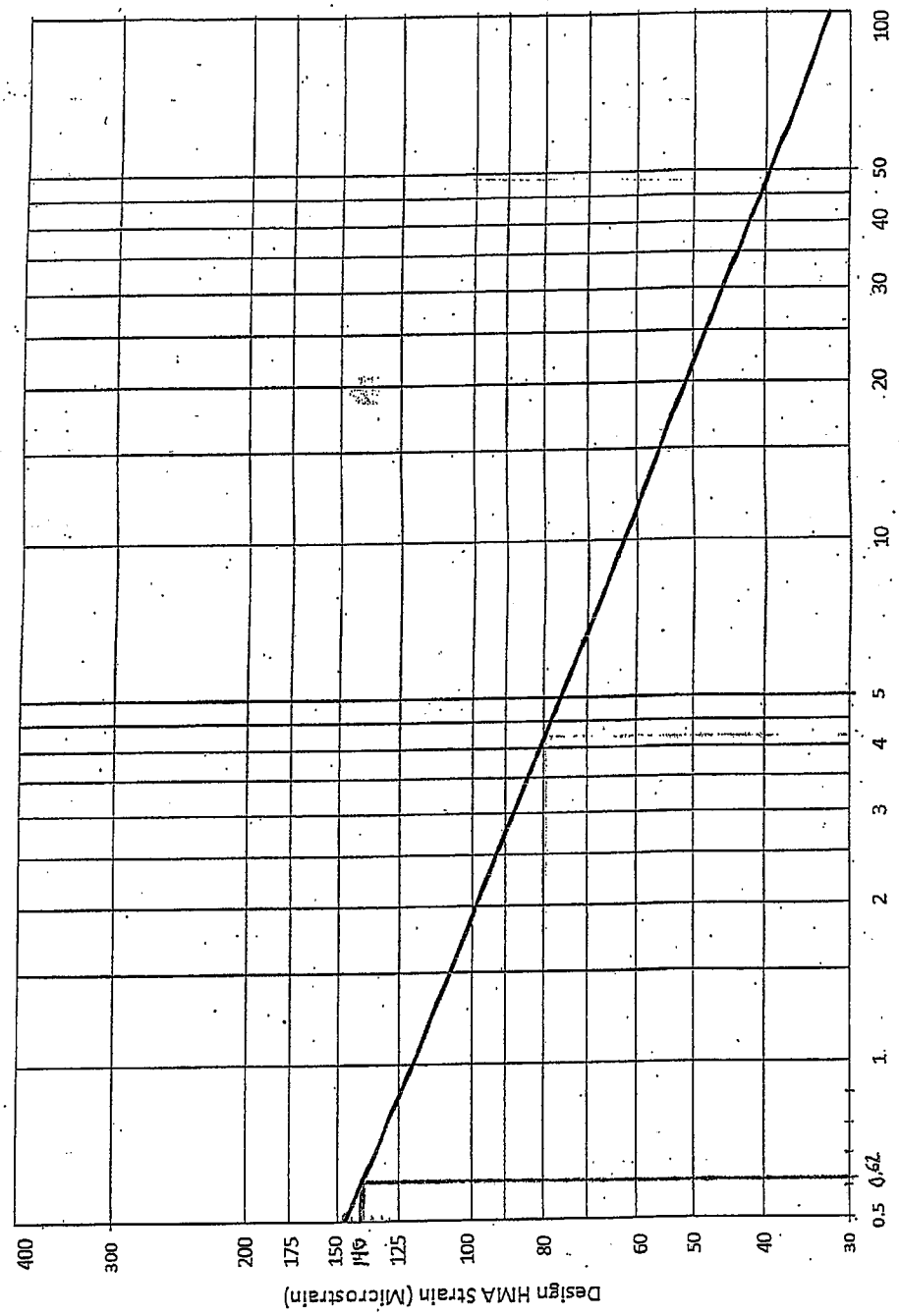


HMA MIXTURE MODULUS (E_{HMA})
(Mechanistic Design - Flexible Pavement)

Figure 54-5.D

HARD COPIES UNCONTROLLED

PLATO RD @ IL 47

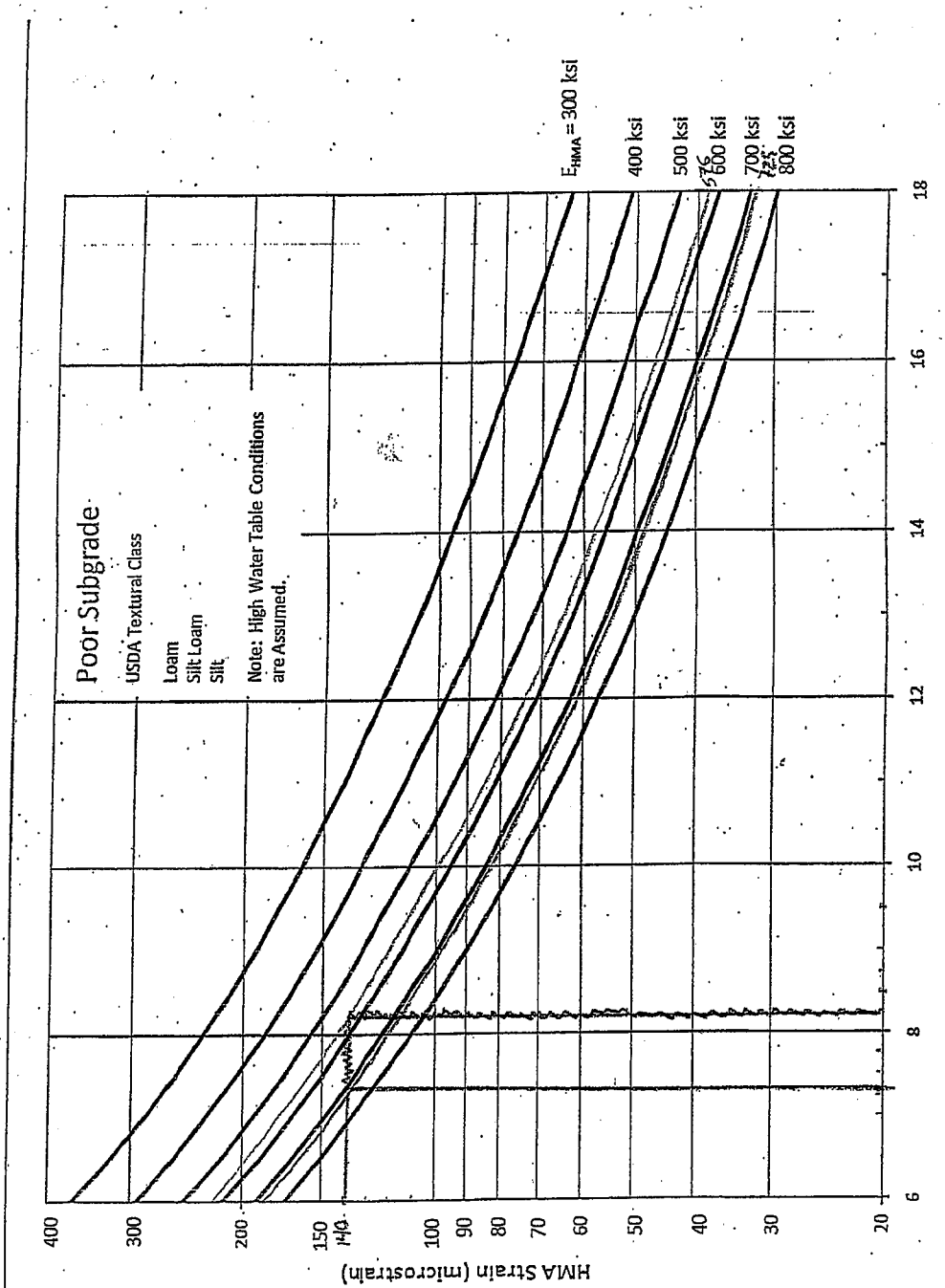


DESIGN HMA STRAIN
(Mechanistic Design: Flexible Pavement)

Figure 54-5.E

HARD COPIES UNCONTROLLED

PLATO RD @ IL 47



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

Figure 54-5.F

~~9 1/2" FULL DEPTH HMA~~

7 1/2" FULL DEPTH

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USE FOR TF ONLY

Spreadsheet by Uehle - Rev. 11/02

MECHANISTIC PAVEMENT DESIGN

Date: 11/16/11

INPUT (Enter Data in Gray Shaded Cells)

Route: FAP 326 (IL 47 at Plato Rd)
Section: [redacted]
County: Kane
Location: Plato Rd at IL 47

Comments: Plato Rd Pavement Design [redacted]

Designer: TMC

	ADT	Year
Current:	3229	2008
Future:	6000	2040

Facility Type: Unmarked State Route

# of Lanes =	2 or 3
Part of future 4 lanes or more ?	No
One Way Street ?	No
Road Class:	II
Subgrade Support Rating (SSR):	Poor
Construction Year:	2014
Design Period (DP) =	20 years

	Minimum ADT	Structural Design Traffic: Actual ADT	Actual %of Total ADT	% of ADT in Design Lane	
PV =	No Min	4,222	91.5%	P =	50%
SU =	No Min	328	7.1%	S =	50%
MU =	No Min	65	1.4%	M =	50%
Struct. Design ADT =		4615	(2024)		

FLEXIBLE & RIGID PAVEMENT CALCULATIONS AND ADDITIONAL INPUT

Flexible Pavement

Cpv =	0.15	
Csu =	112	
Cmu =	385	
TF flexible (Actual)=	0.62	(Actual ADT)
TF flexible (Min)=	No Min	(Min ADT Fig 54-2C)
Use TF flexible =	0.62	
AC Type =	20	
AC Mixture Tempurature =		deg. F (Figure 54-5C)
Design AC Mixture Modulus (Eac)=		ksi (Figure 54-5D)
Design Asphalt Concrete Microstrain =	~~125.0~~	(Figure 54-5E)
Asphalt Concrete Thickness =		in. (Figure 54-5F)

Rigid Pavement

Cpv =	0.15	
Csu =	136	
Cmu =	567	
TF rigid (Actual)=	0.82	(Actual ADT)
TF rigid (Min)=	No Min	(Min ADT Fig 54-2C)
Use TF rigid =	0.82	
	Tied	Shoulder or C. &G.
Rigid Pavt Thick =	~~8.25~~	in. (Figure 54-4D)

DESIGN TABLES FROM BD&E PAVEMENT DESIGN CH. 54 AND PAVEMENT DESIGN MANUAL

Class I Roads	Class II Roads	Class III Roads	Class IV Roads
4 lanes or more Part of a future 4 lanes or more One-way Streets with ADT > 3500	2 lanes with ADT > 2000 One way Street with ADT <= 3500	2 Lanes (ADT 750 -2000)	2 Lanes (ADT < 750)

Facility Type	Min. Str. Design Traffic (Fig 54-2C): PV	SU	MU
Interstate or Supplemental Freeway	0	500	1500
Other Marked State Route	0	300	900
Unmarked State Route	No Min	No Min	No Min

Class Table for One-Way Streets

ADT	Class
0 - 3500	II
>3501	I

Class	Traffic Factor ESAL Coefficients: Rigid (Fig. 54-4C) Csu	Rigid Cmu	Flexible (Fig. 54-5B) Csu	Flexible Cmu
I	143.81	696.42	132.50	482.53
II	135.78	567.21	112.06	385.44
III	129.58	562.47	109.14	384.35
IV(ADT>400)	127.75	555.90	109.14	384.35
IV(ADT<=400)	127.75	555.90	9.86	78.84

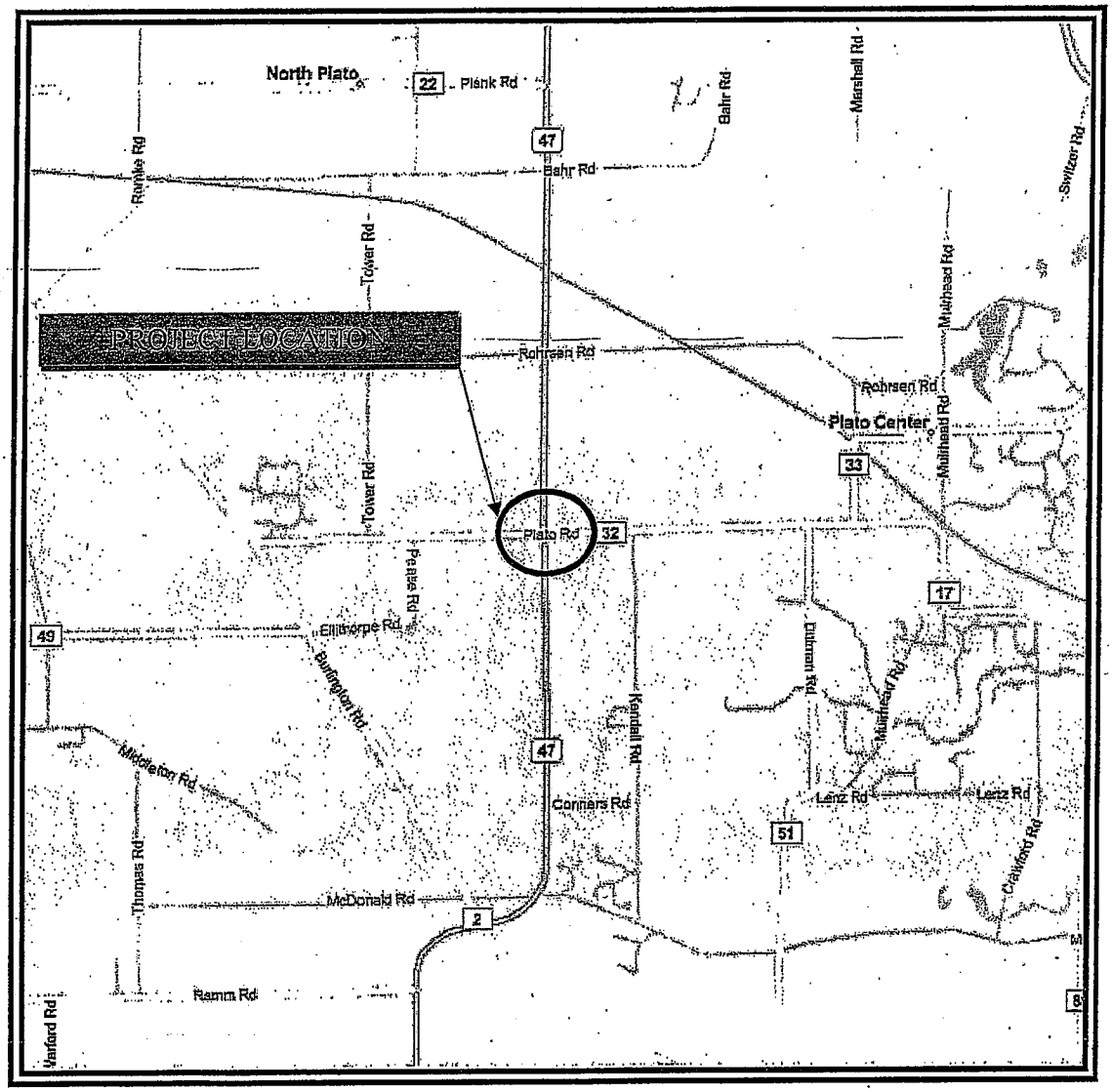
Class Table for 2 or 3 lanes (not future 4 lane & not one-way street)

ADT	Class
0 - 749	IV
750 - 2000	III
>2000	II

Figure 54-2B Percentage of ADT in Design Lane

Number of Lanes	Rural P	Rural S	Rural M	Urban P	Urban S	Urban M
1 Lane Ramp	100%	100%	100%	100%	100%	100%
2 or 3	50%	50%	50%	50%	50%	50%
4	32%	45%	45%	32%	45%	45%
6 or more	20%	40%	40%	8%	37%	37%

LOCATION MAP



N

Route: Illinois Route 47
Limits: At Plato Road
Municipality: Plato Township
County: Kane County

P-91-448-09

ROUNDABOUT

Revised July 1, 1991

MECHANISTIC PAVEMENT DESIGN

Date NOVEMBER 30 2011

Calculations by: TMC

Checked by: MA

Class II Roads and Streets

Urban _____ Rural X

FAP 326 Route IL 47 @ PLATO

Section N/A

KANE County

Location IL 47 @ PLATO

Limits of Analysis Station 494+00 to Station 506+00

Length 1200 Feet 0.23 Miles

Structural Design Traffic

PV = 8,435

SU = 617

MU = 906

Percent of S.D.T. in Design Lane

P = 50 %

S = 50 %

U = 50 %

MINIMUM SUBGRADE SUPPORT RATING = "POOR"

Flexible Pavement Design Actual TF_F = 4.20 Minimum TF_F = 3.81

Selected Design AC Type 20

Design AC Mixture Temp. 74 ° F.

Design AC Microstrain 79

Design E_{AC} 725 KSI

AC Thickness 10.5 Inch

Rigid Pavement Design Actual TF_R = 5.99 Minimum TF_R = 5.51

15' Panel PCC Thickness for: Extended Lane 9.25 Inch

Tied Shoulder 9.25 Inch

Untied Shoulder — Inch

Figure 5.05

RIGID PAVEMENT

Date: NOVEMBER 30, 2011 — FAP Route 326

Quantities by: TMC — Checked by: MA — Section N/A

Unit Prices by: TMC — Checked by: MA — KANE County

Net Length 1,200 Lin. Ft. 0.23 Miles

Number Lanes 2 Urban ____ Rural X

ITEMIZED CONSTRUCTION COST

Quantity	Unit	Item	Unit Cost	Total Cost
4,667	Sq. Yds.	9¼-Inch Jointed PCC	@ $ 51.32	= $ 239,510
5,667	Sq. Yds.	4½Inch (Stabilized/Granular Subbase)	@ $ 19.00	= $ 96,273
2,667	Sq. Yds.	9¼-Inch PCC Shoulders	@ $ 47.00	= $ 125,349
____	Lin. Ft.	Pipe Underdrains	@ $ ____	= $ ____
____		Subbase Gran. Mat., Type C	@ $ ____	= $ ____
2,400	Lin. Ft.	100% Shoulder Joint Seal	@ $ 2.00	= $ 4,800
			@ $ ____	= $ ____
			@ $ ____	= $ ____

Total Cost of Original Pavement Construction $ 465 932

ITEMIZED MAINTENANCE AND REHABILITATION ACTIVITY COST

REHABILITATION ACTIVITY 1 - YEAR 10

5	Sq. Yds.	0.1% Full-Depth PCC Pavement Patching	@ $ 60	= $ 300

Total Cost of Rehabilitation Activity 1 $ 300

FIGURE 5.05a(1)

RIGID PAVEMENT (Cont.)

FAP Route 326

Section N/A

KANE County

REHABILITATION ACTIVITY 2 - YEAR 15

9 Sq. Yds. 0.2% Full-Depth PCC Pavement Patching @ $ 60 = $ 540

Total Cost of Rehabilitation Activity 2 $ 540

REHABILITATION ACTIVITY 3 - YEAR 20

93 Sq. Yds. 2% Full-Depth PCC Pavement Patching @ $ 60 = $ 5,580

13 Sq. Yds. 0.5% Full-Depth PCC Shoulder Patching @ $ 50 = $ 650

2,400 Lin. Ft. 100% Longitudinal/Shoulder Joint Routing & Sealing @ $ 2 = $ 4,800

2,400 Lin. Ft. 100% Centerline Joint Routing & Sealing @ $ 2 = $ 4,800

Total Cost of Rehabilitation Activity 3 $ 15,830

FIGURE 5.05a(2)

RIGID PAVEMENT (Cont.)

FAP Route 326

Section N/A

KANE County

REHABILITATION ACTIVITY 4 - YEAR 25

140	Sq. Yds.	3.0% Full-Depth PCC Pavement Patching	@ $ 60	= $	8,400
27	Sq. Yds.	1.0% Full-Depth PCC Shoulder Patching	@ $ 50	= $	1,350
		Total Cost of Rehabilitation Activity 4		$	9,750

REHABILITATION ACTIVITY 5 - YEAR 30

187	Sq. Yds.	4.0% Full-Depth PCC Pavement Patching	@ $ 60	= $	11,220
40	Sq. Yds.	1.5% Full-Depth PCC Shoulder Patching	@ $ 50	= $	2,000
4,667	Sq. Yds.	Policy HMA Overlay - Pavement	@ $ 11	= $	51,337
2,667	Sq. Yds.	Policy HMA Overlay - Shoulder	@ $ 11	= $	29,337
		Total Cost of Rehabilitation Activity 5		$	93,894

REHABILITATION ACTIVITY 6 - YEAR 35

2400	Lin. Ft.	100% Longitudinal Shoulder Joint Routing & Sealing	@ $ 2	= $	4,800
2400	Lin. Ft.	100% Centerline Joint Routing & Sealing	@ $ 2	= $	4800
1200	Lin. Ft.	50% Random Crack Routing and Sealing - Assume 100 ft/Station	@ $ 2	= $	2400
768	Lin. Ft.	40% Reflective Transverse Crack Routing & Sealing	@ $ 2	= $	1,536
5	Sq. Yds.	0.1% Partial-Depth Pavement Patching (Mill & Fill Surface-Interstates; Mill & Fill 2.5 in.-Non-Interstates)	@ $ 50	= $	250
		Total Cost of Rehabilitation Activity 6		$	13,786

FIGURE 5.05a(3)

RIGID PAVEMENT (Cont.)

FAP Route 326

Section N/A

KANE County

REHABILITATION ACTIVITY 7 - YEAR 40

23	Sq. Yds.	0.5% Full-Depth PCC Pavement Patching	@ $ 60	= $	1,380
23	Sq. Yds.	0.5% Partial-Depth Pavement Patching (Mill & Fill Surface-Interstates; Mill & Fill 2.5 in. Non-Interstates)	@ $ 50	= $	1,150
1,152	Lin. Ft.	60% Reflective Transverse Crack Routing and Sealing	@ $ 2	= $	2,304
1,200	Lin. Ft.	50% Random Crack Routing & Sealing- Assume 100ft/Station	@ $ 2	= $	2,400
2,400	Lin. Ft.	100% Longitudinal/Shoulder Joint Routing & Sealing	@ $ 2	= $	4,800
2,400	Lin. Ft.	100% Centerline Joint Routing & Sealing	@ $ 2	= $	4,800

Total Cost of Rehabilitation Activity 7 $ 16,834

FIGURE 5.05a(4)

Revised July 1, 1991
Sheet 5 of 5

RIGID PAVEMENT (Cont.)

FAP Route 326

Section N/A

KANE County

ANNUAL COST DETERMINATION

Present Worth Calculation:

Total Cost of Original Pavement Construction $ 465,932

Present Worth of Rehabilitation Activity 1	$ 300	X 0.7441	= $	223
Present Worth of Rehabilitation Activity 2	$ 540	X 0.6419	= $	347
Present Worth of Rehabilitation Activity 3	$ 15,830	X 0.5537	= $	8,765
Present Worth of Rehabilitation Activity 4	$ 9,750	X 0.4776	= $	4,657
Present Worth of Rehabilitation Activity 5	$ 93,894	X 0.4120	= $	38,684
Present Worth of Rehabilitation Activity 6	$ 13,780	X 0.3554	= $	4,900
Present Worth of Rehabilitation Activity 7	$ 16,834	X 0.3066	= $	5,161

Total Life Cycle Cost (Present Worth) $ 528,669

Annual Cost Per Mile Calculation

Total pw X CRF_n/Length = Annual Cost/Year-Mile

($ 528,669 X 0.04679 / 0.23 Mi.) = $ 93,758 /Yr.-Mi.

FIGURE 5.05a(5)

FLEXIBLE PAVEMENT

Date: NOVEMBER 2011 — FAP Route 326

Quantities by: TMC Checked by: MA — Section N/A

Unit Prices by: TMC Checked by: MA — KANE County

Net Length 1200 Lin. Ft. 0.23 Miles

Number Lanes 2 Urban _____ Rural X

Single Lane Paving X Dual Lane Paving _____

ITEMIZED CONSTRUCTION COST

Quantity	Unit	Item		Unit Cost	Total Cost
4667	Sq. Yds.	2" -Class I Surface Course	POLY SURFACE, MIX 'F', N90	@ $ 12.10	= $ 56,471
4,667	Sq. Yds.	2¼" -Inch Class I Binder Course	POLY BINDER CSE, IL-19.0, N90	@ $ 12.35	= $ 57,637
2,667	Sq. Yds.	10½" -Inch Stabilized Shoulders	HMA SHOULDERS	@ $ 44.00	= $ 117,348
_____	Lin. Ft.	Pipe Underdrains		@ $ —	= $ _____
_____		Subbase Gran. Matl., Type C		@ $ —	= $ _____
4,667	SQ YDS	6¼" HMA BINDER, IL 19.0, N90		@ $ 31.60	= $ 147,477
_____				@ $ —	= $ _____
		Total Cost of Original Pavement Construction			$ 378,933

ITEMIZED MAINTENANCE AND REHABILITATION ACTIVITY COST

REHABILITATION ACTIVITY 1 - YEAR 5

660 Lin. Ft.	50% Random/Thermal Crack Routing & Sealing (Assume 110ft/station)	@ $ 2	= $ 1,320
2400 Lin. Ft.	100% Longitudinal Shoulder Joint Routing & Sealing	@ $ 2	= $ 4,800
2,400 Lin. Ft.	100% Centerline Joint Routing & Sealing	@ $ 2	= $ 4,800
5 Sq. Yds.	0.1% Partial-Depth Pavement Patching —Mill & Fill Surface	@ $ 38	= $ 190
	Total Cost of Rehabilitation Activity 1		$ 11,110

FLEXIBLE PAVEMENT (Cont.)

FAP Route 326

Section N/A

KANE County

REHABILITATION ACTIVITY 2 - YEAR 10

23	Sq. Yds.	0.5% Partial-Depth HMA Pavement Patching - Mill & Fill Surface	@ $ 38	= $	874
660	Lin. Ft.	50% Random Thermal Crack Routing & Sealing (Assume 110 ft./station)	@ $ 2	= $	1,320
2,400	Lin. Ft.	100% Longitudinal Shoulder Joint Routing & Sealing	@ $ 2	= $	4,800
2,400	Lin. Ft.	100% Centerline Joint Routing & Sealing	@ $ 2	= $	4,800

Total Cost of Rehabilitation Activity 2 $ 11,794

REHABILITATION ACTIVITY 3 - YEAR 15

7,334	Sq. Yds.	2.00 in. Milling - Pavement & Shoulder	@ $ 2	= $	14,668 16,502
47	Sq. Yds.	1.0% Partial-Depth Pavement Patching (Mill & Fill Additional 2.00 in.)	@ $ 38	= $	1,786
821	Tons	2.00 in. HMA Overlay Pavement & Shoulder	@ $ 74	= $	60,754

Total Cost of Rehabilitation Activity 3 $ 77,208

FAP Route 326
Section N/A
KANE County

REHABILITATION ACTIVITY 4 - YEAR 20

2,400 Lin. Ft. 100% Longitudinal Shoulder Joint Routing and Sealing @ $ 2 = $ 4,800

2,400 Lin. Ft. 100% Centerline Joint Routing & Sealing @ $ 2 = $ 4,800

660 Lin. Ft. 50% Random/Thermal Crack Routing & Sealing (Assume 110 ft/station) @ $ 2 = $ 1,320

5 Sq. Yds. 0.1% Partial-Depth HMA Pavement Patching (Mill & Fill Surface) @ $ 38 = $ 190

Total Cost of Rehabilitation Activity 4 $ 11,110

REHABILITATION ACTIVITY 5 - YEAR 25

2,400 Lin. Ft. 100% Longitudinal Shoulder Joint Routing and Sealing @ $ 2 = $ 4,800

2,400 Lin. Ft. 100% Centerline Joint Routing & Sealing @ $ 2 = $ 4,800

660 Lin. Ft. 50% Random/Thermal Crack Routing & Sealing (Assume 110 ft/station) @ $ 2 = $ 1,320

23 Lin. Ft. 0.50% Partial-Depth Pavement Patching (Mill & Fill Surface) @ $ 38 = $ 874

Total Cost of Rehabilitation Activity 7 $ 11,794

REHABILITATION ACTIVITY 6 - YEAR 30

4,667 Sq. Yds. 2.00 in. Milling (Pavement Only - Standard Design Pavement & Shoulder - Limiting Strain Criterion Design) @ $ 2 = $ ~~10,501~~ 9334

93 Sq. Yds. 2.0% Partial-Depth HMA Pavement Patching (Mill & Fill Additional 2.00 in. All Designs) @ $ 38 = $ 3,534

27 Sq. Yds. 1.0% Full-Depth HMA Shoulder Patching (Mill & Fill Surface - Standard Design; Mill & Fill Additional 2.00 in. - Limiting Strain Criterion Design) @ $ 50 = $ 1,350

980 Tons HMA Overlay (3.75 in. - Standard Design Pavement; 2.00 in. - Limiting Strain Criterion Design) @ $ 74 = $ 72,520

261 Tons HMA Overlay - Shoulder (1.75 in. Standard Design; 2.00 in. - Limiting Strain Criterion Design) @ $ 74 = $ 19,314

106,052

Total Cost of Rehabilitation Activity 6 $ ~~107,219~~

FIGURE 5.05b(3)

FLEXIBLE PAVEMENT (Cont.)

FAP Route 325
Section N/A
KANE County

REHABILITATION ACTIVITY 7 - YEAR 35

2400	Lin. Ft.	100% Longitudinal Shoulder Joint Routing and Sealing	@ $ 2	= $	4,800
2400	Lin. Ft.	100% Centerline Joint Routing & Sealing	@ $ 2	= $	4,800
660	Lin. Ft.	50% Random/Thermal Crack Routing & Sealing (Assume 110 ft/Station)	@ $ 2	= $	1,320
5	Sq. Yds.	0.10% Partial-Depth Pavement Patching (Mill & Fill Surface)	@ $ 38	= $	190
		Total Cost of Rehabilitation Activity 7		$	11,110

REHABILITATION ACTIVITY 8 - YEAR 40

2,400	Lin. Ft.	100% Longitudinal Shoulder Joint Routing and Sealing	@ $ 2	= $	4,800
2,400	Lin. Ft.	100% Centerline Joint Routing & Sealing (Single lane and dual lane paving)	@ $ 2	= $	4,800
660	Lin. Ft.	50% Random/Thermal Crack Routing & Sealing	@ $ 2	= $	1,320
23	Sq. Yds.	0.50% Partial-Depth Pavement Patching (Mill & Fill Surface)	@ $ 38	= $	874
		Total Cost of Rehabilitation Activity 8		$	11,794

FIGURE 5.05b(4) - continued

FLEXIBLE PAVEMENT (Cont.)

FAP Route 326

Section N/A

KANE County

ANNUAL COST DETERMINATION

Present Worth Calculation:

					Present Worth
Total Cost of Original Pavement Construction					$ 378,533
Present Worth of Rehabilitation Activity	1	$ 11,110	X 0.8626	= $	9,583
Present Worth of Rehabilitation Activity	2	$ 11,794	X 0.7441	= $	8,776
Present Worth of Rehabilitation Activity	3	$ ~~79,842~~ 77,208	X 0.6419	= $	~~50,737~~ 49,560
Present Worth of Rehabilitation Activity	4	$ 11,110	X 0.5537	= $	6,152
Present Worth of Rehabilitation Activity	5	$ 11,794	X 0.4776	= $	5,633
Present Worth of Rehabilitation Activity	6	$ ~~107,279~~ 104,052	X 0.4120	= $	44,174 43,693
Present Worth of Rehabilitation Activity	7	$ 11,110	X 0.3554	= $	3,948
Present Worth of Rehabilitation Activity	8	$ 11,794	X 0.3066	= $	3,616

Total Life Cycle Cost (Present Worth) $ ~~511,352~~ 509,894

Annual Cost Per Mile Calculation

Present Worth Total Cost X CRF_n/Length = Annual Cost/Year-Mile

($ ~~511,552~~ 509,894 X 0.04079/0.23 Mi.) = $ ~~93,723~~ 90,429 /Yr.-Mi.

$$\frac{93,758 - 90,429}{90,429} = 0.033$$

FAVORS HMA BY 3.3%

FIGURE 5.05b(5)

PLAIN JOINTED PCC PAVEMENT

FILENAME-	IL 47 at Plato Rc	30-Nov-11	
ROUTE-	FAP 326 (IL 47)	03:35 PM	
SECTION-	N/A		
COUNTY-	Kane		
LOCATION-	IL 47 at Plato Rd		
DATE-	11/21/2011		
PROJECT LENGTH (FT)	1200 =	0.23	MILES
AVERAGE LANE WIDTH (FT)	17.5		
NUMBER OF LANES	2		
# OF EDGES	2		
INSIDE SHLDER WIDTH (FT)	10		
OUTSIDE SHLDER WIDTH (FT)	10		
# OF CENTERLINES	2		
RIGID THICKNESS-	9.25		
TRAFFIC FACTORS	MINIMUM	ACTUAL	
RIGID-	5.51	5.99	
TRAFFIC			
PV-	0	8435	
SU-	300	617	
MU-	900	906	

INITIAL COSTS

ITEM	QUANTITY	UNIT PRICE	COST
PAVEMENT (SQ YDS)	4,667	$51.32	$239,510
STAB SUBBASE (SQ YDS)	5,067	$19.00	$96,273
SHOULDERS (SQ YDS)	2,667	$47.00	$125,349
SHOULDER SEAL (LN FT)	2,400	$2.00	$4,800
SUBBASE GRAN MATL TY C (TONS	0	$0.00	$0
CONSTRUCTION INITIAL COST (PW)			$465,932
TOTAL REHABILITATION COST (PW)			$62,737
TOTAL LIFE CYCLE COST (PW)			$528,669
ANNUAL COST PER MILE			$93,758

MAINTENANCE COSTS:

ITEM	UNIT COST
PAVEMENT PATCHING (SQ YDS)	$60.00
SHOULDER PATCHING (SQ YDS)	$50.00
SHLDR JT ROUT & SEAL (LF)	$2.00
CENTERLINE JT ROUT & SEAL (LF)	$2.00
POLICY HMA OVERLAY PVMT (SQ YDS)	$11.00
POLICY HMA OVERLAY SHLDR (SQ YDS)	$11.00
RANDOM CRACK ROUT & SEAL (LF)	$2.00
REFL TRANS CRACK ROUT & SEAL (LF)	$2.00
PARTIAL PVMT PATCH (SQ YDS)	$50.00

MAINTENANCE COSTS

	ITEM	QUANTITY	UNIT PRICE	COST	PW
Activity 1 YEAR 10	PAVEMENT PATCHING 0.1% (SQ YDS)	5	$60	$300	
				$300	$223
Activity 2 YEAR 15	PAVEMENT PATCHING 0.2% (SQ YDS)	9	$60	$540	
				$540	$347
Activity 3 YEAR 20	PAVEMENT PATCHING 2.0% (SQ YDS)	93	$60	$5,580	
	SHOULDER PATCHING 0.5% (SQ YDS)	13	$50	$650	
	SHLDR JT ROUT & SEAL 100% (LF)	2,400	$2	$4,800	
	CENTERLINE JT ROUT & SEAL 100.0% (L	2,400	$2	$4,800	
				$15,830	$8,765
Activity 4 YEAR 25	PAVEMENT PATCHING 3.0% (SQ YDS)	140	$60	$8,400	
	SHOULDER PATCHING 1.0% (SQ YDS)	27	$50	$1,350	
				$9,750	$4,657
Activity 5 YEAR 30	PAVEMENT PATCHING 4.0% (SQ YDS)	187	$60	$11,220	
	SHOULDER PATCHING 1.5% (SQ YDS)	40	$50	$2,000	
	POLICY HMA OVERLAY PVMT (SQ YDS)	4,667	$11	$51,337	
	POLICY HMA OVERLAY SHLDR (SQ YDS)	2,667	$11	$29,337	
				$93,894	$38,684
Activity 6 YEAR 35	SHLDR JT ROUT & SEAL 100% (LF)	2,400	$2	$4,800	
	CENTERLINE JT ROUT & SEAL 100.0% (L	2,400	$2	$4,800	
	RANDOM CRACK ROUT & SEAL 50% (LF)	1,200	$2	$2,400	
	REFL TRANS CRACK ROUT & SEAL 40%	768	$2	$1,536	
	PARTIAL PVMT PATCH 0.1% (SQ YDS)	5	$50	$250	
				$13,786	$4,900
Activity 7 YEAR 40	PAVEMENT PATCHING 0.5% (SQ YDS)	23	$60	$1,380	
	PARTIAL PVMT PATCH 0.5% (SQ YDS)	23	$50	$1,150	
	REFL TRANS CRACK ROUT & SEAL 60%	1,152	$2	$2,304	
	RANDOM CRACK ROUT & SEAL 50% (LF)	1,200	$2	$2,400	
	SHLDR JT ROUT & SEAL 100% (LF)	2,400	$2	$4,800	
	CENTERLINE JT ROUT & SEAL 100.0% (L	2,400	$2	$4,800	
				$16,834	$5,161
	Total Rehabilitation Cost (Present Worth)				$62,737

FULL-DEPTH FLEXIBLE
TRAFFIC FACTOR LESS THAN 15.0 (RURAL)
TRAFFIC FACTOR LESS THAN 10.0 (URBAN)

ROUTE-	FAP 326 (IL 47)	30-Nov-11
SECTION-	N/A	03:35 PM
COUNTY-	Kane	
LOCATION-	IL 47 at Plato Rd	
PROJECT LENGTH (FT)	1200	
AVERAGE LANE WIDTH (FT)	17.5	

FULL-DEPTH FLEXIBLE PAVEMENT
MAINTENANCE COSTS

	ITEM	QUANTITY	UNIT PRICE	COST	Present Worth
Activity 1 YEAR 5	RAND/THERM CRACK ROUT & SEAL 50%	660	$2	$1,320	
	SHLDR JT ROUT & SEAL 100% (LF)	2,400	$2	$4,800	
	CENTERLINE JT ROUT & SEAL 100.0% (L	2,400	$2	$4,800	

NUMBER OF LANES	2		
# OF EDGES	2		
INSIDE SHLDER WIDTH (FT)	10		
OUTSIDE SHLDER WIDTH (FT)	10		
# OF CENTERLINES	2		
PROJECT TYPE	1	1=RURAL, 2=URBAN	
PAVING WIDTH	1	1=SINGLE LANE, 2=DUAL LANE	
FLEXIBLE THICKNESS-	0		

TRAFFIC FACTORS	MINIMUM	ACTUAL
FLEXIBLE	3.81	4.2
TRAFFIC		
PV-	0	8435
SU-	300	617
MU-	900	906

PAVEMENT OVERLAY THICKNESS	3.75
SHOULDER OVERLAY THICKNESS	1.75

INITIAL COSTS

ITEM	QUANTITY	UNIT PRICE	COST
SURFACE (SQ YDS)	4,667	$12.10	$56,471
POLY BINDER (SQ YDS)	4,667	$12.35	$57,637
BINDER (SQ YDS)	4,667	$31.60	$147,477
SHOULDERS (SQ YDS)	2667	$44.00	$117,348
SUBBASE GRAN MATL TY C (TONS	0	$0.00	$0

CONSTRUCTION INITIAL COST (PW)	$378,933
TOTAL REHABILITATION COST (PW)	$130,961
TOTAL LIFE CYCLE COST (PW)	$509,894
ANNUAL COST PER MILE	$90,429

MAINTENANCE COSTS:

ITEM	UNIT COST
RAND/THERM CRACK ROUT & SEAL (LF)	$2.00
SHLDR JT ROUT & SEAL (LF)	$2.00
CENTERLINE JT ROUT & SEAL (LF)	$2.00
PARTIAL PVMT PATCH (SQ YDS)	$38.00
2" MILL PVMT & SHLDR (SQ YDS)	$2.00
2" OVERLAY PVMT & SHLDR (TONS)	$74.00
2" MILL PVMT ONLY (SQ YDS)	$2.00
HMA SHOULDER PATCHING (SQ YDS)	$50.00
POLICY HMA OVERLAY PVMT (TONS)	$74.00
POLICY HMA OVERLAY SHLDR (TONS)	$74.00

MATERIAL TYPE/PERCENTAGE	ASPHALT	3.7%

	PARTIAL PVMT PATCH 0.1% (SQ YDS)	5	$38	$190	
				$11,110	$9,583
Activity 2					
YEAR 10	PARTIAL PVMT PATCH 0.5% (SQ YDS)	23	$38	$874	
	RAND/THERM CRACK ROUT & SEAL 50%	660	$2	$1,320	
	SHLDR JT ROUT & SEAL 100% (LF)	2,400	$2	$4,800	
	CENTERLINE JT ROUT & SEAL 100.0% (L	2,400	$2	$4,800	
				$11,794	$8,776
Activity 3					
YEAR 15	2" MILL PVMT & SHLDR 100% (SQ YDS)	7,334	$2	$14,668	
	PARTIAL PVMT PATCH 1.0% (SQ YDS)	47	$38	$1,786	
	2" OVERLAY PVMT & SHLDR 100% (TONS	821	$74	$60,754	
				$77,208	$49,560
Activity 4					
YEAR 20	SHLDR JT ROUT & SEAL 100% (LF)	2,400	$2	$4,800	
	CENTERLINE JT ROUT & SEAL 100.0% (L	2,400	$2	$4,800	
	RAND/THERM CRACK ROUT & SEAL 50%	660	$2	$1,320	
	PARTIAL PVMT PATCH 0.1% (SQ YDS)	5	$38	$190	
				$11,110	$6,152
Activity 5					
YEAR 25	SHLDR JT ROUT & SEAL 100% (LF)	2,400	$2	$4,800	
	CENTERLINE JT ROUT & SEAL 100.0% (L	2,400	$2	$4,800	
	RAND/THERM CRACK ROUT & SEAL 50%	660	$2	$1,320	
	PARTIAL PVMT PATCH 0.5% (SQ YDS)	23	$38	$874	
				$11,794	$5,633
Activity 6					
YEAR 30	2" MILL PVMT ONLY 100% (SQ YDS)	4,667	$2	$9,334	
	PARTIAL PVMT PATCH 2.0% (SQ YDS)	93	$38	$3,534	
	HMA SHOULDER PATCHING 1.0% (SQ YI	27	$50	$1,350	
	POLICY HMA OVERLAY PVMT (TONS)	980	$74	$72,520	
	POLICY HMA OVERLAY SHLDR (TONS)	261	$74	$19,314	
				$106,052	$43,693
Activity 7					
YEAR 35	SHLDR JT ROUT & SEAL 100% (LF)	2,400	$2	$4,800	
	CENTERLINE JT ROUT & SEAL 100.0% (L	2,400	$2	$4,800	
	RAND/THERM CRACK ROUT & SEAL 50%	660	$2	$1,320	
	PARTIAL PVMT PATCH 0.1% (SQ YDS)	5	$38	$190	
				$11,110	$3,948
Activity 8					
YEAR 40	SHLDR JT ROUT & SEAL 100% (LF)	2,400	$2	$4,800	
	CENTERLINE JT ROUT & SEAL 100.0% (L	2,400	$2	$4,800	
	RAND/THERM CRACK ROUT & SEAL 50%	660	$2	$1,320	
	PARTIAL PVMT PATCH 0.5% (SQ YDS)	23	$38	$874	
				$11,794	$3,616
	Total Rehabilitation Cost (Present Worth)				$130,961