Illinois Department of Transportation

To:	Eric Therkildsen	Attn: District Three
From:	John D. Baranzelli	
Subject:	Pavement Design	
Date:	July 11, 2012	

FAP Route 326 (IL 47)
Section (109,110)R, 110BR & BR-1
Kendall County
From Sherrill Road to Caton Farm Road

We have reviewed the revised pavement design for the above captioned section submitted to BDE on June 15, 2012.Two of the major intersections [Prologis and Granville Road] meet the criteria for high stress intersections. Adjacent sections of this project are designed with rigid pavement. For the ease of constructability, the entire roadway segment will be designed with the same material. The life cycle cost analysis favored the rigid design. The approved pavement design is as follows:

IL 47 from I-80 to Sherrill Road [new pavement]

10.5 inches of Jointed PCC Pavement with Tied PCC Shoulders
4 inches of Stabilized Sub-base
12 inches of Aggregate Subgrade Improvement

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

PAVEMENT DESIGNS AND COST ANALYSES

Contract 66B**84**
FAP Route 326 (IL 47)
Sections (109, 110)R-1
Kendall County
IL 47 from Sherrill Rd (Grundy Co Line) N to Caton Farm Rd

Desription: Both contracts consist of reconstruction of IL 47 to 2 lanes in each direction with turn lanes and a raised 32' median

Pavement Design Results

Contract 66B84 (7.2 miles) ---Rigid 10 ½"; Flexible 13 ¾"
Two high stress intersections at US 52 and Plattville Rds. Both intersections combined account for 2561' (0.485 miles) along IL 47.

Pavement Cost Analysis Results (in $ millions)

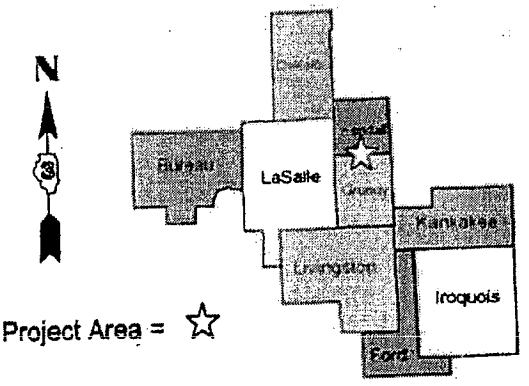
66B84	Initial Cost	Life Cycle Cost
Rigid	$20.661	$24.191
Flexible	$20.108	$25.794
SMA	$23.685	$29.706

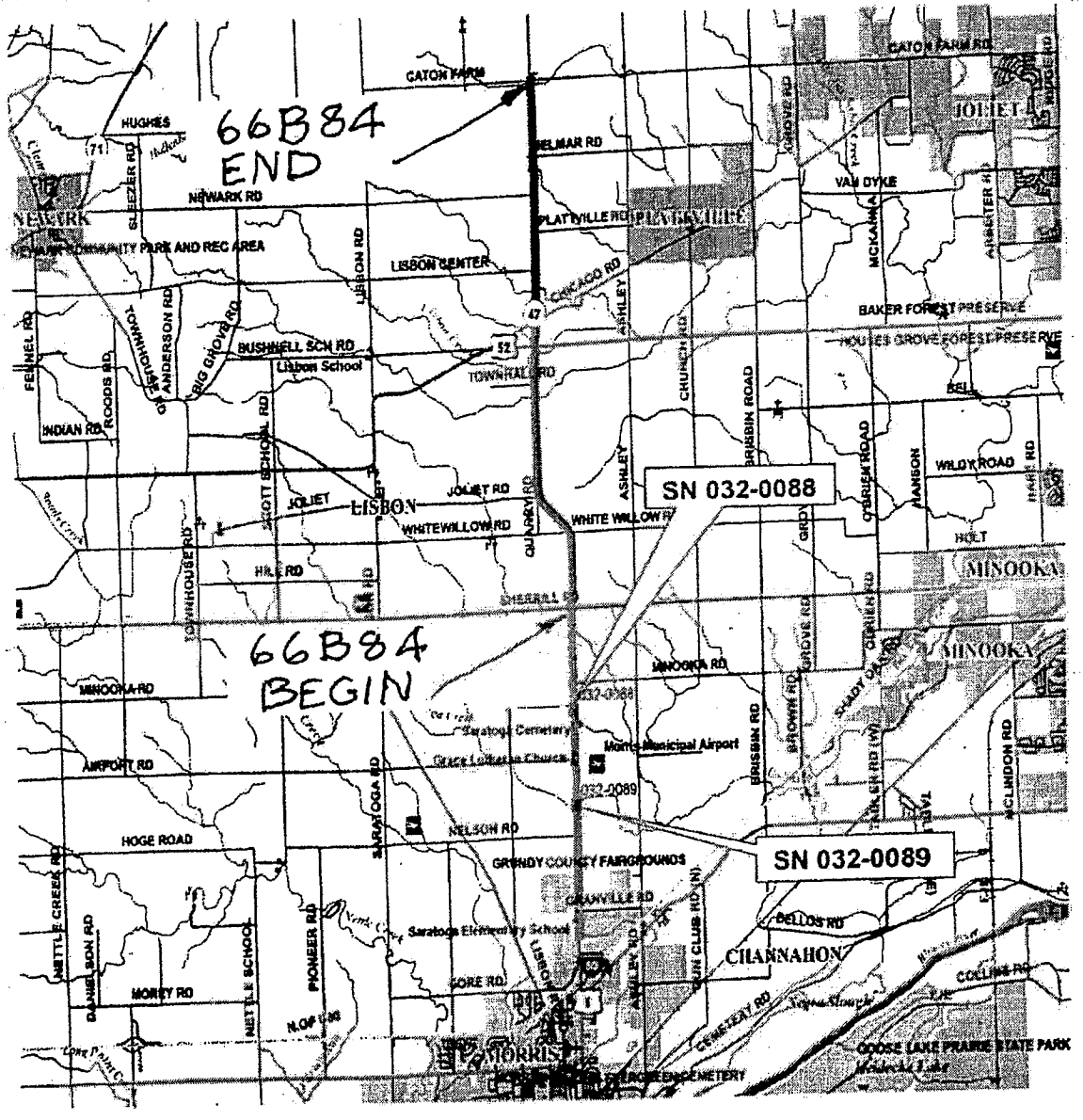
The difference in the life cycle costs between the rigid option and the flexible option is 9.4%, with the rigid option being the more favorable. District 3 prefers the use of a rigid design for this project.

District 3 requests approval to use PCC Pavement 10 ½" for this project.

Project Location Map

FAP Route 326 (IL 47)
Section (109,110)R, R-1, 110BR & BR-1
Grundy and Kendall Counties
Reconstruction: 2 Lanes each direction w/turn lanes;
Bridge Replacements (SN 032-0088 & 0089)
IL 47 3000 ft N of I-80 at Morris to Sherrill Rd (66B83)
IL 47 from Sherrill Rd to Caton Farm Rd (66B84)
Phase 1 Job No: P-93-029-12
Phase 2 Job No: D-93-026-12
Contract No. 66B83 and 66B84





Contract No: 66B83
Contract No: 66B84

D3# 4042 & 4046

BDE 5401 Template (05/29/2012)

IDOT MECHANISTIC PAVEMENT DESIGN

Printed: 06/12/2012

PROJECT AND TRAFFIC INPUTS

(Enter Data in Gray Shaded Cells)

66B84

Route: IL 47
Section: (109,110)R
County: Kendall County
Location: Shentl Rd (Grundy Co Line) to Caton Farm

Comments: ADT's based on approved Prairie Parkway IDS's
Truck breakdowns from inside IDOT link

Design Date: 05/01/2012 MU <-- BY
Modified Date: <-- BY

	ADT	Year
Current	17,140	2020
Future	23,200	2030

READ ME

Facility Type: Other Marked State Route
# of Lanes = 4

RESET

Road Class: I

Subgrade Support Rating (SSR): Poor
Construction Year: 2015
Design Period (DP) = 20 years

	Minimum ADT	Structural Design Traffic: Actual ADT	Actual %of Total ADT	% of ADT in Design Lane
PV =	0	15,582	75.0%	P = 32%
SU =	250	1,402	6.8%	S = 45%
MU =	750	3,792	18.3%	M = 45%
Struct. Design ADT =		20,776	(2026)	

TRAFFIC FACTOR CALCULATION

FLEXIBLE PAVEMENT

Cpv = 0.15
Csu = 132.5
Cmu = 482.53
TF flexible (Actual) = 18.15 (Actual ADT)
TF flexible (Min) = 3.56 (Min ADT Fig. 54-2.C)

RIGID PAVEMENT

Cpv = 0.15
Csu = 143.61
Cmu = 696.42
TF rigid (Actual) = 25.60 (Actual ADT)
TF rigid (Min) = 5.02 (Min ADT Fig. 54-2.C)

NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS

Full-Depth HMA Pavement

Use TF flexible = 18.15
PG Grade Lower Binder Lifts = PG 64-22 (Fig. 53-4.R)
HMA Mixture Temp. = 75.5 deg. F (Fig. 54-5.C)
Design HMA Mixture Modulus (E_{mix}) = 680 ksi (Fig. 54-5.D)
Design HMA Strain (ε_{mix}) = 53 (Fig. 54-5.E)
Full Depth HMA Design Thickness = 13.75 in. (Fig. 54-5.F)
Limiting Strain Criterion Thickness = 14.75 in. (Fig. 54-5.I)
Use Full-Depth HMA Thickness = 13.75 inches

JPC Pavement

Use TF rigid = 25.60
Edge Support = Tied Shoulder or C.&G.
Rigid Pavt Thick. = 10.50 in. (Fig. 54-4.E)

CRC Pavement

Use TF rigid = 25.60
IBR value = 3
CRCP Thickness = 10.25 in. (Fig. 54-4.M)

TF MUST BE > 60 FOR CRCP

RECONSTRUCTION ONLY (SUPPLEMENTAL) PAVEMENT DESIGN CALCULATIONS

HMA Overlay of Rubblized PCC

Use TF flexible = 18.15
District = 3,4,5,6
HMA Overlay Design Thickness = 12.00 in. (Fig. 54-5.U)

Unbonded Concrete Overlay

Review 54-4.03 for limitations and special considerations.
JPCP Thickness = NA inches

CONTACT BMPR FOR ASSISTANCE

DESIGN TABLES FROM BDE MANUAL CHAPTER 54 - PAVEMENT DESIGN

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)

	Min. Str. Design Traffic (Fig 54-2.C)		
Facility Type	PV	SU	MU
Interstate or Supplemental Freeway	0	500	1500
Other Marked State Route	0	250	750
Unmarked State Route	No Min	No Min	No Min

Class Table for One-Way Streets	
ADT	Class
0 - 3500	II
>3501	I

	Traffic Factor ESAL Coefficients			
	Rigid (Fig. 54-4.C)		Flexible (Fig. 54-5.B)	
Class	Csu	Cmu	Csu	Cmu
I	143.61	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	129.58	562.47	109.14	384.35

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

	Design Lane Distribution Factors For Structural Design Traffic (Fig. 54-2.B)					
	Rural			Urban		
Number of Lanes	P	S	M	P	S	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%

66B84

Revised July 1, 1991

MECHANISTIC PAVEMENT DESIGN

Date June 22, 2012

FAP Route 326 (IL 47)

Calculations by: MJ MQ

Section (109,110)BR, 110BR & BR-1

Checked by: MQ MJ

KENDALL County

Class 1 Roads and Streets

Location Grundy Co. to Sherrill Rd

Urban _____ Rural ✓

Limits of Analysis Station 6260+00 to Station 6636+00

Length 37,600 Feet 7.121 Miles

Structural Design Traffic

PV = 75 %

SU = 6.8 %

MU = 18.3 %

Percent of S.D.T. in Design Lane

P = 32 %

S = 45 %

U = 45 %

MINIMUM SUBGRADE SUPPORT RATING- "Poor"

Flexible Pavement Design

Actual TF_F = 18.15 Minimum TF_F = 3.56

Selected Design AC Type PG 64-22

Design AC Mixture Temp. 75.5 degrees F

Design E_{AC} 680 KSI

Design AC Microstrain 53

AC Thickness 13.75 Inch

Rigid Pavement Design

Actual TF_R = 25.6 Minimum TF_R = 5.02

Extended Lane 10.5 Inch

15' Panel PCC Thickness for:

Tied Shoulder 10.5 Inch

Untied Shoulder 10.75 Inch

IDS

Trucks
MU 16.91%
SU 8.09%

⇒ TF = 14.87/20.84 (Flex/Rigid)

Granville
ADT2026 = 17,880
16,200 / 2020
19,000 / 2030

MU 12.68
SU 11.59

TF = 12.33/16.91

MU 12.68
SU 11.59

TF = 11.52/15.79

Prologis
ADT = 16,700
2024 14,000 2020
18,500 2030

MU 12.68
SU 11.59

TF = 11.52/15.79

MU 12.68
SU 11.59

TF = 11.52/15.79

Sherrill Rd
NO IDS

MU 17.65
SU 7.35

TF = 14.28/20.08

MU 17.65
SU 7.35

TF = 14.28/20.08

Joliet Rd
NO IDS

MU 17.89
SU 6.32

TF = 17.25/20.10

MU 17.89
SU 6.32

TF = 17.47/24.65

US 52
ADT = 20460
2026 17900 2024
22200 2030

MU 18.25
SU 6.75

TF = 17.89/25.23

MU 18.25
SU 6.75

TF = 18.15/25.60

Plattville Rd
ADT = 20,776
2026 17140 2020
23200 2030

MU 17.19
SU 5.47

TF = 16.88/23.87

MU 17.19
SU 5.47

TF = 16.88/23.87

Caton Farm Rd

MU 17.69
5.38

TF = 17.31/24.50

Rigid Pvt Design

TF calc by computer

TF = 25.60

Input Class I Road

TF minimums are exceeded

1" dowels 15 panels

Rural typical w/ tied shlds

Design Period = 20 yrs

Traffic Factor) eqn 5-4.1

HMA subbase 4"

Composite Agg Improved subgrade

SSR = Poor

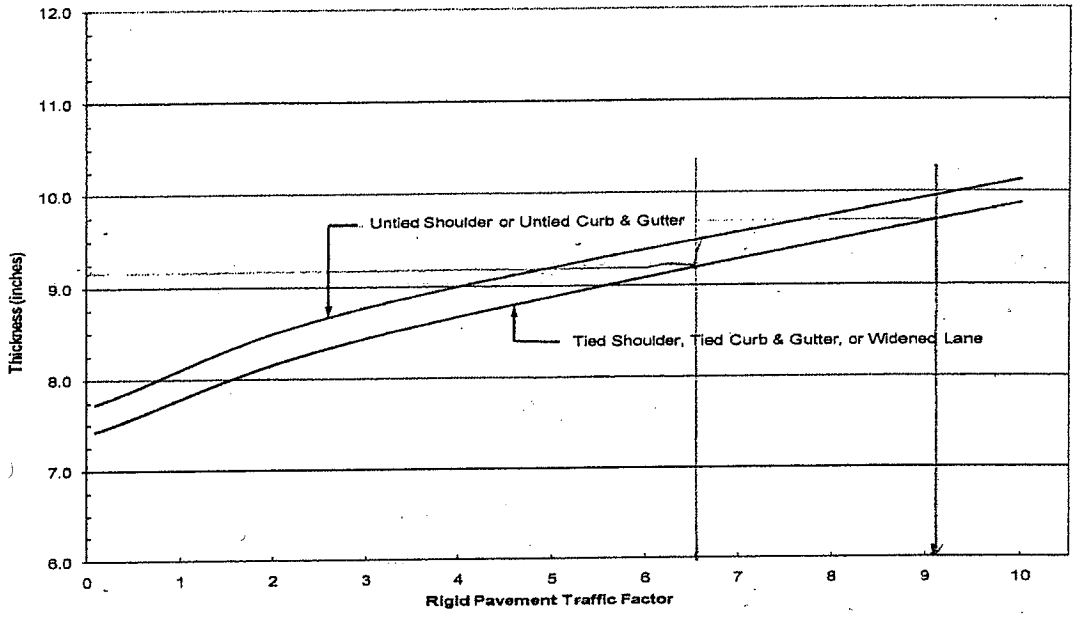
Output Concrete Thickness

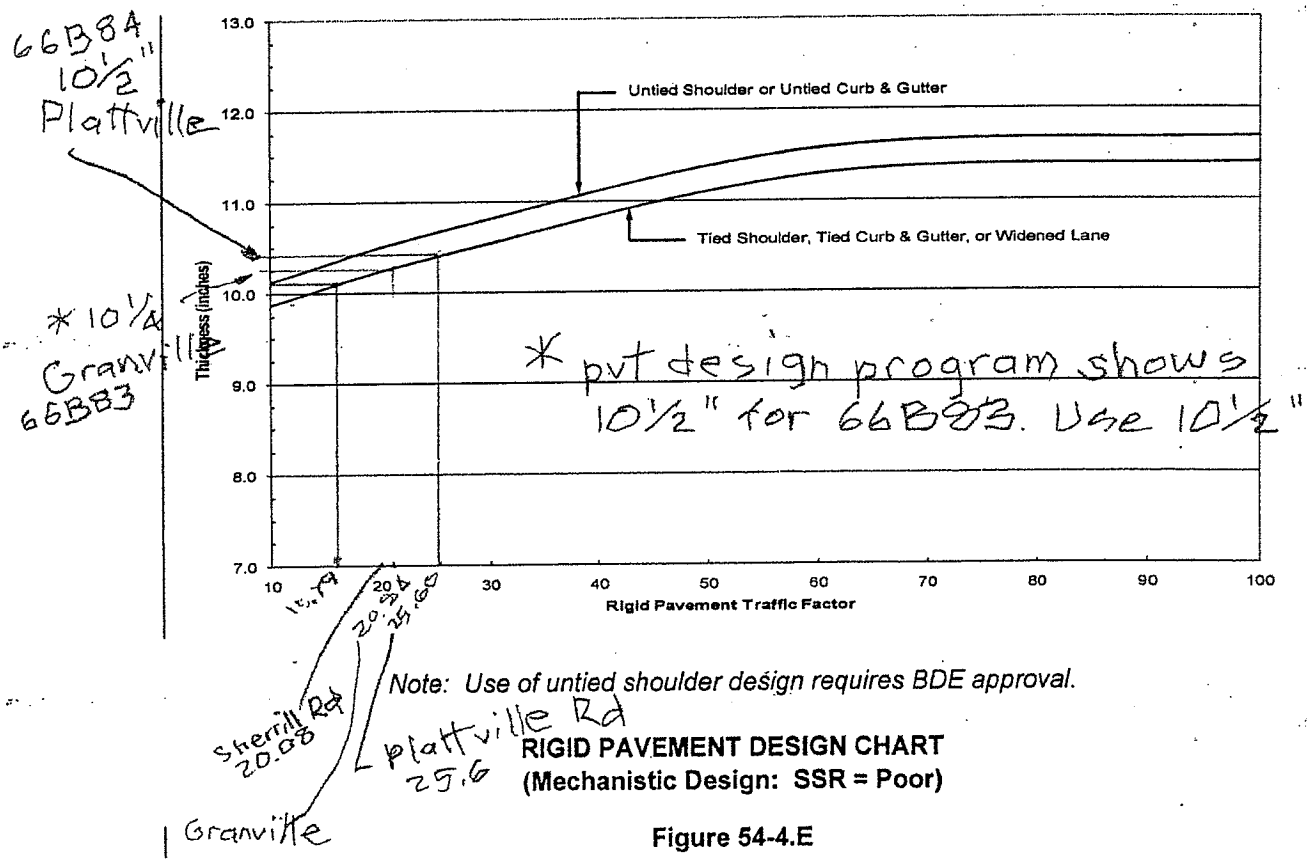
to $10\frac{1}{2}$"

Contract 66B8A use $10\frac{1}{2}$" PCC Pvt

(based on Plattville Rd TF = 25.60)

use US 52 TF = 25.23





Note: Use of untied shoulder design requires BDE approval.

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

Figure 54-4.E

Flexible Design

Input Class I Road

TF exceed minimum

SSE = poor

Temp = 75.5°

PG 64-22

E_{HMA} = 675

~~$TF_{Granville} = 14.87$~~

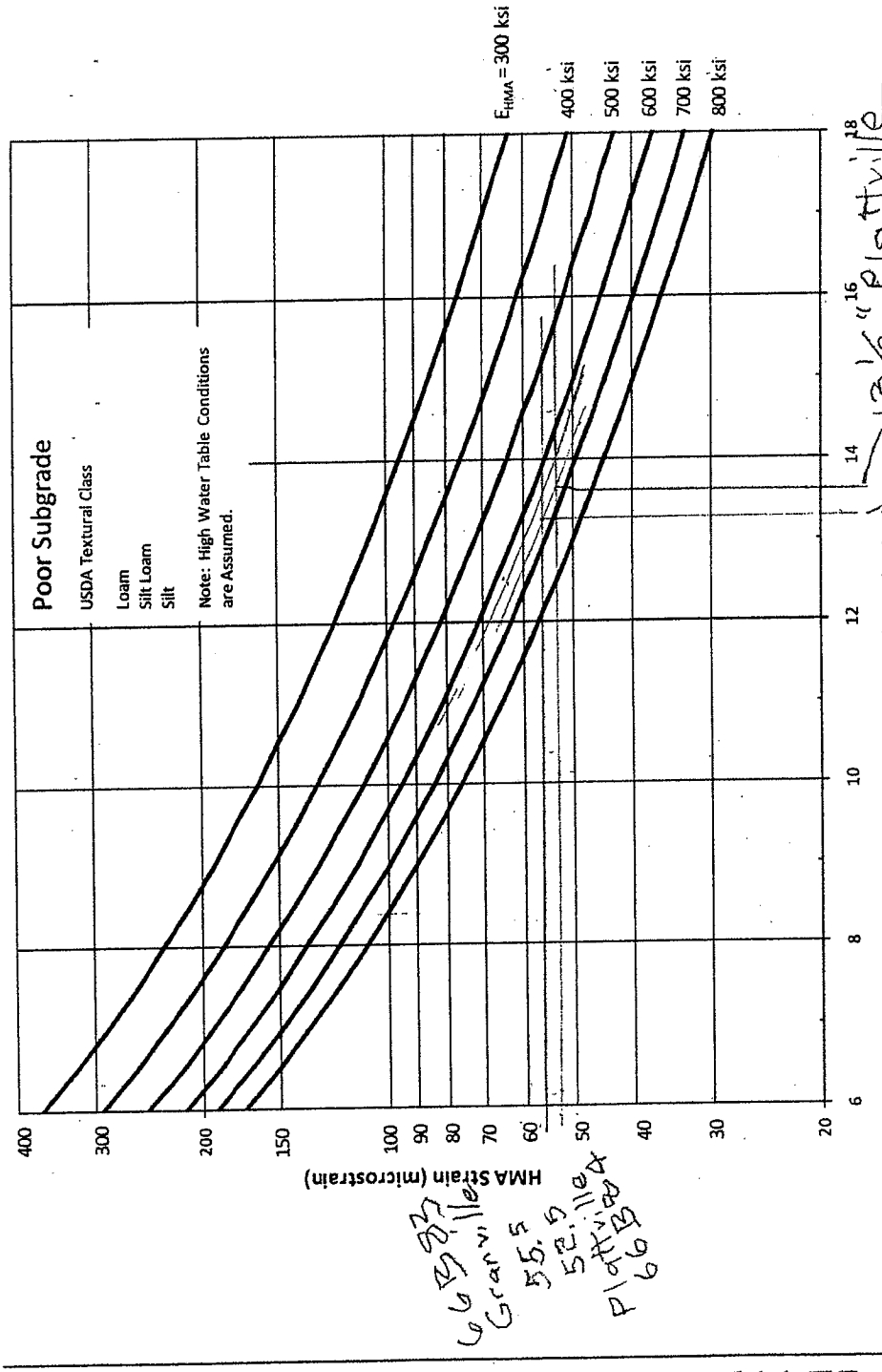
$TF_{Flatville} = 18.15$

from Thickness Design

~~$13\frac{1}{4}$" @ Granville (64B23)~~

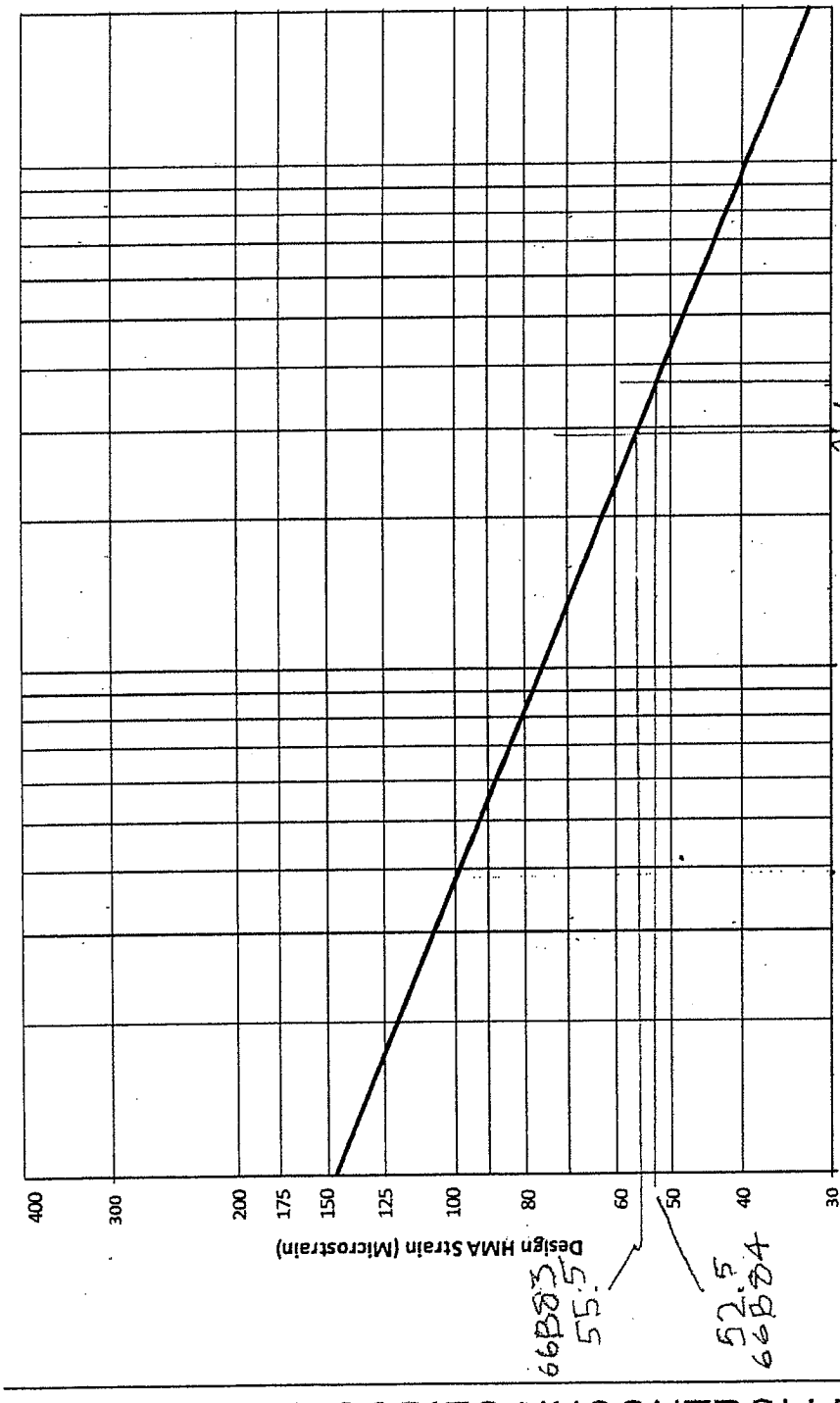
$13\frac{3}{4}$" @ Flatteville (66B84)

checks with limiting strains criteria



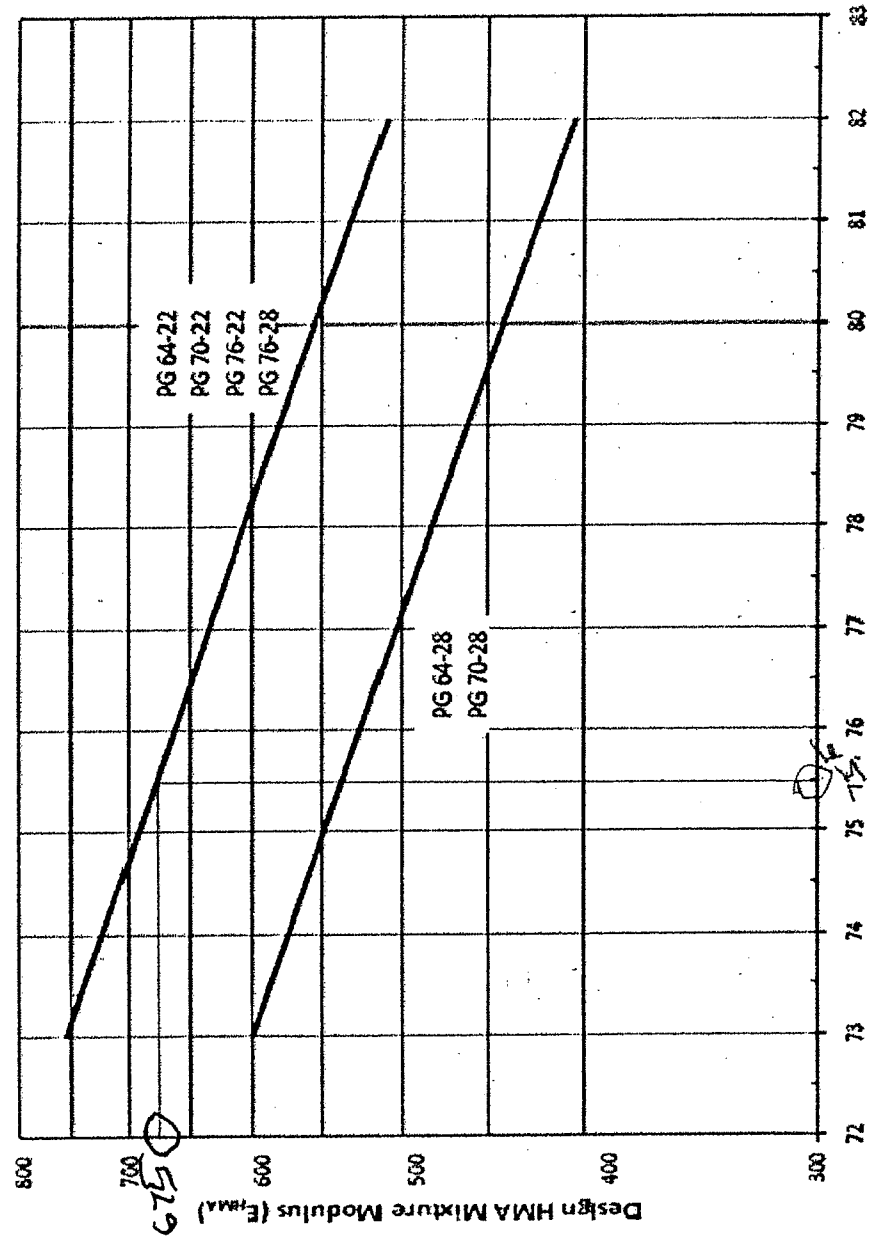
HMA THICKNESS DESIGN CHART
(Mechanistic Design: Flexible Pavement: SSR = Poor)

Figure 54-5.F



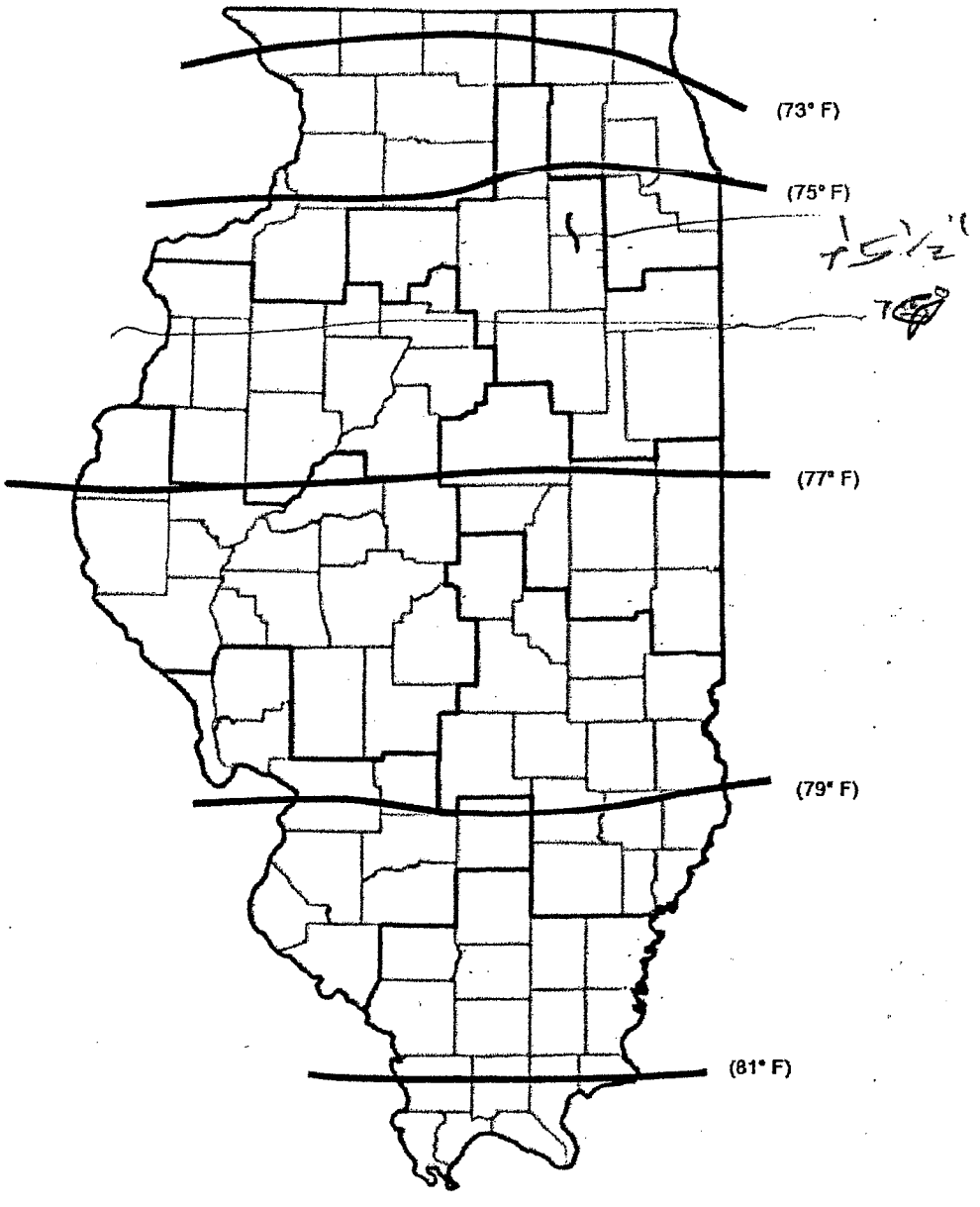
DESIGN HMA STRAIN
(Mechanistic Design: Flexible Pavement)

Figure 54-5.E



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

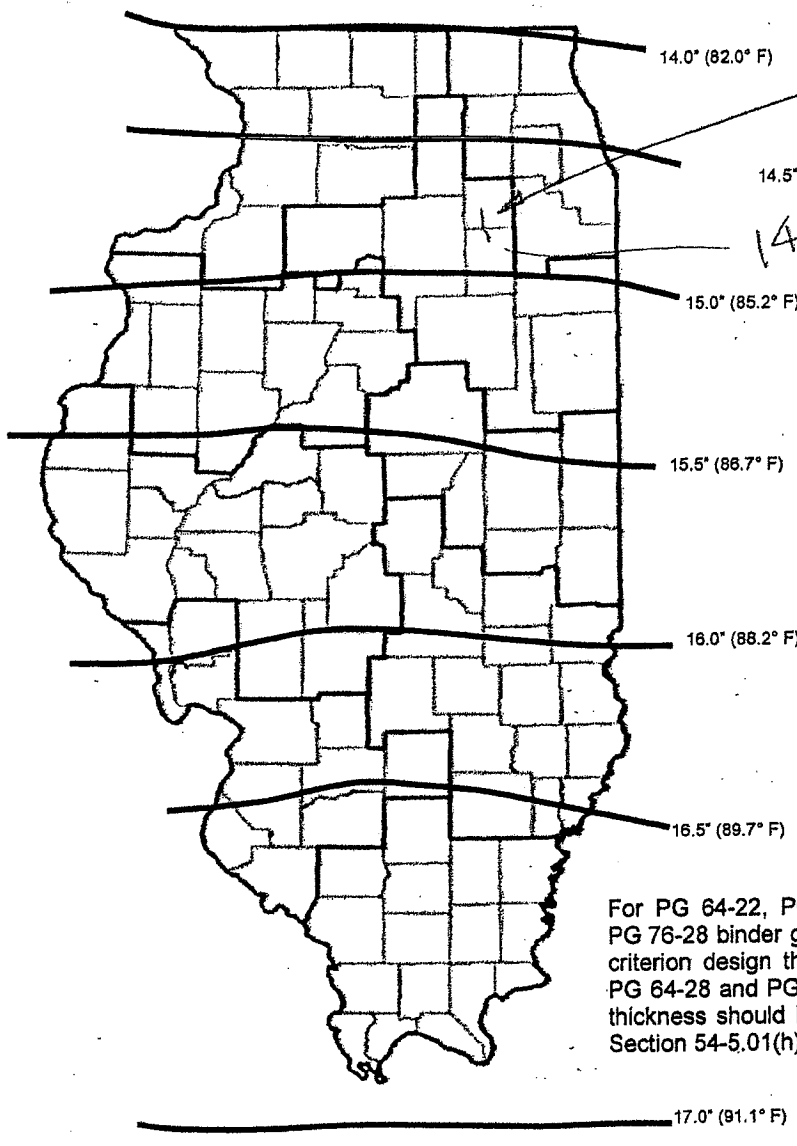
Figure 54-5.D



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

HMA MIXTURE TEMPERATURE
(Mechanistic Design: Flexible Pavement)

Figure 54-5.C



For PG 64-22, PG 70-22, PG 76-22, and PG 76-28 binder grades, read limiting strain criterion design thickness off of map. For PG 64-28 and PG 70-28 binder grades, the thickness should be corrected according to Section 54-5.01(h)8a.

Note. Thickness values based upon Mean Monthly Pavement Temperature at 4 in. depth correlated to July Mean Monthly Air Temperature, axle load of 20,000 lb, strain of 70 με, and E_{Ri} of 2 ksi.

MAXIMUM PAVEMENT THICKNESS
(Limiting Strain Criterion Design: Flexible Pavement)

Figure 54-5.I

HMA FLEXIBLE PAVEMENT

Date: = 6-11-2012					FAP	Route	326 (IL 47)
Quantities by:	MQ	Checked by:		MJ	Section		(109,110)R, 110BR & BR-1
Unit Prices by:	MY	Checked by:			GRUNDY		County
Net Length	37,600	Lin. Ft.	7.121212	Miles	contract 66B84		
Number Lanes		Urban	4	Rural			
	Single Lane Paving			Dual Lane Paving			

ITEMIZED CONSTRUCTION COST

Quantity	Unit	Item		Unit Cost		Total Cost
222,000	Sq. Yds.	2" POLY HMA SURF CSE, MIX D, N90	@	$10.02	=	$2,225,328.00
222,000	Sq. Yds.	2" 1/4" POLY HMA BINDER CSE, IL 19.0 N90	@	$11.23	=	$2,492,616.00
222,000	Sq. Yds.	9" HMA BINDER CSE, IL 19.0 N70	@	$37.30	=	$8,280,156.00
65,000	Sq. Yds.	HMA SHLD 8"	@	$34.05	=	$2,213,250.00
150,400	Lin. Ft.	PIPE UNDERDRAIN	@	$5.50	=	$827,200.00
23,255	Tons	SUBBASE GRAN MAT, TY C	@	$24.85	=	$577,886.75
321,200	Sq. Yds.	AGG SUBGRD IMPROV 12"	@	$7.00	=	$2,248,400.00
5,800	Tons	AGG SHLD, TY B	@	$19.80	=	$114,840.00
0	Lin. Ft.	100% SHLD JT SEAL	@	$0.00	=	$0.00
0	Lin. Ft.	CC&G B-6.24	@	$0.00	=	$0.00
75,200	Lin. Ft.	CC&G M-4.24	@	$15.00	=	$1,128,000.00

Total Cost of Original Pavement Construction = **$20,107,676.75**

ITEMIZED MAINTENANCE AND REHABILITATION ACTIVITY COST

REHABILITATION ACTIVITY 1 – YEAR 5

41,360	Lin. Ft.	50% Random/Thermal Crack-Routing & Sealing Assume 110ft/Station	@	$1.75	=	$72,380.00
75,200	Lin. Ft.	100% Longitudinal/ Shoulder Joint Routing & Sealing	@	$1.75	=	$131,600.00
150,400	Lin. Ft.	100% Centerline Joint, Routing & Sealing	@	$1.75	=	$263,200.00
222	Sq. Yds.	0.1% Partial-Depth Pavement Patching (Mill & Fill Surface)	@	$11.57	=	$2,568.54

Total Cost of Rehabilitation Activity 1 = **$469,748.54**
HMA FLEXIBLE PAVEMENT

FAB	Route	326 (IL 47)	
Section	(109,110)R, 110BR & BR-1		
GRUNDY		County	

REHABILITAION ACTIVITY 2 – YEAR 10

1,110	Sq. Yds.	0.5% Partial-Depth HMA Pavement Patching (Mill & Fill Surface)	@	$11.57 =	$12,842.70
41,360	Lin. Ft.	50% Random/Thermal Crack-Routing & Sealing Assume 110ft/Station	@	$1.75 =	$72,380.00
75,200	Lin. Ft.	100% Longitudinal/ Shoulder Joint Routing & Sealing	@	$1.75 =	$131,600.00
150,400	Lin. Ft.	100% Centerline Joint, Routing & Sealing	@	$1.75 =	$263,200.00

Total Cost of Rehabilitation Activity 2 = **$480,022.70**

REHABILITAION ACTIVITY 3 – YEAR 15

287,000	Sq. Yds.	2.00 in. Milling-Pavement & Shoulder	@	$1.55 =	$444,850.00
2,220	Sq. Yds.	1.0% Partial-Depth Pavement Patching (Mill & Fill Additional 2.00 in)	@	$11.57 =	$25,685.40
24,864	Tons	2.00 in. HMA Overlay Pavement & Shoulder	@	$89.50	$2,225,328.00
7,820				$76.00 =	$594,320.00

Total Cost of Rehabilitation Activity 3 = **$3,290,183.40**

REHABILITATION ACTIVITY 4 – YEAR 20

41,360	Lin. Ft.	50% Random/Thermal Crack-Routing & Sealing Assume 110ft/Station	@	$1.75 =	$72,380.00
75,200	Lin. Ft.	100% Longitudinal/ Shoulder Joint Routing & Sealing	@	$1.75 =	$131,600.00
150,400	Lin. Ft.	100% Centerline Joint, Routing & Sealing	@	$1.75 =	$263,200.00

222	Sq. Yds.	0.1% Partial-Depth Pavement Patching (Mill & Fill Surface)	@	$11.57	=	$2,568.54

Total Cost of Rehabilitation Activity 4 = **$469,748.54**

HMA FLEXIBLE PAVEMENT

FAB Route 326 (IL 47)
Section (109,110)R, 110BR & BR-1
GRUNDY County

REHABILITATION ACTIVITY 5 – YEAR 25

1,110	Sq. Yds.	0.5% Partial-Depth HMA Pavement Patching (Mill & Fill Surface)	@	$11.57	=	$12,842.70
41,360	Lin. Ft.	50% Random/Thermal Crack-Routing & Sealing Assume 110ft/Station	@	$1.75	=	$72,380.00
75,200	Lin. Ft.	100% Longitudinal/ Shoulder Joint Routing & Sealing	@	$1.75	=	$131,600.00
150,400	Lin. Ft.	100% Centerline Joint, Routing & Sealing	@	$1.75	=	$263,200.00

Total Cost of Rehabilitation Activity 5 = **$480,022.70**

REHABILITATION ACTIVITY 6 – YEAR 30

222,000	Sq. Yds.	2.00 Milling- (Pavement Only-Standard Design Pvt & Shld - Limiting Strain Criterion Design)	@	$1.55	=	$344,100.00
4,440	Sq. Yds.	2.0% Partial-Depth HMA Pavement Patching (Mill & Fill Additional 2.00 in. All Designs)	@	$11.57	=	$51,370.80
650	Sq. Yds.	1.0% Full-Depth HMA Shoulder Patching (Mill & Fill Surface-Standard Design)(Mill & Fill Additional 2.00 in. -Limiting Strain Criterion Design)	@	$138.00	=	$89,700.00
18,650	Tons	HMA Overlay Pavement	@	$89.50		$1,669,175.00
27,980		(Pavement 3.75 in.-Standard Design; 2.00 in.-Limiting Strain Criterion Design)		$80.10	=	$2,241,198.00
6,370	Tons	HMA Overlay Shoulder (Shoulder 1.75 in. Standard Design; 2.00 in.-Limiting Strain Criterion Design)	@	$75.90	=	$483,483.00

Total Cost of Rehabilitation Activity 6 = **$4,879,026.80**

HMA FLEXIBLE PAVEMENT

FAB	Route	326 (IL 47)	
Section	(109,110)R, 110BR & BR-1		
GRUNDY		County	

REHABILITATION ACTIVITY 7 – YEAR 35

41,360	Lin. Ft.	50% Random/Thermal Crack-Routing & Sealing Assume 110ft/Station	@	$1.75	=	$72,380.00
75,200	Lin. Ft.	100% Longitudinal/ Shoulder Joint Routing & Sealing	@	$1.75	=	$131,600.00
150,400	Lin. Ft.	100% Centerline Joint, Routing & Sealing	@	$1.75	=	$263,200.00
222	Sq. Yds.	0.1% Partial-Depth Pavement Patching (Mill & Fill Surface)	@	$11.57	=	$2,568.54
		Total Cost of Rehabilitation Activity 7			=	**$469,748.54**

REHABILITATION ACTIVITY 8– YEAR 40

1,110	Sq. Yds.	0.5% Partial-Depth HMA Pavement Patching (Mill & Fill Surface)	@	$11.57	=	$12,842.70
41,360	Lin. Ft.	50% Random/Thermal Crack-Routing & Sealing Assume 110ft/Station	@	$1.75	=	$72,380.00
72,500	Lin. Ft.	100% Longitudinal/ Shoulder Joint Routing & Sealing	@	$1.75	=	$126,875.00
150,400	Lin. Ft.	100% Centerline Joint, Routing & Sealing	@	$1.75	=	$263,200.00
		Total Cost of Rehabilitation Activity 8			=	**$475,297.70**

HMA FLEXIBLE PAVEMENT

FAB	Route .326 (IL 47)
Section	(109,110)R, 110BR & BR-1
GRUNDY	County

ANNUAL COST DETERMINATION

Present Worth Calculation:

Total Cost of Original Pavement Construction				=	$20,107,676.75
Present Worth of Rehabilitation Activity 1	$469,748.54	X	0.8626	=	$405,205.09
Present Worth of Rehabilitation Activity 2	$480,022.70	X	0.7441	=	$357,184.89
Present Worth of Rehabilitation Activity 3	$3,290,183.40	X	0.6419	=	$2,111,968.72
Present Worth of Rehabilitation Activity 4	$469;748.54	X	0.5537	=	$260,099.77
Present Worth of Rehabilitation Activity 5	$480,022.70	X	0.4776	=	$229,258.84
Present Worth of Rehabilitation Activity 6	$4,879,026.80	X	0.412	=	$2,010,159.04
Present Worth of Rehabilitation Activity 7	$469,748.54	X	0.3554	=	$166,948.63
Present Worth of Rehabilitation Activity 8	$475,297.70	X	0.3066	=	$145,726.27
Total Life Cycle Cost (Present Worth)				=	**$25,794,228.01**

Annual Cost per Mile Calculation

Total PW	X	CRF_n	÷	Length (Miles)	=	Ann. Cost / Year*Mile
$25,794,228.01	X	0.4079	÷	7.121212 Miles	=	**$1,477,482.40**

RIGID PAVEMENT

Date: = 6-15-2012					
Quantities by:	MQ	Checked by:		MJ	
Unit Prices by:	MY	Checked by:			
Net Length	37,600	Lin. Ft.	7.121	Miles	
Number Lanes		Urban	4	Rural	

FAB	Route	326 (IL 47)
Section		(109,110)R
KENDALL		County

CONTRACT 66B84

ITEMIZED CONSTRUCTION COST

Quantity	Unit	Item		Unit Cost		Total Cost
222,000	Sq. Yds.	PCC PVT 10 1/2"	@	$39.45	=	$8,757,900.00
259,000	Sq. Yds.	STAB SUBBASE 4"	@	$18.00	=	$4,662,000.00
65,000	Sq. Yds.	PCC SHLD 8"	@	$30.80	=	$2,002,000.00
150,400	Lin. Ft.	PIPE UNDERDRAIN	@	$4.65	=	$699,360.00
23,433	Tons	SUBBASE GRAN MAT, TY C	@	$25.20	=	$590,511.60
321,193	Sq. Yds.	AGG SUBGRD IMPROV 12"	@	$8.00	=	$2,569,544.00
5,710	Tons	AGG SHLD, TY B	@	$19.80	=	$113,058.00
75,200	Lin. Ft.	100% SHLD JT SEAL	@	$0.65	=	$48,880.00
0	Lin. Ft.	CC&G B-6.24	@	$15.00	=	$0.00
75,200	Lin. Ft.	CC&G M-4.24	@	$16.20	=	$1,218,240.00
0	Sq. Yds.		@	$0.00	=	$0.00

Total Cost of Original Pavement Construction = **$20,661,493.60**

ITEMIZED MAINTENANCE AND REHABILITATION ACTIVITY COST

REHABILITATION ACTIVITY 1 – YEAR 10

222	Sq. Yds.	0.1% Full-Depth PCC Pavement Patching	@	$128.50	=	$28,527.00

Total Cost of Rehabilitation Activity 1 = **$28,527.00**

REHABILITAION ACTIVITY 2 – YEAR 15

444	Sq. Yds.	0.2% Full-Depth PCC Pavement Patching	@	$128.50	=	$57,054.00

Total Cost of Rehabilitation Activity 2 = **$57,054.00**

RIGID PAVEMENT

FAB	Route	326 (IL 47)	
Section		(109,110)R	
KENDALL		County	

REHABILITAION ACTIVITY 3 – YEAR 20

4,440	Sq. Yds.	2.0% Full-Depth PCC Pavement Patching	@	$128.50	=	$570,540.00
325	Sq. Yds.	0.5% Full-Depth PCC Shoulder Patching	@	$110.00	=	$35,750.00
75,200	Lin. Ft.	100% Longitudinal/ Shoulder Joint Routing & Sealing	@	$1.75	=	$131,600.00
150,400	Lin. Ft.	100% Centerline Joint, Routing & Sealing	@	$1.75	=	$263,200.00

Total Cost of Rehabilitation Activity 3 = **$1,001,090.00**

REHABILITATION ACTIVITY 4 – YEAR 25

6,660	Sq. Yds.	3.0% Full-Depth PCC Pavement Patching	@	$128.50	=	$855,810.00
650	Sq. Yds.	1.0% Full-Depth PCC Shoulder Patching	@	$110.00	=	$71,500.00

Total Cost of Rehabilitation Activity 4 = **$927,310.00**

REHABILITATION ACTIVITY 5 – YEAR 30

8,880	Sq. Yds.	4.0% Full-Depth PCC Pavement Patching	@	$128.50	=	$1,141,080.00
975	Sq. Yds.	1.5% Full-Depth PCC Shoulder Patching	@	$110.00	=	$107,250.00
238,711	Sq. Yds.	Policy HMA Overlay - Pavement	@	$12.01	=	$2,866,919.11
65,000	Sq. Yds.	Policy HMA Overlay - Shoulder	@	$10.64	=	$691,600.00

Total Cost of Rehabilitation Activity 5 = **$4,806,849.11**

RIGID PAVEMENT

FAB	Route 326 (IL 47)
Section	(109,110)R
KENDALL	County

REHABILITATION ACTIVITY 6 – YEAR 35

75,200	Lin. Ft.	100% Longitudinal/ Shoulder Joint Routing & Sealing	@	$1.75	=	$131,600.00
150,400	Lin. Ft.	100% Centerline Joint, Routing & Sealing	@	$1.75	=	$263,200.00
37,600	Lin. Ft.	50% Random Crack- Routing &-Sealing Assume 100ft/Station	@	$1.75	=	$65,800.00
96,300	Lin. Ft.	40% Reflective Transverse Crack Routing & Sealing	@	$1.75	=	$168,525.00
222	Sq. Yds.	0.1% Partial-Depth Pavement Patching (Mill & Fill Surface-Interstates; Mill& Fill 2.5" -Non-Interstates)	@	$18.50	=	$4,107.00
		Total Cost of Rehabilitation Activity 6			=	**$633,232.00**

REHABILITATION ACTIVITY 7 – YEAR 40

1,110	Sq. Yds.	0.5% Full-Depth PCC Pavement Patching	@	$128.50	=	$142,635.00
1,110	Sq. Yds.	0.5% Partial-Depth Pavement Patching (Mill & Fill Surface-Interstates; Mill& Fill 2.5" -Non-Interstates)	@	$18.50	=	$20,535.00
144,400	Lin. Ft.	60% Reflective Transverse Crack Routing & Sealing	@	$1.75	=	$252,700.00
37,500	Lin. Ft.	50% Random Crack- Routing & Sealing Assume 100ft/Station	@	$1.75	=	$65,625.00
75,200	Lin. Ft.	100% Longitudinal/ Shoulder Joint Routing & Sealing	@	$1.75	=	$131,600.00
150,400	Lin. Ft.	100% Centerline Joint, Routing & Sealing	@	$1.75	=	$263,200.00

Total Cost of Rehabilitation Activity 7 = **$876,295.00**

RIGID PAVEMENT

FAB	Route	326 (IL 47)
Section		(109,110)R
KENDALL		County

ANNUAL COST DETERMINATION

Present Worth Calculation:

Total Cost of Original Pavement Construction = $20,661,493.60

Present Worth of Rehabilitation Activity 1	$28,527.00	X	0.7441	=	$21,226.94
Present Worth of Rehabilitation Activity 2	$57,054.00	X	0.6419	=	$36,622.96
Present Worth of Rehabilitation Activity 3	$1,001,090.00	X	0.5537	=	$554,303.53
Present Worth of Rehabilitation Activity 4	$927,310.00	X	0.4776	=	$442,883.26
Present Worth of Rehabilitation Activity 5	$4,806,849.11	X	0.4120	=	$1,980,421.83
Present Worth of Rehabilitation Activity 6	$633,232.00	X	0.3554	=	$225,050.65
Present Worth of Rehabilitation Activity 7	$876,295.00	X	0.3066	=	$268,672.05

Total Life Cycle Cost (Present Worth) = **$24,190,674.83**

Annual Cost per Mile Calculation

Total PW	X	CRF_n	÷	Length (Miles)	=	Ann. Cost / Year*Mile
$24,190,674.83	X	0.4079	÷	7.12121 Miles	=	**$1,385,631.56**

SMA FLEXIBLE PAVEMENT

Date: =				FAB	Route 326 (IL 47)
Quantities by:	MQ	Checked by:	MJ	Section	(109,110)R, 110BR & BR-1
Unit Prices by:	MY	Checked by:		GRUNDY	County
Net Length	37,600	Lin. Ft.	7.121212 Miles	contract 66B84	
Number Lanes	4	Urban	Rural		
	Single Lane Paving		Dual Lane Paving		

ITEMIZED CONSTRUCTION COST

Quantity	Unit	Item		Unit Cost		Total Cost
222,000	Sq. Yds.	2" POLY HMA SURF CSE, SMA, N80	@	$11.14	=	$2,473,968.00
222,000	Sq. Yds.	2" POLY HMA BINDER CSE, SMA, N81	@	$9.60	=	$2,132,088.00
222,000	Sq. Yds.	9 1/4" HMA BINDER CSE, IL 19.0 N70	@	$41.50	=	$9,212,112.00
65,000	Sq. Yds.	HMA SHLD 8"	@	$76.00	=	$4,940,000.00
150,400	Lin. Ft.	PIPE UNDERDRAIN	@	$5.50	=	$827,200.00
23,255	Tons	SUBBASE GRAN MAT, TY C	@	$24.85	=	$577,886.75
321,200	Sq. Yds.	AGG SUBGRD IMPROV 12"	@	$7.00	=	$2,248,400.00
2,772	Tons	AGG SHLD, TY B	@	$19.80	=	$54,885.60
0	Lin. Ft.	100% SHLD JT SEAL	@	$0.00	=	$0.00
0	Lin. Ft.	CC&G B-6.24	@	$0.00	=	$0.00
75,200	Lin. Ft.	CC&G M-4.24	@	$16.20	=	$1,218,240.00

Total Cost of Original Pavement Construction = **$23,684,780.35**

ITEMIZED MAINTENANCE AND REHABILITATION ACTIVITY COST

REHABILITATION ACTIVITY 1 – YEAR 5

41,360	Lin. Ft.	50% Random/Thermal Crack-Routing & Sealing Assume 110ft/Station	@	$1.75	=	$72,380.00
75,200	Lin. Ft.	100% Longitudinal/ Shoulder Joint Routing & Sealing	@	$1.75	=	$131,600.00
150,400	Lin. Ft.	100% Centerline Joint, Routing & Sealing	@	$1.75	=	$263,200.00
222	Sq. Yds.	0.1% Partial-Depth Pavement Patching (Mill & Fill Surface)	@	$11.57	=	$2,568.54

Total Cost of Rehabilitation Activity 1 = **$469,748.54**
SMA FLEXIBLE PAVEMENT

FAB		Route		326 (IL 47)		
Section		(109,110)R, 110BR & BR-1				
GRUNDY		County				

REHABILITAION ACTIVITY 2 – YEAR 10

1,110	Sq. Yds.	0.5% Partial-Depth HMA Pavement Patching (Mill & Fill Surface)	@	$11.57	=	$12,842.70
41,360	Lin. Ft.	50% Random/Thermal Crack-Routing & Sealing Assume 110ft/Station	@	$1.75	=	$72,380.00
75,200	Lin. Ft.	100% Longitudinal/ Shoulder Joint Routing & Sealing	@	$1.75	=	$131,600.00
150,400	Lin. Ft.	100% Centerline Joint, Routing & Sealing	@	$1.75	=	$263,200.00

Total Cost of Rehabilitation Activity 2 = **$480,022.70**

REHABILITAION ACTIVITY 3 – YEAR 15

287,000	Sq. Yds.	2.00 in. Milling-Pavement & Shoulder	@	$1.55	=	$444,850.00
2,220	Sq. Yds.	1.0% Partial-Depth Pavement Patching (Mill & Fill Additional 2.00 in)	@	$11.57	=	$25,685.40
24,864	Tons	2.00 in.Poly SMA HMA Overlay Pavt & Shldr	@	$99.50		$2,473,968.00
7,820				$76.00	=	$594,320.00

Total Cost of Rehabilitation Activity 3 = **$3,538,823.40**

REHABILITATION ACTIVITY 4 – YEAR 20

41,360	Lin. Ft.	50% Random/Thermal Crack-Routing & Sealing Assume 110ft/Station	@	$1.75	=	$72,380.00
108,200	75200	100% Longitudinal/ Shoulder Joint Routing & Sealing	@	$1.75	=	$189,350.00
150,400	Lin. Ft.	100% Centerline Joint, Routing & Sealing	@	$1.75	=	$263,200.00

222	Sq. Yds.	0.1% Partial-Depth Pavement Patching (Mill & Fill Surface)	@	$11.57 =	$2,568.54

Total Cost of Rehabilitation Activity 4 = **$527,498.54**

SMA FLEXIBLE PAVEMENT

FAB	Route 326 (IL 47)
Section	(109,110)R, 110BR & BR-1
GRUNDY	County

REHABILITATION ACTIVITY 5 – YEAR 25

1,110	Sq. Yds.	0.5% Partial-Depth HMA Pavement Patching (Mill & Fill Surface)	@	$10.57 =	$11,732.70
41,360	Lin. Ft.	50% Random/Thermal Crack-Routing & Sealing Assume 110ft/Station	@	$1.75 =	$72,380.00
75,200	Lin. Ft.	100% Longitudinal/ Shoulder Joint Routing & Sealing	@	$1.75 =	$131,600.00
150,400	Lin. Ft.	100% Centerline Joint, Routing & Sealing	@	$1.75 =	$263,200.00

Total Cost of Rehabilitation Activity 5 = **$478,912.70**

REHABILITATION ACTIVITY 6 – YEAR 30

222,000	Sq. Yds.	2.00 Milling- (Pavement Only-Standard Design Pvt & Shld - Limiting Strain Criterion Design)	@	$1.55 =	$344,100.00
4,440	Sq. Yds.	2.0% Partial-Depth HMA Pavement Patching (Mill & Fill Additional 2.00 in. All Designs)	@	$11.57 =	$51,370.80
650	Sq. Yds.	1.0% Full-Depth HMA Shoulder Patching (Mill & Fill Surface-Standard Design)(Mill & Fill Additional 2.00 in. -Limiting Strain Criterion Design)	@	$138.00 =	$89,700.00
18,650.0	Tons	HMA Overlay Pavement	@	$99.50	$1,855,675.00
27,980.0		(Pavement 3.75 in.-Standard Design; 2.00 in.-Limiting Strain Criterion Design)		$85.75 =	$2,399,285.00
6,370	Tons	HMA Overlay Shoulder (Shoulder 1.75 in. Standard Design; 2.00 in.-Limiting Strain Criterion Design)	@	$76.00 =	$484,120.00

Total Cost of Rehabilitation Activity 6 = **$5,224,250.80**

SMA FLEXIBLE PAVEMENT

FAB	Route 326 (IL 47)
Section	(109,110)R, 110BR & BR-1
GRUNDY	County

REHABILITATION ACTIVITY 7 – YEAR 35

41,360	Lin. Ft.	50% Random/Thermal Crack-Routing & Sealing	@	$1.75	=	$72,380.00
		Assume 110ft/Station				
75,200	Lin. Ft.	100% Longitudinal/ Shoulder Joint	@	$1.75	=	$131,600.00
		Routing & Sealing				
150,400	Lin. Ft.	100% Centerline Joint, Routing & Sealing	@	$1.75	=	$263,200.00
222	Sq. Yds.	0.1% Partial-Depth Pavement Patching	@	$11.57	=	$2,568.54
		(Mill & Fill Surface)				
		Total Cost of Rehabilitation Activity 7			=	**$469,748.54**

REHABILITATION ACTIVITY 8– YEAR 40

1,110	Sq. Yds.	0.5% Partial-Depth HMA Pavement Patching	@	$11.57	=	$12,842.70
		(Mill & Fill Surface)				
41,360	Lin. Ft.	50% Random/Thermal Crack-Routing & Sealing	@	$1.75	=	$72,380.00
		Assume 110ft/Station				
75,200	Lin. Ft.	100% Longitudinal/ Shoulder Joint	@	$1.75	=	$131,600.00
		Routing & Sealing				
150,400	Lin. Ft.	100% Centerline Joint, Routing & Sealing	@	$1.75	=	$263,200.00
		Total Cost of Rehabilitation Activity 8			=	**$480,022.70**

SMA FLEXIBLE PAVEMENT

FAB	Route 326 (IL 47)
Section	(109,110)R, 110BR & BR-1
GRUNDY	County

ANNUAL COST DETERMINATION

Present Worth Calculation:

Total Cost of Original Pavement Construction				=	$23,684,780.35
Present Worth of Rehabilitation Activity 1	$469,748.54	X	0.8626	=	$405,205.09
Present Worth of Rehabilitation Activity 2	$480,022.70	X	0.7441	=	$357,184.89
Present Worth of Rehabilitation Activity 3	$3,538,823.40	X	0.6419	=	$2,271,570.74
Present Worth of Rehabilitation Activity 4	$527,498.54	X	0.5537	=	$292,075.94
Present Worth of Rehabilitation Activity 5	$478,912.70	X	0.4776	=	$228,728.71
Present Worth of Rehabilitation Activity 6	$5,224,250.80	X	0.412	=	$2,152,391.33
Present Worth of Rehabilitation Activity 7	$469,748.54	X	0.3554	=	$166,948.63
Present Worth of Rehabilitation Activity 8	$480,022.70	X	0.3066	=	$147,174.96
Total Life Cycle Cost (Present Worth)				=	**$29,706,060.64**

Annual Cost per Mile Calculation

Total PW	X	CRF_n	÷	Length (Miles)	=	Ann. Cost / Year*Mile
$29,706,060.64	X	0.4079	÷	7.121212 Miles	=	**$1,701,550.51**