



Illinois Department of Transportation

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

A handwritten signature in black ink, appearing to be 'J. Baranzelli', written over the subject line.

FAP Route 326 (IL 47)
Section (109,110)R, 110BR & BR-1
Kendall County
From I-80 to Sherrill 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 ANALYSIS RESULTS

Contract 66B83

FAP Route 326 (IL 47)

Sections (109,110)R, 110BR & BR-1

Grundy County

IL 47 from 3000' N of I-80 to Sherrill Rd (Kendall Co Line)

Description: This contract consists of the reconstruction of IL 47 to 2 lanes in each direction with turn lanes and a raised 32' median

Pavement Design Results

Contract 66B83 (4.4 miles - urban) —Rigid 10 ½"; Flexible 13 ¼"

Two high stress intersections at Prologis and Granville Rds. Both intersections combined account for 2550' (0.483 miles) along IL 47.

NOTE: If untied shoulders are used for the rigid option, the thickness increases to 10.75"

Pavement Cost Analysis Results (in \$ millions)

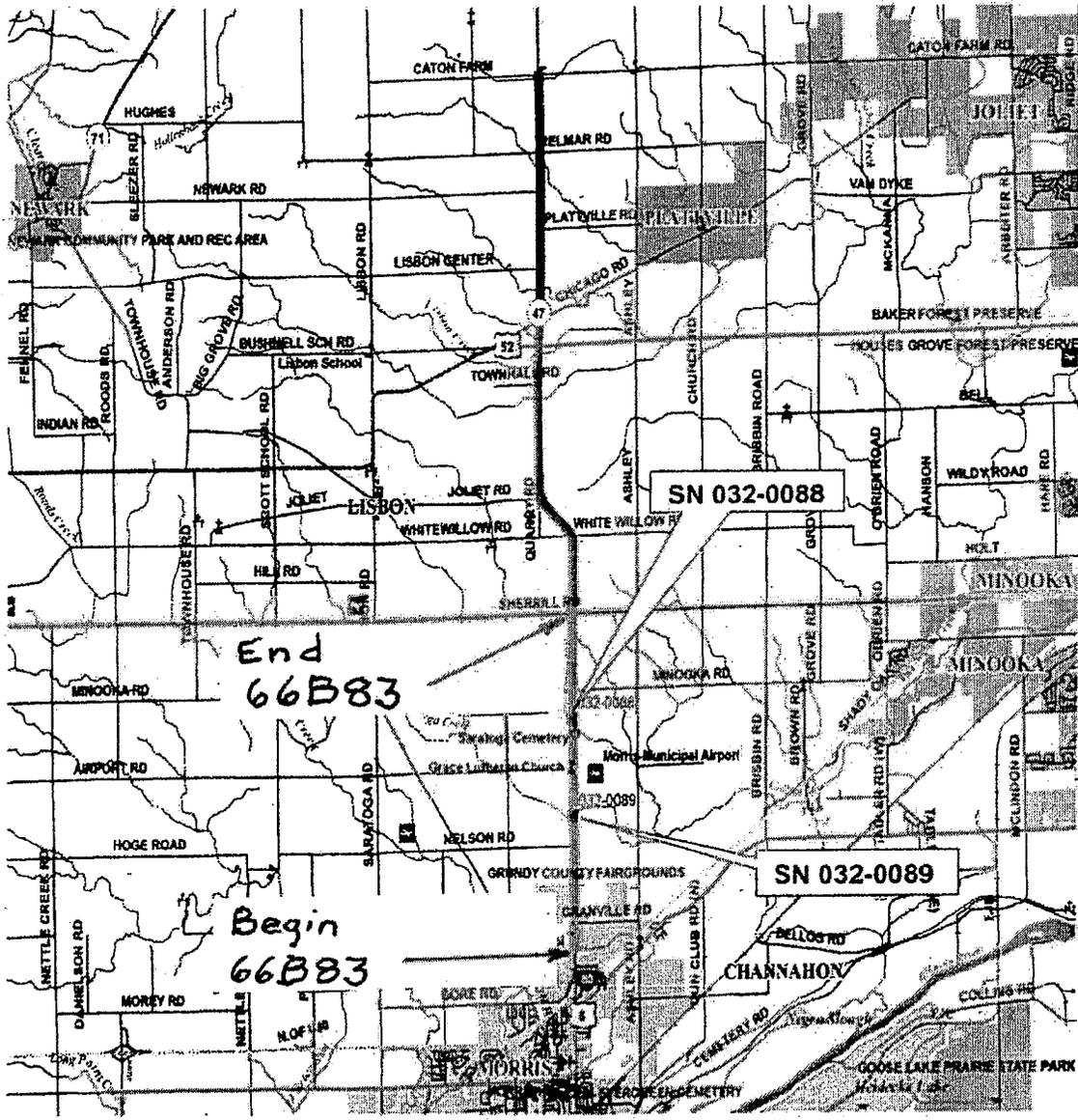
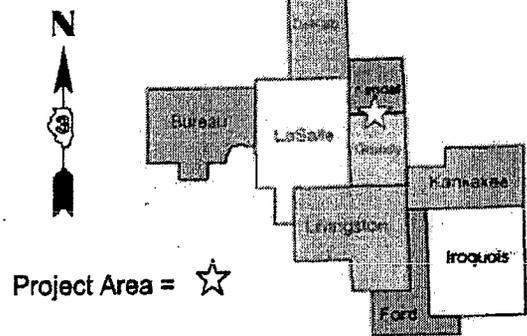
<u>66B83</u>	<u>Initial Cost</u>	<u>Life Cycle Cost</u>
Rigid	\$13.91	\$16.25
Flexible	\$13.88	\$17.69
SMA	\$14.12	\$18.23

The difference in the life cycle costs between the rigid option and the flexible option is 9.2%, 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



D3# 4042 & 4046

Contract No: 66B83
 Contract No: 66B84

PROJECT AND TRAFFIC INPUTS (Enter Data in Gray Shaded Cells)

Route: IL 47 Comments: ADT's based on approved Prairie Parkway IDS's
 Section: (109.110)R Truck breakdowns from (Roads on Inside IDOT link) **66B83**
 County: Grundy County Design Date: 05/01/2012 MJ <- BY
 Location: Morris to Spencer Road (Kendall Co.) Modified Date: <- BY

	ADT	Year
Current	19,200	2020
Future	19,000	2030

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

RESET

Road Class: 1

Subgrade Support Rating (SSR): Poor
 Construction Year: 2016
 Design Period (DP): 20 years

Structural Design Traffic			
Minimum ADT	Actual ADT	Actual % of Total ADT	% of ADT in Design Lane
PV = 0	13,410	75.0%	P = 32%
SU = 250	1,446	5.1%	S = 45%
MU = 750	3,024	16.9%	M = 45%
Struct. Design ADT = 17,880		(2026)	

TRAFFIC FACTOR CALCULATION

FLEXIBLE PAVEMENT		RIGID PAVEMENT
Cpv = 0.15		Cpv = 0.15
Csu = 132.5		Csu = 143.81
Cmu = 482.53		Cmu = 698.42
TF flexible (Actual) = 14.87 (Actual ADT)		TF rigid (Actual) = 20.84 (Actual ADT)
TF flexible (Min) = 3.56 (Min ADT Fig. 54-2.C)		TF rigid (Min) = 5.02 (Min ADT Fig. 54-2.C)

NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS

Full-Depth HMA Pavement	JPC Pavement
Use TF flexible = 14.87	Use TF rigid = 20.84
PG Grade Lower Binder Lths = PG 64-22 (Fig. 54-4.R)	Edge Support = Tied Shoulder or C.R.G.
HMA Mixture Temp. = 75.5 deg. F (Fig. 54-5.C)	Rigid Pavt Thick. = 10.50 in. (Fig. 54-4.E)
Design HMA Mixture Modulus (E _{mix}) = 680 ksi (Fig. 54-5.D)	
Design HMA Strain (ε _{max}) = 58 (Fig. 54-5.E)	CRCP Pavement
Full Depth HMA Design Thickness = 13.25 in. (Fig. 54-5.F)	Use TF rigid = 20.84
Limiting Strain Criterion Thickness = 14.75 in. (Fig. 54-5.I)	IBR value = 3
Use Full-Depth HMA Thickness = 13.25 inches	CRCP Thickness = 10.00 in. (Fig. 54-4.M)

TF MUST BE > 60 FOR CRCP

RECONSTRUCTION ONLY (SUPPLEMENTAL) PAVEMENT DESIGN CALCULATIONS

HMA Overlay of Rubblized PCC	Unbonded Concrete Overlay
Use TF flexible = 14.87	Review 54-4.03 for limitations and special considerations.
District = 3,4,5,6	
HMA Overlay Design Thickness = 11.25 in. (Fig. 54-5.U)	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)

Facility Type	Min. Str. Design Traffic (Fig 54-2.C)		
	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	Traffic Factor ESAL Coefficients			
	Rigid (Fig. 54-4.C)		Flexible (Fig. 54-5.B)	
	Csu	Cmu	Csu	Cmu
I	143.81	698.42	132.50	482.53
II	135.78	587.21	112.06	385.44
III	129.58	562.47	109.14	384.35
IV	129.58	562.47	109.14	384.35

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

Class	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

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

IDS

66B83

Granville

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

TRUCKS
MU 16.91%
SU 8.09%

MU 12.68
SU 11.59

MU 12.68
SU 11.59

Prologis

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

MU 12.88
SU 11.59

MU 12.68
SU 11.59

Sherrill Rd
NO IDS

MU 17.65
SU 7.35

MU 17.65
SU 7.35

66B84
Joliet Rd
NO IDS

MU 17.89
SU 6.32

US 52
ADT = 20,460
2026 17,900 2020
22,200 2030

MU 17.89
SU 6.32

MU 18.25
SU 6.75

MU 18.25
SU 6.75

Blattville Rd
ADT = 20,778
2026 17,140 2020
23,200 2030

MU 17.19
SU 5.47

MU 17.19
SU 5.47

Caton Farm Rd
(no IDS)

MU 17.69
SU 5.38

TF = 14.87 / 20.84
Flex / Rigid

TF = 12.33 / 16.91

TF = 11.52 / 15.79

TF = 11.52 / 15.79

TF = 11.52 / 15.79

TF = 14.28 / 20.08

TF = 14.28 / 20.08

TF = 17.25 / 20.10

TF = 17.47 / 24.65

TF = 17.89 / 25.23

TF = 18.15 / 25.60

TF = 16.88 / 23.87

TF = 16.88 / 23.87

TF = 17.31 / 24.50

Rigid Pav Design

TF calc by computer

$$TF = 20.84$$

Input Class I Road

TF minimums are exceeded

1" dowels 15 panels

Rural typical w/ tied slabs

Design Period = 20 yrs

Traffic Factor eqn 54-4.1

HMA subbase 4"

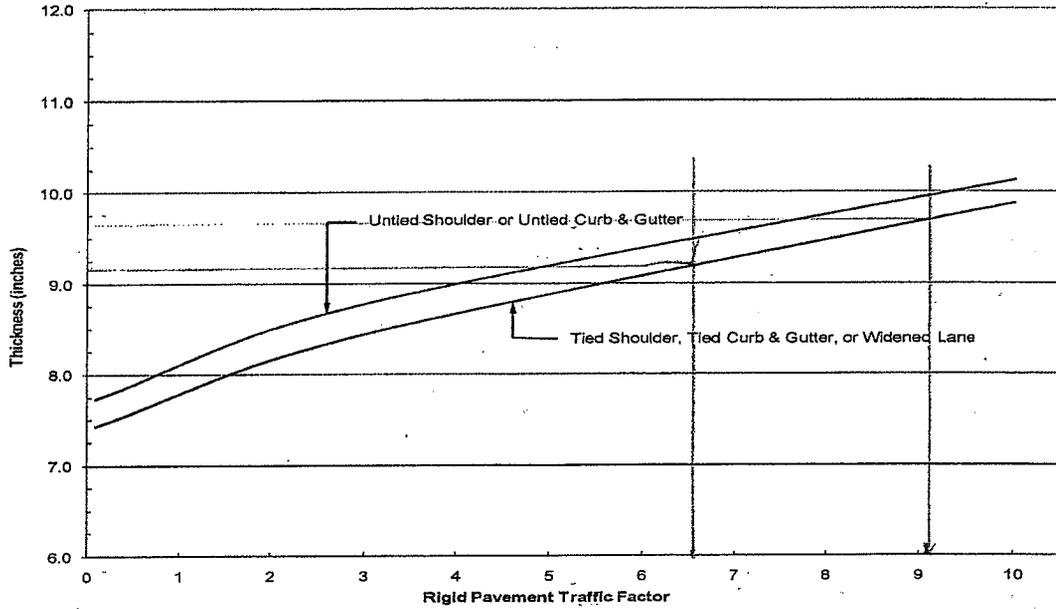
Composite Agg Improved subgrade

SSR = poor

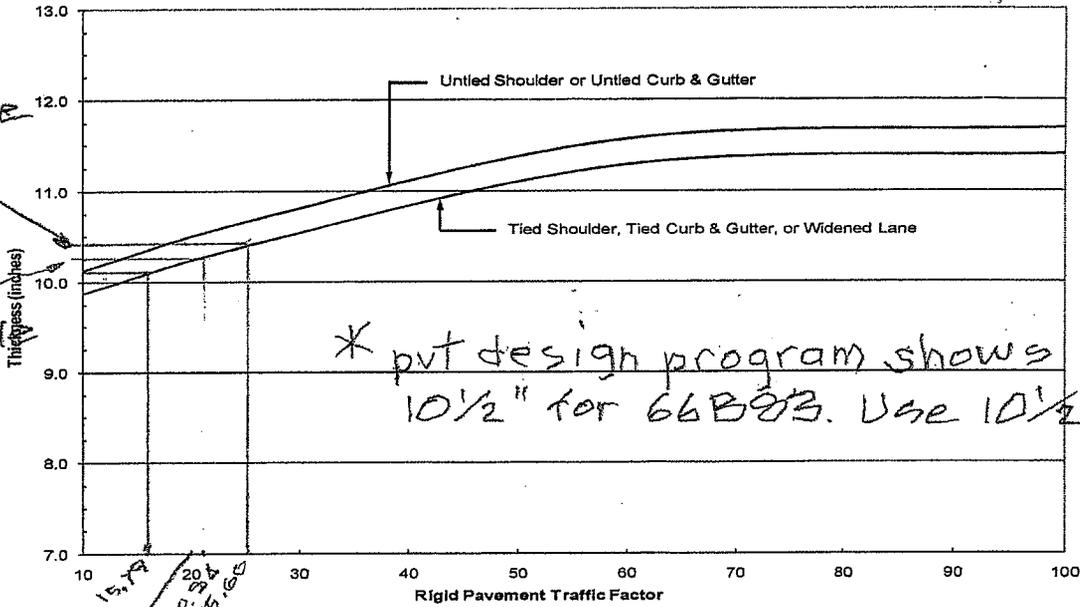
Output Concrete Thickness

Contract 66B23 use $10\frac{1}{2}$ " PCC Pav

(based on Sherrill Rd. ~~TF = 20.00~~
use → Granville Rd. TF = 20.84



66B84
10 1/2"
Plattville



* 10 1/4
Granville
66B83
use 10 1/4
from
program

* pvt design program shows
10 1/2" for 66B83. Use 10 1/2"

Sherill Rd
20.08

Plattville Rd
29.6

Granville

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 1 Road

TF exceed minimum

SSR = poor

Temp = 75.5°

PG 64-22

E_{HMA} = 675

TF_{Granville} = 14.87

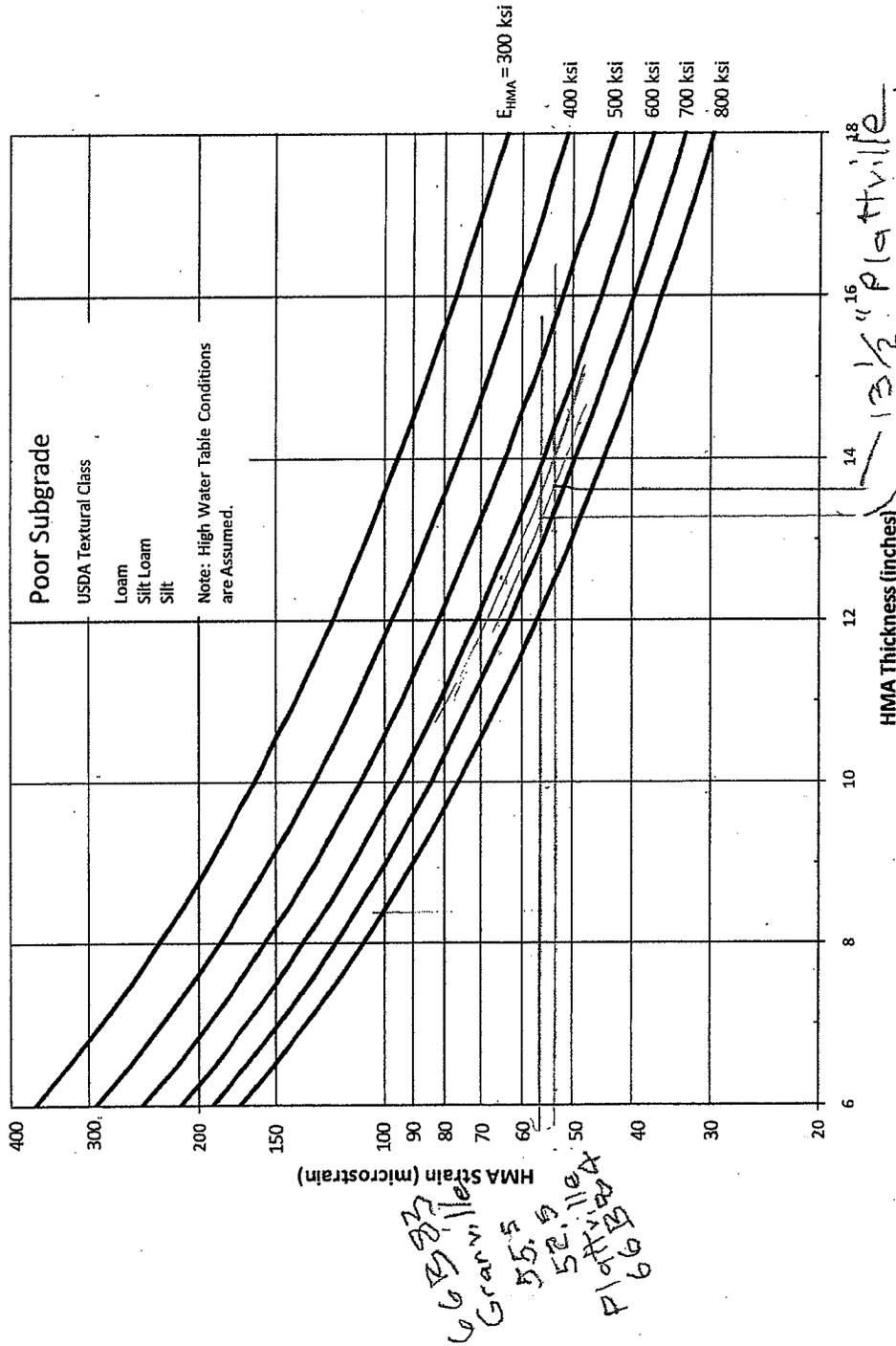
~~TF_{Platteville} = 18.15~~

from Thickness Design

1 3/4" @ Granville (64B83)

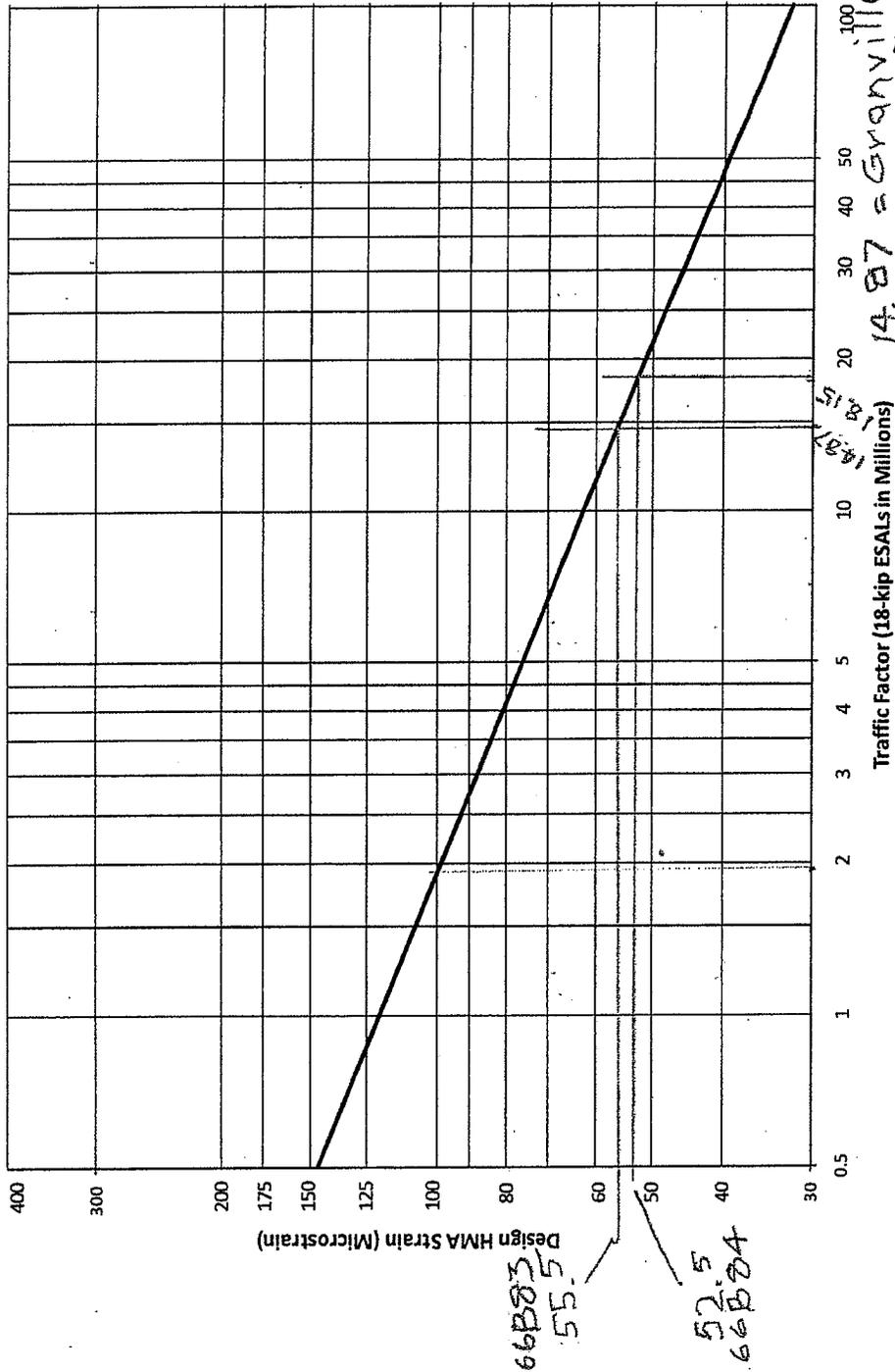
~~1 1/2" @ Platteville (66B84)~~

checks with limiting strain criteria



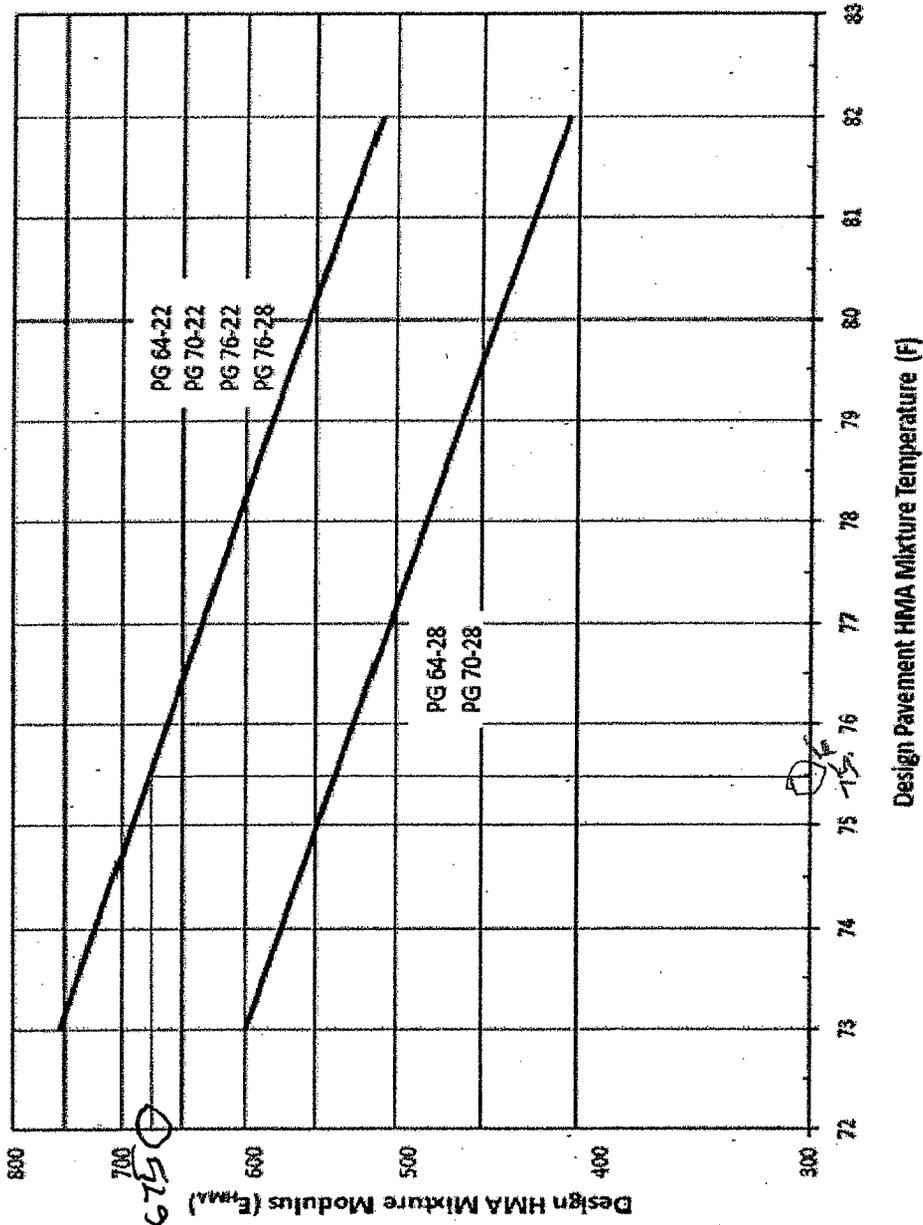
HMA THICKNESS DESIGN CHART
(Mechanistic Design: Flexible Pavement: SSR = Poor)

Figure 54-5.F



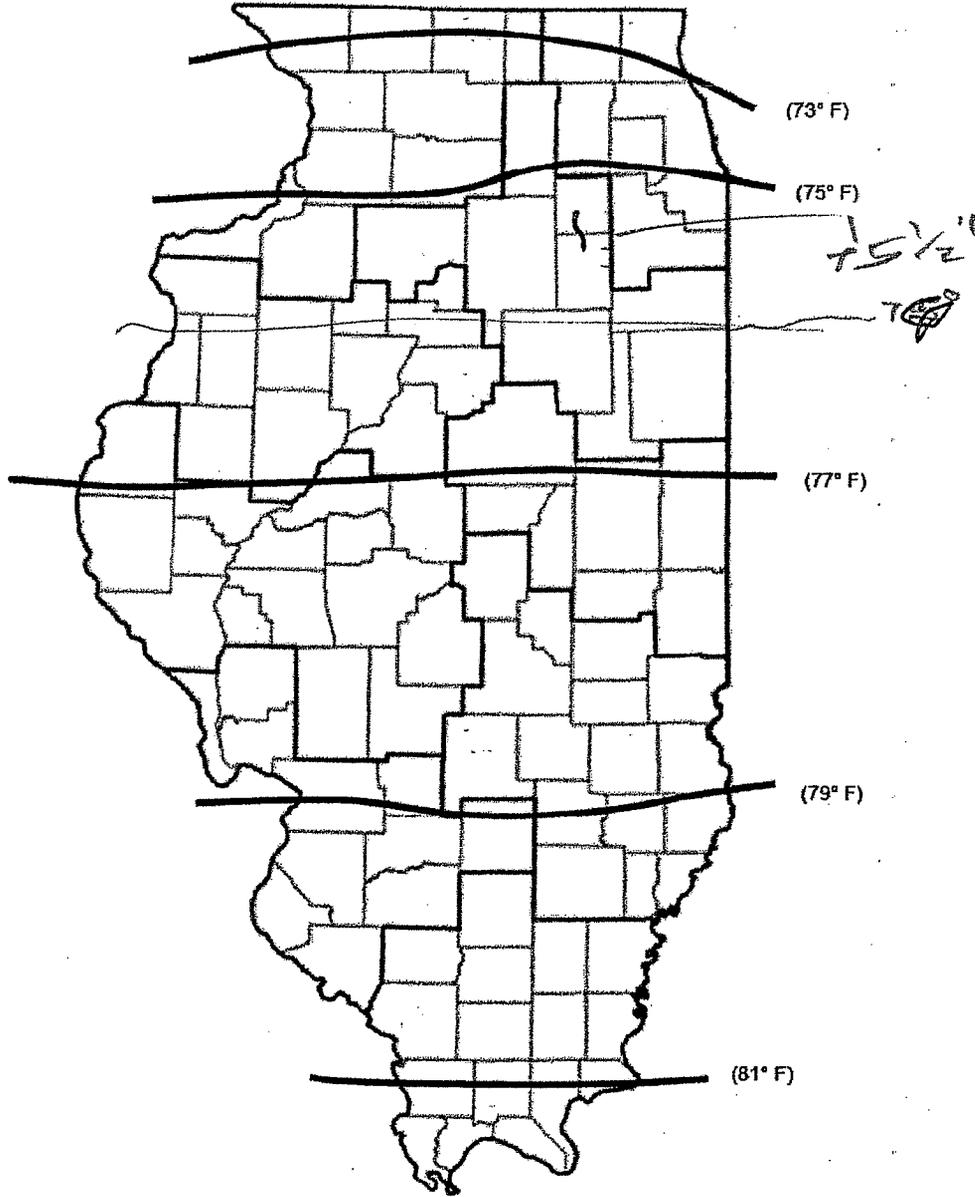
DESIGN HMA STRAIN
(Mechanistic Design: Flexible Pavement)

Figure 54-5.E



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

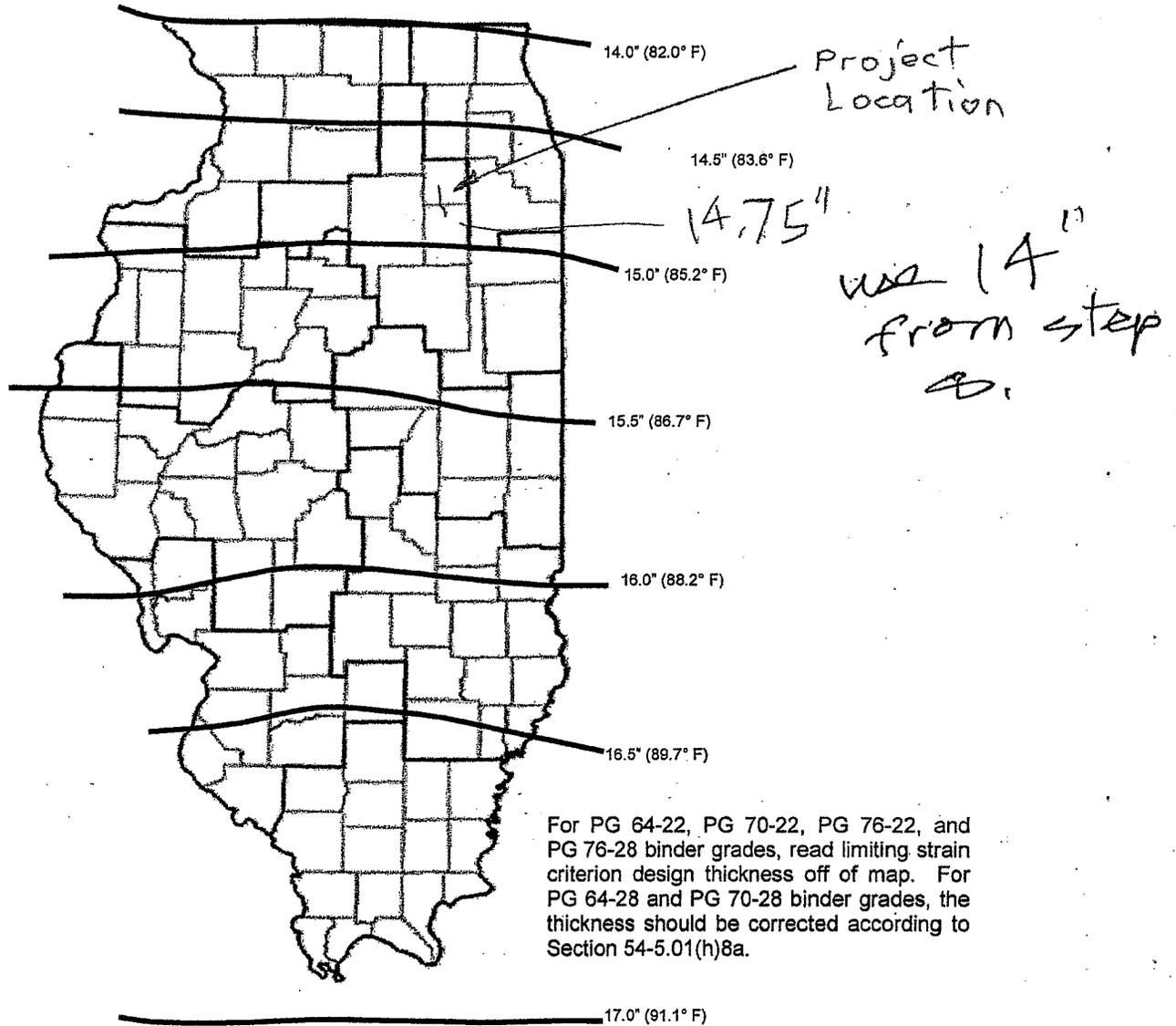
Figure 54-5.D



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

HMA MIXTURE TEMPERATURE
(Mechanistic Design: Flexible Pavement)

Figure 54-5.C



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 $\mu\epsilon$, and E_{Ri} of 2 ksi.

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

Figure 54-5.1

RIGID PAVEMENT

Date =	6-11-2012	Checked by:	MQ
Quantities by:	MJ	Checked by:	MQ
Unit Prices by:	MY	Checked by:	
Net Length	23,100	Lin. Ft.	4.375 Miles
Number Lanes	4	Urban	Rural

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

ITEMIZED CONSTRUCTION COST

Quantity	Unit	Item	Unit Cost	Total Cost
142,600	Sq. Yds.	PCC PVT 10 1/2"	@ \$39.45	= \$5,625,570.00
153,010	Sq. Yds.	STAB SUBBASE 4"	@ \$18.00	= \$2,754,180.00
51,000	Sq. Yds.	PCC SHLD 8"	@ \$30.80	= \$1,570,800.00
92,400	Lin. Ft.	PIPE UNDERDRAIN	@ \$4.65	= \$429,660.00
22,198	Tons	SUBBASE GRAN MAT, TY C	@ \$25.20	= \$559,389.60
208,500	Sq. Yds.	AGG SUBGRD IMPROV 12"	@ \$8.00	= \$1,668,000.00
2,956	Tons	AGG SHLD, TY B	@ \$19.80	= \$58,528.80
108,200	Lin. Ft.	100% SHLD JT SEAL	@ \$0.65	= \$70,330.00
62,400	Lin. Ft.	CC&G B-6.24	@ \$15.00	= \$936,000.00
14,600	Lin. Ft.	CC&G M-4.24	@ \$16.20	= \$236,520.00
0	Sq. Yds.		@ \$0.00	= \$0.00

Total Cost of Original Pavement Construction = **\$13,908,978.40**

ITEMIZED MAINTENANCE AND REHABILITATION ACTIVITY COST

REHABILITATION ACTIVITY 1 – YEAR 10

143	Sq. Yds.	0.1% Full-Depth PCC Pavement Patching	@ \$128.50	= \$18,375.50
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Total Cost of Rehabilitation Activity 1 = **\$18,375.50**

REHABILITATION ACTIVITY 2 – YEAR 15

285	Sq. Yds.	0.2% Full-Depth PCC Pavement Patching	@ \$128.50	= \$36,622.50
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Total Cost of Rehabilitation Activity 2 = **\$36,622.50**

RIGID PAVEMENT

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

REHABILITATION ACTIVITY 3 – YEAR 20

2,852	Sq. Yds.	2.0% Full-Depth PCC Pavement Patching	@	\$128.50	=	\$366,482.00
255	Sq. Yds.	0.5% Full-Depth PCC Shoulder Patching	@	\$110.00	=	\$28,050.00
108,200	Lin. Ft.	100% Longitudinal/ Shoulder Joint Routing & Sealing	@	\$1.75	=	\$189,350.00
48,254	Lin. Ft.	100% Centerline Joint, Routing & Sealing	@	\$1.75	=	\$84,444.50

Total Cost of Rehabilitation Activity 3 = **\$668,326.50**

REHABILITATION ACTIVITY 4 – YEAR 25

4,278	Sq. Yds.	3.0% Full-Depth PCC Pavement Patching	@	\$128.50	=	\$549,723.00
510	Sq. Yds.	1.0% Full-Depth PCC Shoulder Patching	@	\$110.00	=	\$56,100.00

Total Cost of Rehabilitation Activity 4 = **\$605,823.00**

REHABILITATION ACTIVITY 5 – YEAR 30

5,704	Sq. Yds.	4.0% Full-Depth PCC Pavement Patching	@	\$128.50	=	\$732,964.00
765	Sq. Yds.	1.5% Full-Depth PCC Shoulder Patching	@	\$110.00	=	\$84,150.00
152,780	Sq. Yds.	Policy HMA Overlay - Pavement	@	\$12.53	=	\$1,914,333.40
54,245	Sq. Yds.	Policy HMA Overlay - Shoulder	@	\$10.63	=	\$576,624.35

Total Cost of Rehabilitation Activity 5 = **\$3,308,071.75**

RIGID PAVEMENT

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

REHABILITATION ACTIVITY 6 – YEAR 35

108,200	Lin. Ft.	100% Longitudinal/ Shoulder Joint Routing & Sealing	@	\$1.75	=	\$189,350.00
48,254	Lin. Ft.	100% Centerline Joint, Routing & Sealing	@	\$1.75	=	\$84,444.50
23,100	Lin. Ft.	50% Random Crack- Routing & Sealing Assume 100ft/Station	@	\$1.75	=	\$40,425.00
29,600	Lin. Ft.	40% Reflective Transverse Crack Routing & Sealing	@	\$1.75	=	\$51,800.00
143	Sq. Yds.	0.1% Partial-Depth Pavement Patching (Mill & Fill Surface-Interstates; Mill & Fill 2.5" -Non-Interstates)	@	\$17.53	=	\$2,506.79

Total Cost of Rehabilitation Activity 6 = **\$368,526.29**

REHABILITATION ACTIVITY 7 – YEAR 40

713	Sq. Yds.	0.5% Full-Depth PCC Pavement Patching	@	\$128.50	=	\$91,620.50
713	Sq. Yds.	0.5% Partial-Depth Pavement Patching (Mill & Fill Surface-Interstates; Mill & Fill 2.5" -Non-Interstates)	@	\$14.08	=	\$10,039.04
44,352	Lin. Ft.	60% Reflective Transverse Crack Routing & Sealing	@	\$1.75	=	\$77,616.00
23,100	Lin. Ft.	50% Random Crack- Routing & Sealing Assume 100ft/Station	@	\$1.75	=	\$40,425.00
108,200	Lin. Ft.	100% Longitudinal/ Shoulder Joint Routing & Sealing	@	\$1.75	=	\$189,350.00
48,254	Lin. Ft.	100% Centerline Joint, Routing & Sealing	@	\$1.75	=	\$84,444.50

Total Cost of Rehabilitation Activity 7 = \$493,495.04

RIGID 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 = \$13,908,978.40

Present Worth of Rehabilitation Activity 1	\$18,375.50	X	0.7441	=	\$13,673.21
Present Worth of Rehabilitation Activity 2	\$36,622.50	X	0.6419	=	\$23,507.98
Present Worth of Rehabilitation Activity 3	\$668,326.50	X	0.5537	=	\$370,052.38
Present Worth of Rehabilitation Activity 4	\$605,823.00	X	0.4776	=	\$289,341.06
Present Worth of Rehabilitation Activity 5	\$3,308,071.75	X	0.4120	=	\$1,362,925.56
Present Worth of Rehabilitation Activity 6	\$368,526.29	X	0.3554	=	\$130,974.24
Present Worth of Rehabilitation Activity 7	\$493,495.04	X	0.3066	=	\$151,305.58

Total Life Cycle Cost (Present Worth) = \$16,250,758.42

Annual Cost per Mile Calculation

Total PW	X	CRF _n	÷	Length (Miles)	=	Ann. Cost / Year*Mile
\$16,250,758.42	X	0.4079	÷	4.375 Miles	=	\$1,515,127.85

HMA FLEXIBLE PAVEMENT

Date: = 6-11-2012

Quantities by: MJ Checked by: MQ

Unit Prices by: MY Checked by:

Net Length 23,100 Lin. Ft. 4.375 Miles

Number Lanes 4 Urban Rural

Single Lane Paving Dual Lane Paving

FAB Route 326 (IL 47)

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

GRUNDY County

ITEMIZED CONSTRUCTION COST

Quantity	Unit	Item	Unit Cost	Total Cost
142,600	Sq. Yds.	2" POLY HMA SURF CSE, MIX D, N90	@ \$10.02	= \$1,428,852.00
142,600	Sq. Yds.	2" 1/4" POLY HMA BINDER CSE, IL 19.0 N90	@ \$10.09	= \$1,438,834.00
142,600	Sq. Yds.	9" HMA BINDER CSE, IL 19.0 N70	@ \$38.25	= \$5,454,450.00
51,000	Sq. Yds.	HMA SHLD 8"	@ \$34.00	= \$1,734,000.00
92,400	Lin. Ft.	PIPE UNDERDRAIN	@ \$4.65	= \$429,660.00
19,667	Tons	SUBBASE GRAN MAT, TY C	@ \$25.20	= \$495,608.40
208,500	Sq. Yds.	AGG SUBGRD IMPROV 12"	@ \$8.00	= \$1,668,000.00
2,772	Tons	AGG SHLD, TY B	@ \$19.80	= \$54,885.60
0	Lin. Ft.	100% SHLD JT SEAL	@ \$0.00	= \$0.00
62,400	Lin. Ft.	CC&G B-6.24	@ \$15.00	= \$936,000.00
14,600	Lin. Ft.	CC&G M-4.24	@ \$16.20	= \$236,520.00

Total Cost of Original Pavement Construction = \$13,876,810.00

ITEMIZED MAINTENANCE AND REHABILITATION ACTIVITY COST

REHABILITATION ACTIVITY 1 - YEAR 5

25,410	Lin. Ft.	50% Random/Thermal Crack-Routing & Sealing	@ \$1.75	= \$44,467.50
Assume 110ft/Station				
108,200	Lin. Ft.	100% Longitudinal/ Shoulder Joint Routing & Sealing	@ \$1.75	= \$189,350.00
48,254	Lin. Ft.	100% Centerline Joint, Routing & Sealing	@ \$1.75	= \$84,444.50
143	Sq. Yds.	0.1% Partial-Depth Pavement Patching (Mill & Fill Surface)	@ \$15.02	= \$2,147.86

Total Cost of Rehabilitation Activity 1 = **\$320,409.86**
HMA FLEXIBLE PAVEMENT

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

REHABILITAION ACTIVITY 2 – YEAR 10

<u>713</u>	Sq. Yds.	0.5% Partial-Depth HMA Pavement Patching (Mill & Fill Surface)	@	<u>\$15.02</u>	=	\$10,709.26
<u>25,410</u>	Lin. Ft.	50% Random/Thermal Crack-Routing & Sealing Assume 110ft/Station	@	<u>\$1.75</u>	=	\$44,467.50
<u>108,200</u>	Lin. Ft.	100% Longitudinal/ Shoulder Joint Routing & Sealing	@	<u>\$1.75</u>	=	\$189,350.00
<u>48,254</u>	Lin. Ft.	100% Centerline Joint, Routing & Sealing	@	<u>\$1.75</u>	=	\$84,444.50
Total Cost of Rehabilitation Activity 2					=	\$328,971.26

REHABILITAION ACTIVITY 3 – YEAR 15

<u>193,541</u>	Sq. Yds.	2.00 in. Milling-Pavement & Shoulder	@	<u>\$1.55</u>	=	\$299,988.55
<u>1,426</u>	Sq. Yds.	1.0% Partial-Depth Pavement Patching (Mill & Fill Additional 2.00 in)	@	<u>\$15.02</u>	=	\$21,418.52
<u>15,980</u>	Tons	2.00 in. HMA Overlay Pavement & Shoulder	@	<u>\$89.50</u>	=	\$1,430,210.00
<u>5,712</u>			@	<u>\$75.90</u>	=	\$433,540.80
Total Cost of Rehabilitation Activity 3					=	\$2,185,157.87

REHABILITATION ACTIVITY 4 – YEAR 20

<u>25,410</u>	Lin. Ft.	50% Random/Thermal Crack-Routing & Sealing Assume 110ft/Station	@	<u>\$1.75</u>	=	\$44,467.50
<u>108,200</u>	Lin. Ft.	100% Longitudinal/ Shoulder Joint Routing & Sealing	@	<u>\$1.75</u>	=	\$189,350.00
<u>48,254</u>	Lin. Ft.	100% Centerline Joint, Routing & Sealing	@	<u>\$1.75</u>	=	\$84,444.50

143 Sq. Yds. 0.1% Partial-Depth Pavement Patching @ \$15.02 = \$2,147.86
(Mill & Fill Surface)

Total Cost of Rehabilitation Activity 4 = **\$320,409.86**
HMA FLEXIBLE PAVEMENT

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

REHABILITATION ACTIVITY 5 – YEAR 25

713 Sq. Yds. 0.5% Partial-Depth HMA Pavement Patching @ \$15.02 = \$10,709.26
(Mill & Fill Surface)

25,410 Lin. Ft. 50% Random/Thermal Crack-Routing & Sealing @ \$1.75 = \$44,467.50
Assume 110ft/Station

108,200 Lin. Ft. 100% Longitudinal/ Shoulder Joint @ \$1.75 = \$189,350.00
Routing & Sealing

48,254 Lin. Ft. 100% Centerline Joint, Routing & Sealing @ \$1.75 = \$84,444.50

Total Cost of Rehabilitation Activity 5 = **\$328,971.26**

REHABILITATION ACTIVITY 6 – YEAR 30

142,600 Sq. Yds. 2.00 Milling- @ \$1.55 = \$221,030.00
(Pavement Only-Standard Design Pvt & Shld - Limiting Strain Criterion Design)

2,852 Sq. Yds. 2.0% Partial-Depth HMA Pavement Patching @ \$21.66 = \$61,774.32
(Mill & Fill Additional 2.00 in. All Designs)

510 Sq. Yds. 1.0% Full-Depth HMA Shoulder Patching @ \$138.00 = \$70,380.00
(Mill & Fill Surface-Standard Design)(Mill & Fill Additional 2.00 in. -Limiting Strain Criterion Design)

12,000 Tons HMA Overlay Pavement @ \$89.50 = \$1,074,000.00
17,970 Tons HMA Overlay Pavement @ \$80.10 = \$1,439,397.00
(Pavement 3.75 in.-Standard Design; 2.00 in.-Limiting Strain Criterion Design)

5,000 Tons HMA Overlay Shoulder @ \$75.90 = \$379,500.00
(Shoulder 1.75 in. Standard Design; 2.00 in.-Limiting Strain Criterion Design)

Total Cost of Rehabilitation Activity 6 = **\$3,246,081.32**

HMA FLEXIBLE PAVEMENT

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

REHABILITATION ACTIVITY 7 – YEAR 35

<u>25,410</u>	Lin. Ft.	50% Random/Thermal Crack-Routing & Sealing	@	<u>\$1.75</u>	=	\$44,467.50
		Assume 110ft/Station				
<u>108,200</u>	Lin. Ft.	100% Longitudinal/ Shoulder Joint Routing & Sealing	@	<u>\$1.75</u>	=	\$189,350.00
<u>48,254</u>	Lin. Ft.	100% Centerline Joint, Routing & Sealing	@	<u>\$1.75</u>	=	\$84,444.50
<u>143</u>	Sq. Yds.	0.1% Partial-Depth Pavement Patching (Mill & Fill Surface)	@	<u>\$15.02</u>	=	\$2,147.86

Total Cost of Rehabilitation Activity 7 = **\$320,409.86**

REHABILITATION ACTIVITY 8 – YEAR 40

<u>713</u>	Sq. Yds.	0.5% Partial-Depth HMA Pavement Patching (Mill & Fill Surface)	@	<u>\$15.02</u>	=	\$10,709.26
<u>25,410</u>	Lin. Ft.	50% Random/Thermal Crack-Routing & Sealing	@	<u>\$1.75</u>	=	\$44,467.50
		Assume 110ft/Station				
<u>108,200</u>	Lin. Ft.	100% Longitudinal/ Shoulder Joint Routing & Sealing	@	<u>\$1.75</u>	=	\$189,350.00
<u>48,254</u>	Lin. Ft.	100% Centerline Joint, Routing & Sealing	@	<u>\$1.75</u>	=	\$84,444.50

Total Cost of Rehabilitation Activity 8 = **\$328,971.26**

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	=	\$13,876,810.00
Present Worth of Rehabilitation Activity 1	\$320,409.86	X	0.8626 = \$276,385.55
Present Worth of Rehabilitation Activity 2	\$328,971.26	X	0.7441 = \$244,787.51
Present Worth of Rehabilitation Activity 3	\$2,185,157.87	X	0.6419 = \$1,402,652.84
Present Worth of Rehabilitation Activity 4	\$320,409.86	X	0.5537 = \$177,410.94
Present Worth of Rehabilitation Activity 5	\$328,971.26	X	0.4776 = \$157,116.67
Present Worth of Rehabilitation Activity 6	\$3,246,081.32	X	0.412 = \$1,337,385.50
Present Worth of Rehabilitation Activity 7	\$320,409.86	X	0.3554 = \$113,873.66
Present Worth of Rehabilitation Activity 8	\$328,971.26	X	0.3066 = \$100,862.59
	Total Life Cycle Cost (Present Worth)	=	\$17,687,285.27

Annual Cost per Mile Calculation

Total PW	X	CRF _n	÷	Length (Miles)	=	Ann. Cost / Year*Mile
\$17,687,285.27	X	0.4079	÷	4.375 Miles	=	\$1,649,061.41

SMA FLEXIBLE PAVEMENT

Date: =		FAB	Route	326 (IL 47)
Quantities by:		Checked by:	Section	(109,110)R, 110BR & BR-1
Unit Prices by:		Checked by:	GRUNDY	County
Net Length	23,100	Lin. Ft.	4.375	Miles
Number Lanes	4	Urban		Rural
		Single Lane Paving		Dual Lane Paving

ITEMIZED CONSTRUCTION COST

Quantity	Unit	Item	Unit Cost	Total Cost
142,600	Sq. Yds.	2" POLY HMA SURF CSE, SMA, N80	@ \$11.14	= \$1,588,564.00
142,600	Sq. Yds.	2" POLY HMA BINDER CSE, SMA, N81	@ \$9.60	= \$1,368,960.00
142,600	Sq. Yds.	9 1/4" HMA BINDER CSE, IL 19.0 N70	@ \$39.32	= \$5,607,032.00
51,000	Sq. Yds.	HMA SHLD 8"	@ \$34.00	= \$1,734,000.00
92,400	Lin. Ft.	PIPE UNDERDRAIN	@ \$4.65	= \$429,660.00
19,700	Tons	SUBBASE GRAN MAT, TY C	@ \$25.20	= \$496,440.00
208,500	Sq. Yds.	AGG SUBGRD IMPROV 12"	@ \$8.00	= \$1,668,000.00
2,772	Tons	AGG SHLD, TY B	@ \$19.80	= \$54,885.60
0	Lin. Ft.	100% SHLD JT SEAL	@ \$0.00	= \$0.00
62,400	Lin. Ft.	CC&G B-6.24	@ \$15.00	= \$936,000.00
14,600	Lin. Ft.	CC&G M-4.24	@ \$16.20	= \$236,520.00

Total Cost of Original Pavement Construction = **\$14,120,061.60**

ITEMIZED MAINTENANCE AND REHABILITATION ACTIVITY COST

REHABILITATION-ACTIVITY 1 - YEAR 5

25,410	Lin. Ft.	50% Random/Thermal Crack-Routing & Sealing	@ \$1.75	= \$44,467.50
		Assume 110ft/Station		
108,200	Lin. Ft.	100% Longitudinal/ Shoulder Joint Routing & Sealing	@ \$1.75	= \$189,350.00
48,254	Lin. Ft.	100% Centerline Joint, Routing & Sealing	@ \$1.75	= \$84,444.50
143	Sq. Yds.	0.1% Partial-Depth Pavement Patching (Mill & Fill Surface)	@ \$21.66	= \$3,097.38

Total Cost of Rehabilitation Activity 1 = \$321,359.38
 SMA FLEXIBLE PAVEMENT

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

REHABILITAION ACTIVITY 2 – YEAR 10

713	Sq. Yds.	0.5% Partial-Depth HMA Pavement Patching (Mill & Fill Surface)	@	\$21.66	=	\$15,443.58
25,410	Lin. Ft.	50% Random/Thermal Crack-Routing & Sealing Assume 110ft/Station	@	\$1.75	=	\$44,467.50
108,200	Lin. Ft.	100% Longitudinal/ Shoulder Joint Routing & Sealing	@	\$1.75	=	\$189,350.00
48,254	Lin. Ft.	100% Centerline Joint, Routing & Sealing	@	\$1.75	=	\$84,444.50
Total Cost of Rehabilitation Activity 2					=	\$333,705.58

REHABILITAION ACTIVITY 3 – YEAR 15

193,541	Sq. Yds.	2.00 in. Milling-Pavement & Shoulder	@	\$1.55	=	\$299,988.55
1,426	Sq. Yds.	1.0% Partial-Depth Pavement Patching (Mill & Fill Additional 2.00 in)	@	\$21.66	=	\$30,887.16
15,980	Tons	2.00 in. HMA Overlay Pavement & Shoulder	@	\$99.50	=	\$1,590,010.00
5,712			@	\$85.75	=	\$489,804.00
Total Cost of Rehabilitation Activity 3					=	\$2,410,689.71

REHABILITATION ACTIVITY 4 – YEAR 20

25,410	Lin. Ft.	50% Random/Thermal Crack-Routing & Sealing Assume 110ft/Station	@	\$1.75	=	\$44,467.50
108,200	Lin. Ft.	100% Longitudinal/ Shoulder Joint Routing & Sealing	@	\$1.75	=	\$189,350.00
48,254	Lin. Ft.	100% Centerline Joint, Routing & Sealing	@	\$1.75	=	\$84,444.50

143 Sq. Yds. 0.1% Partial-Depth Pavement Patching @ \$21.66 = \$3,097.38
(Mill & Fill Surface)

Total Cost of Rehabilitation Activity 4 = **\$321,359.38**
SMA FLEXIBLE PAVEMENT

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

REHABILITATION ACTIVITY 5 -- YEAR 25

713 Sq. Yds. 0.5% Partial-Depth HMA Pavement Patching @ \$21.66 = \$15,443.58
(Mill & Fill Surface)

25,410 Lin. Ft. 50% Random/Thermal Crack-Routing & Sealing @ \$1.75 = \$44,467.50
Assume 110ft/Station

108,200 Lin. Ft. 100% Longitudinal/ Shoulder Joint @ \$1.75 = \$189,350.00
Routing & Sealing

48,254 Lin. Ft. 100% Centerline Joint, Routing & Sealing @ \$1.75 = \$84,444.50

Total Cost of Rehabilitation Activity 5 = **\$333,705.58**

REHABILITATION ACTIVITY 6 -- YEAR 30

142,600 Sq. Yds. 2.00 Milling- @ \$1.55 = \$221,030.00
(Pavement Only-Standard Design Pvt & Shld - Limiting Strain Criterion Design)

2,852 Sq. Yds. 2.0% Partial-Depth HMA Pavement Patching @ \$21.66 = \$61,774.32
(Mill & Fill Additional 2.00 in. All Designs)

1,426 Sq. Yds. 1.0% Full-Depth HMA Shoulder Patching @ \$138.00 = \$196,788.00
(Mill & Fill Surface-Standard Design)(Mill & Fill Additional 2.00 in. -Limiting Strain Criterion Design)

11,978.4 Tons HMA Overlay Pavement @ \$99.50 = \$1,191,850.80
17,967.6 @ \$85.75 = \$1,540,721.70

(Pavement 3.75 in.-Standard Design; 2.00 in.-Limiting Strain Criterion Design)
5,000 Tons HMA Overlay Shoulder @ \$75.90 = \$379,500.00
(Shoulder 1.75 in. Standard Design; 2.00 in.-Limiting Strain Criterion Design)

Total Cost of Rehabilitation Activity 6 = **\$3,591,664.82**

SMA FLEXIBLE PAVEMENT

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

REHABILITATION ACTIVITY 7 – YEAR 35

25,410	Lin. Ft.	50% Random/Thermal Crack-Routing & Sealing	@	\$1.75	=	\$44,467.50
		Assume 110ft/Station				
108,200	Lin. Ft.	100% Longitudinal/ Shoulder Joint	@	\$1.75	=	\$189,350.00
		Routing & Sealing				
48,254	Lin. Ft.	100% Centerline Joint, Routing & Sealing	@	\$1.75	=	\$84,444.50
143	Sq. Yds.	0.1% Partial-Depth Pavement Patching	@	\$21.66	=	\$3,097.38
		(Mill & Fill Surface)				

Total Cost of Rehabilitation Activity 7 = \$321,359.38

REHABILITATION ACTIVITY 8 – YEAR 40

713	Sq. Yds.	0.5% Partial-Depth HMA Pavement Patching	@	\$21.66	=	\$15,443.58
		(Mill & Fill Surface)				
25,410	Lin. Ft.	50% Random/Thermal Crack-Routing & Sealing	@	\$1.75	=	\$44,467.50
		Assume 110ft/Station				
108,200	Lin. Ft.	100% Longitudinal/ Shoulder Joint	@	\$1.75	=	\$189,350.00
		Routing & Sealing				
48,254	Lin. Ft.	100% Centerline Joint, Routing & Sealing	@	\$1.75	=	\$84,444.50

Total Cost of Rehabilitation Activity 8 = \$333,705.58

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	=	\$14,120,061.60
Present Worth of Rehabilitation Activity 1	\$321,359.38	X	0.8626 = \$277,204.60
Present Worth of Rehabilitation Activity 2	\$333,705.58	X	0.7441 = \$248,310.32
Present Worth of Rehabilitation Activity 3	\$2,410,689.71	X	0.6419 = \$1,547,421.72
Present Worth of Rehabilitation Activity 4	\$321,359.38	X	0.5537 = \$177,936.69
Present Worth of Rehabilitation Activity 5	\$333,705.58	X	0.4776 = \$159,377.79
Present Worth of Rehabilitation Activity 6	\$3,591,664.82	X	0.412 = \$1,479,765.91
Present Worth of Rehabilitation Activity 7	\$321,359.38	X	0.3554 = \$114,211.12
Present Worth of Rehabilitation Activity 8	\$333,705.58	X	0.3066 = \$102,314.13
	Total Life Cycle Cost (Present Worth)	=	\$18,226,603.88

Annual Cost per Mile Calculation

Total PW	X	CRF _n	÷	Length (Miles)	=	Ann. Cost / Year*Mile
\$18,226,603.88	X	0.4079	÷	4.375 Miles	=	\$1,699,344.39