



# Illinois Department of Transportation

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To: John Fortmann                      Attn: District One  
From: John D. Baranzelli  
Subject: Pavement Design  
Date: September 9, 2015

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A handwritten signature in black ink, appearing to be 'JDB', enclosed in a hand-drawn oval.

FAU Route 0347 (IL 38)  
05-00102-00-PV  
Kane County  
From the Fox River to Kirk Road

The project, submitted to BDE by email memo dated September 8, 2015, will reconstruct a short section of IL 38, and widen IL 25 [Bennett Street]. The project length does not qualify for alternate bid, as it is less than 2 lane-miles. The LCCA favors a rigid design by more than 10%. The widening and resurfacing of IL 25 will use a mechanistic flexible design based on first cost.

The approved pavement design is as follows:

IL 38 and IL 25 [Sta. 326+77.24 to 328+83.65](Pavement Reconstruction)

10 inches of PCC Pavement with tied PCC Curb & Gutter  
12 inches of Aggregate Subgrade Improvement

IL 25 [Bennett Street] (Pavement Widening & Resurfacing)

10.25 inches of Full Depth HMA Pavement with PCC Curb & Gutter  
1.75 inches of HMA Surface Course, Mix "D", N70  
0.75 inches of Leveling Binder (Machine Method) N70  
7.75 inches of HMA Binder Course, IL-19.0, N70  
12 inches of Aggregate Subgrade Improvement

IL 25 (Pavement Resurfacing)

Cold Milling of HMA Pavement (2.5 inches minimum)  
1.75 inches of HMA Surface Course, Mix "D", N70  
0.75 inches of Leveling Binder (Machine Method) N70

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



# Illinois Department of Transportation

## Memorandum

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To: John D. Baranzelli                      Attn: Paul Niedernhofer  
From: Jose A. Dominguez                  By: Melchor Mangoba / Ojas Patel  
Subject: Pavement Analysis\*  
Date: September 8, 2015

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\*Route: Illinois Route 38  
Limits: Fox River to Kirk Road  
Section: 05-00102-00-PV  
Current target: 09CY17

County: Kane  
Contract No.: Unknown  
Job No.: Unknown

We have completed the pavement analysis for the above captioned location. Review by the Central Office is required since the total pavement area for reconstruction exceeds 4,750 Square Yards. The following is the scope of the project:

***Reconstruction of IL 38 from Fox River to Kirk Road to provide corridor improvements as part of a Bureau of Local Roads project.***

A 20-year pavement analysis was performed on the above segments. We recommend a mechanistic-rigid pavement design based on the life cycle cost analysis which favors PCC pavement by 14% for IL 38. We recommend a mechanistic flexible pavement design for IL 25 using a first cost analysis.

**IL 38 and IL 25 (Sta. 326+77.24 to 328+83.65)**

Reconstruction  
PCC Curb and Gutter (Tied)  
10" PCC Pavement<sup>1</sup>  
12" Aggregate Subgrade Improvement<sup>5</sup>

**IL 25 (Bennett Street)**

Widening and Resurfacing  
PCC Curb and Gutter  
10 ¼" Full Depth HMA<sup>6</sup>  
    1 ¾" HMA Surface Course, Mix "D", N70<sup>2</sup>  
    ¾" Leveling Binder (MM), N70<sup>3</sup>  
    7 ¾" HMA Binder Course, IL-19.0, N70<sup>4</sup>  
12" Aggregate Subgrade Improvement<sup>5</sup>

**IL 25 Pavement Resurfacing**

Cold Milling of HMA Pavement

2 ½" minimum (more if necessary)

1 ¾" HMA Surface Course, Mix "D", N70<sup>2</sup>

¾" Leveling Binder (MM), N70<sup>3</sup>

<sup>1</sup>Designer Note 1: Use pay item **42000501, PORTLAND CEMENT CONCRETE PAVEMENT 10" (JOINTED)**, paid for in square yards.

<sup>2</sup>Designer Note 2: Use pay item **40603340, HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N70** paid for in tons.

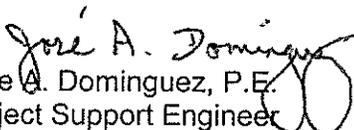
<sup>3</sup>Designer Note 3: Use pay item **40600635, LEVELING BINDER (MACHINE METHOD), N70** paid for in tons.

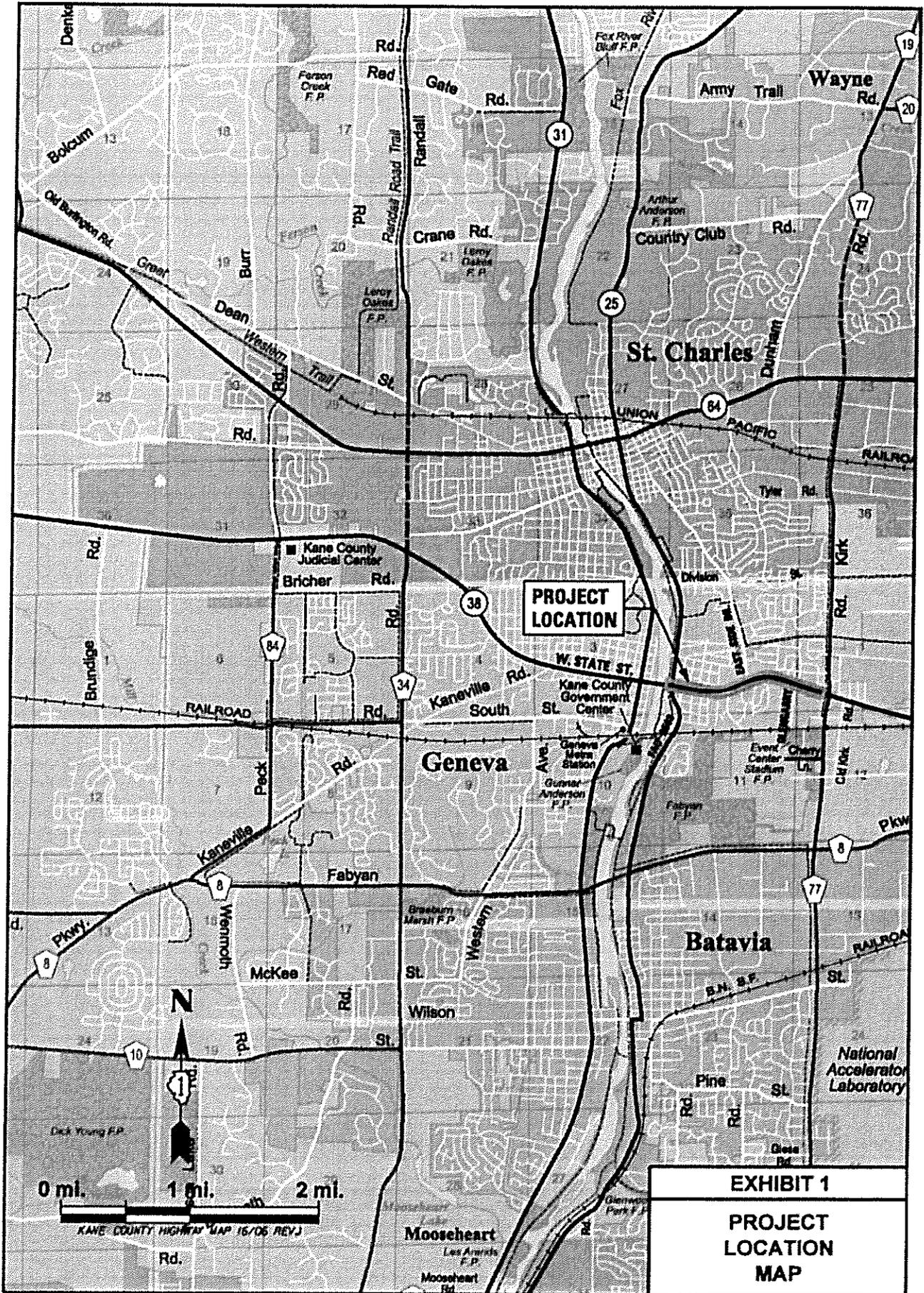
<sup>4</sup>Designer Note 4: For widening of six feet or less use pay item **35600707, Hot-Mix Asphalt Base Course Widening, 7 ¾"**, paid for in square yards. For widening of greater than six feet use pay item **35501315, Hot-Mix Asphalt Base Course, 7 ¾"**, paid for in square yards.

<sup>5</sup>Designer Note 5: Use pay item **30300112, AGGREGATE SUBGRADE IMPROVEMENT, 12"**, paid in square yards.

<sup>6</sup>Designer Note 6: Refer to the District One, Bureau of Materials' "Hot-Mix Asphalt – Mix Selection" tables to determine the corresponding HMA mix table requirements for the plans.

If you have any questions or need additional information, please contact Ojas Patel, Pavement Design Engineer, at (847)705-4550.

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



**EXHIBIT 1**  
**PROJECT**  
**LOCATION**  
**MAP**

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

Route: <b>IL 38</b>	Comments: <b>BLR Project to reconstruct IL 38</b>
Section:	<b>Coordination with BDE Required</b>
County: <b>Kane</b>	Design Date: <b>07/10/2015 ONP</b>
Location: <b>(Fox R. to Kirk)</b>	Modify Date:

Facility Type: <b>Other Marked State Route</b>	# of Lanes = <b>4</b>
Road Class: <b>I</b>	
Subgrade Support Rating (SSR): <b>Poor</b>	
Construction Year: <b>2018</b>	
Design Period (DP) = <b>20</b> years	

<-- BY	ADT	Year
Current:	<b>34,000</b>	<b>2010</b>
Future:	<b>41,000</b>	<b>2030</b>

Structural Design Traffic			
	Minimum ADT	Actual ADT	Actual % of Total ADT
PV =	<b>0</b>	<b>37,479</b>	<b>93.0%</b>
SU =	<b>250</b>	<b>1,209</b>	<b>3.0%</b>
MU =	<b>750</b>	<b>1,612</b>	<b>4.0%</b>
Struct. Design ADT =	<b>40,300</b>	<b>(2028)</b>	

% of ADT in Design Lane	
P = <b>32%</b>	S = <b>45%</b>
M = <b>45%</b>	

**TRAFFIC FACTOR CALCULATION**

<b>FLEXIBLE PAVEMENT</b>		<b>RIGID PAVEMENT</b>	
Cpv =	0.15	Cpv =	0.15
Csu =	<b>132.5</b>	Csu =	<b>143.81</b>
Cmu =	<b>482.53</b>	Cmu =	<b>696.42</b>
TF flexible (Actual) =	8.48 (Actual ADT)	TF rigid (Actual) =	11.70 (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**

<b>Full-Depth HMA Pavement</b>		<b>JPC Pavement</b>	
Use TF flexible =	8.48	Use TF rigid =	11.70
PG Grade Lower Binder Lifts =	<b>PG 64-22</b> (Fig. 53-4.R)	Edge Support =	<b>Tied</b> Shoulder or C.&G.
HMA Mixture Temp. =	<b>75.0</b> deg. F (Fig. 54-5.C)	<b>Rigid Pavt Thick. =</b>	<b>10.00</b> in. (Fig. 54-4.E)
Design HMA Mixture Modulus (E <sub>HMA</sub> ) =	690 ksi (Fig. 54-5.D)	<b>CRC Pavement</b>	
Design HMA Strain (ε <sub>HMA</sub> ) =	65 (Fig. 54-5.E)	Use TF rigid =	11.70
Full Depth HMA Design Thickness =	12.00 in. (Fig. 54-5.F)	IBR value =	<b>3</b>
Limiting Strain Criterion Thickness =	<b>14.75</b> in. (Fig. 54-5.I)	<b>CRCP Thickness =</b>	<b>9.00</b> in. (Fig. 54-4.M)
<b>Use Full-Depth HMA Thickness =</b>	<b>12.00</b> inches	<b>TF MUST BE &gt; 60 FOR CRCP</b>	

**RECONSTRUCTION ONLY (SUPPLEMENTAL) PAVEMENT DESIGN CALCULATIONS**

<b>HMA Overlay of Rubblized PCC</b>		<b>Unbonded Concrete Overlay</b>	
Use TF flexible =	8.48	Review 54-4.03 for limitations and special considerations.	
HMA Overlay Design Thickness =	9.25 in. (Fig. 54-5.U)	<b>JPCP Thickness =</b>	<b>NA</b> inches
Limiting Strain Criterion Thickness =	in. (Fig. 54-5.V)	<b>CONTACT BMPR FOR ASSISTANCE</b>	
<b>Use HMA Overlay Thickness =</b>	<b>999.00</b> inches		

**DESIGN TABLES FROM BDE MANUAL CHAPTER 54 - PAVEMENT DESIGN**

<b>Class I Roads</b> 4 lanes or more Part of a future 4 lanes or more One-way Streets with ADT > 3500	<b>Class II Roads</b> 2 lanes with ADT > 2000 One way Street with ADT <= 3500	<b>Class III Roads</b> 2 Lanes (ADT 750 -2000)	<b>Class IV Roads</b> 2 Lanes (ADT < 750)
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Facility Type	Min. Str. Design Traffic (Fig 54-2.C)			
	PV	SU	MU	
	Interstate or 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

Class	Traffic Factor ESAL Coefficients			
	Rigid (Fig. 54-4.C)		Flexible (Fig. 54-5.B)	
I	Csu	Cmu	Csu	Cmu
II	143.81	696.42	132.50	482.53
III	135.78	567.21	112.06	385.44
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

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%

# LIFE-CYCLE COST ANALYSIS: NEW CONSTRUCTION / RECONSTRUCTION

## FULL-DEPTH HMA PAVEMENT

Standard Design

ROUTE IL 38  
SECTION  
COUNTY Kane  
LOCATION (Fox R. to Kirk)

FACILITY TYPE NON-INTERSTATE

PROJECT LENGTH 6410 FT ==> 1.21 Miles  
# OF CENTERLINES 4 CL  
# OF LANES 5 LANES  
# OF EDGES 2 EP  
LANE WIDTH - AVERAGE 12 FT  
SHOULDER WIDTH HMA Left 0 FT  
HMA Right 0 FT  
Total Width of Paved Shoulders 0 FT

PAVEMENT THICKNESS (FLEXIBLE) 12.00 IN 14.75 IN MAX  
SHOULDER THICKNESS 8.00 IN HMA-30 Standard Design  
POLICY OVERLAY THICKNESS 2.25 IN

FLEX PAVEMENT	TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
		3.56	8.48	8.48

Read Me!

HMA COST PER TON	UNIT PRICE
HMA SURFACE	\$99.84 / TON
HMA TOP BINDER	\$92.04 / TON
HMA LOWER BINDER	\$70.87 / TON
HMA BINDER (LEVELING)	\$81.45 / TON
HMA SHOULDER	\$72.00 / TON

### INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT	UNIT PRICE	COST
HMA PAVEMENT (FULL-DEPTH)	(12.00")	42,733	SQ YD	\$54.07 / SQ YD	\$2,310,591 ~
HMA SURFACE COURSE	(2.00")	4,799	TONS	\$99.84 / TON	\$0
HMA TOP BINDER COURSE	(2.25")	5,431	TONS	\$92.04 / TON	\$0
HMA LOWER BINDER COURSE	(7.75")	18,965	TONS	\$70.87 / TON	\$0
HMA SHOULDER	(8.00")	0	TONS	\$72.00 / TON	\$0 ~
CURB & GUTTER		12,850	LIN FT	\$30.00 / LIN FT	\$385,500
SUBBASE GRAN MATL TY C (TONS)		146	TONS	\$25.00 / TON	\$3,650
IMPROVED SUBGRADE: Aggregate		44,870	SQ YD	\$7.00 / SQ YD	\$314,090
Reserved For User Supplied Item		0	UNITS	\$0.00 / UNITS	\$0
Reserved For User Supplied Item		0	UNITS	\$0.00 / UNITS	\$0
PAVEMENT REMOVAL		42,733	SQ YD	\$15.00 / SQ YD	\$640,995
SHOULDER REMOVAL		0	SQ YD	\$0.00 / SQ YD	\$0

Note: \* Denotes User Supplied Quantity

FLEXIBLE CONSTRUCTION INITIAL COST \$3,654,826  
FLEXIBLE CONSTRUCTION ANNUAL COST PER MILE \$122,785

### MAINTENANCE COSTS:

ITEM	THICKNESS	MATERIAL	UNIT COST
ROUTINE MAINTENANCE ACTIVITY			\$0.00 LANE-MILE / YEAR
HMA OVERLAY PVMT SURF	(2.00")	Surface Mix	\$11.21 / SQ YD
HMA OVERLAY PVMT	(2.25")	Surface Mix	\$11.84 / SQ YD
HMA SURFACE MIX	(1.50")	Surface Mix	\$8.40 / SQ YD
HMA BINDER MIX	(0.75")	Leveling Binder Mix	\$3.44 / SQ YD
HMA OVERLAY SHLD (Year 30)	(2.25")	Shoulder Mix	\$9.07 / SQ YD
HMA OVERLAY SHLD	(2.00")	Shoulder Mix	\$8.06 / SQ YD
MILLING (2.00 IN)			\$3.00 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill Surf)		Surface Mix	\$81.18 / SQ YD
PARTIAL DEPTH SHLD PATCH (Mill & Fill Surf)		Shoulder Mix	\$78.06 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill +2.00")		Leveling Binder Mix	\$79.12 / SQ YD
PARTIAL DEPTH SHLD PATCH (Mill & Fill +2.00")		Shoulder Mix	\$78.06 / SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL			\$2.00 / LIN FT
CENTERLINE JOINT ROUT & SEAL			\$2.00 / LIN FT
RANDOM / THERMAL CRACK ROUT & SEAL (100% Rehab = 110.00' / Station / Lane)			\$2.00 / LIN FT

FLEXIBLE TOTAL LIFE-CYCLE COST \$4,758,454  
FLEXIBLE TOTAL ANNUAL COST PER MILE \$159,862

FULL-DEPTH HMA PAVEMENT  
HMA OVERLAY OF RUBBLIZED PCC PAVEMENT  
Figure 54-7.C  
STANDARD DESIGN

MAINTENANCE COSTS: ITEM % QUANTITY UNIT UNIT COST COST PRESENT WORTH

YEAR 5							
	LONG SHLD JT R&S	100.00%	12,820	LIN FT	\$2.00	\$25,640	
	CNTR LINE JOINT R&S	100.00%	25,640	LIN FT	\$2.00	\$51,280	
	RNDM / THRM CRACK R&S	50.00%	17,628	LIN FT	\$2.00	\$35,256	
	PD PVMT PATCH M&F SURF	0.10%	43	SQ YD	\$81.18	\$3,491	
	PWF <sub>n</sub> =	0.8626		PW =	0.8626 X	\$115,667	
						\$99,775	

YEAR 10							
	LONG SHLD JT R&S	100.00%	12,820	LIN FT	\$2.00	\$25,640	
	CNTR LINE JOINT R&S	100.00%	25,640	LIN FT	\$2.00	\$51,280	
	RNDM / THRM CRACK R&S	50.00%	17,628	LIN FT	\$2.00	\$35,256	
	PD PVMT PATCH M&F SURF	0.50%	214	SQ YD	\$81.18	\$17,373	
	PWF <sub>n</sub> =	0.7441		PW =	0.7441 X	\$129,549	
						\$96,397	

YEAR 15							
	MILL PVMT & SHLD 2.00"	100.00%	42,733	SQ YD	\$3.00	\$128,199	
	PD PVMT PATCH M&F ADD'L 2.00"	1.00%	427	SQ YD	\$79.12	\$33,785	
	HMA OVERLAY PVMT 2.00"	100.00%	42,733	SQ YD	\$11.21	\$479,175	
	HMA OVERLAY SHLD 2.00"	100.00%	0	SQ YD	\$8.06	\$0	
	PWF <sub>n</sub> =	0.6419		PW =	0.6419 X	\$641,159	
						\$411,536	

YEAR 20							
	LONG SHLD JT R&S	100.00%	12,820	LIN FT	\$2.00	\$25,640	
	CNTR LINE JOINT R&S	100.00%	25,640	LIN FT	\$2.00	\$51,280	
	RNDM / THRM CRACK R&S	50.00%	17,628	LIN FT	\$2.00	\$35,256	
	PD PVMT PATCH M&F SURF	0.10%	43	SQ YD	\$81.18	\$3,491	
	PWF <sub>n</sub> =	0.5537		PW =	0.5537 X	\$115,667	
						\$64,042	

YEAR 25							
	LONG SHLD JT R&S	100.00%	12,820	LIN FT	\$2.00	\$25,640	
	CNTR LINE JOINT R&S	100.00%	25,640	LIN FT	\$2.00	\$51,280	
	RNDM / THRM CRACK R&S	50.00%	17,628	LIN FT	\$2.00	\$35,256	
	PD PVMT PATCH M&F SURF	0.50%	214	SQ YD	\$81.18	\$17,373	
	PWF <sub>n</sub> =	0.4776		PW =	0.4776 X	\$129,549	
						\$61,873	

HMA SD

YEAR 30 NON-INTERSTATE							
	MILL PVMT & SHLD 2.00"	100.00%	42,733	SQ YD	\$3.00	\$128,199	
	PD PVMT PATCH M&F ADD'L 2.00"	2.00%	855	SQ YD	\$79.12	\$67,650	
	PD SHLD PATCH M&F ADD'L 2.00"	1.00%	0	SQ YD	\$78.06	\$0	
	HMA OVERLAY PVMT 2.25"	100.00%	42,733	SQ YD	\$11.84	\$506,080	
	HMA OVERLAY SHLD 2.25"	100.00%	0	SQ YD	\$9.07	\$0	
	PWF <sub>n</sub> =	0.4120		PW =	0.4120 X	\$701,929	
						\$289,185	

YEAR 35							
	LONG SHLD JT R&S	100.00%	12,820	LIN FT	\$2.00	\$25,640	
	CNTR LINE JOINT R&S	100.00%	25,640	LIN FT	\$2.00	\$51,280	
	RNDM / THRM CRACK R&S	50.00%	17,628	LIN FT	\$2.00	\$35,256	
	PD PVMT PATCH M&F SURF	0.10%	43	SQ YD	\$81.18	\$3,491	
	PWF <sub>n</sub> =	0.3554		PW =	0.3554 X	\$115,667	
						\$41,106	

YEAR 40							
	LONG SHLD JT R&S	100.00%	12,820	LIN FT	\$2.00	\$25,640	
	CNTR LINE JOINT R&S	100.00%	25,640	LIN FT	\$2.00	\$51,280	
	RNDM / THRM CRACK R&S	50.00%	17,628	LIN FT	\$2.00	\$35,256	
	PD PVMT PATCH M&F SURF	0.50%	214	SQ YD	\$81.18	\$17,373	
	PWF <sub>n</sub> =	0.3066		PW =	0.3066 X	\$129,549	
						\$39,714	

\$1,103,628

ROUTINE MAINTENANCE ACTIVITY 6.07 Lane Miles 0.00 \$0 \$0

45 YEAR LIFE CYCLE CRF<sub>n</sub> = 0.0407852 MAINTENANCE LIFE-CYCLE COST \$1,103,628  
MAINTENANCE ANNUAL COST PER MILE \$37,077

**PCC PAVEMENT**

**JPCP**

ROUTE IL 38  
 SECTION 0  
 COUNTY Kane  
 LOCATION (Fox R. to Kirk)

FACILITY TYPE NON-INTERSTATE

PROJECT LENGTH 6410 FT ==> 1.21 Miles  
 # OF CENTERLINES 4 CL  
 # OF LANES 5 LANES  
 # OF EDGES 2 EP  
 LANE WIDTH - AVERAGE 12 FT  
 SHOULDER WIDTH PCC Left 0 FT  
 PCC Right 0 FT  
 Total Width of Paved Shoulders 0 FT

PAVEMENT THICKNESS (RIGID) JPCP 10.00 IN TIED SHLD  
 SHOULDER THICKNESS 10.00 IN

POLICY OVERLAY THICKNESS 2.50 IN

RIGID PAVEMENT	TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
Worksheet Construction Type is	Reconstruction	5.02	11.70	JPCP
			The Pavement Type is	JPCP

**INITIAL COSTS**

ITEM	THICKNESS	100% QUANTITY UNIT	UNIT PRICE	COST
JPC PAVEMENT	( 10.00" )	42,733 SQ YD	\$51.02 / SQ YD	\$2,180,238
PAVEMENT REINFORCEMENT		0 SQ YD	\$22.00 / SQ YD	\$0
STABILIZED SUBBASE	( 4.00" )	0 SQ YD *	\$19.00 / SQ YD	\$0
PCC SHOULDERS	( 10.00" to 10.00" )	0 SQ YD	\$40.00 / SQ YD	\$0
CURB & GUTTER		12,850 LIN FT *	\$30.00 / LIN FT	\$385,500
SUBBASE GRAN MATL TY C	( ~ 0.00" )	0 TONS	\$25.00 / TON	\$0
IMPROVED SUBGRADE:	Aggregate (Depth = 6.12)	43,446 SQ YD	\$7.00 / SQ YD	\$304,122
Reserved For User Supplied Item		0 UNITS	\$0.00 / UNITS	\$0
Reserved For User Supplied Item		0 UNITS	\$0.00 / UNITS	\$0
PAVEMENT REMOVAL		42,733 SQ YD	\$15.00 / SQ YD	\$640,995
SHOULDER REMOVAL		0 SQ YD	\$0.00 / SQ YD	\$0

Note: \* Denotes User Supplied Quantity

RIGID CONSTRUCTION INITIAL COST \$3,510,855  
 RIGID CONSTRUCTION ANNUAL COST PER MILE \$117,948

**MAINTENANCE COSTS:**

ITEM	THICKNESS	MATERIAL	UNIT COST
ROUTINE MAINTENANCE ACTIVITY			\$0.00 / LANE-MILE / YEAR
HMA POLICY OVERLAY	( 2.50" )		\$2.30
HMA POLICY OVERLAY PVMT	( 2.50" )		\$12.99 / SQ YD
HMA SURFACE MIX	( 1.50" )	Surface Mix	\$8.40 / SQ YD
HMA BINDER MIX	( 1.00" )	elting Binder Mix	\$4.59 / SQ YD
HMA POLICY OVERLAY SHLD	( 2.50" )	Shoulder Mix	\$10.08 / SQ YD
CLASS A PAVEMENT PATCHING			\$195.00 / SQ YD
CLASS B PAVEMENT PATCHING			\$150.00 / SQ YD
CLASS C SHOULDER PATCHING			\$145.00 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA Surf)		Surface Mix	\$78.39 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA 2.50")		Surface Mix	\$83.98 / SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL			\$2.00 / LIN FT
CENTERLINE JOINT ROUT & SEAL			\$2.00 / LIN FT
REFLECTIVE TRANSVERSE CRACK ROUT & SEAL			\$2.00 / LIN FT
RANDOM CRACK ROUT & SEAL	(100% Rehab = 100.00' / Station / Lane)		\$2.00 / LIN FT

RIGID TOTAL LIFE-CYCLE COST \$4,169,072  
 RIGID TOTAL ANNUAL COST PER MILE \$140,061

MAINTENANCE AND REHABILITATION ACTIVITY SCHEDULE

09/08/15

JOINTED PLAIN CONCRETE PAVEMENT  
UNBONDED JOINTED PLAIN CONCRETE OVERLAY  
Figure 54-7.A

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST	COST	PRESENT WORTH
<b>YEAR 10</b>							
	PAVEMENT PATCH CLASS B	0.10%	43	SQ YD	\$150.00	\$6,450	
		PWFn = 0.7441			PW = 0.7441 X	\$6,450	\$4,799
<b>YEAR 15</b>							
	PAVEMENT PATCH CLASS B	0.20%	85	SQ YD	\$150.00	\$12,750	
		PWFn = 0.6419			PW = 0.6419 X	\$12,750	\$8,184
<b>YEAR 20</b>							
	PAVEMENT PATCH CLASS B	2.00%	855	SQ YD	\$150.00	\$128,250	
	SHOULDER PATCH CLASS C	0.50%	0	SQ YD	\$145.00	\$0	
	LONGITUDINAL SHLD JT R&S	100.00%	12,820	LIN FT	\$2.00	\$25,640	
	CENTERLINE JT R&S	100.00%	25,640	LIN FT	\$2.00	\$51,280	
		PWFn = 0.5537			PW = 0.5537 X	\$205,170	\$113,598
<b>YEAR 25</b>							
	PAVEMENT PATCH CLASS B	3.00%	1,282	SQ YD	\$150.00	\$192,300	
	SHOULDER PATCH CLASS C	1.00%	0	SQ YD	\$145.00	\$0	
		PWFn = 0.4776			PW = 0.4776 X	\$192,300	\$91,844
<b>YEAR 30</b>							
	NON-INTERSTATE						
	PAVEMENT PATCH CLASS B	4.00%	1,709	SQ YD	\$150.00	\$256,350	
	SHOULDER PATCH CLASS C	1.50%	0	SQ YD	\$145.00	\$0	
	HMA POLICY OVERLAY 2.5" (PVMT)	100.00%	42,733	SQ YD	\$12.99	\$555,130	
	HMA POLICY OVERLAY 2.5" (SHLD)	100.00%	0	SQ YD	\$10.08	\$0	
		PWFn = 0.4120			PW = 0.4120 X	\$811,480	\$334,319
<b>YEAR 35</b>							
	NON-INTERSTATE						
	LONGITUDINAL SHLD JT R&S	100.00%	12,820	LIN FT	\$2.00	\$25,640	
	CENTERLINE JT R&S	100.00%	25,640	LIN FT	\$2.00	\$51,280	
	RANDOM CRACK R&S	50.00%	16,025	LIN FT	\$2.00	\$32,050	
	REFLECTIVE TRANSVERSE CRACK R&S	40.00%	10,248	LIN FT	\$2.00	\$20,496	
	PD PVMT PATCH M&F HMA 2.50"	0.10%	43	SQ YD	\$83.98	\$3,611	
		PWFn = 0.3554			PW = 0.3554 X	\$133,077	\$47,293
<b>YEAR 40</b>							
	NON-INTERSTATE						
	PAVEMENT PATCH CLASS B	0.50%	214	SQ YD	\$150.00	\$32,100	
	LONGITUDINAL SHLD JT R&S	100.00%	12,820	LIN FT	\$2.00	\$25,640	
	CENTERLINE JT R&S	100.00%	25,640	LIN FT	\$2.00	\$51,280	
	REFLECTIVE TRANSVERSE CRACK R&S	60.00%	15,372	LIN FT	\$2.00	\$30,744	
	RANDOM CRACK R&S	50.00%	16,025	LIN FT	\$2.00	\$32,050	
	PD PVMT PATCH M&F HMA 2.50"	0.50%	214	SQ YD	\$83.98	\$17,971	
		PWFn = 0.3066			PW = 0.3066 X	\$189,785	\$58,180
							\$658,217
	ROUTINE MAINTENANCE ACTIVITY		6.07	Lane Miles	\$0.00	\$0	\$0
							MAINTENANCE LIFE-CYCLE COST \$658,217
45	YEAR LIFE CYCLE	CRFn = 0.0407852					MAINTENANCE ANNUAL COST PER MILE \$22,113

## LIFE-CYCLE COST ANALYSIS: NEW DESIGN

Calculated / Revised : 9/4/15 9:06 AM

			JPCP	HMA
CONSTRUCTION	INITIAL COST	PRESENT WORTH	\$3,510,855	\$3,654,826
		ANNUAL COST PER MILE	\$117,948	\$122,785
MAINTENANCE	LIFE-CYCLE COST	PRESENT WORTH	\$658,217	\$1,103,628
		ANNUAL COST PER MILE	\$22,113	\$37,077
TOTAL	LIFE-CYCLE COST	PRESENT WORTH	\$4,169,072	\$4,758,454
		ANNUAL COST PER MILE	\$140,061	\$159,862

## LIFE-CYCLE COST ANALYSIS: FINAL SUMMARY

LOWEST COST OPTION	=====>	JPCP	\$140,061	
OTHER OPTIONS (LOWEST TO HIGHEST):	TYPE / PERCENTAGE	HMA	\$159,862	14.1%

PROJECT AND TRAFFIC INPUTS				(Enter Data in Gray Shaded Cells)		
Route: <b>IL 25 (Bennett St)</b>	Comments: <b>BLR Project to reconstruct IL 38</b>					
Section:	Coordination with BDE Required					
County: <b>Kane</b>	Design Date: <b>07/10/2015</b>	<b>ONP</b>	<-- BY	ADT	Year	
Location: <b>at IL 38</b>	Modify Date:		<-- BY	Current: <b>11,600</b>	<b>2010</b>	
Facility Type: <b>Other Marked State Route</b>	# of Lanes = <b>4</b>			Future: <b>12,000</b>	<b>2030</b>	
Road Class: <b>I</b>	Structural Design Traffic					
Subgrade Support Rating (SSR): <b>Poor</b>	Minimum ADT	Actual ADT	Actual % of Total ADT	% of ADT in Design Lane		
Construction Year: <b>2018</b>	PV = <b>0</b>	11,242	94.0%	P = <b>32%</b>		
Design Period (DP) = <b>20</b> years	SU = <b>250</b>	359	3.0%	S = <b>45%</b>		
	MU = <b>750</b>	359	3.0%	M = <b>45%</b>		
	Struct. Design ADT = <b>11,960</b>		<b>(2028)</b>			
TRAFFIC FACTOR CALCULATION						
FLEXIBLE PAVEMENT				RIGID PAVEMENT		
Cpv = <b>0.15</b>	Csu = <b>132.5</b>	Cmu = <b>482.53</b>	TF flexible (Actual) = <b>2.00</b>	TF rigid (Actual) = <b>2.72</b>	TF flexible (Min) = <b>3.56</b>	TF rigid (Min) = <b>5.02</b>
			(Actual ADT)	(Actual ADT)	(Min ADT Fig. 54-2.C)	(Min ADT Fig. 54-2.C)

NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS			
Full-Depth HMA Pavement		JPC Pavement	
Use TF flexible = <b>3.56</b>	PG Grade Lower Binder Lifts = <b>PG 64-22</b> (Fig. 53-4.R)	Use TF rigid = <b>5.02</b>	Edge Support = <b>Tied</b> Shoulder or C.&G.
<a href="#">Goto Map</a>	HMA Mixture Temp. = <b>75.0</b> deg. F (Fig. 54-5.C)	<b>Rigid Pavt Thick. = 9.00</b> in. (Fig. 54-4.E)	
Design HMA Mixture Modulus (E <sub>HMA</sub> ) = <b>690</b> ksi (Fig. 54-5.D)	Design HMA Strain (ε <sub>HMA</sub> ) = <b>84</b> (Fig. 54-5.E)	CRC Pavement	
<a href="#">Goto Map</a>	Full Depth HMA Design Thickness = <b>10.25</b> in. (Fig. 54-5.F)	Use TF rigid = <b>5.02</b>	IBR value = <b>3</b>
Limiting Strain Criterion Thickness = <b>14.75</b> in. (Fig. 54-5.I)	<b>Use Full-Depth HMA Thickness = 10.25</b> inches	<b>CRCP Thickness = 8.00</b> in. (Fig. 54-4.M)	
<b>TF MUST BE &gt; 60 FOR CRCP</b>			

RECONSTRUCTION ONLY (SUPPLEMENTAL) PAVEMENT DESIGN CALCULATIONS			
HMA Overlay of Rubblized PCC		Unbonded Concrete Overlay	
Use TF flexible = <b>3.56</b>	HMA Overlay Design Thickness = <b>7.50</b> in. (Fig. 54-5.U)	Review 54-4.03 for limitations and special considerations.	
<a href="#">Goto Map</a>	Limiting Strain Criterion Thickness = <b>in.</b> (Fig. 54-5.V)		
<b>Use HMA Overlay Thickness = 999.00</b> inches		<b>JPCP Thickness = NA</b> inches	
<b>CONTACT BMPR FOR ASSISTANCE</b>			

DESIGN TABLES FROM BDE MANUAL CHAPTER 54 - PAVEMENT DESIGN								
Class I Roads 4 lanes or more Part of a future 4 lanes or more One-way Streets with ADT > 3500		Class II Roads 2 lanes with ADT > 2000 One way Street with ADT <= 3500			Class III Roads 2 Lanes (ADT 750 -2000)		Class IV Roads 2 Lanes (ADT < 750)	
		Min. Str. Design Traffic (Fig 54-2.C)			Class Table for One-Way Streets			
Facility Type		PV	SU	MU	ADT	Class		
Interstate or Freeway		0	500	1500	0 - 3500	II		
Other Marked State Route		0	250	750	>3501	I		
Unmarked State Route		No Min	No Min	No Min				
		Traffic Factor ESAL Coefficients				Class Table for 2 or 3 lanes (not future 4 lane & not one-way street)		
		Rigid (Fig. 54-4.C)		Flexible (Fig. 54-5.B)				
Class	Csu	Cmu	Csu	Cmu	ADT	Class		
I	143.81	696.42	132.50	482.53	0 - 749	IV		
II	135.78	567.21	112.06	385.44	750 - 2000	III		
III	129.58	562.47	109.14	384.35	>2000	II		
IV	129.58	562.47	109.14	384.35				
Design Lane Distribution Factors For Structural Design Traffic (Fig. 54-2.B)								
Rural								
Number of Lanes	P	S	M					
1 Lane Ramp	100%	100%	100%					
2 or 3	50%	50%	50%					
4	32%	45%	45%					
6 or more	20%	40%	40%					
Urban								
Number of Lanes	P	S	M					
1 Lane Ramp	100%	100%	100%					
2 or 3	50%	50%	50%					
4	32%	45%	45%					
6 or more	20%	40%	40%					

# LIFE-CYCLE COST ANALYSIS: NEW CONSTRUCTION / RECONSTRUCTION

## FULL-DEPTH HMA PAVEMENT

Standard Design

ROUTE SECTION COUNTY LOCATION  
 Job Route  
 Job Section  
 Job County  
 Job Location

FACILITY TYPE INTERSTATE

PROJECT LENGTH 1000 FT ==> 0.19 Miles  
 # OF CENTERLINES 2 CL  
 # OF LANES 4 LANES  
 # OF EDGES 4 EP  
 LANE WIDTH - AVERAGE 12 FT  
 SHOULDER WIDTH HMA Inside 6 FT  
 HMA Outside 10 FT  
 Total Width of Paved Shoulders 32 FT

PAVEMENT THICKNESS (FLEXIBLE) 12.00 IN 17.00 IN MAX  
 SHOULDER THICKNESS 8.00 IN HMA, 3.75 IN Standard Design  
 POLICY OVERLAY THICKNESS 3.75 IN

FLEX PAVEMENT	TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
		7.11	1.00	7.11

Read Me!

HMA COST PER TON	UNIT PRICE
HMA SURFACE	\$95.00 / TON
HMA TOP BINDER	\$95.00 / TON
HMA LOWER BINDER	\$80.00 / TON
HMA BINDER (LEVELING)	\$85.00 / TON
HMA SHOULDER	\$72.00 / TON

### INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT	UNIT PRICE	COST
HMA PAVEMENT (FULL-DEPTH)	(12.00")	5,333	SQ YD	\$59.62 / SQ YD	\$317,988 ~
HMA SURFACE COURSE	(2.00")	601	TONS	\$95.00 / TON	\$0
HMA TOP BINDER COURSE	(2.25")	687	TONS	\$95.00 / TON	\$0
HMA LOWER BINDER COURSE	(7.75")	2,445	TONS	\$80.00 / TON	\$0
HMA SHOULDER	(8.00")	1,593	TONS	\$72.00 / TON	\$114,688 ~
CURB & GUTTER		0	LIN FT	\$30.00 / LIN FT	\$0
SUBBASE GRAN MATL TY C (TONS)		499	TONS	\$25.00 / TON	\$12,475
IMPROVED SUBGRADE: Modified Soil		9,556	SQ YD	\$7.00 / SQ YD	\$66,892
Reserved For User Supplied Item		0	UNITS	\$0.00 / UNITS	\$0
Reserved For User Supplied Item		0	UNITS	\$0.00 / UNITS	\$0
PAVEMENT REMOVAL		5,333	SQ YD	\$0.00 / SQ YD	\$0
SHOULDER REMOVAL		3,556	SQ YD	\$0.00 / SQ YD	\$0

Note: \* Denotes User Supplied Quantity

FLEXIBLE CONSTRUCTION INITIAL COST \$512,043  
 FLEXIBLE CONSTRUCTION ANNUAL COST PER MILE \$110,266

### MAINTENANCE COSTS:

ITEM	THICKNESS	MATERIAL	UNIT COST
ROUTINE MAINTENANCE ACTIVITY			\$0.00 LANE-MILE / YEAR
HMA OVERLAY PVMT SURF	(2.00")	Surface Mix	\$10.71 / SQ YD
HMA OVERLAY PVMT	(3.75")	Surface Mix	\$20.21 / SQ YD
HMA SURFACE MIX	(1.50")	Surface Mix	\$8.02 / SQ YD
HMA BINDER MIX	(2.25")	Top Binder Mix	\$12.19 / SQ YD
HMA OVERLAY SHLD (Year 30)	(1.75")	Shoulder Mix	\$7.06 / SQ YD
HMA OVERLAY SHLD	(2.00")	Shoulder Mix	\$8.06 / SQ YD
MILLING (2.00 IN)			\$3.00 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill Surf)		Surface Mix	\$80.64 / SQ YD
PARTIAL DEPTH SHLD PATCH (Mill & Fill Surf)		Shoulder Mix	\$78.06 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill +2.00")		Leveling Binder Mix	\$79.52 / SQ YD
PARTIAL DEPTH SHLD PATCH (Mill & Fill +2.00")		Shoulder Mix	\$78.06 / SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL			\$2.00 / LIN FT
CENTERLINE JOINT ROUT & SEAL			\$2.00 / LIN FT
RANDOM / THERMAL CRACK ROUT & SEAL (100% Rehab = 110.00' / Station / Lane)			\$2.00 / LIN FT

FLEXIBLE TOTAL LIFE-CYCLE COST \$711,101  
 FLEXIBLE TOTAL ANNUAL COST PER MILE \$153,133

FULL-DEPTH HMA PAVEMENT  
 HMA OVERLAY OF RUBBLIZED PCC PAVEMENT  
 Figure 54-7.C  
 STANDARD DESIGN

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST	COST	PRESENT WORTH
<b>YEAR 5</b>							
	LONG SHLD JT R&S	100.00%	4,000	LIN FT	\$2.00	\$8,000	
	CNTR LINE JOINT R&S	100.00%	2,000	LIN FT	\$2.00	\$4,000	
	RNDM / THRM CRACK R&S	50.00%	2,200	LIN FT	\$2.00	\$4,400	
	PD PVMT PATCH M&F SURF	0.10%	5	SQ YD	\$80.64	\$403	
	PWFn =	0.8626		PW =	0.8626 X	\$16,803	\$14,494
<b>YEAR 10</b>							
	LONG SHLD JT R&S	100.00%	4,000	LIN FT	\$2.00	\$8,000	
	CNTR LINE JOINT R&S	100.00%	2,000	LIN FT	\$2.00	\$4,000	
	RNDM / THRM CRACK R&S	50.00%	2,200	LIN FT	\$2.00	\$4,400	
	PD PVMT PATCH M&F SURF	0.50%	27	SQ YD	\$80.64	\$2,177	
	PWFn =	0.7441		PW =	0.7441 X	\$18,577	\$13,823
<b>YEAR 15</b>							
	MILL PVMT & SHLD 2.00"	100.00%	8,889	SQ YD	\$3.00	\$26,667	
	PD PVMT PATCH M&F ADD'L 2.00"	1.00%	53	SQ YD	\$79.52	\$4,215	
	HMA OVERLAY PVMT 2.00"	100.00%	5,333	SQ YD	\$10.71	\$57,141	
	HMA OVERLAY SHLD 2.00"	100.00%	3,556	SQ YD	\$8.06	\$28,672	
	PWFn =	0.6419		PW =	0.6419 X	\$116,695	\$74,902
<b>YEAR 20</b>							
	LONG SHLD JT R&S	100.00%	4,000	LIN FT	\$2.00	\$8,000	
	CNTR LINE JOINT R&S	100.00%	2,000	LIN FT	\$2.00	\$4,000	
	RNDM / THRM CRACK R&S	50.00%	2,200	LIN FT	\$2.00	\$4,400	
	PD PVMT PATCH M&F SURF	0.10%	5	SQ YD	\$80.64	\$403	
	PWFn =	0.5537		PW =	0.5537 X	\$16,803	\$9,303
<b>YEAR 25</b>							
	LONG SHLD JT R&S	100.00%	4,000	LIN FT	\$2.00	\$8,000	
	CNTR LINE JOINT R&S	100.00%	2,000	LIN FT	\$2.00	\$4,000	
	RNDM / THRM CRACK R&S	50.00%	2,200	LIN FT	\$2.00	\$4,400	
	PD PVMT PATCH M&F SURF	0.50%	27	SQ YD	\$80.64	\$2,177	
	PWFn =	0.4776		PW =	0.4776 X	\$18,577	\$8,872
<b>HMA_SD</b>							
<b>YEAR 30</b>							
	INTERSTATE						
	MILL PVMT ONLY 2.00"	100.00%	5,333	SQ YD	\$3.00	\$15,999	
	PD PVMT PATCH M&F ADD'L 2.00"	2.00%	107	SQ YD	\$79.52	\$8,509	
	PD SHLD PATCH M&F SURF 2.00"	1.00%	36	SQ YD	\$78.06	\$2,810	
	HMA OVERLAY PVMT 3.75 "	100.00%	5,333	SQ YD	\$20.21	\$107,785	
	HMA OVERLAY SHLD 1.75 "	100.00%	3,556	SQ YD	\$7.06	\$25,088	
	PWFn =	0.4120		PW =	0.4120 X	\$160,191	\$65,997
<b>YEAR 35</b>							
	LONG SHLD JT R&S	100.00%	4,000	LIN FT	\$2.00	\$8,000	
	CNTR LINE JOINT R&S	100.00%	2,000	LIN FT	\$2.00	\$4,000	
	RNDM / THRM CRACK R&S	50.00%	2,200	LIN FT	\$2.00	\$4,400	
	PD PVMT PATCH M&F SURF	0.10%	5	SQ YD	\$80.64	\$403	
	PWFn =	0.3554		PW =	0.3554 X	\$16,803	\$5,972
<b>YEAR 40</b>							
	LONG SHLD JT R&S	100.00%	4,000	LIN FT	\$2.00	\$8,000	
	CNTR LINE JOINT R&S	100.00%	2,000	LIN FT	\$2.00	\$4,000	
	RNDM / THRM CRACK R&S	50.00%	2,200	LIN FT	\$2.00	\$4,400	
	PD PVMT PATCH M&F SURF	0.50%	27	SQ YD	\$80.64	\$2,177	
	PWFn =	0.3066		PW =	0.3066 X	\$18,577	\$5,695
							\$199,058
ROUTINE MAINTENANCE ACTIVITY			0.76 Lane Miles	0.00	\$0	\$0	
						MAINTENANCE LIFE-CYCLE COST	\$199,058
45	YEAR LIFE CYCLE	CRFn = 0.0407852			MAINTENANCE ANNUAL COST PER MILE		\$42,866

**PCC PAVEMENT**

**JPCP**

ROUTE  
SECTION  
COUNTY  
LOCATION

**Job Route**  
**Job Section**  
**Job County**  
**Job Location**

FACILITY TYPE

**INTERSTATE**

PROJECT LENGTH **1000 FT ==>** 0.19 Miles  
 # OF CENTERLINES **2 CL**  
 # OF LANES **4 LANES**  
 # OF EDGES **4 EP**  
 LANE WIDTH - AVERAGE **12 FT**  
 SHOULDER WIDTH PCC Inside **6 FT**  
 PCC Outside **10 FT**  
 Total Width of Paved Shoulders **32 FT**

PAVEMENT THICKNESS (RIGID) **JPCP 10.00 IN TIED SHLD**  
 SHOULDER THICKNESS **10.00 IN**

POLICY OVERLAY THICKNESS **3.75 IN**

RIGID PAVEMENT	TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
		<b>10.05</b>	<b>1.00</b>	<b>10.05</b>
Worksheet Construction Type is	New Construction	The Pavement Type is		<b>JPCP</b>

**INITIAL COSTS**

ITEM	THICKNESS	100% QUANTITY UNIT	UNIT PRICE	COST
JPC PAVEMENT	( 10.00" )	5,333 SQ YD	<b>\$50.00</b> /SQ YD	\$266,650
PAVEMENT REINFORCEMENT		0 SQ YD	<b>\$22.00</b> /SQ YD	\$0
STABILIZED SUBBASE	( 4.00" )	6,000 SQ YD	<b>\$19.00</b> /SQ YD	\$114,000
PCC SHOULDERS	( 10.00" to 10.00" )	3,556 SQ YD	<b>\$40.00</b> /SQ YD	\$142,240
CURB & GUTTER		0 LIN FT	<b>\$30.00</b> /LIN FT	\$0
SUBBASE GRAN MATL TY C	( ~ 3.48" )	418 TONS	<b>\$25.00</b> /TON	\$10,450
IMPROVED SUBGRADE:	Modified Soil <small>(MDS = 82.3)</small>	9,111 SQ YD	<b>\$7.00</b> /SQ YD	\$63,777
Reserved For User Supplied Item		0 UNITS	<b>\$0.00</b> /UNITS	\$0
Reserved For User Supplied Item		0 UNITS	<b>\$0.00</b> /UNITS	\$0
PAVEMENT REMOVAL		5,333 SQ YD	<b>\$0.00</b> /SQ YD	\$0
SHOULDER REMOVAL		3,556 SQ YD	<b>\$0.00</b> /SQ YD	\$0

Note: \* Denotes User Supplied Quantity

RIGID CONSTRUCTION INITIAL COST **\$597,117**  
 RIGID CONSTRUCTION ANNUAL COST PER MILE **\$128,587**

**MAINTENANCE COSTS:**

ITEM	THICKNESS	MATERIAL	UNIT COST
ROUTINE MAINTENANCE ACTIVITY			<b>\$0.00</b> /LANE-MILE / YEAR
HMA POLICY OVERLAY	( 3.75" )		<b>\$20.21</b> /SQ YD
HMA POLICY OVERLAY PVMT	( 3.75" )		<b>\$8.02</b> /SQ YD
HMA SURFACE MIX	( 1.50" )	Surface Mix	<b>\$12.19</b> /SQ YD
HMA BINDER MIX	( 2.25" )	Top Binder Mix	<b>\$15.12</b> /SQ YD
HMA POLICY OVERLAY SHLD	( 3.75" )	Shoulder Mix	<b>\$195.00</b> /SQ YD
CLASS A PAVEMENT PATCHING			<b>\$150.00</b> /SQ YD
CLASS B PAVEMENT PATCHING			<b>\$145.00</b> /SQ YD
CLASS C SHOULDER PATCHING			<b>\$77.98</b> /SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA Surf)		Surface Mix	<b>\$77.98</b> /SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA 1.50")		Surface Mix	<b>\$77.98</b> /SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL			<b>\$2.00</b> /LIN FT
CENTERLINE JOINT ROUT & SEAL			<b>\$2.00</b> /LIN FT
REFLECTIVE TRANSVERSE CRACK ROUT & SEAL			<b>\$2.00</b> /LIN FT
RANDOM CRACK ROUT & SEAL	(100% Rehab = 100.00' / Station / Lane)		<b>\$2.00</b> /LIN FT

RIGID TOTAL LIFE-CYCLE COST **\$727,263**  
 RIGID TOTAL ANNUAL COST PER MILE **\$156,613**

MAINTENANCE AND REHABILITATION ACTIVITY SCHEDULE

09/08/15

JOINTED PLAIN CONCRETE PAVEMENT  
UNBONDED JOINTED PLAIN CONCRETE OVERLAY  
Figure 54-7.A

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST	COST	PRESENT WORTH
<b>YEAR 10</b>							
	PAVEMENT PATCH CLASS B	0.10%	5 SQ YD		\$150.00	\$750	
		PWFn = 0.7441			PW = 0.7441 X	\$750	\$558
<b>YEAR 15</b>							
	PAVEMENT PATCH CLASS B	0.20%	11 SQ YD		\$150.00	\$1,650	
		PWFn = 0.6419			PW = 0.6419 X	\$1,650	\$1,059
<b>YEAR 20</b>							
	PAVEMENT PATCH CLASS B	2.00%	107 SQ YD		\$150.00	\$16,050	
	SHOULDER PATCH CLASS C	0.50%	18 SQ YD		\$145.00	\$2,610	
	LONGITUDINAL SHLD JT R&S	100.00%	4,000 LIN FT		\$2.00	\$8,000	
	CENTERLINE JT R&S	100.00%	2,000 LIN FT		\$2.00	\$4,000	
		PWFn = 0.5537			PW = 0.5537 X	\$30,660	\$16,976
<b>YEAR 25</b>							
	PAVEMENT PATCH CLASS B	3.00%	160 SQ YD		\$150.00	\$24,000	
	SHOULDER PATCH CLASS C	1.00%	36 SQ YD		\$145.00	\$5,220	
		PWFn = 0.4776			PW = 0.4776 X	\$29,220	\$13,956
<b>YEAR 30</b>							
	INTERSTATE						
	PAVEMENT PATCH CLASS B	4.00%	213 SQ YD		\$150.00	\$31,950	
	SHOULDER PATCH CLASS C	1.50%	53 SQ YD		\$145.00	\$7,685	
	HMA POLICY OVERLAY 3.75" (PVMT)	100.00%	5,333 SQ YD		\$20.21	\$107,785	
	HMA POLICY OVERLAY 3.75" (SHLD)	100.00%	3,556 SQ YD		\$15.12	\$53,760	
		PWFn = 0.4120			PW = 0.4120 X	\$201,180	\$82,883
<b>YEAR 35</b>							
	INTERSTATE						
	LONGITUDINAL SHLD JT R&S	100.00%	4,000 LIN FT		\$2.00	\$8,000	
	CENTERLINE JT R&S	100.00%	2,000 LIN FT		\$2.00	\$4,000	
	RANDOM CRACK R&S	50.00%	2,000 LIN FT		\$2.00	\$4,000	
	REFLECTIVE TRANSVERSE CRACK R&S	40.00%	1,286 LIN FT		\$2.00	\$2,572	
	PD PVMT PATCH M&F HMA SURF 1.50"	0.10%	5 SQ YD		\$77.98	\$390	
		PWFn = 0.3554			PW = 0.3554 X	\$18,962	\$6,739
<b>YEAR 40</b>							
	INTERSTATE						
	PAVEMENT PATCH CLASS B	0.50%	27 SQ YD		\$150.00	\$4,050	
	LONGITUDINAL SHLD JT R&S	100.00%	4,000 LIN FT		\$2.00	\$8,000	
	CENTERLINE JT R&S	100.00%	2,000 LIN FT		\$2.00	\$4,000	
	REFLECTIVE TRANSVERSE CRACK R&S	60.00%	1,930 LIN FT		\$2.00	\$3,860	
	RANDOM CRACK R&S	50.00%	2,000 LIN FT		\$2.00	\$4,000	
	PD PVMT PATCH M&F HMA SURF 1.50"	0.50%	27 SQ YD		\$77.98	\$2,105	
		PWFn = 0.3066			PW = 0.3066 X	\$26,015	\$7,975
							\$130,146
	ROUTINE MAINTENANCE ACTIVITY		0.76 Lane Miles		\$0.00	\$0	\$0
							MAINTENANCE LIFE-CYCLE COST \$130,146
45	YEAR LIFE CYCLE	CRFn = 0.0407852					MAINTENANCE ANNUAL COST PER MILE \$28,026

## LIFE-CYCLE COST ANALYSIS: NEW DESIGN

Calculated / Revised : 9/5/13 9:40 AM

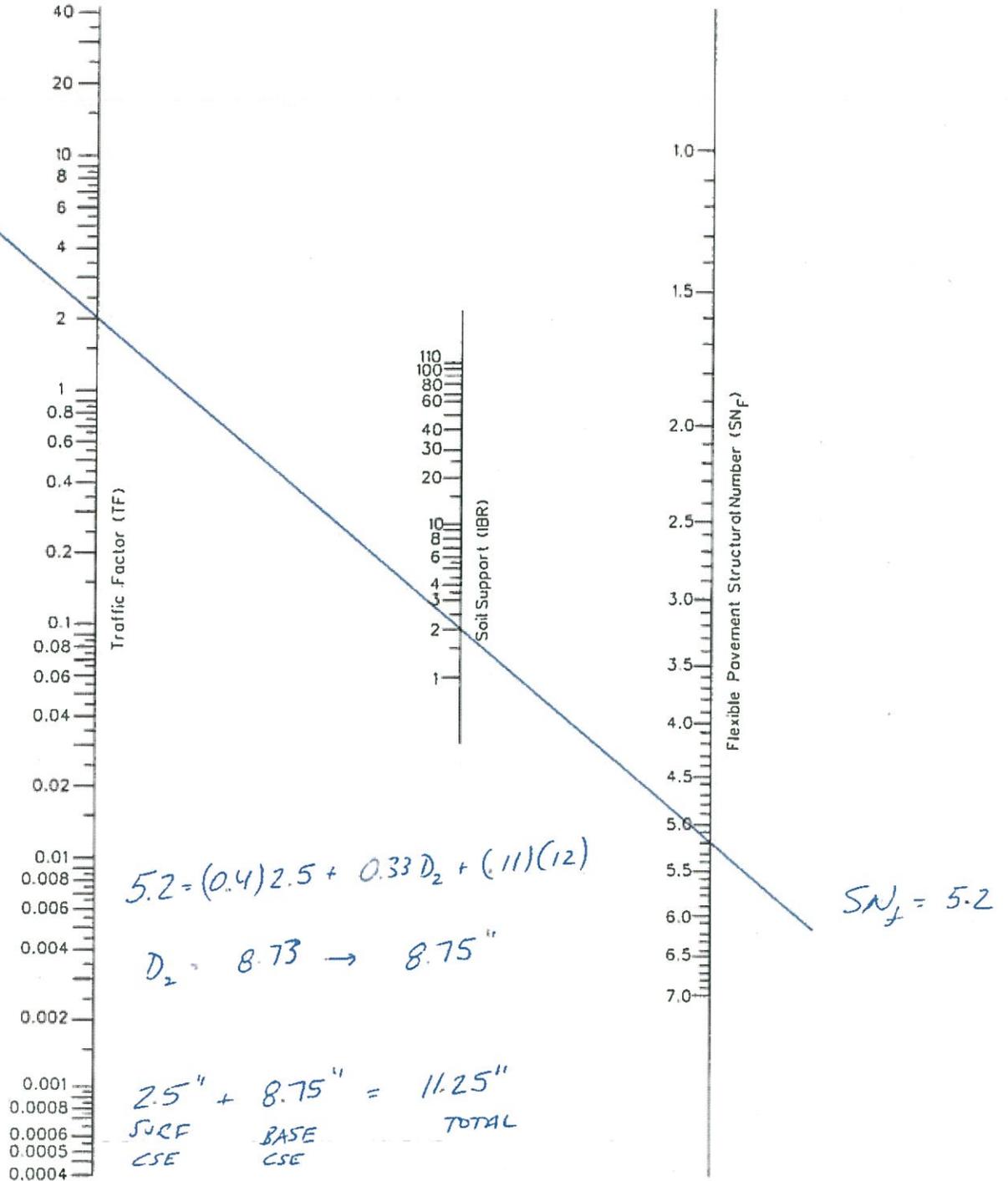
			JPCP	HMA
CONSTRUCTION	INITIAL COST	PRESENT WORTH	\$597,117	\$512,043
		ANNUAL COST PER MILE	\$128,587	\$110,266
MAINTENANCE	LIFE-CYCLE COST	PRESENT WORTH	\$130,146	\$199,058
		ANNUAL COST PER MILE	\$28,026	\$42,866
TOTAL	LIFE-CYCLE COST	PRESENT WORTH	\$727,263	\$711,101
		ANNUAL COST PER MILE	\$156,613	\$153,133

## LIFE-CYCLE COST ANALYSIS: FINAL SUMMARY

LOWEST COST OPTION	=====>	HMA	\$153,133	
OTHER OPTIONS (LOWEST TO HIGHEST):	TYPE / PERCENTAGE	JPCP	\$156,613	2.3%

16 L3  
(BENNETT ST.)

TF = 2.00



**FLEXIBLE PAVEMENT DESIGN NOMOGRAPH  
(Modified AASHTO Design: Class I Facilities)**

Figure 54-5.M