Illinois Department of Transportation

To:	Joseph E. Crowe	Attn: District Four
From:	John D. Baranzelli	
Subject:	Pavement Design	
Date:	July 10, 2013	

FAP Route 407/310 (IL Route 336)
Section 55-3
McDonough County
[NW Macomb Bypass]

FAP Route 407/310 (IL Route 336)
Section 55-3
McDonough County
IL 336 to US 67

Both pavement design sections will be built under one contract. The project meets the criteria for the alternate bid process. The total length exceeds 2 lane-miles, and the economic analysis does not result in one design being more than 10% cheaper than the other. The approved pavement design is as follows:

IL Route 336 (NW Macomb Bypass) (Pavement Reconstruction)

Option 1:

- 11.25 inches of HMA Full-Depth Pavement with HMA Shoulders
  - 2 inches of HMA Surface Course
  - 2.25 inches of HMA Top Binder Course
  - 7 inches of Lower Binder Course
- 12 inches of Lime Modified Soil

Option 2:

- 9.25 inches of PCC pavement with tied PCC Shoulders
- 4 inches of Stabilized Sub-Base
- 12 inches of Lime Modified Soil

IL Route 336 (from US 136 to US 67) (Pavement Reconstruction)

Option 1:

10.75 inches of HMA Full-Depth Pavement with HMA Shoulders
- 2 inches of HMA Surface Course
- 2.25 inches of HMA Top Binder Course
- 6.5 inches of Lower Binder Course

12 inches of Lime Modified Soil

Option 2:

9 inches of PCC pavement with tied PCC Shoulders
4 inches of Stabilized Sub-Base
12 inches of Lime Modified Soil

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

Pavement Committee Meeting Summary 07/02/13

BMPR Representative: LaDonna Rowden
Construction Representative: Doug Dirks
BDE Representative: Paul Niedernhofer

D-4 Project: US 67 [Macomb Bypass] & IL 336

D-4 Representative: Chris Maushard
D-4 Representative: Elias Elderzi

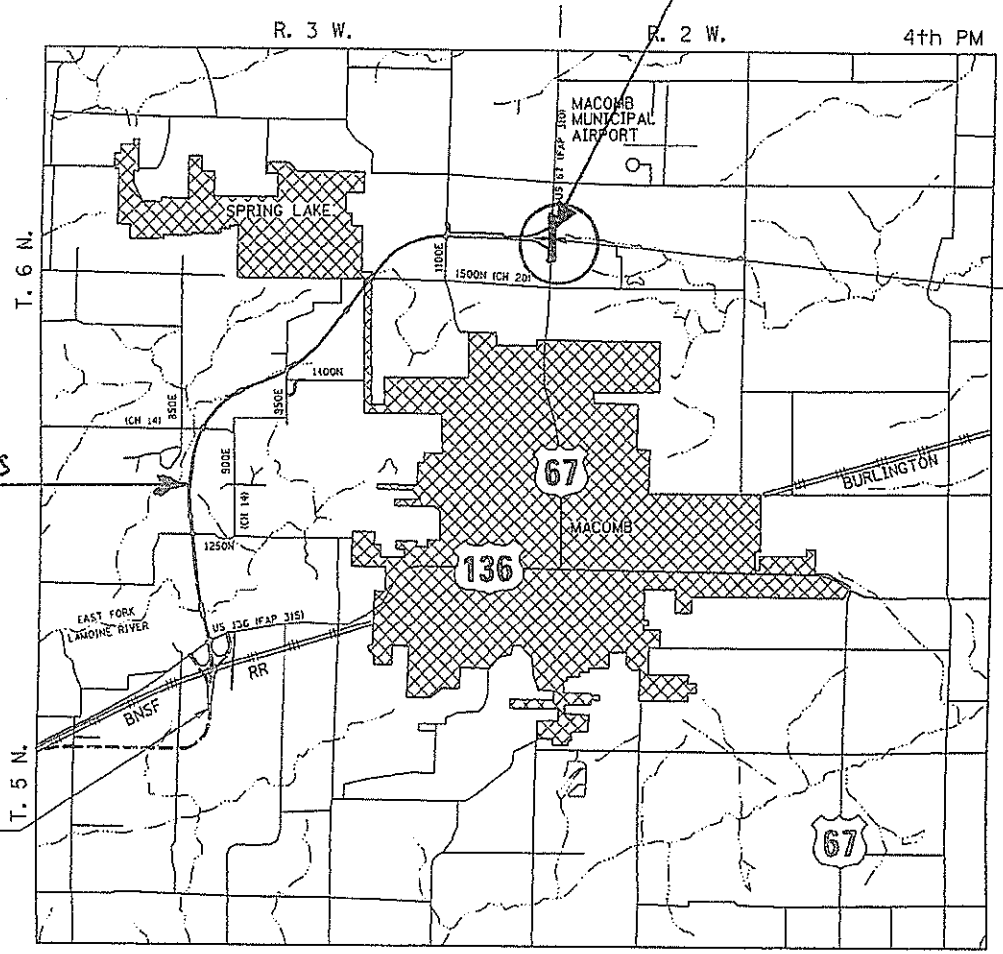
Original pavement design approval for the Macomb Bypass was granted to D-4 by BDE allowing them to select the HMA option, even though the rigid design was cheaper. The approval was based on the proposed pavement design for the adjacent section. Further discussions based on the BDE Manual protocol led to the request to have D-4 resubmit this pavement design using the latest economic model. This latest pavement design submittal for the Macomb Bypass was within the 10% economic analysis threshold.

IL 336 was also within the 10% economic analysis threshold. D-4 stated that these 2 projects would be let as a single contract.

The committee concurred with this combined project being designed as alternate bid contract.

Pavement design approval was granted by BDE on July 11, 2013.

PROJECT LOCATION
US BUSINESS 67



SECTION 55-3
ENDS
STA. 896+40.45

IL 336
N.W. MACOMB BYPASS

SECTION 55-3
BEGINS
STA. 541+57.14

1 MI 0' 1 MI

STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION		ROUTE	SECTION	COUNTY	SHEET	
		F.A.			TOTAL	NO.
		MKD.	CONTRACT NO.		28	1

BDE 5401 Template (Rev. 10/05/2012)

IDOT MECHANISTIC PAVEMENT DESIGN

Printed: 11/06/2013

PROJECT AND TRAFFIC INPUTS

(Enter Data in Gray Shaded Cells)

Route: FAP ROUTE 407/310 (IL336)
Section: 55-3
County: McDonough
Location: N.W MACOMB BY PASS
Comments: US BUSINESS 67
Design Date: 03/13/2013
Modify Date:

Facility Type: Other Marked State Route
# of Lanes = 4
Road Class: I
Subgrade Support Rating (SSR): Poor
Construction Year: 2022
Design Period (DP) = 20 years

	ADT	Year
<-- BY		
<-- BY	ADT	Year
Current:	8,585	2012
Future:	10,475	2032

	Minimum ADT	Structural Design Traffic: Actual ADT	Actual %of Total ADT	% of ADT in Design Lane
PV =	0	9,218	88.0%	P = 32%
SU =	250	314	3.0%	S = 45%
MU =	750	943	9.0%	M = 45%
Struct. Design ADT =		10,475	(2032)	

TRAFFIC FACTOR CALCULATION

FLEXIBLE PAVEMENT

Cpv =	0.15	
Csu =	132.5	
Cmu =	482.53	
TF flexible (Actual) =	4.48	(Actual ADT)
TF flexible (Min) =	3.56	(Min ADT Fig. 54-2.C)

RIGID PAVEMENT

Cpv =	0.15	
Csu =	143.81	
Cmu =	696.42	
TF rigid (Actual) =	6.32	(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 =	4.48	
PG Grade Lower Binder Lifts =	PG 64-22	(Fig. 53-4.R)
HMA Mixture Temp. =	77.0	deg. F (Fig. 54-5.C)
Design HMA Mixture Modulus (E_{HMA}) =	630	ksi (Fig. 54-5.D)
Design HMA Strain (ε_{HMA}) =	78	(Fig. 54-5.E)
Full Depth HMA Design Thickness =	11.25	in. (Fig. 54-5.F)
Limiting Strain Criterion Thickness =	15.50	in. (Fig. 54-5.I)
Use Full-Depth HMA Thickness =	**11.25**	**inches**

Goto Map

Goto Map

JPC Pavement

Use TF rigid =	6.32	
Edge Support =	Tied	Shoulder or C.&G.
Rigid Pavt Thick. =	**9.25**	**in. (Fig. 54-4.E)**

CRC Pavement

Use TF rigid =	6.32	
IBR value =	3	
CRCP Thickness =	**8.25**	**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 =	4.48	
District =	3,4,5,6	
HMA Overlay Design Thickness =	**8.50**	**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)

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

Class	Traffic Factor ESAL Coefficients: Rigid (Fig. 54-4.C) Csu	Cmu	Flexible (Fig. 54-5.B) Csu	Cmu
I	143.81	696.42	132.50	482.53
II	135.78	567.21	112.06	385.44
III	129.58	562.47	109.14	384.35
IV	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 P	S	M	Urban 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%

BDE 5401 Template (Rev. 10/05/2012) Printed: 11/06/2013

LIFE-CYCLE COST ANALYSIS: NEW CONSTRUCTION / RECONSTRUCTION

FULL-DEPTH HMA PAVEMENT

Standard Design

ROUTE			FAP ROUTE 407/310 (IL336)		
SECTION			55-3		
COUNTY			McDonough		
LOCATION			N.W MACOMB BY PASS		
FACILITY TYPE			NON-INTERSTATE		
PROJECT LENGTH			2205 FT	= = >	0.42 Miles
# OF CENTERLINES			2 CL		
# OF LANES			4 LANES		
# OF EDGES			4 EP		
LANE WIDTH - AVERAGE			12 FT		
SHOULDER WIDTH	HMA	Inside	4 FT		
	HMA	Outside	10 FT		

PAVEMENT THICKNESS (FLEXIBLE)	11.25 IN	15.50 IN MAX
SHOULDER THICKNESS	8.00 IN	Standard Design
POLICY OVERLAY THICKNESS	2.25 IN	

FLEX PAVEMENT TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
	3.56	4.48	4.48

Read Me!

HMA COST PER TON	UNIT PRICE
HMA SURFACE	$86.24 / TON
HMA TOP BINDER	$81.89 / TON
HMA LOWER BINDER	$76.49 / TON
HMA BINDER (LEVELING)	$86.24 / TON
HMA SHOULDER	$75.00 / TON

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT		UNIT PRICE		COST	
HMA PAVEMENT (FULL-DEPTH)	(11.25")	15,810	SQ YD	*	$51.87	/ SQ YD	$0	
HMA SURFACE COURSE	(2.00")	1,771	TONS	*	$86.24	/ TON	$152,731	~
HMA TOP BINDER COURSE	(2.25")	1,992	TONS	*	$81.89	/ TON	$163,125	~
HMA LOWER BINDER COURSE	(7.00")	6,198	TONS	*	$76.49	/ TON	$474,085	~
HMA SHOULDER	(8.00")	2,959	TONS	*	$75.00	/ TON	$221,925	~
CURB & GUTTER		0	LIN FT		$0.00	/ LIN FT	$0	
SUBBASE GRAN MATL TY C (TONS)		682	TONS		$0.00	/ TON	$0	
IMPROVED SUBGRADE:	Modified Soil	20,029	SQ YD		$7.00	/ SQ YD	$140,203	
Reserved For User Supplied Item		0	UNITS		$0.00	/ UNITS	$0	
Reserved For User Supplied Item		0	UNITS		$0.00	/ UNITS	$0	
PAVEMENT REMOVAL		11,760	SQ YD		$0.00	/ SQ YD	$0	
SHOULDER REMOVAL		6,860	SQ YD		$0.00	/ SQ YD	$0	

Note: * Denotes User Supplied Quantity

FLEXIBLE CONSTRUCTION INITIAL COST	$1,152,069
FLEXIBLE CONSTRUCTION ANNUAL COST PER MILE	$112,514

MAINTENANCE COSTS:

ITEM		THICKNESS	MATERIAL	UNIT COST	
ROUTINE MAINTENANCE ACTIVITY				$0.00	LANE-MILE / YEAR
HMA OVERLAY PVMT SURF		(2.00")	Surface Mix	$9.73	/ SQ YD
HMA OVERLAY PVMT		(2.25")		$10.95	/ SQ YD
HMA SURFACE MIX		(1.50")	Surface Mix	$7.28	/ SQ YD
HMA BINDER MIX		(0.75")	eling Binder Mix	$3.67	/ SQ YD
HMA OVERLAY SHLD	(Year 30)	(2.25")	Shoulder Mix	$9.45	/ SQ YD
HMA OVERLAY SHLD		(2.00")	Shoulder Mix	$8.40	/ SQ YD
MILLING (2.00 IN)				$3.00	/ SQ YD
PARTIAL DEPTH PVMT PATCH		(Mill & Fill Surf)	Surface Mix	$79.66	/ SQ YD
PARTIAL DEPTH SHLD PATCH		(Mill & Fill Surf)	Shoulder Mix	$78.40	/ SQ YD
PARTIAL DEPTH PVMT PATCH		(Mill & Fill +2.00 ")	Leveling Binder Mix	$79.66	/ SQ YD
PARTIAL DEPTH SHLD PATCH		(Mill & Fill +2.00 ")	Shoulder Mix	$78.40	/ 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	$1,606,077
FLEXIBLE TOTAL ANNUAL COST PER MILE	$156,853

MAINTENANCE AND REHABILITATION ACTIVITY SCHEDULE 11/06/13

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%	8,820	LIN FT	$2.00		$17,640	
	CNTR LINE JOINT R&S	100.00%	4,410	LIN FT	$2.00		$8,820	
	RNDM / THRM CRACK R&S	50.00%	4,851	LIN FT	$2.00		$9,702	
	PD PVMT PATCH M&F SURF	0.10%	16	SQ YD	$79.66		$1,275	
	PWFn =	0.8626		PW =	0.8626	X	$37,437	$32,293
YEAR 10								
	LONG SHLD JT R&S	100.00%	8,820	LIN FT	$2.00		$17,640	
	CNTR LINE JOINT R&S	100.00%	4,410	LIN FT	$2.00		$8,820	
	RNDM / THRM CRACK R&S	50.00%	4,851	LIN FT	$2.00		$9,702	
	PD PVMT PATCH M&F SURF	0.50%	79	SQ YD	$79.66		$6,293	
	PWFn =	0.7441		PW =	0.7441	X	$42,455	$31,591
YEAR 15								
	MILL PVMT & SHLD 2.00"	100.00%	22,415	SQ YD	$3.00		$67,245	
	PD PVMT PATCH M&F ADD'L 2.00"	1.00%	158	SQ YD	$79.66		$12,586	
	HMA OVERLAY PVMT 2.00"	100.00%	15,810	SQ YD	$9.73		$153,767	
	HMA OVERLAY SHLD 2.00 "	100.00%	6,605	SQ YD	$8.40		$55,481	
	PWFn =	0.6419		PW =	0.6419	X	$289,079	$185,549
YEAR 20								
	LONG SHLD JT R&S	100.00%	8,820	LIN FT	$2.00		$17,640	
	CNTR LINE JOINT R&S	100.00%	4,410	LIN FT	$2.00		$8,820	
	RNDM / THRM CRACK R&S	50.00%	4,851	LIN FT	$2.00		$9,702	
	PD PVMT PATCH M&F SURF	0.10%	16	SQ YD	$79.66		$1,275	
	PWFn =	0.5537		PW =	0.5537	X	$37,437	$20,728
YEAR 25								
	LONG SHLD JT R&S	100.00%	8,820	LIN FT	$2.00		$17,640	
	CNTR LINE JOINT R&S	100.00%	4,410	LIN FT	$2.00		$8,820	
	RNDM / THRM CRACK R&S	50.00%	4,851	LIN FT	$2.00		$9,702	
	PD PVMT PATCH M&F SURF	0.50%	79	SQ YD	$79.66		$6,293	
	PWFn =	0.4776		PW =	0.4776	X	$42,455	$20,277
HMA_SD								
YEAR 30	NON-INTERSTATE							
	MILL PVMT & SHLD 2.00"	100.00%	22,415	SQ YD	$3.00		$67,245	
	PD PVMT PATCH M&F ADD'L 2.00"	2.00%	316	SQ YD	$79.66		$25,172	
	PD SHLD PATCH M&F ADD'L 2.00"	1.00%	66	SQ YD	$78.40		$5,174	
	HMA OVERLAY PVMT 2.25 "	100.00%	15,810	SQ YD	$10.95		$173,137	
	HMA OVERLAY SHLD 2.25 "	100.00%	6,605	SQ YD	$9.45		$62,416	
	PWFn =	0.4120		PW =	0.4120	X	$333,144	$137,251
YEAR 35								
	LONG SHLD JT R&S	100.00%	8,820	LIN FT	$2.00		$17,640	
	CNTR LINE JOINT R&S	100.00%	4,410	LIN FT	$2.00		$8,820	
	RNDM / THRM CRACK R&S	50.00%	4,851	LIN FT	$2.00		$9,702	
	PD PVMT PATCH M&F SURF	0.10%	16	SQ YD	$79.66		$1,275	
	PWFn =	0.3554		PW =	0.3554	X	$37,437	$13,304
YEAR 40								
	LONG SHLD JT R&S	100.00%	8,820	LIN FT	$2.00		$17,640	
	CNTR LINE JOINT R&S	100.00%	4,410	LIN FT	$2.00		$8,820	
	RNDM / THRM CRACK R&S	50.00%	4,851	LIN FT	$2.00		$9,702	
	PD PVMT PATCH M&F SURF	0.50%	79	SQ YD	$79.66		$6,293	
	PWFn =	0.3066		PW =	0.3066	X	$42,455	$13,015
								$454,008
	ROUTINE MAINTENANCE ACTIVITY		1.67	Lane Miles	0.00		$0	$0
					MAINTENANCE LIFE-CYCLE COST			$454,008
45	YEAR LIFE CYCLE	CRFn = 0.0407852			MAINTENANCE ANNUAL COST PER MILE			$44,340

PCC PAVEMENT

JPCP

ROUTE			FAP ROUTE 407/310 (IL336)	
SECTION			55-3	
COUNTY			McDonough	
LOCATION			N.W MACOMB BY PASS	
FACILITY TYPE			NON-INTERSTATE	
PROJECT LENGTH			2205 FT = = >	0.42 Miles
# OF CENTERLINES			2 CL	
# OF LANES			4 LANES	
# OF EDGES			4 EP	
LANE WIDTH - AVERAGE			12 FT	
SHOULDER WIDTH	PCC	Inside	4 FT	
	PCC	Outside	10 FT	

PAVEMENT THICKNESS (RIGID)	JPCP	9.25 IN	TIED SHLD
SHOULDER THICKNESS		9.25 IN	
POLICY OVERLAY THICKNESS		2.50 IN	

RIGID PAVEMENT TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
	5.02	6.32	6.32
Worksheet Construction Type is New Construction		The Pavement Type is	JPCP

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT		UNIT PRICE		COST
JPC PAVEMENT	(9.25")	15,810	SQ YD	*	$45.10	/ SQ YD	$713,031
PAVEMENT REINFORCEMENT		0	SQ YD		$0.00	/ SQ YD	$0
STABILIZED SUBBASE	(4.00")	17,280	SQ YD	*	$17.36	/ SQ YD	$299,981
PCC SHOULDERS	(9.25" to 9.25")	6,605	SQ YD	*	$33.94	/ SQ YD	$224,174
CURB & GUTTER		0	LIN FT		$0.00	/ LIN FT	$0
SUBBASE GRAN MATL TY C	(~ 3.37")	799	TONS		$0.00	/ TON	$0
IMPROVED SUBGRADE:	Modified Soil	19,110	SQ YD		$7.00	/ SQ YD	$133,770
Reserved For User Supplied Item		0	UNITS		$0.00	/ UNITS	$0
Reserved For User Supplied Item		0	UNITS		$0.00	/ UNITS	$0
PAVEMENT REMOVAL		11,760	SQ YD		$0.00	/ SQ YD	$0
SHOULDER REMOVAL		6,860	SQ YD		$0.00	/ SQ YD	$0

Note: * Denotes User Supplied Quantity

RIGID CONSTRUCTION INITIAL COST	$1,370,956
RIGID CONSTRUCTION ANNUAL COST PER MILE	$133,891

MAINTENANCE COSTS:

ITEM	THICKNESS	MATERIAL		UNIT COST	
ROUTINE MAINTENANCE ACTIVITY				$0.00	/ LANE-MILE / YEAR
HMA POLICY OVERLAY	(2.50")				
HMA POLICY OVERLAY PVMT	(2.50")			$12.18	/ SQ YD
HMA SURFACE MIX	(1.50")	Surface Mix		$7.28	/ SQ YD
HMA BINDER MIX	(1.00")	aling Binder Mix		$4.90	/ SQ YD
HMA POLICY OVERLAY SHLD	(2.50")	Shoulder Mix		$10.50	/ 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		$77.24	/ SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA 2.50")		Surface Mix		$82.07	/ 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	$1,644,804
RIGID TOTAL ANNUAL COST PER MILE	$160,636

MAINTENANCE AND REHABILITATION ACTIVITY SCHEDULE 11/06/13

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

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST		COST	PRESENT WORTH
YEAR 10								
	PAVEMENT PATCH CLASS B	0.10%	16	SQ YD	$150.00		$2,400	
	PWFn =	0.7441		PW =	0.7441	X	$2,400	$1,786
YEAR 15								
	PAVEMENT PATCH CLASS B	0.20%	32	SQ YD	$150.00		$4,800	
	PWFn =	0.6419		PW =	0.6419	X	$4,800	$3,081
YEAR 20								
	PAVEMENT PATCH CLASS B	2.00%	316	SQ YD	$150.00		$47,400	
	SHOULDER PATCH CLASS C	0.50%	33	SQ YD	$145.00		$4,785	
	LONGITUDINAL SHLD JT R&S	100.00%	8,820	LIN FT	$2.00		$17,640	
	CENTERLINE JT R&S	100.00%	4,410	LIN FT	$2.00		$8,820	
	PWFn =	0.5537		PW =	0.5537	X	$78,645	$43,544
YEAR 25								
	PAVEMENT PATCH CLASS B	3.00%	474	SQ YD	$150.00		$71,100	
	SHOULDER PATCH CLASS C	1.00%	66	SQ YD	$145.00		$9,570	
	PWFn =	0.4776		PW =	0.4776	X	$80,670	$38,528
YEAR 30	NON-INTERSTATE							
	PAVEMENT PATCH CLASS B	4.00%	632	SQ YD	$150.00		$94,800	
	SHOULDER PATCH CLASS C	1.50%	99	SQ YD	$145.00		$14,355	
	HMA POLICY OVERLAY 2.5" (PVMT)	100.00%	15,810	SQ YD	$12.18		$192,541	
	HMA POLICY OVERLAY 2.5" (SHLD)	100.00%	6,605	SQ YD	$10.50		$69,352	
	PWFn =	0.4120		PW =	0.4120	X	$371,048	$152,867
YEAR 35	NON-INTERSTATE							
	LONGITUDINAL SHLD JT R&S	100.00%	8,820	LIN FT	$2.00		$17,640	
	CENTERLINE JT R&S	100.00%	4,410	LIN FT	$2.00		$8,820	
	RANDOM CRACK R&S	50.00%	4,410	LIN FT	$2.00		$8,820	
	REFLECTIVE TRANSVERSE CRACK R&S	40.00%	2,822	LIN FT	$2.00		$5,644	
	PD PVMT PATCH M&F HMA 2.50"	0.10%	16	SQ YD	$82.07		$1,313	
	PWFn =	0.3554		PW =	0.3554	X	$42,237	$15,010
YEAR 40	NON-INTERSTATE							
	PAVEMENT PATCH CLASS B	0.50%	79	SQ YD	$150.00		$11,850	
	LONGITUDINAL SHLD JT R&S	100.00%	8,820	LIN FT	$2.00		$17,640	
	CENTERLINE JT R&S	100.00%	4,410	LIN FT	$2.00		$8,820	
	REFLECTIVE TRANSVERSE CRACK R&S	60.00%	4,234	LIN FT	$2.00		$8,468	
	RANDOM CRACK R&S	50.00%	4,410	LIN FT	$2.00		$8,820	
	PD PVMT PATCH M&F HMA 2.50"	0.50%	79	SQ YD	$82.07		$6,484	
	PWFn =	0.3066		PW =	0.3066	X	$62,082	$19,032
								$273,848
	ROUTINE MAINTENANCE ACTIVITY		1.67	Lane Miles	$0.00		$0	$0
					MAINTENANCE LIFE-CYCLE COST			$273,848
45	YEAR LIFE CYCLE	CRFn = 0.0407852			MAINTENANCE ANNUAL COST PER MILE			$26,745

LIFE-CYCLE COST ANALYSIS: NEW DESIGN

Calculated / Revised : 3/13/13 10:52 AM

			JPCP	HMA
CONSTRUCTION	INITIAL COST	PRESENT WORTH	$1,370,956	$1,152,069
		ANNUAL COST PER MILE	$133,891	$112,514
MAINTENANCE	LIFE-CYCLE COST	PRESENT WORTH	$273,848	$454,008
		ANNUAL COST PER MILE	$26,745	$44,340
TOTAL	LIFE-CYCLE COST	PRESENT WORTH	$1,644,804	$1,606,077
		ANNUAL COST PER MILE	$160,636	$156,853

LIFE-CYCLE COST ANALYSIS: FINAL SUMMARY

LOWEST COST OPTION	==========>	**HMA**	**$156,853**	
OTHER OPTIONS (LOWEST TO HIGHEST):	TYPE / PERCENTAGE	**JPCP**	**$160,636**	2.4%

P:\Pavement Design Stuff\D-4\US 67 at IL 336 north of Macomb 03-25-13\[US 67 Pavement Design NW BAPASS latest version.xlsm]LifeCycleCost

BDE 5401 Template (Rev. 10/05/2012)

IDOT MECHANISTIC PAVEMENT DESIGN

Printed: 11/06/2013

PROJECT AND TRAFFIC INPUTS

(Enter Data in Gray Shaded Cells)

Route: FAP ROUTE 407/310 (IL336)
Section: 55-3
County: McDonough
Location: N.W MACOMB BY PASS
Comments: IL 336 fron US136 to US 67
Design Date: 01/13/2011
Modify Date: 01/14/2013

	ADT	Year
<-- BY		
<-- BY	ADT	Year
Current:	2,956	2012
Future:	3,607	2032

Facility Type: Other Marked State Route
# of Lanes = 4
Road Class: I
Subgrade Support Rating (SSR): Poor
Construction Year: 2022
Design Period (DP) = 20 years

Structural Design Traffic	Minimum ADT	Actual ADT	Actual %of Total ADT	% of ADT in Design Lane
PV =	0	3,246	90.0%	P = 32%
SU =	250	180	5.0%	S = 45%
MU =	750	180	5.0%	M = 45%
Struct. Design ADT =		3,607	(2032)	

TRAFFIC FACTOR CALCULATION

FLEXIBLE PAVEMENT			RIGID PAVEMENT		
Cpv =	0.15		Cpv =	0.15	
Csu =	132.5		Csu =	143.81	
Cmu =	482.53		Cmu =	696.42	
TF flexible (Actual) =	1.00	(Actual ADT)	TF rigid (Actual) =	1.37	(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

Use TF flexible = 3.56
PG Grade Lower Binder Lifts = PG 64-22 (Fig. 53-4.R)
Goto Map
HMA Mixture Temp. = 77.0 deg. F (Fig. 54-5.C)
Design HMA Mixture Modulus (E_{HMA}) = 630 ksi (Fig. 54-5.D)
Design HMA Strain (ε_{HMA}) = 84 (Fig. 54-5.E)
Goto Map
Full Depth HMA Design Thickness = 10.75 in. (Fig. 54-5.F)
Limiting Strain Criterion Thickness = 15.50 in. (Fig. 54-5.I)

Use Full-Depth HMA Thickness = 10.75 inches

JPC Pavement

Use TF rigid = 5.02
Edge Support = Tied Shoulder or C.&G.

Rigid Pavt Thick. = 9.00 in. (Fig. 54-4.E)

CRC Pavement

Use TF rigid = 5.02
IBR value = 3

CRCP Thickness = 8.00 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 = 3.56
District = 3,4,5,6

HMA Overlay Design Thickness = 8.00 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)

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

Class	Traffic Factor ESAL Coefficients Rigid (Fig. 54-4.C) Csu	Cmu	Flexible (Fig. 54-5.B) Csu	Cmu
I	143.81	696.42	132.50	482.53
II	135.78	567.21	112.06	385.44
III	129.58	562.47	109.14	384.35
IV	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 P	S	M	Urban 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%

BDE 5401 Template (Rev. 10/05/2012) Printed: 11/06/2013

LIFE-CYCLE COST ANALYSIS: NEW CONSTRUCTION / RECONSTRUCTION

FULL-DEPTH HMA PAVEMENT

Standard Design

ROUTE	FAP ROUTE 407/310 (IL336)
SECTION	55-3
COUNTY	McDonough
LOCATION	N.W MACOMB BY PASS
FACILITY TYPE	NON-INTERSTATE

PROJECT LENGTH			35483	FT = = >	6.72 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	

PAVEMENT THICKNESS (FLEXIBLE)	10.75 IN	15.50 IN MAX	
SHOULDER THICKNESS	8.00 IN		Standard Design
POLICY OVERLAY THICKNESS	2.25 IN		

FLEX PAVEMENT TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
	3.56	1.00	3.56

Read Me!

HMA COST PER TON	UNIT PRICE
HMA SURFACE	$84.93 / TON
HMA TOP BINDER	$80.80 / TON
HMA LOWER BINDER	$74.61 / TON
HMA BINDER (LEVELING)	$84.93 / TON
HMA SHOULDER	$72.25 / TON

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT	UNIT PRICE	COST
HMA PAVEMENT (FULL-DEPTH)	(10.75")	189,243	SQ YD	$48.55 / SQ YD	$0
HMA SURFACE COURSE	(2.00")	21,342	TONS	$84.93 / TON	$1,812,607 ~
HMA TOP BINDER COURSE	(2.25")	24,362	TONS	$80.80 / TON	$1,968,453 ~
HMA LOWER BINDER COURSE	(6.50")	72,472	TONS	$74.61 / TON	$5,407,140 ~
HMA SHOULDER	(8.00")	56,520	TONS	$72.25 / TON	$4,083,604 ~
CURB & GUTTER		0	LIN FT	$30.00 / LIN FT	$0
SUBBASE GRAN MATL TY C (TONS)		8,404	TONS	$0.00 / TON	$0
IMPROVED SUBGRADE:	Modified Soil	337,417	SQ YD	$0.00 / SQ YD	$0
Reserved For User Supplied Item		0	UNITS	$0.00 / UNITS	$0
Reserved For User Supplied Item		0	UNITS	$0.00 / UNITS	$0
PAVEMENT REMOVAL		189,243	SQ YD	$0.00 / SQ YD	$0
SHOULDER REMOVAL		126,162	SQ YD	$0.00 / SQ YD	$0

Note: * Denotes User Supplied Quantity

FLEXIBLE CONSTRUCTION INITIAL COST	$13,271,804
FLEXIBLE CONSTRUCTION ANNUAL COST PER MILE	$80,546

MAINTENANCE COSTS:

ITEM		THICKNESS	MATERIAL	UNIT COST
ROUTINE MAINTENANCE ACTIVITY				$0.00 LANE-MILE / YEAR
HMA OVERLAY PVMT SURF		(2.00")	Surface Mix	$9.58 / SQ YD
HMA OVERLAY PVMT		(2.25")		$10.78 / SQ YD
HMA SURFACE MIX		(1.50")	Surface Mix	$7.17 / SQ YD
HMA BINDER MIX		(0.75")	eling Binder Mix	$3.61 / SQ YD
HMA OVERLAY SHLD	(Year 30)	(2.25")	Shoulder Mix	$9.10 / SQ YD
HMA OVERLAY SHLD		(2.00")	Shoulder Mix	$8.09 / SQ YD
MILLING (2.00 IN)				$3.00 / SQ YD
PARTIAL DEPTH PVMT PATCH		(Mill & Fill Surf)	Surface Mix	$79.51 / SQ YD
PARTIAL DEPTH SHLD PATCH		(Mill & Fill Surf)	Shoulder Mix	$78.09 / SQ YD
PARTIAL DEPTH PVMT PATCH		(Mill & Fill +2.00 ")	Leveling Binder Mix	$79.51 / SQ YD
PARTIAL DEPTH SHLD PATCH		(Mill & Fill +2.00 ")	Shoulder Mix	$78.09 / 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	$19,724,730
FLEXIBLE TOTAL ANNUAL COST PER MILE	$119,709

HMA_SD MAINTENANCE AND REHABILITATION ACTIVITY SCHEDULE 11/06/13

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%	141,932	LIN FT	$2.00		$283,864	
	CNTR LINE JOINT R&S	100.00%	70,966	LIN FT	$2.00		$141,932	
	RNDM / THRM CRACK R&S	50.00%	78,063	LIN FT	$2.00		$156,126	
	PD PVMT PATCH M&F SURF	0.10%	189	SQ YD	$79.51		$15,028	
	PWFn =	0.8626		PW =	0.8626	X	$596,950	$514,934
YEAR 10								
	LONG SHLD JT R&S	100.00%	141,932	LIN FT	$2.00		$283,864	
	CNTR LINE JOINT R&S	100.00%	70,966	LIN FT	$2.00		$141,932	
	RNDM / THRM CRACK R&S	50.00%	78,063	LIN FT	$2.00		$156,126	
	PD PVMT PATCH M&F SURF	0.50%	946	SQ YD	$79.51		$75,219	
	PWFn =	0.7441		PW =	0.7441	X	$657,141	$488,975
YEAR 15								
	MILL PVMT & SHLD 2.00"	100.00%	315,404	SQ YD	$3.00		$946,212	
	PD PVMT PATCH M&F ADD'L 2.00"	1.00%	1,892	SQ YD	$79.51		$150,437	
	HMA OVERLAY PVMT 2.00"	100.00%	189,243	SQ YD	$9.58		$1,812,607	
	HMA OVERLAY SHLD 2.00 "	100.00%	126,162	SQ YD	$8.09		$1,020,901	
	PWFn =	0.6419		PW =	0.6419	X	$3,930,157	$2,522,618
YEAR 20								
	LONG SHLD JT R&S	100.00%	141,932	LIN FT	$2.00		$283,864	
	CNTR LINE JOINT R&S	100.00%	70,966	LIN FT	$2.00		$141,932	
	RNDM / THRM CRACK R&S	50.00%	78,063	LIN FT	$2.00		$156,126	
	PD PVMT PATCH M&F SURF	0.10%	189	SQ YD	$79.51		$15,028	
	PWFn =	0.5537		PW =	0.5537	X	$596,950	$330,517
YEAR 25								
	LONG SHLD JT R&S	100.00%	141,932	LIN FT	$2.00		$283,864	
	CNTR LINE JOINT R&S	100.00%	70,966	LIN FT	$2.00		$141,932	
	RNDM / THRM CRACK R&S	50.00%	78,063	LIN FT	$2.00		$156,126	
	PD PVMT PATCH M&F SURF	0.50%	946	SQ YD	$79.51		$75,219	
	PWFn =	0.4776		PW =	0.4776	X	$657,141	$313,854
HMA_SD								
YEAR 30	NON-INTERSTATE							
	MILL PVMT & SHLD 2.00"	100.00%	315,404	SQ YD	$3.00		$946,212	
	PD PVMT PATCH M&F ADD'L 2.00"	2.00%	3,785	SQ YD	$79.51		$300,954	
	PD SHLD PATCH M&F ADD'L 2.00"	1.00%	1,262	SQ YD	$78.09		$98,552	
	HMA OVERLAY PVMT 2.25 "	100.00%	189,243	SQ YD	$10.78		$2,040,941	
	HMA OVERLAY SHLD 2.25 "	100.00%	126,162	SQ YD	$9.10		$1,148,514	
	PWFn =	0.4120		PW =	0.4120	X	$4,535,173	$1,868,431
YEAR 35								
	LONG SHLD JT R&S	100.00%	141,932	LIN FT	$2.00		$283,864	
	CNTR LINE JOINT R&S	100.00%	70,966	LIN FT	$2.00		$141,932	
	RNDM / THRM CRACK R&S	50.00%	78,063	LIN FT	$2.00		$156,126	
	PD PVMT PATCH M&F SURF	0.10%	189	SQ YD	$79.51		$15,028	
	PWFn =	0.3554		PW =	0.3554	X	$596,950	$212,146
YEAR 40								
	LONG SHLD JT R&S	100.00%	141,932	LIN FT	$2.00		$283,864	
	CNTR LINE JOINT R&S	100.00%	70,966	LIN FT	$2.00		$141,932	
	RNDM / THRM CRACK R&S	50.00%	78,063	LIN FT	$2.00		$156,126	
	PD PVMT PATCH M&F SURF	0.50%	946	SQ YD	$79.51		$75,219	
	PWFn =	0.3066		PW =	0.3066	X	$657,141	$201,451
								$6,452,926
	ROUTINE MAINTENANCE ACTIVITY		26.88	Lane Miles	0.00		$0	$0
					MAINTENANCE LIFE-CYCLE COST			$6,452,926
45	YEAR LIFE CYCLE	CRFn = 0.0407852			MAINTENANCE ANNUAL COST PER MILE			$39,163

PCC PAVEMENT

JPCP

ROUTE			FAP ROUTE 407/310 (IL336)		
SECTION			55-3		
COUNTY			McDonough		
LOCATION			N.W MACOMB BY PASS		
FACILITY TYPE			NON-INTERSTATE		
PROJECT LENGTH			35483 FT	= = >	6.72 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		
PAVEMENT THICKNESS (RIGID)		JPCP	9.00 IN	TIED SHLD	
SHOULDER THICKNESS			9.00 IN		
POLICY OVERLAY THICKNESS			2.50 IN		

RIGID PAVEMENT TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
	5.02	1.37	5.02
Worksheet Construction Type is New Construction		The Pavement Type is	JPCP

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT	UNIT PRICE		COST
JPC PAVEMENT	(9.00")	189,243	SQ YD	$41.50	/ SQ YD	$7,853,585
PAVEMENT REINFORCEMENT		0	SQ YD	$22.00	/ SQ YD	$0
STABILIZED SUBBASE	(4.00")	212,898	SQ YD	$16.64	/ SQ YD	$3,542,623
PCC SHOULDERS	(9.00" to 9.00")	126,162	SQ YD	$35.00	/ SQ YD	$4,415,670
CURB & GUTTER		0	LIN FT	$30.00	/ LIN FT	$0
SUBBASE GRAN MATL TY C	(~ 3.46")	14,844	TONS	$0.00	/ TON	$0
IMPROVED SUBGRADE:	Modified Soil	323,290	SQ YD	$0.00	/ SQ YD	$0
Reserved For User Supplied Item		0	UNITS	$0.00	/ UNITS	$0
Reserved For User Supplied Item		0	UNITS	$0.00	/ UNITS	$0
PAVEMENT REMOVAL		189,243	SQ YD	$0.00	/ SQ YD	$0
SHOULDER REMOVAL		126,162	SQ YD	$0.00	/ SQ YD	$0

Note: * Denotes User Supplied Quantity

RIGID CONSTRUCTION INITIAL COST	$15,811,878
RIGID CONSTRUCTION ANNUAL COST PER MILE	$95,962

MAINTENANCE COSTS:

ITEM	THICKNESS	MATERIAL		UNIT COST	
ROUTINE MAINTENANCE ACTIVITY				$0.00	/ LANE-MILE / YEAR
HMA POLICY OVERLAY	(2.50")				
HMA POLICY OVERLAY PVMT	(2.50")			$11.99	/ SQ YD
HMA SURFACE MIX	(1.50")	Surface Mix		$7.17	/ SQ YD
HMA BINDER MIX	(1.00")	eling Binder Mix		$4.82	/ SQ YD
HMA POLICY OVERLAY SHLD	(2.50")	Shoulder Mix		$10.12	/ 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		$77.13	/ SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA 2.50")		Surface Mix		$81.89	/ 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	$19,528,502
RIGID TOTAL ANNUAL COST PER MILE	$118,518

MAINTENANCE AND REHABILITATION ACTIVITY SCHEDULE 11/06/13

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

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST		COST	PRESENT WORTH
YEAR 10								
	PAVEMENT PATCH CLASS B	0.10%	189	SQ YD	$150.00		$28,350	
	PWFn = 0.7441			PW =	0.7441	X	$28,350	$21,095
YEAR 15								
	PAVEMENT PATCH CLASS B	0.20%	378	SQ YD	$150.00		$56,700	
	PWFn = 0.6419			PW =	0.6419	X	$56,700	$36,394
YEAR 20								
	PAVEMENT PATCH CLASS B	2.00%	3,785	SQ YD	$150.00		$567,750	
	SHOULDER PATCH CLASS C	0.50%	631	SQ YD	$145.00		$91,495	
	LONGITUDINAL SHLD JT R&S	100.00%	141,932	LIN FT	$2.00		$283,864	
	CENTERLINE JT R&S	100.00%	70,966	LIN FT	$2.00		$141,932	
	PWFn = 0.5537			PW =	0.5537	X	$1,085,041	$600,761
YEAR 25								
	PAVEMENT PATCH CLASS B	3.00%	5,677	SQ YD	$150.00		$851,550	
	SHOULDER PATCH CLASS C	1.00%	1,262	SQ YD	$145.00		$182,990	
	PWFn = 0.4776			PW =	0.4776	X	$1,034,540	$494,102
YEAR 30	NON-INTERSTATE							
	PAVEMENT PATCH CLASS B	4.00%	7,570	SQ YD	$150.00		$1,135,500	
	SHOULDER PATCH CLASS C	1.50%	1,892	SQ YD	$145.00		$274,340	
	HMA POLICY OVERLAY 2.5" (PVMT)	100.00%	189,243	SQ YD	$11.99		$2,269,666	
	HMA POLICY OVERLAY 2.5" (SHLD)	100.00%	126,162	SQ YD	$10.12		$1,276,126	
	PWFn = 0.4120			PW =	0.4120	X	$4,955,632	$2,041,655
YEAR 35	NON-INTERSTATE							
	LONGITUDINAL SHLD JT R&S	100.00%	141,932	LIN FT	$2.00		$283,864	
	CENTERLINE JT R&S	100.00%	70,966	LIN FT	$2.00		$141,932	
	RANDOM CRACK R&S	50.00%	70,966	LIN FT	$2.00		$141,932	
	REFLECTIVE TRANSVERSE CRACK R&S	40.00%	45,427	LIN FT	$2.00		$90,854	
	PD PVMT PATCH M&F HMA 2.50"	0.10%	189	SQ YD	$81.89		$15,477	
	PWFn = 0.3554			PW =	0.3554	X	$674,059	$239,549
YEAR 40	NON-INTERSTATE							
	PAVEMENT PATCH CLASS B	0.50%	946	SQ YD	$150.00		$141,900	
	LONGITUDINAL SHLD JT R&S	100.00%	141,932	LIN FT	$2.00		$283,864	
	CENTERLINE JT R&S	100.00%	70,966	LIN FT	$2.00		$141,932	
	REFLECTIVE TRANSVERSE CRACK R&S	60.00%	68,141	LIN FT	$2.00		$136,282	
	RANDOM CRACK R&S	50.00%	70,966	LIN FT	$2.00		$141,932	
	PD PVMT PATCH M&F HMA 2.50"	0.50%	946	SQ YD	$81.89		$77,468	
	PWFn = 0.3066			PW =	0.3066	X	$923,378	$283,068
								$3,716,624
	ROUTINE MAINTENANCE ACTIVITY		26.88	Lane Miles	$0.00		$0	$0
					MAINTENANCE LIFE-CYCLE COST			$3,716,624
	45 YEAR LIFE CYCLE CRFn = 0.0407852				MAINTENANCE ANNUAL COST PER MILE			$22,556

LIFE-CYCLE COST ANALYSIS: NEW DESIGN

Calculated / Revised : **1/14/13 11:45 AM**

			JPCP	HMA
CONSTRUCTION	INITIAL COST	PRESENT WORTH	$15,811,878	$13,271,804
		ANNUAL COST PER MILE	$95,962	$80,546
MAINTENANCE	LIFE-CYCLE COST	PRESENT WORTH	$3,716,624	$6,452,926
		ANNUAL COST PER MILE	$22,556	$39,163
TOTAL	LIFE-CYCLE COST	PRESENT WORTH	$19,528,502	$19,724,730
		ANNUAL COST PER MILE	$118,518	$119,709

LIFE-CYCLE COST ANALYSIS: FINAL SUMMARY

LOWEST COST OPTION	==========>	**JPCP**	**$118,518**	
OTHER OPTIONS (LOWEST TO HIGHEST):	TYPE / PERCENTAGE	**HMA**	**$119,709**	1.0%

P:\Pavement Design Stuff\D-4\IL 336 [NW Macomb Bypass]\[IL 336 Pavement Design NW BAPASS latest.xlsm]LifeCycleCost