Illinois Department of Transportation

Memorandum

To:	Omer Osman	Attn: District Nine
From:	John Baranzelli	
Subject:	Pavement Design	
Date:	September 14, 2012	

FAI Route 57 (I-57)
Section (77-1, 91-4,91-3)R-1,R-2
Union & Pulaski Counties
From 1.2 miles south of the Union/Pulaski CL to 5 miles north of the Union/Pulaski CL

We have reviewed the pavement selection for the above captioned section, which was submitted with your memorandum dated August 20, 2012. The NB lanes are scheduled for the November, 2012 letting, and the SB lanes for the April 2013 letting. BMPR did the pavement design analysis and calculated a pavement design thickness of 11.5 inches.

The approved pavement design is as follows:

I-57 [NB & SB][Pavement Rubblization]

11.5 inches Full Depth
- 2 inches of HMA Polymerized Surface Course, Mix "E", N105
- 2.25 inches of HMA Polymerized Binder Course, N105, IL-19.0
- 7.25 inches of HMA Binder Course, N90, IL-19.0

8.5 inches HMA Shoulders

The existing pipe underdrain system will be replaced as part of the projects.

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

Illinois Department of Transportation

Memorandum

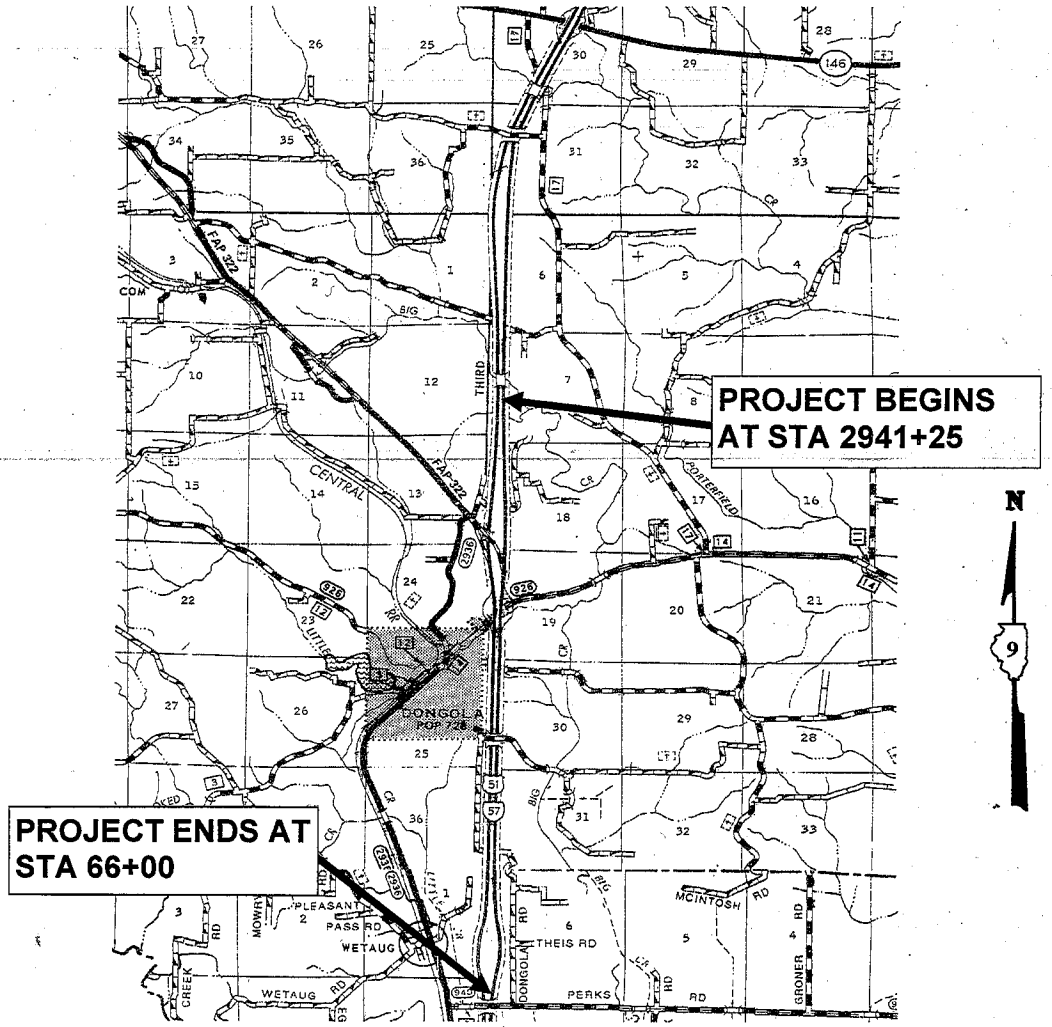
To:	Paul Niedernhofer
From:	Charles Stein
Subject:	Pavement Design
Date:	August 20, 2012

Route	FAP 869 (ILL 34)
Section	105R-1
County	Saline
Contract	78290

This project involves rubblizing 5 miles of the existing HMA overlaid PCC pavement on I 57 from 1.2 miles south of the Union/Pulaski County line to 5 miles north (see attached map). The northbound lanes are scheduled for the November 2012 letting. The southbound lanes are scheduled for the April 2013 letting. The original PCC pavement was built in 1962, and resurfaced in 2001. The existing pipe underdrain system will be replaced as part of the projects. The district proposes to rubblize the existing PCC pavement and place 11.5" of HMA pavement on the rubblized pavement. BMPR provided the 11.5" thickness based on new Limiting Strain Criterion. The mechanistic pavement design and life cycle cost analysis are attached.

LOCATION MAP

FAI 57 (I-57)
SECTION (77-1,91-4,91-4-1,91-3)R-1,R-2
UNION & PULASKI COUNTIES



RUBBLIZATION PROJECT PROPOSED FOR INTERSTATE 57.

BDE 5401 Template (Rev. 08/14/2012) **IDOT MECHANISTIC PAVEMENT DESIGN** Printed: 10/23/2012

PROJECT AND TRAFFIC INPUTS

(Enter Data in Gray Shaded Cells)

Route: FAI 57
Section: 77-1-91-4-91-4-1-93-1)R-1
County: Union and Pulaski
Location:

Comments: From 1.2 miles south of the Union/Pulaski county line to 5 miles north

Design Date: 08/16/2012 CWS <-- BY
Modify Date: <-- BY

	ADT	Year
Current:	-	-
Future:	-	-

Facility Type: Interstate or Supplemental Freeway

# of Lanes = 4

Road Class: I

Subgrade Support Rating (SSR): Poor
Construction Year: 2013
Design Period (DP) = 20 years

	Minimum ADT	Structural Design Traffic Actual ADT	Actual %of Total ADT	% of ADT in Design Lane
PV =	0	7,680	50.6%	P = 32%
SU =	500	570	3.8%	S = 45%
MU =	1500	6,930	45.7%	M = 45%
Struct. Design ADT =		15,180	(2023)	

TRAFFIC FACTOR CALCULATION

FLEXIBLE PAVEMENT

Cpv =	0.15	
Csu =	132.5	
Cmu =	482.53	
TF flexible (Actual) =	30.78	(Actual ADT)
TF flexible (Min) =	7.11	(Min ADT Fig. 54-2.C)

RIGID PAVEMENT

Cpv =	0.15	
Csu =	143.81	
Cmu =	696.42	
TF rigid (Actual) =	44.18	(Actual ADT)
TF rigid (Min) =	10.05	(Min ADT Fig. 54-2.C)

NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS

Full-Depth HMA Pavement

Use TF flexible =	30.78	
PG Grade Lower Binder Lifts =	PG 64-22	(Fig. 53-4.R)
Goto Map HMA Mixture Temp. =	81.0	deg. F (Fig. 54-5.C)
Design HMA Mixture Modulus (E_{HMA}) =	530	ksi (Fig. 54-5.D)
Design HMA Strain (ε_{HMA}) =	45	(Fig. 54-5.E)
Goto Map Full Depth HMA Design Thickness =	17.00	in. (Fig. 54-5.F)
Limiting Strain Criterion Thickness =	16.75	in. (Fig. 54-5.I)
Use Full-Depth HMA Thickness =	**16.75**	**inches**

JPC Pavement

Use TF rigid =	44.18	
Edge Support =	Tied	Shoulder or C.&G.
Rigid Pavt Thick. =	**11.00**	**in. (Fig. 54-4.E)**

CRC Pavement

Use TF rigid =	44.18	
IBR value =	3	
CRCP Thickness =	**11.00**	**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 =	30.78	
District =	3-4-5-6	
HMA Overlay Design Thickness =	**13.50**	**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)

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

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

	Traffic Factor ESAL Coefficients			
	Rigid (Fig. 54-4.C)		Flexible (Fig. 54-5.B)	
Class	Csu	Cmu	Csu	Cmu
I	143.81	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

	Design Lane Distribution Factors For Structural Design Traffic (Fig. 54-2.B)					
	Rural			Urban		
Number of Lanes	P	S	M	P	S	M
1 Lane Ramp	100%	100%	100%	100%	100%	100%
2 or 3	50%	50%	50%	50%	50%	50%
4	32%	45%	45%	32%	45%	45%
6 or more	20%	40%	40%	8%	37%	37%

LIFE-CYCLE COST ANALYSIS: NEW CONSTRUCTION / RECONSTRUCTION

HMA_LSCD

FULL-DEPTH HMA PAVEMENT

LSC Design

ROUTE	FAI 57
SECTION	(77-1,91-4,91-4-1,93-1)R-1
COUNTY	Union and Pulaski
LOCATION	

FACILITY TYPE: INTERSTATE

PROJECT LENGTH			26400 FT	= = > 5.00 Miles	USER OVERRIDE COLUMN
# 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)	16.75 IN	16.75 IN MAX
SHOULDER THICKNESS	8.00 IN	HMA_LSCD LSC Design
POLICY OVERLAY THICKNESS	2.00 IN	

FLEX PAVEMENT TRAFFIC FACTORS	MINIMUM	ACTUAL	USE	On User Override
	7.11	30.78	30.78	

Read Me!

HMA COST PER TON	UNIT PRICE
HMA SURFACE	$89.00 / TON
HMA TOP BINDER	$75.00 / TON
HMA LOWER BINDER	$70.00 / TON
HMA BINDER (LEVELING)	$0.00 / TON
HMA SHOULDER	$74.00 / TON

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT	UNIT PRICE	COST	USER SUPPLIED QUANTITY	USER SUPPLIED UNIT PRICE
HMA PAVEMENT (FULL-DEPTH)	(16.75")	140800	140,800 SQ YD	$72.27 / SQ YD	$0		
HMA SURFACE COURSE	(2.00")	1.0069	140,800 SQ YD	$10.04 / SQ YD	$1,413,241	~	
HMA TOP BINDER COURSE	(2.25")	1.0217	140,800 SQ YD	$9.66 / SQ YD	$1,359,435	~	
HMA LOWER BINDER COURSE	(12.50")	1.0729	140,800 SQ YD	$52.57 / SQ YD	$7,402,267	~	
HMA SHOULDER	(8.00")	82133	36,796 TONS	$74.00 / TON	$2,722,884	~	
CURB & GUTTER			0 LIN FT	$0.00 / LIN FT	$0		
SUBBASE GRAN MATL TY C (TONS)			34,995 TONS	$18.00 / TON	$629,910		
IMPROVED SUBGRADE:	Modified Soil		228,800 SQ YD	$3.00 / SQ YD	$686,400		
Reserved For User Supplied Item			0 SQ YD	$0.00 / SQ YD	$0		
Reserved For User Supplied Item			0 SQ YD	$0.00 / SQ YD	$0		
PAVEMENT REMOVAL			140,800 SQ YD	$5.50 / SQ YD	$774,400		
SHOULDER REMOVAL			82,133 SQ YD	$4.50 / SQ YD	$369,599		

Note: * Denotes User Supplied Quantity

FLEXIBLE CONSTRUCTION INITIAL COST $14,214,137

FLEXIBLE CONSTRUCTION ANNUAL COST PER MILE $115,945

MAINTENANCE COSTS:

ITEM	THICKNESS	MATERIAL	DEPTH	UNIT COST	Unit Cost Override
ROUTINE MAINTENANCE ACTIVITY				$0.00 LANE-MILE / YEAR	
HMA OVERLAY PVMT SURF	(2.00")	(HMA SURFACE MIX)	2.00	$9.97 / SQ YD	
HMA OVERLAY PVMT	(2.00")		2.00	$9.97 / SQ YD	
HMA SURFACE MIX	(2.00")	(HMA SURFACE MIX)	2.00	$9.97 / SQ YD	
HMA BINDER MIX	(0.00")	(Leveling Binder Mix)	0.00	$0.00 / SQ YD	
HMA OVERLAY SHLD (Year 30)	(2.00")	(HMA SHLD MIX)	2.00	$8.29 / SQ YD	
HMA OVERLAY SHLD	(2.00")	(HMA SHLD MIX)	2.00	$8.29 / SQ YD	
MILLING (2.00 IN)			2.00	$2.00 / SQ YD	

MAINTENANCE AND REHABILITATION ACTIVITY SCHEDULE 10/23/12

FULL-DEPTH HMA PAVEMENT
HMA OVERLAY OF RUBBLIZED PCC PAVEMENT
Figure 54-7.C
LIMITING STRAIN CRITERION DESIGN

MAINTENANCE COSTS: ITEM		%	QUANTITY	UNIT COST		COST	PRESENT WORTH
YEAR 5							
	LONG SHLD JT R&S	LIN FT 100.00%	105,600	$2.00		$211,200	
	CNTR LINE JOINT R&S	LIN FT 100.00%	52,800	$2.00		$105,600	
	RNDM / THRM CRACK R&S	LIN FT 50.00%	58,080	$2.00		$116,160	
	PD PVMT PATCH M&F SURF	SQ YD 0.10%	141	$78.97		$11,134	
		PWFn = 0.8626	PW =	0.8626	X	$444,094	$383,079
YEAR 10							
	LONG SHLD JT R&S	LIN FT 100.00%	105,600	$2.00		$211,200	
	CNTR LINE JOINT R&S	LIN FT 100.00%	52,800	$2.00		$105,600	
	RNDM / THRM CRACK R&S	LIN FT 50.00%	58,080	$2.00		$116,160	
	PD PVMT PATCH M&F SURF	SQ YD 0.50%	704	$78.97		$55,593	
		PWFn = 0.7441	PW =	0.7441	X	$488,553	$363,529
YEAR 15							
	MILL PVMT & SHLD 2.00"	SQ YD 100.00%	222,933	$2.00		$445,866	
	PD PVMT PATCH M&F ADD'L 2.00"	SQ YD 1.00%	1,408	$69.00		$97,152	
	HMA OVERLAY PVMT 2.00"	SQ YD 100.00%	140,800	$9.97		$1,403,494	
	HMA OVERLAY SHLD 2.00 "	SQ YD 100.00%	82,133	$8.29		$680,718	
		PWFn = 0.6419	PW =	0.6419	X	$2,627,230	$1,686,319
YEAR 20							
	LONG SHLD JT R&S	LIN FT 100.00%	105,600	$2.00		$211,200	
	CNTR LINE JOINT R&S	LIN FT 100.00%	52,800	$2.00		$105,600	
	RNDM / THRM CRACK R&S	LIN FT 50.00%	58,080	$2.00		$116,160	
	PD PVMT PATCH M&F SURF	SQ YD 0.10%	141	$78.97		$11,134	
		PWFn = 0.5537	PW =	0.5537	X	$444,094	$245,884
YEAR 25							
	LONG SHLD JT R&S	LIN FT 100.00%	105,600	$2.00		$211,200	
	CNTR LINE JOINT R&S	LIN FT 100.00%	52,800	$2.00		$105,600	
	RNDM / THRM CRACK R&S	LIN FT 50.00%	58,080	$2.00		$116,160	
	PD PVMT PATCH M&F SURF	SQ YD 0.50%	704	$78.97		$55,593	
		PWFn = 0.4776	PW =	0.4776	X	$488,553	$233,336

HMA_LSCD

YEAR 30	INTERSTATE						
	MILL PVMT & SHLD 2.00"	SQ YD 100.00%	222,933	$2.00		$445,866	
	PD PVMT PATCH M&F ADD'L 2.00"	SQ YD 2.00%	2,816	$69.00		$194,304	
	PD SHLD PATCH M&F ADD'L 2.00"	SQ YD 1.00%	821	$77.29		$63,453	
	HMA OVERLAY PVMT 2.00"	SQ YD 100.00%	140,800	$9.97		$1,403,494	
	HMA OVERLAY SHLD 2.00 "	SQ YD 100.00%	82,133	$8.29		$680,718	
		PWFn = 0.4120	PW =	0.4120	X	$2,787,835	$1,148,551
YEAR 35							
	LONG SHLD JT R&S	LIN FT 100.00%	105,600	$2.00		$211,200	
	CNTR LINE JOINT R&S	LIN FT 100.00%	52,800	$2.00		$105,600	
	RNDM / THRM CRACK R&S	LIN FT 50.00%	58,080	$2.00		$116,160	
	PD PVMT PATCH M&F SURF	SQ YD 0.10%	141	$78.97		$11,134	
		PWFn = 0.3554	PW =	0.3554	X	$444,094	$157,824
YEAR 40							
	LONG SHLD JT R&S	LIN FT 100.00%	105,600	$2.00		$211,200	
	CNTR LINE JOINT R&S	LIN FT 100.00%	52,800	$2.00		$105,600	
	RNDM / THRM CRACK R&S	LIN FT 50.00%	58,080	$2.00		$116,160	
	PD PVMT PATCH M&F SURF	SQ YD 0.50%	704	$78.97		$55,593	
		PWFn = 0.3066	PW =	0.3066	X	$488,553	$149,769
							$4,368,291
	ROUTINE MAINTENANCE ACTIVITY			20.00	0.00	0	$0
						MAINTENANCE LIFE-CYCLE COST	$4,368,291
45 YEARS	CRFn =	0.040785				MAINTENANCE ANNUAL COST PER MILE	$35,632

PARTIAL DEPTH PVMT PATCH	(Mill & Fill Surf)	(HMA SURFACE MIX)	2.00	**$78.97**	/ SQ YD
PARTIAL DEPTH SHLD PATCH	(Mill & Fill Surf)	(HMA SHLD MIX)	2.00	**$77.29**	/ SQ YD
PARTIAL DEPTH PVMT PATCH	(Mill & Fill +2.00 ")	(HMA L BINDER)	2.00	**$69.00**	/ SQ YD
PARTIAL DEPTH SHLD PATCH	(Mill & Fill +2.00 ")	(HMA SHLD MIX)	2.00	**$77.29**	/ 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	$18,582,428
FLEXIBLE TOTAL ANNUAL COST PER MILE	$151,578

PCC PAVEMENT

JPCP

JPCP

MAINTENANCE AND REHABILITATION ACTIVITY SCHEDULE

10/23/12

ROUTE			FAI 57
SECTION			(77-1,91-4,91-4-1,93-1)R-1
COUNTY			Union and Pulaski
LOCATION			0
FACILITY TYPE			INTERSTATE
PROJECT LENGTH			26400 FT = = > 5.00 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

USER OVERRIDE COLUMN

PAVEMENT THICKNESS (RIGID)	JPCP	11.00 IN	TIED SHLD
SHOULDER THICKNESS		11.00 IN	
POLICY OVERLAY THICKNESS		3.75 IN	

RIGID PAVEMENT TRAFFIC FACTORS	MINIMUM	ACTUAL	USE	On User Override
	10.50	1.00	10.50	
Worksheet Construction Type is: Reconstruction		The Pavement Type is	JPCP	

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT	UNIT PRICE	COST	USER SUPPLIED QUANTITY
JPC PAVEMENT	(11.00")	140,800	SQ YD	$41.00 / SQ YD	$5,772,800	
PAVEMENT REINFORCEMENT		0	SQ YD	$22.00 / SQ YD	$0	
STABILIZED SUBBASE	(4.00")	158,400	SQ YD	$16.00 / SQ YD	$2,534,400	
PCC SHOULDERS	(11.00" to 11.00")	82,133	SQ YD	$31.00 / SQ YD	$2,546,123	
CURB & GUTTER		0	LIN FT	$0.00 / LIN FT	$0	
SUBBASE GRAN MATL TY C	(~ 3.37")	9,561	TONS	$18.00 / TON	$172,098	
IMPROVED SUBGRADE:	Modified Soil	228,800	SQ YD	$3.00 / SQ YD	$686,400	
Reserved For User Supplied Item		0		$0.00	$0	
Reserved For User Supplied Item		0		$0.00	$0	
PAVEMENT REMOVAL		140,800	SQ YD	$5.50 / SQ YD	$774,400	
SHOULDER REMOVAL		82,133	SQ YD	$4.50 / SQ YD	$369,599	

Note: * Denotes User Supplied Quantity

RIGID CONSTRUCTION INITIAL COST	$12,855,820
RIGID CONSTRUCTION ANNUAL COST PER MILE	$104,865

JPCP

MAINTENANCE COSTS:

ITEM	THICKNESS	MATERIAL	DEPTH	UNIT COST	Unit Cost Override
ROUTINE MAINTENANCE ACTIVITY				$0.00 / LANE-MILE / YEAR	
HMA POLICY OVERLAY	(3.75")		3.75		
HMA POLICY OVERLAY PVMT	(3.75")		3.75	$16.93 / SQ YD	
HMA SURFACE MIX	(1.50")	HMA Surface Mix	1.50	$7.48 / SQ YD	
HMA BINDER MIX	(2.25")	Top Binder Mix	2.25	$9.45 / SQ YD	
HMA POLICY OVERLAY SHLD	(3.75")		3.75	$15.54 / 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)		(HMA SURFACE MIX)	2.00	$78.97 / SQ YD	
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA 1.50")		(HMA SURFACE MIX)	1.50	$76.48 / 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	$16,017,841
RIGID TOTAL ANNUAL COST PER MILE	$130,658

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

MAINTENANCE COSTS:	ITEM		%	QUANTITY	UNIT COST		COST	PRESENT WORTH
YEAR 10								
	PAVEMENT PATCH CLASS B	SQ YD	0.10%	141	$150.00		$21,150	
		PWFn =	0.7441	PW =	0.7441	X	$21,150	$15,738
YEAR 15								
	PAVEMENT PATCH CLASS B	SQ YD	0.20%	282	$150.00		$42,300	
		PWFn =	0.6419	PW =	0.6419	X	$42,300	$27,151
YEAR 20								
	PAVEMENT PATCH CLASS B	SQ YD	2.00%	2,816	$150.00		$422,400	
	SHOULDER PATCH CLASS C	SQ YD	0.50%	411	$145.00		$59,595	
	LONGITUDINAL SHLD JT R&S	LIN FT	100.00%	105,600	$2.00		$211,200	
	CENTERLINE JT R&S	LIN FT	100.00%	52,800	$2.00		$105,600	
		PWFn =	0.5537	PW =	0.5537	X	$798,795	$442,273
YEAR 25								
	PAVEMENT PATCH CLASS B	SQ YD	3.00%	4,224	$150.00		$633,600	
	SHOULDER PATCH CLASS C	SQ YD	1.00%	821	$145.00		$119,045	
		PWFn =	0.4776	PW =	0.4776	X	$752,645	$359,467
YEAR 30	INTERSTATE							
	PAVEMENT PATCH CLASS B	SQ YD	4.00%	5,632	$150.00		$844,800	
	SHOULDER PATCH CLASS C	SQ YD	1.50%	1,232	$145.00		$178,640	
	HMA POLICY OVERLAY 3.75" (PVMT)	SQ YD	100.00%	140,800	$16.93		$2,383,181	
	HMA POLICY OVERLAY 3.75" (SHLD)	SQ YD	100.00%	82,133	$15.54		$1,276,347	
		PWFn =	0.4120	PW =	0.4120	X	$4,682,968	$1,929,321
YEAR 35	INTERSTATE							
	LONGITUDINAL SHLD JT R&S	LIN FT	100.00%	105,600	$2.00		$211,200	
	CENTERLINE JT R&S	LIN FT	100.00%	52,800	$2.00		$105,600	
	RANDOM CRACK R&S	LIN FT	50.00%	52,800	$2.00		$105,600	
	REFLECTIVE TRANSVERSE CRACK R&S	LIN FT	40.00%	33,792	$2.00		$67,584	
	PD PVMT PATCH M&F HMA SURF 2.00"	SQ YD	0.10%	141	$78.97		$11,134	
		PWFn =	0.3554	PW =	0.3554	X	$501,118	$178,089
YEAR 40	INTERSTATE							
	PAVEMENT PATCH CLASS B	SQ YD	0.50%	704	$150.00		$105,600	
	LONGITUDINAL SHLD JT R&S	LIN FT	100.00%	105,600	$2.00		$211,200	
	CENTERLINE JT R&S	LIN FT	100.00%	52,800	$2.00		$105,600	
	REFLECTIVE TRANSVERSE CRACK R&S	LIN FT	60.00%	50,688	$2.00		$101,376	
	RANDOM CRACK R&S	LIN FT	50.00%	52,800	$2.00		$105,600	
	PD PVMT PATCH M&F HMA SURF 2.00"	SQ YD	0.50%	704	$78.97		$55,593	
		PWFn =	0.3066	PW =	0.3066	X	$684,969	$209,982
								$3,162,021
	ROUTINE MAINTENANCE ACTIVITY			20.00	$0.00		$0	$0
							MAINTENANCE LIFE-CYCLE COST	$3,162,021
45 YEARS	CRFn =	0.040785					MAINTENANCE ANNUAL COST PER MILE	$25,793

RECONSTRUCTION - HMA OVER RUBBLIZED PAVEMENT

PAVEMENT OVERLAY THICKNESS (FLEXIBLE) **11.50** IN **999.99** IN MAX **HMA_SD** Maintenance Schedule
SHOULDER OVERLAY THICKNESS **8.50** IN

INITIAL COSTS

ITEM	THICKNESS		100% QUANTITY	UNIT	UNIT PRICE		COST	USER SUPPLIED QUANTITY	USER SUPPLIED UNIT PRICE
HMA OVERLAY REMOVAL	3.00		140,800	SQ YD	$2.50	/ SQ YD	$352,000		
RUBBLIZING PCC PAVEMENT			140,800	SQ YD	$2.30	/ SQ YD	$323,840		
HMA OVERLAY (TOTAL)	11.50		140,800	SQ YD	$49.67	/ SQ YD	$6,993,046	~	
HMA SURFACE COURSE	2.00	1.0069	140,800	SQ YD	$10.04	/ SQ YD	$0		
HMA TOP BINDER COURSE	2.25	1.0217	140,800	SQ YD	$9.66	/ SQ YD	$0		
HMA LOWER BINDER COURSE	7.25	1.0547	140,800	SQ YD	$29.97	/ SQ YD	$0		
HMA SHOULDER	8.50		39,095	TONS	$74.00	/ TON	$2,893,065	~	
Reserved For User Supplied Item			0	SQ YD	$0.00	/ SQ YD	$0		
Reserved For User Supplied Item			0	SQ YD	$0.00	/ SQ YD	$0		
EARTHWORK			0	CU YD	$0.00	/ CU YD	$0		

Note: * Denotes User Supplied Quantity

RUBBLIZED CONSTRUCTION INITIAL COST $9,886,111
RUBBLIZED CONSTRUCTION ANNUAL COST PER MILE $80,641

MAINTENANCE COSTS:

If the maintenance schedule used here (HMA_SD) is different than the maintenance schedule used above (HMA_LSCD), additional information may be needed. Please supply the additional maintenance costs below if different than the default costs supplied.

HMA OVERLAY PVMT		(3.75")		3.75	$16.93	/ SQ YD
HMA SURFACE MIX		(1.50")	(HMA SURFACE MIX)	1.50	$7.48	/ SQ YD
HMA BINDER MIX		(2.25")	(Leveling Binder Mix)	2.25	$9.45	/ SQ YD
HMA OVERLAY SHLD	(Year 30)	(1.75")	(HMA SHLD MIX)	1.75	$7.25	/ SQ YD

RUBBLIZED MAINTENANCE LIFE-CYCLE COST $4,669,178
RUBBLIZED MAINTENANCE ANNUAL COST PER MILE $38,087

RUBBLIZED TOTAL LIFE-CYCLE COST $14,555,289
RUBBLIZED TOTAL ANNUAL COST PER MILE $118,728

RECONSTRUCTION - PCC UNBONDED OVERLAY

LIFE-CYCLE COST ANALYSIS: NEW DESIGN

Calculated / Revised : 2:49 PM 07/19/2012

			JPCP	HMA
CONSTRUCTION	INITIAL COST	PRESENT WORTH	$12,855,820	$14,214,137
		ANNUAL COST PER MILE	$104,865	$115,945
MAINTENANCE	LIFE-CYCLE COST	PRESENT WORTH	$3,162,021	$4,368,291
		ANNUAL COST PER MILE	$25,793	$35,632
TOTAL	LIFE-CYCLE COST	PRESENT WORTH	$16,017,841	$18,582,428
		ANNUAL COST PER MILE	$130,658	$151,578

LIFE-CYCLE COST ANALYSIS: SUPPLEMENTAL DESIGNS

			PCC Unbonded	Rubblized
CONSTRUCTION	INITIAL COST	PRESENT WORTH	$10,477,855	$9,886,111
		ANNUAL COST PER MILE	$85,468	$80,641
MAINTENANCE	LIFE-CYCLE COST	PRESENT WORTH	$3,162,021	$4,669,178
		ANNUAL COST PER MILE	$25,793	$38,087
TOTAL	LIFE-CYCLE COST	PRESENT WORTH	$13,639,876	$14,555,289
		ANNUAL COST PER MILE	$99,999,999	$118,728

LIFE-CYCLE COST ANALYSIS: FINAL SUMMARY

LOWEST COST OPTION	==========>	**Rubblized**	**$118,728**	
OTHER OPTIONS (LOWEST TO HIGHEST):	TYPE / PERCENTAGE	**JPCP**	$130,658	10.0%
	TYPE / PERCENTAGE	**HMA**	$151,578	27.7%