



Illinois Department of Transportation

To: Masood Ahmad Attn: Dave Broviak
From: Jack Elston By: Michael Brand
Subject: Pavement Design Approval
Date: November 26, 2019

Michael Brand

Route: I-57 Job No.: P-93-013-17
Section: (139)VB,HB-3]BR,139R Contract No.: 66F74
County: Kankakee Target Letting: 2021
Limits: Grinnell Road to 0.37 miles south of Norfolk Southern Railroad

We have reviewed the pavement design for the above referenced project which was submitted on November 21, 2019. The scope of the project involves removing and replacing the existing pavement.

The pavement design resulted in two pavement options: 15" Full-Depth HMA and 11" PCC. The life-cycle cost analysis of those options resulted in the PCC pavement being 23.6% less expensive (\$224,299/mile compared to HMA's cost of \$277,231/mile).

In summary, the approved pavement design is as follows:

- 11" PCC Pavement w/ tied PCC Shoulders
- 4" HMA Stabilized Subbase
- 12" Improved Subgrade

If you have any questions, please contact Mike Brand at (217) 782-7651.



Illinois Department of Transportation

Memorandum

To: Jack Elston Attn: Mike Brand
From: Masood Ahmad By: Dave Broviak
Subject: Pavement Design Review *
Date: November 21, 2019

* FAI 57 (I-57)
Section (139)VB,HB-3]BR, 139R
Kankakee County
Job Nos. P-93-013-17
Contract Nos. 66F74

Attached for approval is the pavement design for I-57 from Grinnell Road to 0.37 mile south of Norfolk Southern Railroad in Kankakee County with a total length of approximately 0.63 mile. Construction of this project is currently funded for FY 2021.

Eleven (11) inches of JPCP, with an annual life-cycle cost per mile of \$224,299, is the preferred pavement type based on life-cycle cost in the attached mechanistic pavement design analysis. The annual life-cycle cost per mile for the JPCP option is 23.6% less than 15.00" of Full-Depth HMA pavement (\$277,231). This proposed design includes removing the existing pavement and constructing a 12" improved subgrade, 4" stabilized subbase, underdrains, and 11" of JPCP. The estimated new pavement quantity is 17,600 square yards.

The pavements were designed using Chapter 54 of the Bureau of Design and Environment manual, current as of November 2019. The following facts and assumptions were used in the design:

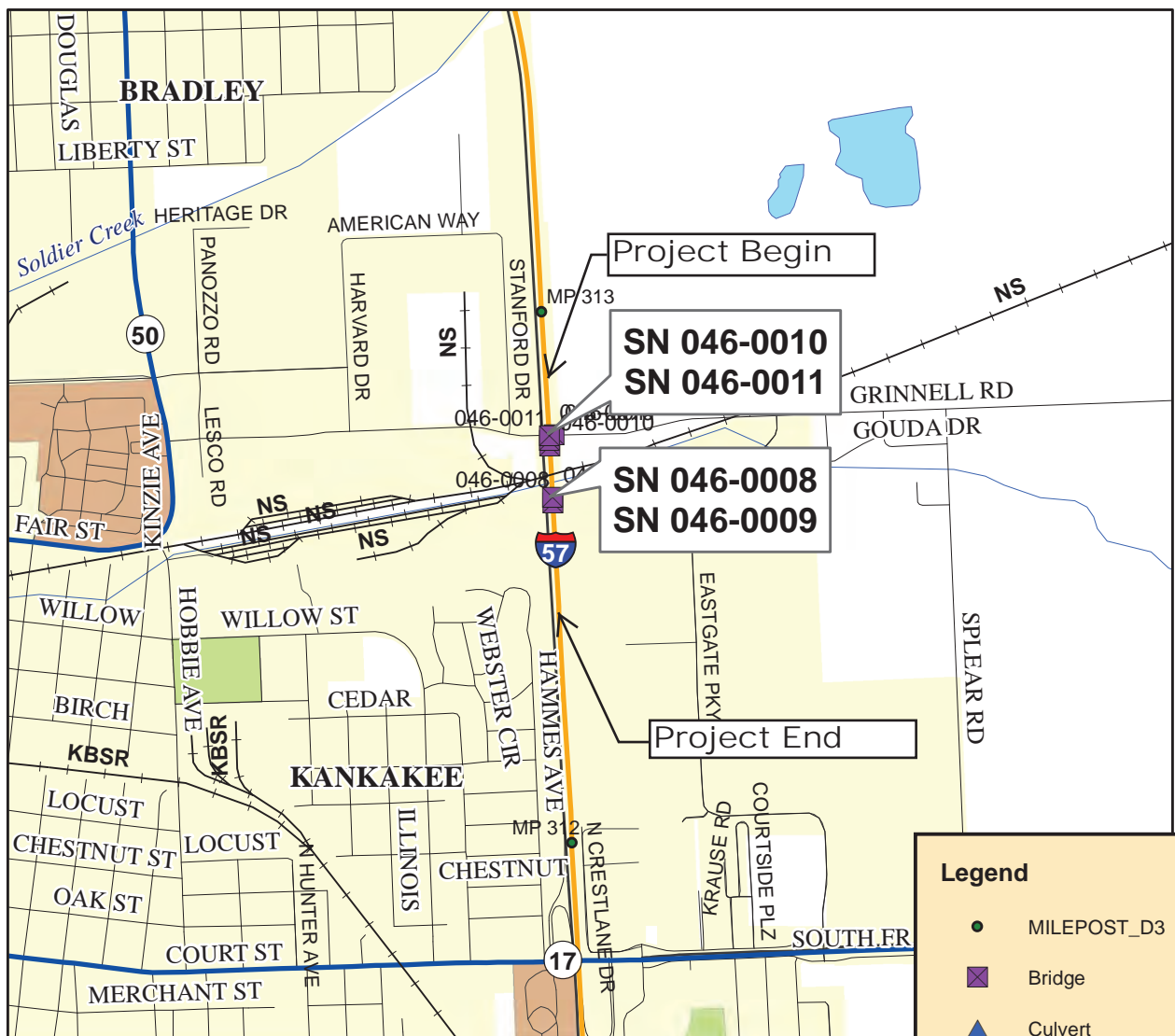
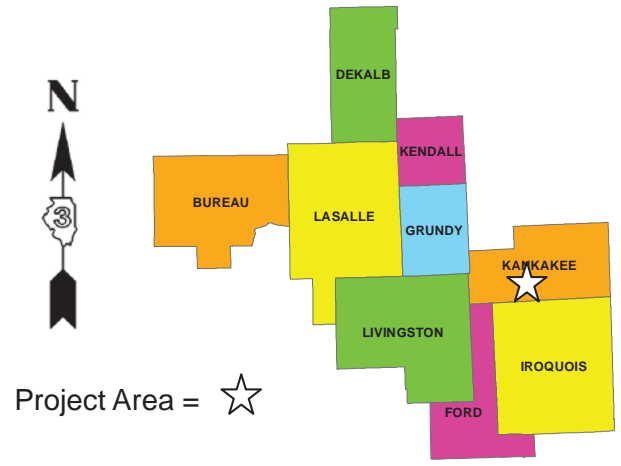
- Jointed Plain Concrete Pavement constructed with tied shoulder.
- Design traffic was based on 2029 projections.
- Design period of 20 years.
- Poor subgrade.
- PG 70-22 for top lift of binder and the surface course.
- PG 64-22 for the lower binder lifts.
- Unbonded overlay and HMA overlay of rubblized pavement were not considered due to scope of the project.

If you have any questions, please contact Dave Alexander at (815) 434-8468.

RS:dld

Project Location Map

FAI 57 (I-57)
 [(139)VB,HB-3]ES
 Kankakee County
 Reconstruction & Bridge Replacement
 (SN 046-0008/0009/0010/0011)
 Over Norfolk Southern RR, Ditch, & Grinnell Road
 North of IL 17 in Kankakee
 Phase I Job No: P-93-013-17
 Contract No.66F74



Legend

- MILEPOST_D3
- ⊠ Bridge
- ▲ Culvert

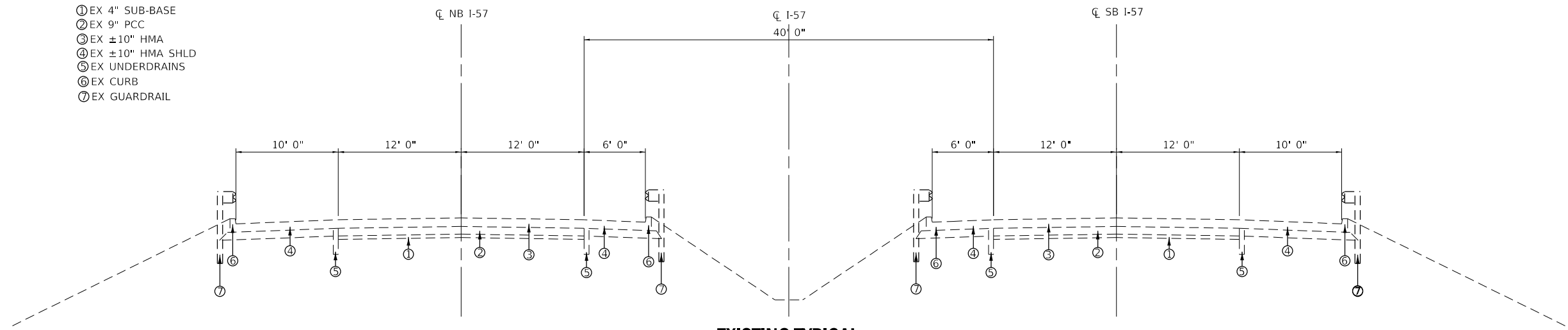
Marked Routes

Route Type

- Interstate
- State
- US

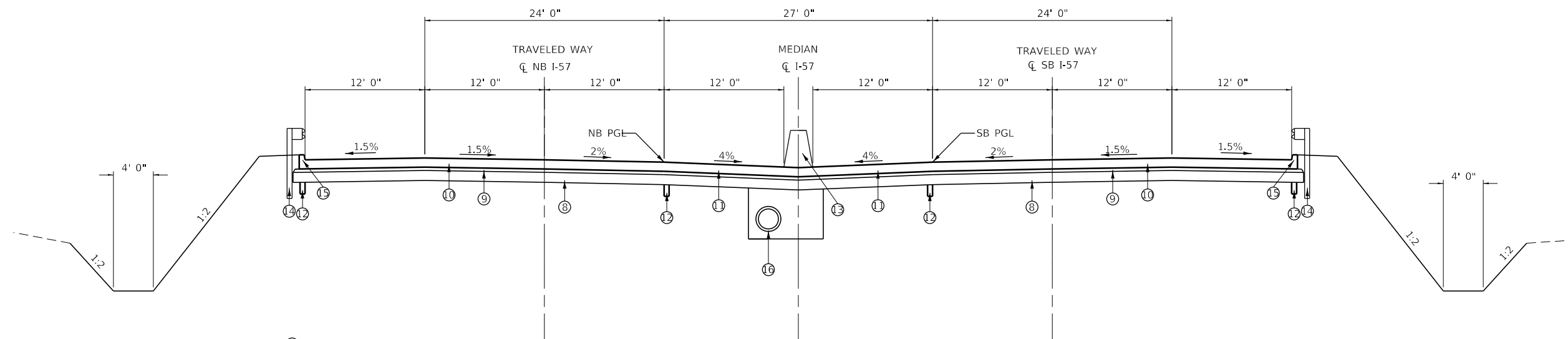
D3# 3295

- ① EX 4" SUB-BASE
- ② EX 9" PCC
- ③ EX ±10" HMA
- ④ EX ±10" HMA SHLD
- ⑤ EX UNDERDRAINS
- ⑥ EX CURB
- ⑦ EX GUARDRAIL



EXISTING TYPICAL

STA. 133+00 TO STA. 138+20
 STA. 139+50 TO STA. 142+50
 STA. 145+20 TO STA. 155+00
 (LOOKING SOUTH)



PROPOSED TYPICAL

STA. 133+00 TO STA. 138+20
 STA. 139+50 TO STA. 142+50
 STA. 145+20 TO STA. 156+00
 (LOOKING SOUTH)

- ⑧ PR 12" SUBGRADE
- ⑨ PR 4" STABILIZED SUBBASE
- ⑩ PR 11" PCC PAVEMENT
- ⑪ PR PCC SHOULDER
- ⑫ PR UNDERDRAIN
- ⑬ PR CONCRETE BARRIER
- ⑭ PR GUARDRAIL
- ⑮ PR CURB
- ⑯ PR MEDIAN STORM SEWER

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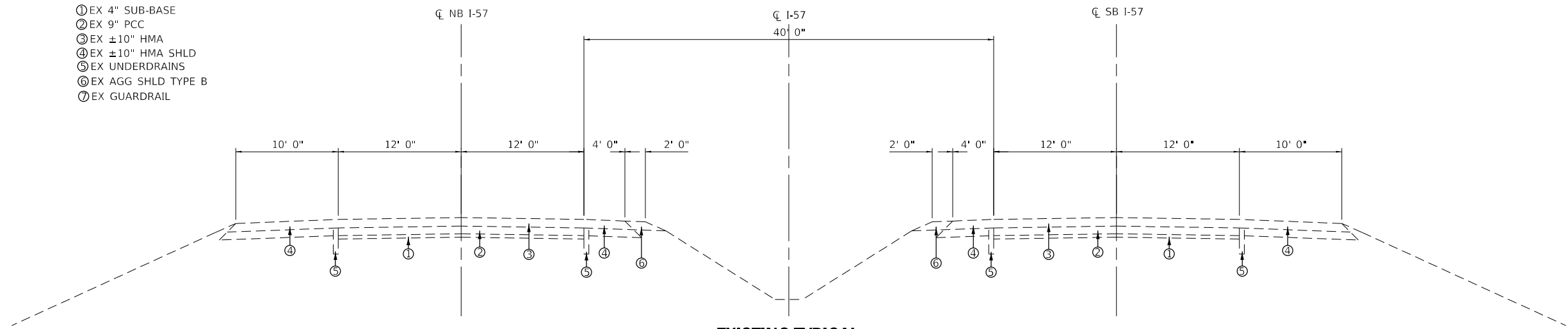
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PLOT DATE = 9/18/2018	DATE -	REVISED -

**STATE OF ILLINOIS
 DEPARTMENT OF TRANSPORTATION**

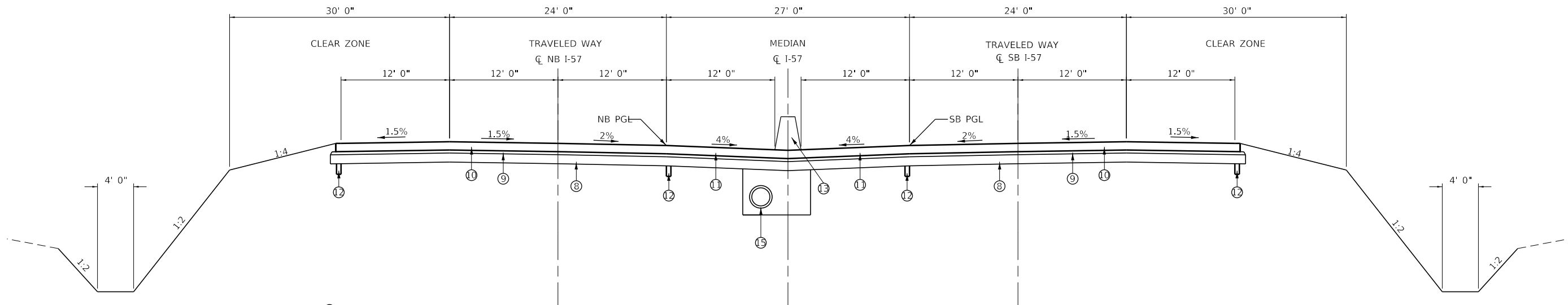
I-57 TYPICAL SECTION		SCALE:	SHEET	OF	SHEETS	STA.	TO	STA.

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
57	[(139)VB,HB-3]ES	KANKAKEE		
CONTRACT NO. 66F74				
ILLINOIS FED. AID PROJECT				

- ① EX 4" SUB-BASE
- ② EX 9" PCC
- ③ EX ±10" HMA
- ④ EX ±10" HMA SHLD
- ⑤ EX UNDERDRAINS
- ⑥ EX AGG SHLD TYPE B
- ⑦ EX GUARDRAIL



EXISTING TYPICAL
 STA. 124+00 TO STA. 133+50
 STA. 155+00 TO STA. 164+00
 (LOOKING SOUTH)



- ⑧ PR 12" SUBGRADE
- ⑨ PR 4" STABILIZED SUBBASE
- ⑩ PR 11" PCC PAVEMENT
- ⑪ PR PCC SHOULDER
- ⑫ PR UNDERDRAIN
- ⑬ PR CONCRETE BARRIER
- ⑭ PR GUARDRAIL
- ⑮ PR MEDIAN STORM SEWER

PROPOSED TYPICAL
 STA. 126+00 TO STA. 133+00
 STA. 156+00 TO STA. 163+00
 (LOOKING SOUTH)

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PLOT DATE = 9/18/2018	DATE -	REVISED -

**STATE OF ILLINOIS
 DEPARTMENT OF TRANSPORTATION**

I-57 TYPICAL SECTION			
SCALE:	SHEET	OF SHEETS	STA. TO STA.

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
57	[(139)VB.HB-3]ES	KANKAKEE		
CONTRACT NO. 66F74				
ILLINOIS FED. AID PROJECT				

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

Route: FAI 57 (I-57)	Comments: OVER NORFOLK-SOUTHERN RR STRUCTURES, DITCH, & GRINNELL RD N OF IL 17		
Section: (139)VB,HB-3)BR,139R	Design Date: 11/20/2019	RBS	<-- BY
County: Kankakee	Modify Date:		<-- BY
Location: See Comments			ADT
			Year
			Current: 28,800
			Future: 37,152
			2012
			2041
Facility Type: Interstate or Freeway	# of Lanes = 4		
	Road Class: I		
	Subgrade Support Rating (SSR): Poor		
	Construction Year: 2021		
	Design Period (DP) = 20 years		
		Structural Design Traffic	
		Minimum ADT	Actual ADT
			Actual % of Total ADT
			% of ADT in Design Lane
		PV = 0	26,184
		SU = 500	1,439
		MU = 1500	6,649
		Struct. Design ADT = 34,272	(2031)
			P = 32%
			S = 45%
			M = 45%

TRAFFIC FACTOR CALCULATION

FLEXIBLE PAVEMENT

Cpv = 0.15
 Csu = **132.5**
 Cmu = **482.53**
 TF flexible (Actual) = 30.62 (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) = 43.56 (Actual ADT)
 TF rigid (Min) = 10.05 (Min ADT Fig. 54-2.C)

NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS

Full-Depth HMA Pavement	JPC Pavement
Use TF flexible = 30.62	Use TF rigid = 43.56
PG Grade Lower Binder Lifts = PG 64-22 (Fig. 53-4.O)	Edge Support = Tied Shoulder or C&G
HMA Mixture Temp. = 76.0 deg. F (Fig. 54-5.C)	Rigid Pavt Thick. = 11.00 in. (Fig. 54-4.E)
Design HMA Mixture Modulus (E _{HMA}) = 660 ksi (Fig. 54-5.D)	
Design HMA Strain (ε _{HMA}) = 45 (Fig. 54-5.E)	
Full Depth HMA Design Thickness = 15.25 in. (Fig. 54-5.F)	
Limiting Strain Criterion Thickness = 15.00 in. (Fig. 54-5.I)	
Use Full-Depth HMA Thickness = 15.00 inches	CRCP Thickness = 11.00 in. (Fig. 54-4.M)

TF MUST BE > 60 FOR CRCP

RECONSTRUCTION ONLY (SUPPLEMENTAL) PAVEMENT DESIGN CALCULATIONS

HMA Pavement Over Rubblized PCC	Unbonded Concrete Overlay
Use TF flexible = 30.62	Review 54-4.03 for limitations and special considerations.
HMA Overlay Design Thickness = 12.75 in. (Fig. 54-5.U)	
Limiting Strain Criterion Thickness = 11.00 in. (Fig. 54-5.V)	
Use HMA Overlay Thickness = 11.00 inches	JPCP Thickness = NA inches

CONTACT RESEARCH 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 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	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 One-Way Streets	
ADT	Class
0 - 3500	II
>3501	I

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)						
Number of Lanes	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

LSC Design

ROUTE (FAI 57) I-57
 SECTION (139)VB,HB-3)BR,139R
 COUNTY KANKAKEE
 LOCATION **lorfolk Southern RR,Ditch,& Grinnell Rd N of IL 17**

FACILITY TYPE **INTERSTATE**

PROJECT LENGTH **3300** FT == > 0.63 Miles
 # OF CENTERLINES **2** CL
 # OF LANES **4** LANES
 # OF EDGES **4** EP
 LANE WIDTH - AVERAGE **12** FT
 SHOULDER WIDTH HMA Inside **13.5** FT
 HMA Outside **12** FT
 Total Width of Paved Shoulders **51** FT

PAVEMENT THICKNESS (FLEXIBLE) **15.00** IN **15.00** IN MAX
 SHOULDER THICKNESS **15.00** IN HMA_LSCD LSC Design
 HMA OVERLAY THICKNESS **3.75** IN

FLEX PAVEMENT	TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
		7.11	30.62	30.62

Read Me!

HMA COST PER TON	UNIT PRICE
HMA SURFACE	\$117.14 / TON
HMA TOP BINDER	\$94.22 / TON
HMA LOWER BINDER	\$83.78 / TON
HMA BINDER (IL-9.5FG or IL-4.75)	\$94.22 / TON
HMA SHOULDER	\$86.36 / TON

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT	UNIT PRICE	COST
HMA PAVEMENT (FULL-DEPTH)	(15.00")	17600	17,600 SQ YD	\$79.15 / SQ YD	\$1,392,984 ~
HMA SURFACE COURSE	(2.00")	1,0069	1,985 TONS	\$117.14 / TON	\$0
HMA TOP BINDER COURSE	(2.25")	1,0217	2,266 TONS	\$94.22 / TON	\$0
HMA LOWER BINDER COURSE	(10.75")	1,0668	11,303 TONS	\$83.78 / TON	\$0
HMA SHOULDER	(15.00")	18700	15,708 TONS	\$86.36 / TON	\$1,356,543 ~
CURB & GUTTER			3,800 LIN FT *	\$25.00 / LIN FT	\$95,000
SUBBASE GRAN MATL TY C (TONS)			1,839 TONS *	\$30.00 / TON	\$55,170
IMPROVED SUBGRADE:	Aggregate Width = 106.0		38,867 SQ YD	\$12.00 / SQ YD	\$466,404
Reserved For User Supplied Item			0 UNITS	\$0.00 / UNITS	\$0
Reserved For User Supplied Item			0 UNITS	\$0.00 / UNITS	\$0
PAVEMENT REMOVAL			17,600 SQ YD	\$0.00 / SQ YD	\$0
SHOULDER REMOVAL			18,700 SQ YD	\$0.00 / SQ YD	\$0

Note: * Denotes User Supplied Quantity
 FLEXIBLE CONSTRUCTION INITIAL COST \$3,366,101
 FLEXIBLE CONSTRUCTION ANNUAL COST PER MILE \$219,659

MAINTENANCE COSTS:

ITEM	THICKNESS	MATERIAL	T	UNIT COST
ROUTINE MAINTENANCE ACTIVITY				\$0.00 LANE-MILE / YEAR
HMA OVERLAY PVMT SURF	(2.00")	1,0069 Surface Mix	2.00	\$13.21 / SQ YD
HMA OVERLAY PVMT	(3.75")	1,0130 Surface Mix	3.75	\$21.98 / SQ YD
HMA SURFACE MIX	(1.50")	1,0052 Surface Mix	1.50	\$9.89 / SQ YD
HMA BINDER MIX	(2.25")	1,0182 Top Binder Mix	2.25	\$12.09 / SQ YD
HMA OVERLAY SHLD (Year 30)	(1.75")	Shoulder Mix	1.75	\$8.46 / SQ YD
HMA OVERLAY SHLD	(2.00")	Shoulder Mix	2.00	\$9.67 / SQ YD
MILLING (2.00 IN)			2.00	\$2.75 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill Surf)		Surface Mix	2.00	\$82.87 / SQ YD
PARTIAL DEPTH SHLD PATCH (Mill & Fill Surf)		Shoulder Mix	2.00	\$79.42 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill +2.00")		Binder Mix	2.00	\$79.52 / SQ YD
PARTIAL DEPTH SHLD PATCH (Mill & Fill +2.00")		Shoulder Mix	2.00	\$79.52 / SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL				\$3.00 / LIN FT
CENTERLINE JOINT ROUT & SEAL				\$3.00 / LIN FT
RANDOM / THERMAL CRACK ROUT & SEAL (100% Rehab = 110.00' / Station / Lane)				\$3.00 / LIN FT

FLEXIBLE TOTAL LIFE-CYCLE COST \$4,248,340
 FLEXIBLE TOTAL ANNUAL COST PER MILE \$277,231

FULL-DEPTH HMA PAVEMENT
 HMA PAVEMENT OVER 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%	13,200	LIN FT	\$3.00	\$39,600	
	CNTR LINE JOINT R&S	100.00%	6,600	LIN FT	\$3.00	\$19,800	
	RNDM / THRM CRACK R&S	50.00%	7,260	LIN FT	\$3.00	\$21,780	
	PD PVMT PATCH M&F SURF	0.10%	18	SQ YD	\$82.87	\$1,492	
		PWFn = 0.8626			PW = 0.8626 X	\$82,672	\$71,314
YEAR 10							
	LONG SHLD JT R&S	100.00%	13,200	LIN FT	\$3.00	\$39,600	
	CNTR LINE JOINT R&S	100.00%	6,600	LIN FT	\$3.00	\$19,800	
	RNDM / THRM CRACK R&S	50.00%	7,260	LIN FT	\$3.00	\$21,780	
	PD PVMT PATCH M&F SURF	0.50%	88	SQ YD	\$82.87	\$7,293	
		PWFn = 0.7441			PW = 0.7441 X	\$88,473	\$65,832
YEAR 15							
	MILL PVMT & SHLD 2.00"	100.00%	36,300	SQ YD	\$2.75	\$99,825	
	PD PVMT PATCH M&F ADD'L 2.00"	1.00%	176	SQ YD	\$79.52	\$13,996	
	HMA OVERLAY PVMT 2.00"	100.00%	17,600	SQ YD	\$13.21	\$232,510	
	HMA OVERLAY SHLD 2.00 "	100.00%	18,700	SQ YD	\$9.67	\$180,872	
		PWFn = 0.6419			PW = 0.6419 X	\$527,203	\$338,392
YEAR 20							
	LONG SHLD JT R&S	100.00%	13,200	LIN FT	\$3.00	\$39,600	
	CNTR LINE JOINT R&S	100.00%	6,600	LIN FT	\$3.00	\$19,800	
	RNDM / THRM CRACK R&S	50.00%	7,260	LIN FT	\$3.00	\$21,780	
	PD PVMT PATCH M&F SURF	0.10%	18	SQ YD	\$82.87	\$1,492	
		PWFn = 0.5537			PW = 0.5537 X	\$82,672	\$45,773
YEAR 25							
	LONG SHLD JT R&S	100.00%	13,200	LIN FT	\$3.00	\$39,600	
	CNTR LINE JOINT R&S	100.00%	6,600	LIN FT	\$3.00	\$19,800	
	RNDM / THRM CRACK R&S	50.00%	7,260	LIN FT	\$3.00	\$21,780	
	PD PVMT PATCH M&F SURF	0.50%	88	SQ YD	\$82.87	\$7,293	
		PWFn = 0.4776			PW = 0.4776 X	\$88,473	\$42,255
YEAR 30							
	HMA SD INTERSTATE						
	MILL PVMT ONLY 2.00"	100.00%	17,600	SQ YD	\$2.75	\$48,400	
	PD PVMT PATCH M&F ADD'L 2.00"	2.00%	352	SQ YD	\$79.52	\$27,991	
	PD SHLD PATCH M&F SURF 2.00"	1.00%	187	SQ YD	\$79.52	\$14,870	
	HMA OVERLAY PVMT 3.75 "	100.00%	17,600	SQ YD	\$21.98	\$386,833	
	HMA OVERLAY SHLD 1.75 "	100.00%	18,700	SQ YD	\$8.46	\$158,263	
		PWFn = 0.4120			PW = 0.4120 X	\$636,357	\$262,171
YEAR 35							
	LONG SHLD JT R&S	100.00%	13,200	LIN FT	\$3.00	\$39,600	
	CNTR LINE JOINT R&S	100.00%	6,600	LIN FT	\$3.00	\$19,800	
	RNDM / THRM CRACK R&S	50.00%	7,260	LIN FT	\$3.00	\$21,780	
	PD PVMT PATCH M&F SURF	0.10%	18	SQ YD	\$82.87	\$1,492	
		PWFn = 0.3554			PW = 0.3554 X	\$82,672	\$29,380
YEAR 40							
	LONG SHLD JT R&S	100.00%	13,200	LIN FT	\$3.00	\$39,600	
	CNTR LINE JOINT R&S	100.00%	6,600	LIN FT	\$3.00	\$19,800	
	RNDM / THRM CRACK R&S	50.00%	7,260	LIN FT	\$3.00	\$21,780	
	PD PVMT PATCH M&F SURF	0.50%	88	SQ YD	\$82.87	\$7,293	
		PWFn = 0.3066			PW = 0.3066 X	\$88,473	\$27,122
							\$882,239
	ROUTINE MAINTENANCE ACTIVITY						
			2.50	Lane Miles	0.00	\$0	\$0
							MAINTENANCE LIFE-CYCLE COST \$882,239
45	YEAR LIFE CYCLE	CRFn = 0.0407852					MAINTENANCE ANNUAL COST PER MILE \$57,572

PCC PAVEMENT

JPCP

ROUTE (FAI 57) I-57
 SECTION (139)VB,HB-3)BR,139R
 COUNTY KANKAKEE
 LOCATION **Volfolk Southern RR,Ditch,& Grinnell Rd N of IL 17**

FACILITY TYPE **INTERSTATE**

PROJECT LENGTH **3300 FT == >** 0.63 Miles
 # OF CENTERLINES **2 CL**
 # OF LANES **4 LANES**
 # OF EDGES **4 EP**
 LANE WIDTH - AVERAGE **12 FT**
 SHOULDER WIDTH PCC Inside **13.5 FT**
 PCC Outside **12 FT**
 Total Width of Paved Shoulders **51 FT**

PAVEMENT THICKNESS (RIGID) **JPCP 11.00 IN TIED SHLD**
 SHOULDER THICKNESS **11.00 IN**

HMA OVERLAY THICKNESS **3.75 IN**

RIGID PAVEMENT	TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
		10.05	43.56	43.56
Worksheet Construction Type is	Reconstruction	The Pavement Type is		JPCP

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT	UNIT PRICE	COST
JPC PAVEMENT	(11.00")	17,600	SQ YD	\$59.09 / SQ YD	\$1,039,984
PAVEMENT REINFORCEMENT		0	SQ YD	\$22.00 / SQ YD	\$0
STABILIZED SUBBASE	(4.00")	19,800	SQ YD	\$17.50 / SQ YD	\$346,500
PCC SHOULDERS		18,700	SQ YD	\$46.00 / SQ YD	\$860,200
CURB & GUTTER		3,800	LIN FT	\$25.00 / LIN FT	\$95,000
SUBBASE GRAN MATL TY C	(~ 2.78")	1,839	TONS	\$30.00 / TON	\$55,170
IMPROVED SUBGRADE:	Modified Soil /width = 101.0	37,033	SQ YD	\$12.00 / SQ YD	\$444,396
Reserved For User Supplied Item		0	UNITS	\$0.00 / UNITS	\$0
Reserved For User Supplied Item		0	UNITS	\$0.00 / UNITS	\$0
PAVEMENT REMOVAL		17,600	SQ YD	\$0.00 / SQ YD	\$0
SHOULDER REMOVAL		18,700	SQ YD	\$0.00 / SQ YD	\$0

Note: * Denotes User Supplied Quantity

RIGID CONSTRUCTION INITIAL COST	\$2,841,250
RIGID CONSTRUCTION ANNUAL COST PER MILE	\$185,409

MAINTENANCE COSTS:

ITEM	THICKNESS	MATERIAL	T	UNIT COST
ROUTINE MAINTENANCE ACTIVITY				\$0.00 / LANE-MILE / YEAR
HMA OVERLAY	(3.75")		3.75	
HMA OVERLAY PAVEMENT	(3.75")	1.0130	3.75	\$21.98 / SQ YD
HMA SURFACE MIX	(1.50")	1.0052	Surface Mix 1.50	\$9.89 / SQ YD
HMA BINDER MIX	(2.25")	1.0182	Top Binder Mix 2.25	\$12.09 / SQ YD
HMA OVERLAY SHOULDER	(3.75")		Shoulder Mix 3.75	\$18.14 / SQ YD
CLASS A PAVEMENT PATCHING				\$195.00 / SQ YD
CLASS B PAVEMENT PATCHING				\$200.00 / SQ YD
CLASS C SHOULDER PATCHING				\$150.00 / SQ YD
PARTIAL DEPTH PVM T PATCH (Mill & Fill HMA Surf)		Surface Mix	1.50	\$79.59 / SQ YD
PARTIAL DEPTH PVM T PATCH (Mill & Fill HMA 1.50")		Surface Mix	1.50	\$79.59 / SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL				\$3.00 / LIN FT
CENTERLINE JOINT ROUT & SEAL				\$3.00 / LIN FT
REFLECTIVE TRANSVERSE CRACK ROUT & SEAL				\$3.00 / LIN FT
RANDOM CRACK ROUT & SEAL (100% Rehab = 100.00' / Station / Lane)				\$3.00 / LIN FT

RIGID TOTAL LIFE-CYCLE COST	\$3,437,199
RIGID TOTAL ANNUAL COST PER MILE	\$224,299

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%	18	SQ YD	\$200.00	\$3,600		
		PWF _n = 0.7441			PW = 0.7441 X	\$3,600	\$2,679	
YEAR 15								
	PAVEMENT PATCH CLASS B	0.20%	35	SQ YD	\$200.00	\$7,000		
		PWF _n = 0.6419			PW = 0.6419 X	\$7,000	\$4,493	
YEAR 20								
	PAVEMENT PATCH CLASS B	2.00%	352	SQ YD	\$200.00	\$70,400		
	SHOULDER PATCH CLASS C	0.50%	94	SQ YD	\$150.00	\$14,100		
	LONGITUDINAL SHLD JT R&S	100.00%	13,200	LIN FT	\$3.00	\$39,600		
	CENTERLINE JT R&S	100.00%	6,600	LIN FT	\$3.00	\$19,800		
		PWF _n = 0.5537			PW = 0.5537 X	\$143,900	\$79,674	
YEAR 25								
	PAVEMENT PATCH CLASS B	3.00%	528	SQ YD	\$200.00	\$105,600		
	SHOULDER PATCH CLASS C	1.00%	187	SQ YD	\$150.00	\$28,050		
		PWF _n = 0.4776			PW = 0.4776 X	\$133,650	\$63,832	
YEAR 30								
	INTERSTATE							
	PAVEMENT PATCH CLASS B	4.00%	704	SQ YD	\$200.00	\$140,800		
	SHOULDER PATCH CLASS C	1.50%	281	SQ YD	\$150.00	\$42,150		
	HMA OVERLAY 3.75" (PVMT)	100.00%	17,600	SQ YD	\$21.98	\$386,833		
	HMA OVERLAY 3.75" (SHLD)	100.00%	18,700	SQ YD	\$18.14	\$339,136		
		PWF _n = 0.4120			PW = 0.4120 X	\$908,919	\$374,463	
YEAR 35								
	INTERSTATE							
	LONGITUDINAL SHLD JT R&S	100.00%	13,200	LIN FT	\$3.00	\$39,600		
	CENTERLINE JT R&S	100.00%	6,600	LIN FT	\$3.00	\$19,800		
	RANDOM CRACK R&S	50.00%	6,600	LIN FT	\$3.00	\$19,800		
	REFLECTIVE TRANSVERSE CRACK R&S	40.00%	4,224	LIN FT	\$3.00	\$12,672		
	PD PVMT PATCH M&F HMA SURF 1.50"	0.10%	18	SQ YD	\$79.59	\$1,433		
		PWF _n = 0.3554			PW = 0.3554 X	\$93,305	\$33,159	
YEAR 40								
	INTERSTATE							
	PAVEMENT PATCH CLASS B	0.50%	88	SQ YD	\$200.00	\$17,600		
	LONGITUDINAL SHLD JT R&S	100.00%	13,200	LIN FT	\$3.00	\$39,600		
	CENTERLINE JT R&S	100.00%	6,600	LIN FT	\$3.00	\$19,800		
	REFLECTIVE TRANSVERSE CRACK R&S	60.00%	6,336	LIN FT	\$3.00	\$19,008		
	RANDOM CRACK R&S	50.00%	6,600	LIN FT	\$3.00	\$19,800		
	PD PVMT PATCH M&F HMA SURF 1.50"	0.50%	88	SQ YD	\$79.59	\$7,004		
		PWF _n = 0.3066			PW = 0.3066 X	\$122,812	\$37,649	
							\$595,949	
	ROUTINE MAINTENANCE ACTIVITY					2.50 Lane Miles	\$0.00	\$0
							\$0	
	MAINTENANCE LIFE-CYCLE COST						\$595,949	
45	YEAR LIFE CYCLE	CRF _n = 0.0407852				MAINTENANCE ANNUAL COST PER MILE	\$38,889	

LIFE-CYCLE COST ANALYSIS: NEW DESIGN

Calculated / Revised : 11/20/19 1:40 PM

			JPCP	HMA
CONSTRUCTION	INITIAL COST	PRESENT WORTH	\$2,841,250	\$3,366,101
		ANNUAL COST PER MILE	\$185,409	\$219,659
MAINTENANCE	LIFE-CYCLE COST	PRESENT WORTH	\$595,949	\$882,239
		ANNUAL COST PER MILE	\$38,889	\$57,572
TOTAL	LIFE-CYCLE COST	PRESENT WORTH	\$3,437,199	\$4,248,340
		ANNUAL COST PER MILE	\$224,299	\$277,231

LIFE-CYCLE COST ANALYSIS: FINAL SUMMARY

LOWEST COST OPTION	=====>	JPCP	\$224,299	
OTHER OPTIONS (LOWEST TO HIGHEST):	TYPE / PERCENTAGE	HMA	\$277,231	23.6%