Illinois Department of Transportation

To:	John Fortmann	Attn: District One
From:	John D. Baranzelli	
Subject:	Pavement Design	
Date:	April 11, 2014	

FAP Route 347 (IL 38)
DuPage County
At Winfield Road

The project, submitted to BDE by email memo dated February 26, 2014, will improve the intersection by widening and reconstruction. IL 38 is considered a "high stress" roadway since the design lane MU ADT exceeds 200 vehicles. The LCCA favored a rigid design by more than 10% for the reconstruction of IL 38, and first cost analysis supports the mechanistic design procedure for widening and resurfacing of Winfield Road. The approved pavement design is as follows:

IL 38 (Pavement Reconstruction)

9.75 inches of PCC Jointed Pavement with Tied PCC Shoulder/Curb & Gutter
4 inches of HMA Stabilized Sub-Base
12 inches of Aggregate Subgrade Improvement

Winfield Road (Pavement Widening & Resurfacing)

9 inches of Full Depth HMA with Tied PCC Curb & Gutter
2 inches of Polymerized HMA Surface Course, Mix "F", N90
0.75 inches of Leveling Binder (MM), N70
6.25 inches of HMA Binder Course, IL-19.0, N90
12 inches of Aggregate Subgrade Improvement

Pavement Resurfacing

Cold Milling of Existing HMA Pavement
2.75 inches Minimum
2 inches of Polymerized HMA Surface Course, Mix "F", N90
0.75 inches of Polymerized Leveling Binder (MM), N70

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

Illinois Department of Transportation

Memorandum

To: John D. Baranzelli — Attn: Paul Niedernhofer

From: Jose A. Dominguez — By: Melchor Mangoba / Ojas Patel

Subject: Pavement Analysis*

Date: February 26, 2014

*Route: Illinois Route 38
Limits: at Winfield Road
Section: GYN-1
Current target: 06CY16

County: DuPage
Contract No.: 60W14
Job No.: D-91-185-13

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:

IL 38 – Reconstruction to provide additional channelization at Winfield Road.
Winfield Road (Local Jurisdiction) – Widening and resurfacing to provide additional channelization on the south leg at IL 38.

The project area is considered "High Stress" since the design lane MU ADT exceeds 200 vehicles. A 20-year pavement analysis was performed on the above segments. For the reconstruction portion (IL 38), we recommend a mechanistic rigid pavement design based on the life cycle cost analysis which favors PCC pavement by 15%. For the widening portion (Winfield Road), our recommendation is based on the mechanistic pavement design procedure using a first cost analysis. Our recommendation is as follows:

IL 38
Reconstruction (Resurfacing at the east project limits)
PCC Curb and Gutter (Tied) and PCC Shoulder (Tied) at the west project limits
- 9 ¾" PCC Pavement (Jointed)[1]
- 4" HMA Stabilized Subbase (Sta. 50+91.20 to Sta. 52+71.2)[6]
- 12" Aggregate Subgrade Improvement[5]

Winfield Road[8]
Widening and Resurfacing
PCC Curb and Gutter (Tied)
- 9" Full Depth HMA[7]
  - 2" Polymerized HMA Surface Course, Mix F, N90[2]
  - ¾" Leveling Binder (Machine Method), N70[3]
  - 6 ¼" HMA Binder Course, IL-19.0, N90[4]
- 12" Aggregate Subgrade Improvement[5]

Pavement Resurfacing

Cold Milling of Existing HMA Pavement
2 ¾" Minimum (more if necessary)
2" Polymerized HMA Surface Course, Mix "F", N90[1]
¾" Leveling Binder (Machine Method), N70[3]

[1]Designer Note 1: Use pay item **42000416, PORTLAND CEMENT CONCRETE PAVEMENT, 9 ¾" (JOINTED)** paid for in square yards.

[2]Designer Note 2: Use pay item **40603595, POLYMERIZED HOT-MIX ASPHALT SURFACE COURSE, MIX "F", N90** paid for in tons.

[3]Designer Note 3: Use pay item **40600635, LEVELING BINDER (MACHINE METHOD), N70** paid for in tons.

[4]Designer Note 4: For widening of six feet or less use pay item **35600701, Hot-Mix Asphalt Base Course Widening, 6 ¼"**, paid for in square yards. For widening of greater than six feet use pay item **35501309, Hot-Mix Asphalt Base Course, 6 ¼"**, paid for in square yards.

[5]Designer Note 5: Use pay item **30300112, "AGGREGATE SUBGRADE IMPROVEMENT, 12"**, paid in square yards.

[6]Designer Note 6: Use pay item **31200500, STABILIZED SUBBASE – HOT MIX ASPHALT, 4"**, paid for in square yards.

[7]Designer Note 7: 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.

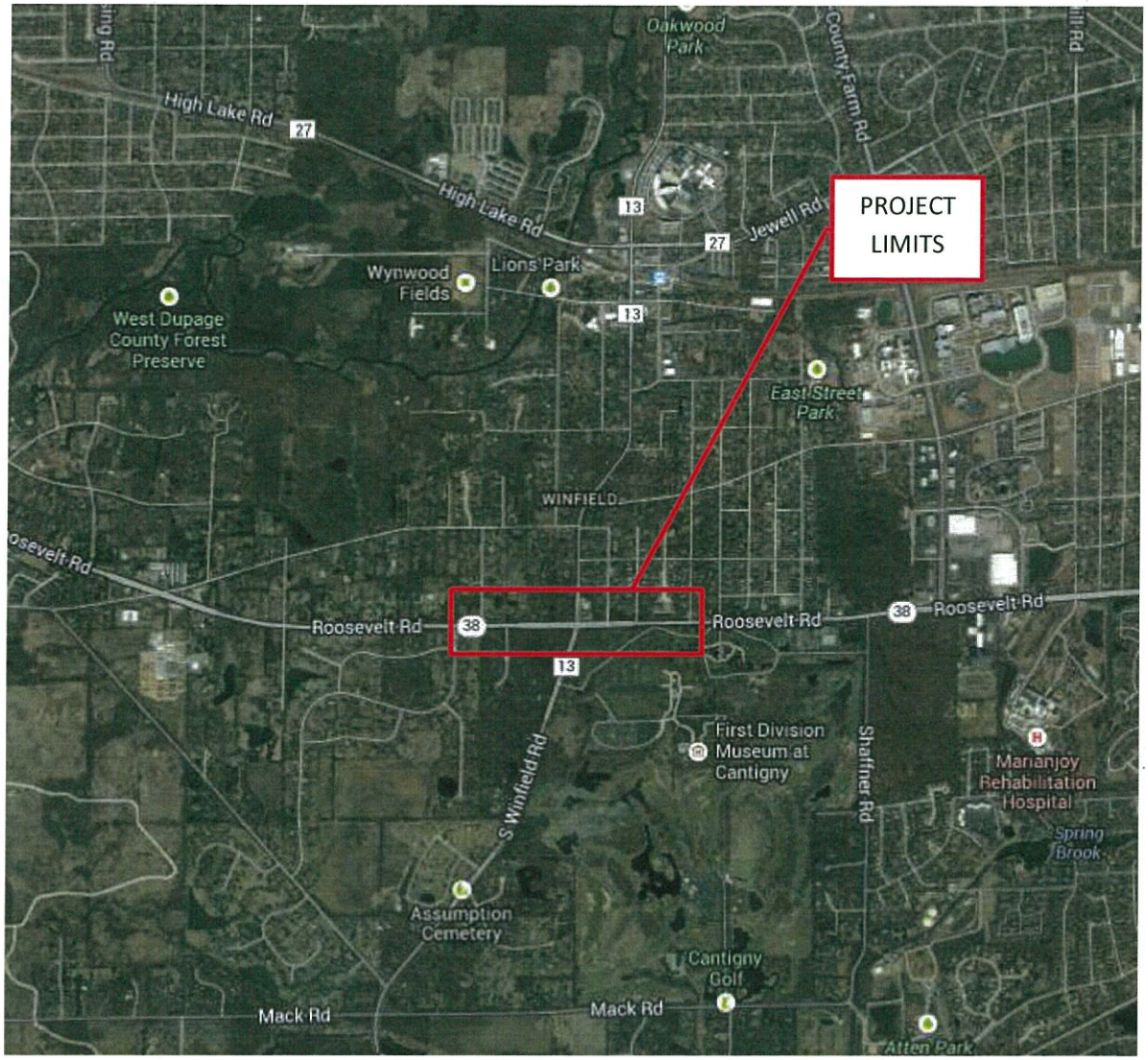
[8]Designer Note 8: Winfield Road is subject to local jurisdictional approval and concurrence.

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

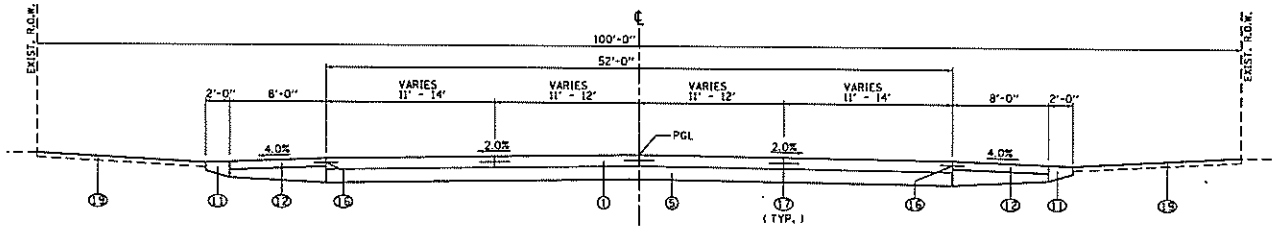
By: José A. Dominguez
Jose A. Dominguez, P.E.
Project Support Engineer

MILHOUSE ENGINEERING & CONSTRUCTION

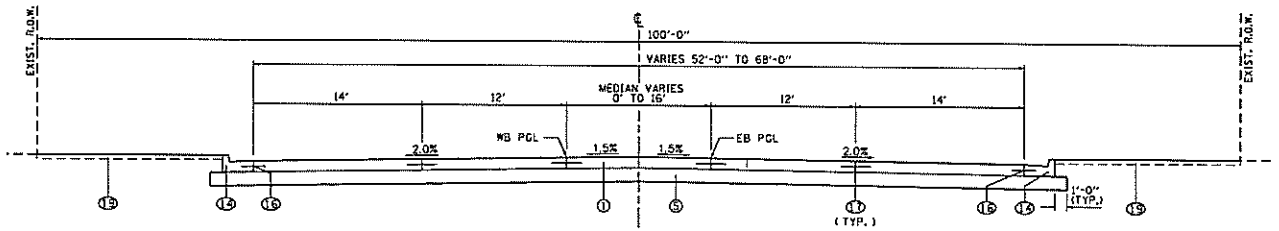
LOCATION MAP



IDOT Contract No.: 60W14
IDOT Section No.: GYN-1
IDOT Job No.: D-91-185-13
FAP Route 347 – Roosevelt Road (IL Route 38) at Winfield Road
DuPage County, Village of Winfield



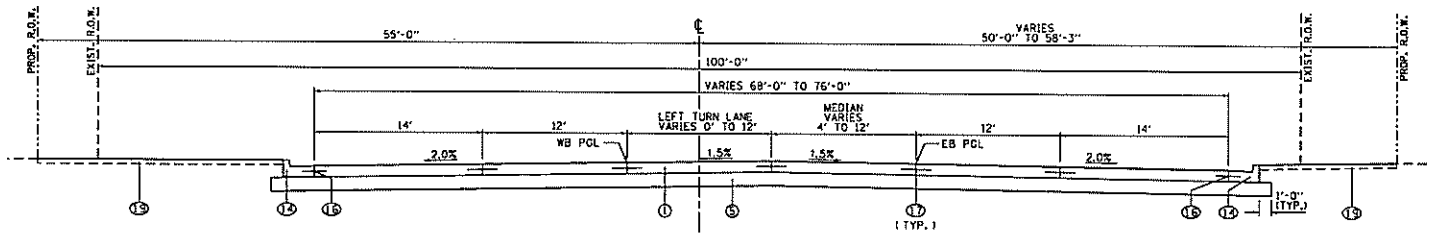
IL ROUTE 38 PROPOSED TYPICAL SECTION
STA. 50+91.20 TO STA. 52+71.20



IL ROUTE 38 PROPOSED TYPICAL SECTION
STA. 52+71.20 TO STA. 57+30.13

LEGEND

- Ⓐ EXISTING PAVEMENT - 12" AND VARIES
- Ⓑ EXISTING AGGREGATE BASE COURSE - 4" AND VARIES
- Ⓒ EXISTING CURB AND GUTTER, TYPE B
- Ⓓ EXISTING PCC SIDEWALK
- Ⓔ EXISTING CURB AND GUTTER, TYPE M
- ① PROPOSED PORTLAND CEMENT CONCRETE PAVEMENT
- ② PROPOSED HOT-MIX ASPHALT SURFACE COURSE
- ③ PROPOSED HOT-MIX ASPHALT LEVELING BINDER COURSE
- ④ PROPOSED PORTLAND CEMENT BASE COURSE
- ⑤ PROPOSED AGGREGATE SUBGRADE IMPROVEMENT 12"
- ⑥ PROPOSED AGGREGATE SUBGRADE IMPROVEMENT 4"
- ⑦ PROPOSED CONCRETE MEDIAN SURFACE, 4"
- ⑧ PROPOSED CONCRETE MEDIAN, TYPE SB
- ⑨ PROPOSED CORRUGATED MEDIAN
- ⑩ PROPOSED COARSE AGGREGATE
- ⑪ PROPOSED AGGREGATE SHOULDER
- ⑫ PROPOSED PCC SHOULDER
- ⑬ PROPOSED COMBINATION CONCRETE CURB AND GUTTER, TYPE B-6.12
- ⑭ PROPOSED COMBINATION CONCRETE CURB AND GUTTER, TYPE B-6.24
- ⑮ PROPOSED COMBINATION CONCRETE CURB AND GUTTER, TYPE M-2.12
- ⑯ PROPOSED #6 30" LONG TIE BAR AT 24" CTS.
- ⑰ PROPOSED #6 30" LONG TIE BAR AT 30" CTS.
- ⑱ PROPOSED PCC SIDEWALK, 5"
- ⑲ PROPOSED TOPSOIL AND SEEDING
- REMOVAL ITEMS



IL ROUTE 38 PROPOSED TYPICAL SECTION
STA. 57+30.13 TO STA. 59+20.00

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USER NAME =	DESIGNED - MKF	REVISED -
	DRAWN - TSJ	REVISED -
PLOT SCALE = 20.0000 '/ in.	CHECKED - JRS	REVISED -
PLOT DATE = 1/30/2014	DATE - 01/01/2014	REVISED -

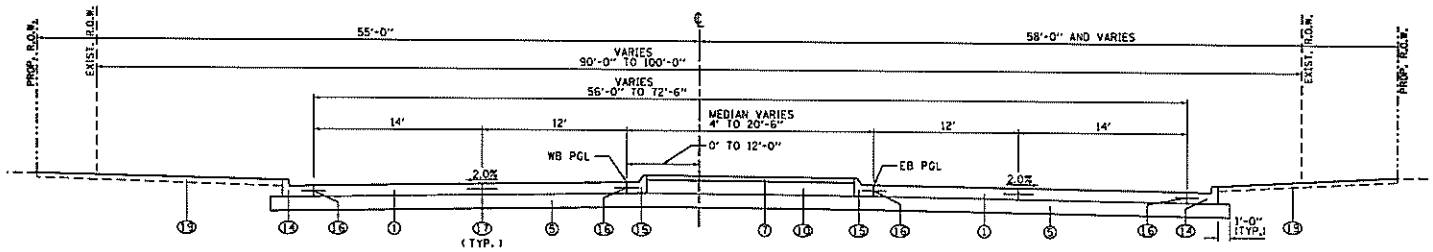
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

IL ROUTE 38
PROPOSED TYPICAL SECTIONS

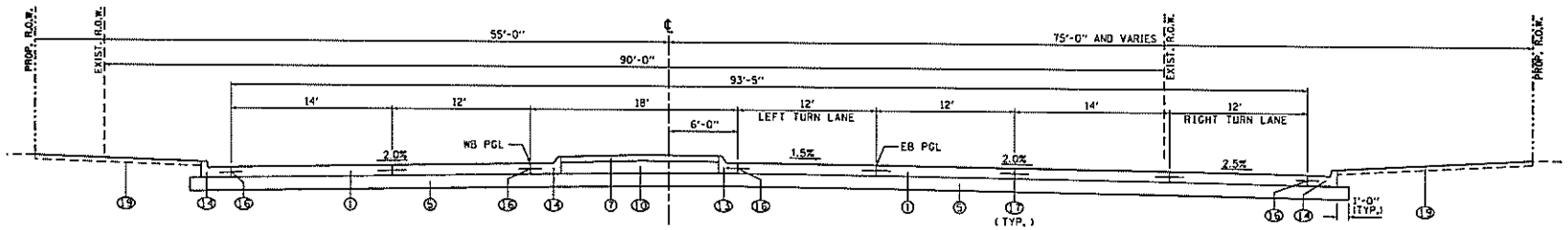
SCALE: NA | SHEET 4 OF 8 SHEETS | STA. | TO STA.

F.A.U. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
347	GYN-1	DUPAGE	XX	6TYS4

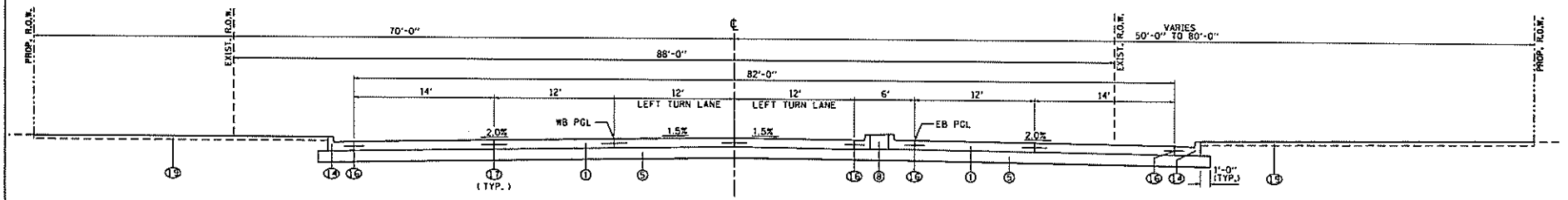
CONTRACT NO. 60W14
ILLINOIS FED. AID PROJECT



IL ROUTE 38 PROPOSED TYPICAL SECTION
STA. 59+20.00 TO STA. 62+00.00



IL ROUTE 38 PROPOSED TYPICAL SECTION
STA. 62+00 TO STA. 66+63.76



IL ROUTE 38 PROPOSED TYPICAL SECTION
STA. 66+63.76 TO STA. 74+31.25

LEGEND

- (A) EXISTING PAVEMENT - 12" AND VARIES
- (B) EXISTING AGGREGATE BASE COURSE - 4" AND VARIES
- (C) EXISTING CURB AND GUTTER, TYPE B
- (D) EXISTING PCC SIDEWALK
- (E) EXISTING CURB AND GUTTER, TYPE M
- REMOVAL ITEMS

- (1) PROPOSED PORTLAND CEMENT CONCRETE PAVEMENT
- (2) PROPOSED HOT-MIX ASPHALT SURFACE COURSE
- (3) PROPOSED HOT-MIX ASPHALT LEVELING BINDER COURSE
- (4) PROPOSED PORTLAND CEMENT BASE COURSE
- (5) PROPOSED AGGREGATE SUBGRADE IMPROVEMENT 12"
- (6) PROPOSED AGGREGATE SUBGRADE IMPROVEMENT 4"
- (7) PROPOSED CONCRETE MEDIAN SURFACE, 4"
- (8) PROPOSED CONCRETE MEDIAN, TYPE SB
- (9) PROPOSED CORRUGATED MEDIAN
- (10) PROPOSED COARSE AGGREGATE
- (11) PROPOSED AGGREGATE SHOULDER
- (12) PROPOSED PCC SHOULDER
- (13) PROPOSED COMBINATION CONCRETE CURB AND GUTTER, TYPE B-6.12
- (14) PROPOSED COMBINATION CONCRETE CURB AND GUTTER, TYPE B-6.24
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- (16) PROPOSED #6 30" LONG TIE BAR AT 24" CTS.
- (17) PROPOSED #6 30" LONG TIE BAR AT 30" CTS.
- (18) PROPOSED PCC SIDEWALK, 5"
- (19) PROPOSED TOPSOIL AND SEEDING

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STATE OF ILLINOIS
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IL ROUTE 38
PROPOSED TYPICAL SECTIONS

SCALE: NA | SHEET 5 OF 8 SHEETS | STA. | TO STA.

F.A.U. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
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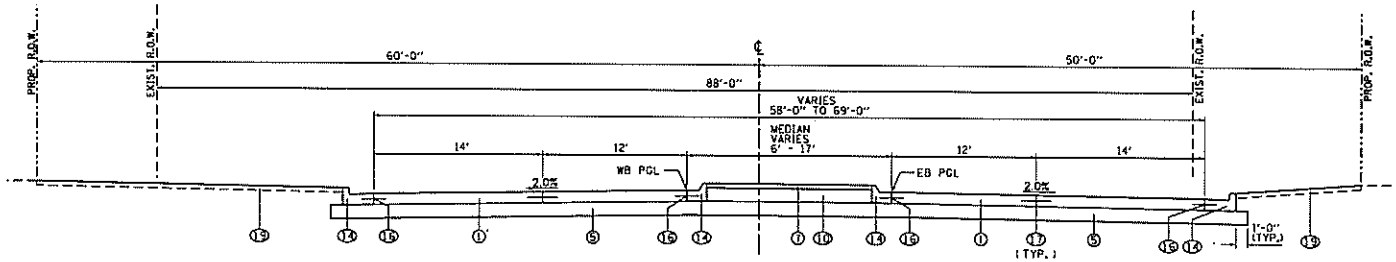
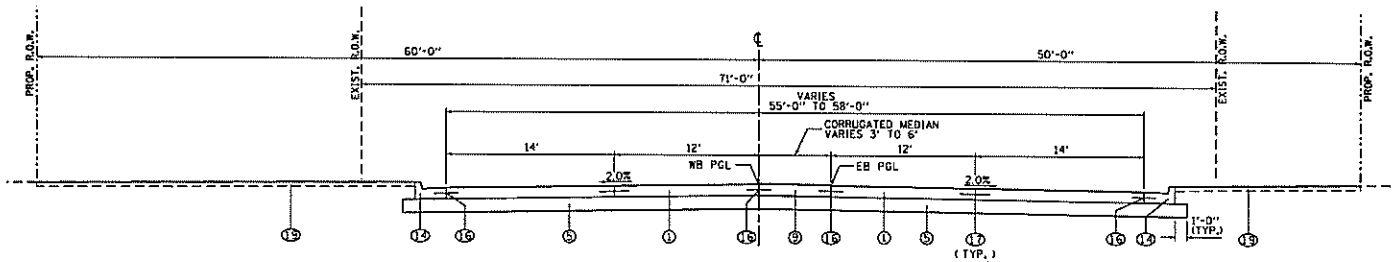
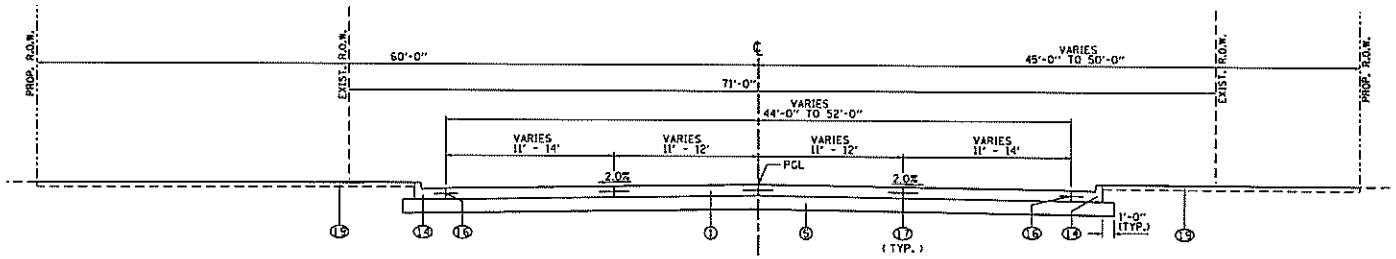
ILLINOIS FED. AID PROJECT



IL ROUTE 38 PROPOSED TYPICAL SECTION
STA. 74+31.25 TO STA. 76+71.40



IL ROUTE 38 PROPOSED TYPICAL SECTION
STA. 76+71.40 TO STA. 78+51.00



IL ROUTE 38 PROPOSED TYPICAL SECTION
STA. 78+51.00 TO STA. 82+68.60

LEGEND

(A)	EXISTING PAVEMENT - 12" AND VARIES
(B)	EXISTING AGGREGATE BASE COURSE - 4" AND VARIES
(C)	EXISTING CURB AND GUTTER, TYPE B
(D)	EXISTING PCC SIDEWALK
(E)	EXISTING CURB AND GUTTER, TYPE M
(1)	PROPOSED PORTLAND CEMENT CONCRETE PAVEMENT
(2)	PROPOSED HOT-MIX ASPHALT SURFACE COURSE
(3)	PROPOSED HOT-MIX ASPHALT LEVELING BINDER COURSE
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(7)	PROPOSED CONCRETE MEDIAN SURFACE, 4"
(8)	PROPOSED CONCRETE MEDIAN, TYPE SB
(9)	PROPOSED CORRUGATED MEDIAN
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(12)	PROPOSED PCC SHOULDER
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(17)	PROPOSED #6 30" LONG TIE BAR AT 30" CTS.
(18)	PROPOSED PCC SIDEWALK, 5"
(19)	PROPOSED TOPSOIL AND SEEDING
	REMOVAL ITEMS

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PLOT DATE = 1/30/2014	DATE - 01/01/2014	REVISED -	

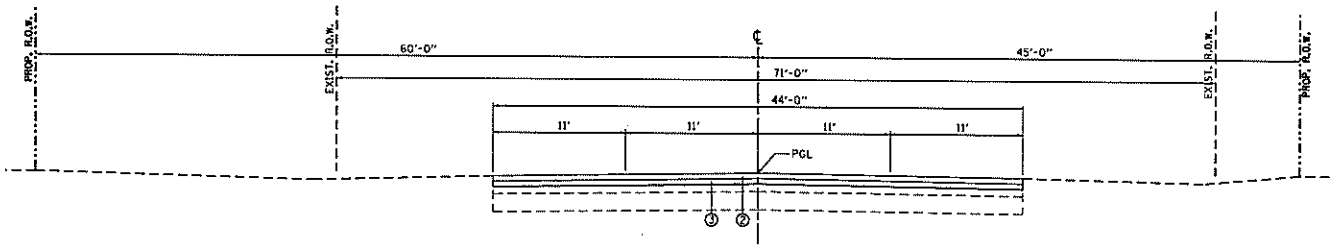
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

IL ROUTE 38
PROPOSED TYPICAL SECTIONS

SCALE: NA | SHEET 6 OF 8 SHEETS | STA. | TO STA.

F.A.U. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
347	GYN-1	DUPAGE	XX	*TY7*

CONTRACT NO. 60W14
ILLINOIS FED. AID PROJECT



IL ROUTE 38 PROPOSED TYPICAL SECTION
RESURFACING STA. 82+68.60 TO STA. 85+57.50

LEGEND

- Ⓐ EXISTING PAVEMENT - 12" AND VARIES
- Ⓑ EXISTING AGGREGATE BASE COURSE - 4" AND VARIES
- Ⓒ EXISTING CURB AND GUTTER, TYPE B
- Ⓓ EXISTING PCC SIDEWALK
- Ⓔ EXISTING CURB AND GUTTER, TYPE M
- ① PROPOSED PORTLAND CEMENT CONCRETE PAVEMENT
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- ⑱ PROPOSED PCC SIDEWALK, 5"
- ⑲ PROPOSED TOPSOIL AND SEEDING
- ▨ REMOVAL ITEMS

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	DRAWN - TSJ	REVISED -	
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PLOT DATE = 1/30/2014	DATE - 01/01/2014	REVISED -	

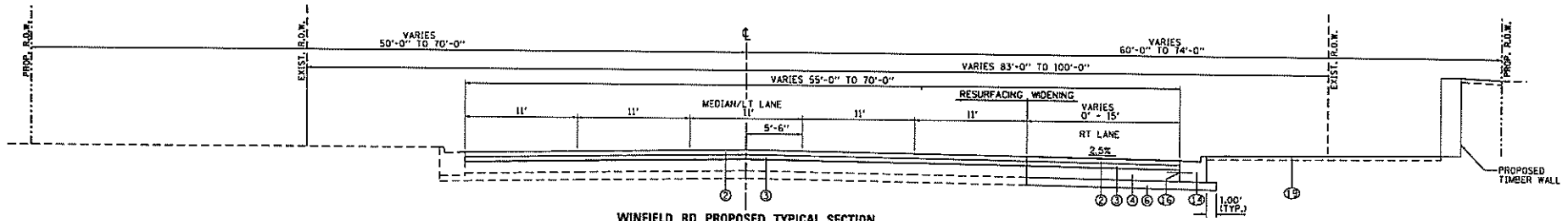
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

IL ROUTE 38
PROPOSED TYPICAL SECTIONS

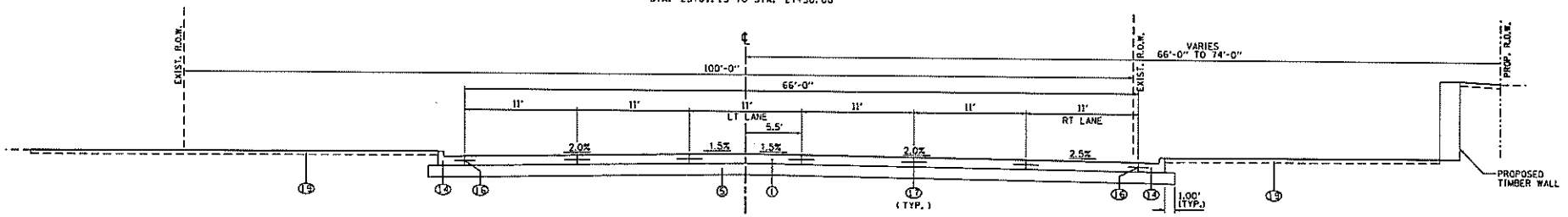
SCALE: NA | SHEET 7 OF 8 SHEETS | STA. | TO STA.

F.A.U. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
347	GYN-1	DUPAGE	XX	8TY7a

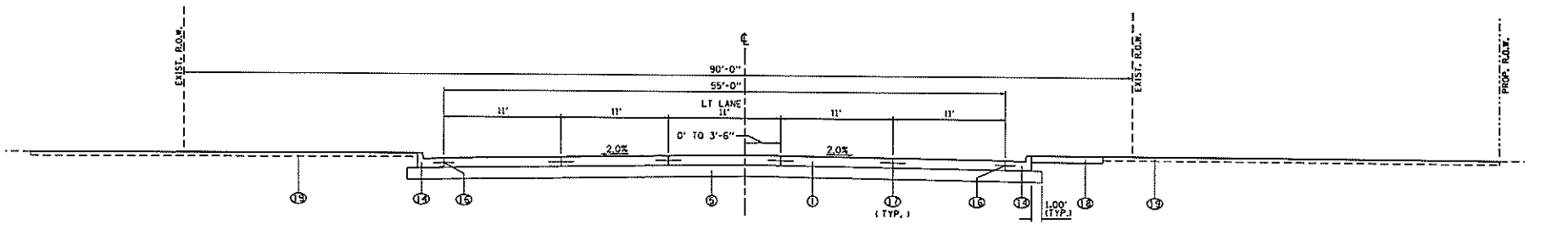
CONTRACT NO. 60W14
ILLINOIS FED. AID PROJECT



WINFIELD RD PROPOSED TYPICAL SECTION
STA. 23+01.13 TO STA. 27+50.00



WINFIELD RD PROPOSED TYPICAL SECTION
STA. 27+50.00 TO STA. 28+52.77



WINFIELD RD PROPOSED TYPICAL SECTION
STA. 30+00.00 TO STA. 30+47.51

LEGEND

- Ⓐ EXISTING PAVEMENT - 12" AND VARIES
- Ⓑ EXISTING AGGREGATE BASE COURSE - 4" AND VARIES
- Ⓒ EXISTING CURB AND GUTTER, TYPE B
- Ⓓ EXISTING PCC SIDEWALK
- Ⓔ EXISTING CURB AND GUTTER, TYPE M
- ▨ REMOVAL ITEMS

- ① PROPOSED PORTLAND CEMENT CONCRETE PAVEMENT
- ② PROPOSED HOT-MIX ASPHALT SURFACE COURSE
- ③ PROPOSED HOT-MIX ASPHALT LEVELING BINDER COURSE
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- ⑲ PROPOSED TOPSOIL AND SEEDING

RS&H IMPROVING YOUR WORLD

USER NAME =	DESIGNED - MXF	REVISED -
	DRAWN - TSJ	REVISED -
PLOT SCALE =	CHECKED - JRS	REVISED -
PLOT DATE = 1/30/2014	DATE - 01/01/2014	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

WINFIELD ROAD
PROPOSED TYPICAL SECTIONS

SCALE: NA | SHEET 8 OF 8 SHEETS | STA. | TO STA.

F.A.U. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
347	GYN-1	DUPAGE	XX	*TY2*
		CONTRACT NO. 60W14		
		ILLINOIS FED. AID PROJECT		

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BDE 5401 Template (Rev. 09/05/2013)

IDOT MECHANISTIC PAVEMENT DESIGN

Printed: 08/12/2014

PROJECT AND TRAFFIC INPUTS

(Enter Data in Gray Shaded Cells)

Route: IL 38
Section: GYN-1
County: DuPage
Location: at Winfield

Comments: IL 38 @ Winfield (Phase II)
BDE Approval Required
Design Date: 02/21/2014 ONP <-- BY
Modify Date: <-- BY

	ADT	Year
Current:	29,400	2003
Future:	35,000	2030

Facility Type: Other Marked State Route
# of Lanes = 4
Road Class: I
Subgrade Support Rating (SSR): Poor
Construction Year: 2016
Design Period (DP) = 20 years

	Minimum ADT	Structural Design Traffic: Actual ADT	Actual %of Total ADT	% of ADT in Design Lane
PV =	0	31,403	91.9%	P = 32%
SU =	250	1,777	5.2%	S = 45%
MU =	750	991	2.9%	M = 45%
Struct. Design ADT =		34,170	(2026)	

TRAFFIC FACTOR CALCULATION

FLEXIBLE PAVEMENT

Cpv =	0.15	
Csu =	132.5	
Cmu =	482.53	
TF flexible (Actual) =	6.45	(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) =	8.54	(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 = 6.45
PG Grade Lower Binder Lifts = PG 64-22 (Fig. 53-4.R)
Goto Map
HMA Mixture Temp. = 75.0 deg. F (Fig. 54-5.C)
Design HMA Mixture Modulus (E_{HMA}) = 690 ksi (Fig. 54-5.D)
Design HMA Strain (ε_{HMA}) = 71 (Fig. 54-5.E)
Goto Map
Full Depth HMA Design Thickness = 11.25 in. (Fig. 54-5.F)
Limiting Strain Criterion Thickness = 14.75 in. (Fig. 54-5.I)

Use Full-Depth HMA Thickness = 11.25 inches

JPC Pavement

Use TF rigid = 8.54
Edge Support = Tied Shoulder or C.&G.

Rigid Pavt Thick. = 9.75 in. (Fig. 54-4.E)

CRC Pavement

Use TF rigid = 8.54
IBR value = 3

CRCP Thickness = 8.75 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 = 6.45
HMA Overlay Design Thickness = 8.75 in. (Fig. 54-5.U)
Goto Map
Limiting Strain Criterion Thickness = in. (Fig. 54-5.V)

Use HMA Overlay Thickness = 999.00 inches

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 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%

BDE 5401 Template (Rev. 09/05/2013) Printed: 08/12/2014

LIFE-CYCLE COST ANALYSIS: NEW CONSTRUCTION / RECONSTRUCTION

FULL-DEPTH HMA PAVEMENT

Standard Design

ROUTE		IL 38	
SECTION		GYN-1	
COUNTY		DuPage	
LOCATION		at Winfield	
FACILITY TYPE		NON-INTERSTATE	
PROJECT LENGTH		3180 FT	= = > 0.60 Miles
# OF CENTERLINES		1 CL	
# OF LANES		4 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)	11.25 IN	14.75 IN MAX
SHOULDER THICKNESS	8.00 IN	HMA_SD Standard Design
POLICY OVERLAY THICKNESS	2.25 IN	

FLEX PAVEMENT TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
	3.56	6.45	6.45

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)	(11.25")	16,960	SQ YD		$54.98 / SQ YD	$0	
HMA SURFACE COURSE	(2.00")	16,960	SQ YD	*	$10.16 / SQ YD	$172,314	~
HMA TOP BINDER COURSE	(2.25")	16,960	SQ YD	*	$9.65 / SQ YD	$163,664	~
HMA LOWER BINDER COURSE	(7.00")	16,960	SQ YD	*	$26.57 / SQ YD	$450,627	~
HMA SHOULDER	(8.00")	0	TONS		$72.00 / TON	$0	~
CURB & GUTTER		0	LIN FT		$30.00 / LIN FT	$0	
SUBBASE GRAN MATL TY C (TONS)		58	TONS		$25.00 / TON	$1,450	
IMPROVED SUBGRADE:	Modified Soil	17,976	SQ YD		$7.00 / SQ YD	$125,832	
Reserved For User Supplied Item		0	UNITS		$0.00 / UNITS	$0	
Reserved For User Supplied Item		0	UNITS		$0.00 / UNITS	$0	
PAVEMENT REMOVAL		16,960	SQ YD		$15.00 / SQ YD	$254,400	
SHOULDER REMOVAL		0	SQ YD		$0.00 / SQ YD	$0	

Note: * Denotes User Supplied Quantity

FLEXIBLE CONSTRUCTION INITIAL COST	$1,168,287
FLEXIBLE CONSTRUCTION ANNUAL COST PER MILE	$79,115

MAINTENANCE COSTS:

ITEM		THICKNESS	MATERIAL	UNIT COST
ROUTINE MAINTENANCE ACTIVITY				$0.00 LANE-MILE / YEAR
HMA OVERLAY PVMT SURF		(2.00")	Surface Mix	$10.16 / SQ YD
HMA OVERLAY PVMT		(2.25")		$11.43 / SQ YD
HMA SURFACE MIX		(1.50")	Surface Mix	$6.35 / SQ YD
HMA BINDER MIX		(0.75")	eling Binder Mix	$2.85 / 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	$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	$1,554,195
FLEXIBLE TOTAL ANNUAL COST PER MILE	$105,248

HMA_SD

MAINTENANCE AND REHABILITATION ACTIVITY SCHEDULE 08/12/14

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%	6,360	LIN FT	$2.00	$12,720	
	CNTR LINE JOINT R&S	100.00%	3,180	LIN FT	$2.00	$6,360	
	RNDM / THRM CRACK R&S	50.00%	6,996	LIN FT	$2.00	$13,992	
	PD PVMT PATCH M&F SURF	0.10%	17	SQ YD	$80.64	$1,371	
	PWFn =	0.8626		PW =	0.8626 X	$34,443	$29,711
YEAR 10							
	LONG SHLD JT R&S	100.00%	6,360	LIN FT	$2.00	$12,720	
	CNTR LINE JOINT R&S	100.00%	3,180	LIN FT	$2.00	$6,360	
	RNDM / THRM CRACK R&S	50.00%	6,996	LIN FT	$2.00	$13,992	
	PD PVMT PATCH M&F SURF	0.50%	85	SQ YD	$80.64	$6,854	
	PWFn =	0.7441		PW =	0.7441 X	$39,926	$29,709
YEAR 15							
	MILL PVMT & SHLD 2.00"	100.00%	16,960	SQ YD	$3.00	$50,880	
	PD PVMT PATCH M&F ADD'L 2.00"	1.00%	170	SQ YD	$79.52	$13,518	
	HMA OVERLAY PVMT 2.00"	100.00%	16,960	SQ YD	$10.16	$172,314	
	HMA OVERLAY SHLD 2.00 "	100.00%	0	SQ YD	$8.06	$0	
	PWFn =	0.6419		PW =	0.6419 X	$236,712	$151,936
YEAR 20							
	LONG SHLD JT R&S	100.00%	6,360	LIN FT	$2.00	$12,720	
	CNTR LINE JOINT R&S	100.00%	3,180	LIN FT	$2.00	$6,360	
	RNDM / THRM CRACK R&S	50.00%	6,996	LIN FT	$2.00	$13,992	
	PD PVMT PATCH M&F SURF	0.10%	17	SQ YD	$80.64	$1,371	
	PWFn =	0.5537		PW =	0.5537 X	$34,443	$19,070
YEAR 25							
	LONG SHLD JT R&S	100.00%	6,360	LIN FT	$2.00	$12,720	
	CNTR LINE JOINT R&S	100.00%	3,180	LIN FT	$2.00	$6,360	
	RNDM / THRM CRACK R&S	50.00%	6,996	LIN FT	$2.00	$13,992	
	PD PVMT PATCH M&F SURF	0.50%	85	SQ YD	$80.64	$6,854	
	PWFn =	0.4776		PW =	0.4776 X	$39,926	$19,069
	HMA_SD						
YEAR 30	NON-INTERSTATE						
	MILL PVMT & SHLD 2.00"	100.00%	16,960	SQ YD	$3.00	$50,880	
	PD PVMT PATCH M&F ADD'L 2.00"	2.00%	339	SQ YD	$79.52	$26,957	
	PD SHLD PATCH M&F ADD'L 2.00"	1.00%	0	SQ YD	$78.06	$0	
	HMA OVERLAY PVMT 2.25 "	100.00%	16,960	SQ YD	$11.43	$193,853	
	HMA OVERLAY SHLD 2.25 "	100.00%	0	SQ YD	$9.07	$0	
	PWFn =	0.4120		PW =	0.4120 X	$271,690	$111,933
YEAR 35							
	LONG SHLD JT R&S	100.00%	6,360	LIN FT	$2.00	$12,720	
	CNTR LINE JOINT R&S	100.00%	3,180	LIN FT	$2.00	$6,360	
	RNDM / THRM CRACK R&S	50.00%	6,996	LIN FT	$2.00	$13,992	
	PD PVMT PATCH M&F SURF	0.10%	17	SQ YD	$80.64	$1,371	
	PWFn =	0.3554		PW =	0.3554 X	$34,443	$12,240
YEAR 40							
	LONG SHLD JT R&S	100.00%	6,360	LIN FT	$2.00	$12,720	
	CNTR LINE JOINT R&S	100.00%	3,180	LIN FT	$2.00	$6,360	
	RNDM / THRM CRACK R&S	50.00%	6,996	LIN FT	$2.00	$13,992	
	PD PVMT PATCH M&F SURF	0.50%	85	SQ YD	$80.64	$6,854	
	PWFn =	0.3066		PW =	0.3066 X	$39,926	$12,240
							$385,908
	ROUTINE MAINTENANCE ACTIVITY		2.41	Lane Miles	0.00	$0	$0
					MAINTENANCE LIFE-CYCLE COST		$385,908
45	YEAR LIFE CYCLE	CRFn = 0.0407852			MAINTENANCE ANNUAL COST PER MILE		$26,133

PCC PAVEMENT

JPCP

ROUTE			**IL 38**	
SECTION			**GYN-1**	
COUNTY			**DuPage**	
LOCATION			**at Winfield**	
FACILITY TYPE			**NON-INTERSTATE**	
PROJECT LENGTH			**3180** FT = = >	0.60 Miles
# OF CENTERLINES			**1** CL	
# OF LANES			**4** 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**	**9.75** IN	TIED SHLD
SHOULDER THICKNESS		**9.75** IN	

POLICY OVERLAY THICKNESS **2.50** IN

RIGID PAVEMENT TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
	5.02	**8.54**	**8.54**
Worksheet Construction Type is Reconstruction		**The Pavement Type is**	**JPCP**

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT		UNIT PRICE		COST
JPC PAVEMENT	(9.75")	16,960	SQ YD		**$41.56**	/ SQ YD	$704,858
PAVEMENT REINFORCEMENT		0	SQ YD		**$22.00**	/ SQ YD	$0
STABILIZED SUBBASE	(4.00")	960	SQ YD	*	**$19.00**	/ SQ YD	$18,240
PCC SHOULDERS	(9.75" to 9.75")	0	SQ YD		**$40.00**	/ SQ YD	$0
CURB & GUTTER		0	LIN FT		**$30.00**	/ LIN FT	$0
SUBBASE GRAN MATL TY C	(~ 0.00")	0	TONS		**$25.00**	/ TON	$0
IMPROVED SUBGRADE:	Modified Soil Width = 49.0'	17,313	SQ YD		**$7.00**	/ SQ YD	$121,191
Reserved For User Supplied Item		0	**UNITS**		**$0.00**	/ UNITS	$0
Reserved For User Supplied Item		0	**UNITS**		**$0.00**	/ UNITS	$0
PAVEMENT REMOVAL		16,960	SQ YD		**$15.00**	/ SQ YD	$254,400
SHOULDER REMOVAL		0	SQ YD		**$0.00**	/ SQ YD	$0

Note: * Denotes User Supplied Quantity

RIGID CONSTRUCTION INITIAL COST	$1,098,689
RIGID CONSTRUCTION ANNUAL COST PER MILE	$74,402

MAINTENANCE COSTS:

ITEM	THICKNESS	MATERIAL	T	UNIT COST	
ROUTINE MAINTENANCE ACTIVITY				**$0.00**	/ LANE-MILE / YEAR
HMA POLICY OVERLAY	(2.50")		2.50		
HMA POLICY OVERLAY PVMT	(2.50")	1.0040	2.50	**$12.70**	/ SQ YD
HMA SURFACE MIX	(1.50")	1.0025 Surface Mix	1.50	**$6.35**	/ SQ YD
HMA BINDER MIX	(1.00")	1.0059 eling Binder Mix	1.00	**$3.79**	/ SQ YD
HMA POLICY OVERLAY SHLD	(2.50")	Shoulder Mix	2.50	**$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	1.50	**$77.98**	/ SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA 2.50")		Surface Mix	2.50	**$83.30**	/ 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	$1,343,950
RIGID TOTAL ANNUAL COST PER MILE	$91,011

MAINTENANCE AND REHABILITATION ACTIVITY SCHEDULE 08/12/14

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%	17	SQ YD	$150.00		$2,550	
	PWFn =	0.7441		PW =	0.7441	X	$2,550	$1,897
YEAR 15								
	PAVEMENT PATCH CLASS B	0.20%	34	SQ YD	$150.00		$5,100	
	PWFn =	0.6419		PW =	0.6419	X	$5,100	$3,273
YEAR 20								
	PAVEMENT PATCH CLASS B	2.00%	339	SQ YD	$150.00		$50,850	
	SHOULDER PATCH CLASS C	0.50%	0	SQ YD	$145.00		$0	
	LONGITUDINAL SHLD JT R&S	100.00%	6,360	LIN FT	$2.00		$12,720	
	CENTERLINE JT R&S	100.00%	3,180	LIN FT	$2.00		$6,360	
	PWFn =	0.5537		PW =	0.5537	X	$69,930	$38,719
YEAR 25								
	PAVEMENT PATCH CLASS B	3.00%	509	SQ YD	$150.00		$76,350	
	SHOULDER PATCH CLASS C	1.00%	0	SQ YD	$145.00		$0	
	PWFn =	0.4776		PW =	0.4776	X	$76,350	$36,465
YEAR 30	NON-INTERSTATE							
	PAVEMENT PATCH CLASS B	4.00%	678	SQ YD	$150.00		$101,700	
	SHOULDER PATCH CLASS C	1.50%	0	SQ YD	$145.00		$0	
	HMA POLICY OVERLAY 2.5" (PVMT)	100.00%	16,960	SQ YD	$12.70		$215,392	
	HMA POLICY OVERLAY 2.5" (SHLD)	100.00%	0	SQ YD	$10.08		$0	
	PWFn =	0.4120		PW =	0.4120	X	$317,092	$130,638
YEAR 35	NON-INTERSTATE							
	LONGITUDINAL SHLD JT R&S	100.00%	6,360	LIN FT	$2.00		$12,720	
	CENTERLINE JT R&S	100.00%	3,180	LIN FT	$2.00		$6,360	
	RANDOM CRACK R&S	50.00%	6,360	LIN FT	$2.00		$12,720	
	REFLECTIVE TRANSVERSE CRACK R&S	40.00%	4,070	LIN FT	$2.00		$8,140	
	PD PVMT PATCH M&F HMA 2.50"	0.10%	17	SQ YD	$83.30		$1,416	
	PWFn =	0.3554		PW =	0.3554	X	$41,356	$14,697
YEAR 40	NON-INTERSTATE							
	PAVEMENT PATCH CLASS B	0.50%	85	SQ YD	$150.00		$12,750	
	LONGITUDINAL SHLD JT R&S	100.00%	6,360	LIN FT	$2.00		$12,720	
	CENTERLINE JT R&S	100.00%	3,180	LIN FT	$2.00		$6,360	
	REFLECTIVE TRANSVERSE CRACK R&S	60.00%	6,106	LIN FT	$2.00		$12,212	
	RANDOM CRACK R&S	50.00%	6,360	LIN FT	$2.00		$12,720	
	PD PVMT PATCH M&F HMA 2.50"	0.50%	85	SQ YD	$83.30		$7,081	
	PWFn =	0.3066		PW =	0.3066	X	$63,843	$19,572
								$245,261
	ROUTINE MAINTENANCE ACTIVITY		2.41	Lane Miles	$0.00		$0	$0
					MAINTENANCE LIFE-CYCLE COST			$245,261
45	YEAR LIFE CYCLE	CRFn = 0.0407852			MAINTENANCE ANNUAL COST PER MILE			$16,609

LIFE-CYCLE COST ANALYSIS: NEW DESIGN

Calculated / Revised : 2/26/14 8:06 AM

			JPCP	HMA
CONSTRUCTION	INITIAL COST	PRESENT WORTH	$1,098,689	$1,168,287
		ANNUAL COST PER MILE	$74,402	$79,115
MAINTENANCE	LIFE-CYCLE COST	PRESENT WORTH	$245,261	$385,908
		ANNUAL COST PER MILE	$16,609	$26,133
TOTAL	LIFE-CYCLE COST	PRESENT WORTH	$1,343,950	$1,554,195
		ANNUAL COST PER MILE	$91,011	$105,248

LIFE-CYCLE COST ANALYSIS: FINAL SUMMARY

LOWEST COST OPTION	==========>	**JPCP**	**$91,011**	
OTHER OPTIONS (LOWEST TO HIGHEST):	TYPE / PERCENTAGE	**HMA**	**$105,248**	**15.6%**

P:\Pavement Design Stuff\D-1\IL 38 at Winfield Road\Pavement Design Files\[IDOT Mechanistic IL 38.xlsm]LifeCycleCost

BDE 5401 Template (Rev. 09/05/2013)

IDOT MECHANISTIC PAVEMENT DESIGN

Printed: 08/12/2014

PROJECT AND TRAFFIC INPUTS

(Enter Data in Gray Shaded Cells)

Route: Winfield Road
Section: GYN-1
County: DuPage
Location: at IL 38

Comments: IL 38 @ Winfield (Phase II)
BDE Approval Required
Design Date: 02/21/2014 ONP <-- BY
Modify Date: <-- BY

	ADT	Year
Current:	19,700	2003
Future:	21,000	2030

Facility Type: Unmarked State Route
# of Lanes = 4
Road Class: I
Subgrade Support Rating (SSR): Poor
Construction Year: 2016
Design Period (DP) = 20 years

	Minimum ADT	Structural Design Traffic: Actual ADT	Actual %of Total ADT	% of ADT in Design Lane
PV =	No Min	20,142	96.8%	P = 32%
SU =	No Min	395	1.9%	S = 45%
MU =	No Min	270	1.3%	M = 45%
Struct. Design ADT =		20,807	(2026)	

TRAFFIC FACTOR CALCULATION

FLEXIBLE PAVEMENT

Cpv =	0.15	
Csu =	132.5	
Cmu =	482.53	
TF flexible (Actual) =	1.67	(Actual ADT)
TF flexible (Min) =	No Min	(Min ADT Fig. 54-2.C)

RIGID PAVEMENT

Cpv =	0.15	
Csu =	143.81	
Cmu =	696.42	
TF rigid (Actual) =	2.23	(Actual ADT)
TF rigid (Min) =	No Min	(Min ADT Fig. 54-2.C)

NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS

Full-Depth HMA Pavement

Use TF flexible = 1.67
PG Grade Lower Binder Lifts = PG 64-22 (Fig. 53-4.R)
Goto Map
HMA Mixture Temp. = 75.0 deg. F (Fig. 54-5.C)
Design HMA Mixture Modulus (E_{HMA}) = 690 ksi (Fig. 54-5.D)
Design HMA Strain (ε_{HMA}) = 104 (Fig. 54-5.E)
Goto Map
Full Depth HMA Design Thickness = 9.00 in. (Fig. 54-5.F)
Limiting Strain Criterion Thickness = 14.75 in. (Fig. 54-5.I)

Use Full-Depth HMA Thickness = 9.00 inches

JPC Pavement

Use TF rigid = 2.23
Edge Support = Tied Shoulder or C.&G.

Rigid Pavt Thick. = 8.25 in. (Fig. 54-4.E)

CRC Pavement

Use TF rigid = 2.23
IBR value = 3

CRCP Thickness = 7.00 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 = 1.67
Goto Map
HMA Overlay Design Thickness = 6.25 in. (Fig. 54-5.U)
Limiting Strain Criterion Thickness = in. (Fig. 54-5.V)

Use HMA Overlay Thickness = 999.00 inches

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 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	Rigid Cmu	Flexible (Fig. 54-5.B) Csu	Flexible 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	Rural S	Rural M	Urban P	Urban S	Urban 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%

First Cost Analysis of Widening Project

Date: 2/26/2014
Quantities by: ONP
Unit prices by: MM

Checked by:
Checked by:
Net Length 450 feet

Route Winfield Road
Section GYN-1
County DuPage
Project IL 38 @ Winfield
Contract

Mechanistic Flexible

Area (Sq. Yd.)	Height (inches)	Weight (Tons)	Material		Unit Cost	Total	ITEM #
		0	HMA **Surface** Course, MIX "D" N50	@		$0.00	40603335
		0	HMA **Surface** Course, MIX "D" N70	@		$0.00	40603340
460	2	52	Poly HMA **Surface** Course, MIX "F" N90	@	$90	$4,636.80	40603595
		0	Poly HMA **Surface** Course, SMA N80	@		$0.00	40603153
		0	HMA **Binder** course, IL-19, N50	@		$0.00	40603080
460	0.75	19	HMA **Binder** course, IL-19, N70	@	$75	$1,449.00	40603085
460	6.25	161	HMA **Binder** course, IL-19, N90	@	$80	$12,880.00	40603090
		0	Poly HMA **Binder** course, IL-19, N90	@		$0.00	40603240
		0	HMA **Binder** course, SMA, N80	@		$0.00	40603148
	NA	NA	12" Aggregate Subgrade	@		$0.00	30300112
			Total			**$18,965.80**	

Modified AASHTO

Area (Sq. Yd.)	Height (inches)	Weight (Tons)	Material		Unit Cost	Total	ITEM #
		0	HMA **Surface** Course, MIX "D" N50	@		$0.00	40603335
		0	HMA **Surface** Course, MIX "D" N70	@		$0.00	40603340
460	2	52	Poly HMA **Surface** Course, MIX "F" N90	@	$90	$4,636.80	40603595
		0	Poly HMA **Surface** Course, SMA N80	@		$0.00	40603153
		0	HMA **Binder** course, IL-19, N50	@		$0.00	40603080
460	0.75	19	HMA **Binder** course, IL-19, N70	@	$70	$1,352.40	40603085
460	7.25	187	HMA **Binder** course, IL-19, N90	@	$80	$14,940.80	40603090
		0	Poly HMA **Binder** course, IL-19, N90	@		$0.00	40603240
		0	HMA **Binder** course, SMA, N80	@		$0.00	40603148
	NA	NA	12" Aggregate Subgrade	@		$0.00	30300112
			Total			**$20,930.00**	

Composite

Area (Sq. Yd.)	Height (inches)	Weight (Tons)	Material		Unit Cost	Total	ITEM #
		0	HMA **Surface** Course, MIX "D" N50	@		$0.00	40603335
460	0.75	19	HMA **Surface** Course, MIX "D" N70	@	$70	$1,352.40	40603340
460	2	52	Poly HMA **Surface** Course, MIX "F" N90	@	$90	$4,636.80	40603595
		0	Poly HMA **Surface** Course, SMA N80	@		$0.00	40603153
460	7.25	NA	PCC Base Course	@	$47	$21,620.00	35300410
	NA	NA	12" Aggregate Subgrade	@		$0.00	30300112
			Total			**$27,609.20**	