Illinois Department of Transportation

To:	John Fortman	Attn: District One
From:	John D. Baranzelli	
Subject:	Pavement Design	
Date:	September 4, 2012	

IL 83 (Elmhurst Road) & Oakton Street
Section 03-96-0021
Cook County
At Elgin-O'Hare Expressway

We have reviewed the pavement selection for the project, which was submitted to BDE by email dated August 20, 2012. The project will reconstruct IL 83 and Oakton Street at the Elgin-O'Hare Expressway. The life cycle cost analysis IL 83 favored the rigid design by 15.8%, and Oakton Street by 25.6%. The approved pavement design for this project is as follows:

IL 83 [Elmhurst Road][Pavement Reconstruction]

10.25 inches of PCC Jointed Pavement with Tied PCC Curb and Gutter
4.5 HMA Stabilized Subbase
12 inches of Aggregate Subgrade Improvement

IL 83 [Elmhurst Road][Pavement Widening]

11.25 inches Full Depth
1.75 inches of HMA Polymerized Surface Course, Mix "F", N90
0.75 inches of HMA Polymerized Leveling Binder Method, IL-4.75 N50
8.75 inches of HMA Binder Course IL-19, N90

12 inches of Aggregate Subgrade Improvement

Oakton Street][Pavement Reconstruction]

9.5 inches of PCC Jointed Pavement with Tied PCC Curb and Gutter
12 inches of Aggregate Subgrade Improvement

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:	John Fortmann	By: Jose Dominguez
Subject:	Pavement Analysis	
Date:	August 20, 2012*	

*Route: IL-83 (Elmhurst Road) and Oakton Street
Limits: at Elgin-O'Hare Expressway
Contract No.: 11838
Letting: By ISTHA

Section: 03-96-0021
County: Cook
Job No.: P-91-443-06

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

a.) Reconstruction of IL-83 (Elmhurst Road) at the Elgin-O'Hare Expressway to re-profile the roadway for the bridge replacement of IL-83 over the expressway for approximately 3,715 feet.

b.) Widening, resurfacing, and overlaying of IL-83 (Elmhurst Road) south of the Elgin-O'Hare Expressway for approximately 1,745 feet.

c.) Reconstruction of Oakton Street at Elmhurst Road to add duel left turn lanes as well as re-profile the roadway for the change of the profile of IL-83 (Elmhurst Road) at the intersection for approximately 1,984 feet.

A 30 year pavement analysis was performed on IL-83 (Elmhurst Road) since the pavement reconstruction is more than 25,000 square yards. We recommend a mechanistic-rigid pavement design based on the life cycle cost analysis which favors PCC pavement by over 15%.

a.) IL-83 (Elmhurst Road)

Pavement Reconstruction

Tied PCC Curb and Gutter
10 ¼" PCC Pavement Jointed [1]
4 ½" HMA Stabilized Subbase [2]
12" Aggregate Subgrade Improvement [3]

A 20 year pavement analysis was performed on widening portion of IL-83 (Elmhurst Road). Our recommendations for the segment are as follows based on the mechanistic pavement design procedure.

b.) IL-83 (Elmhurst Road)

Pavement Widening
- 11 ¼" Full Depth [4]
  - 1 ¾" HMA Polymerized Surface Course, Mix "F", N90 [5]
  - ¾" HMA Polymerized Leveling Binder Machine Method, IL-4.75 N50 [6]
  - 8 ¾" HMA Binder Course IL-19, N90 [7]
- 12" Aggregate Subgrade Improvement [3]

Existing Pavement Resurfacing
- 2 ½" Cold Milling of Existing HMA Pavement
- 1 ¾" HMA Polymerized Surface Course, Mix "F", N90 [5]
- ¾" HMA Polymerized Leveling Binder Machine Method, IL-4.75 N50 [6]

Existing Pavement Overlaying
- 1 ¾" HMA Polymerized Surface Course, Mix "F", N90 [5]
- ¾" HMA Polymerized Leveling Binder Machine Method, IL-4.75 N50 [6]

A 20 year pavement analysis was performed on Oakton Street since the pavement reconstruction is less than 25,000 square yards. We recommend a mechanistic-rigid pavement design based on the life cycle cost analysis which favors PCC pavement by over 25%.

c.) Oakton Street

Pavement Reconstruction
- Tied PCC Curb and Gutter
- 9 ½" PCC Pavement Jointed [8]
- 12" Aggregate Subgrade Improvement [3]

[1] Designer Note 1: Use pay item **#42000506, "PORTLAND CEMENT CONCRETE PAVEMENT 10 1/4" (JOINTED)"**, paid in square yards.

[2] Designer Note 2: Use pay item **#31200502, "STABILIZED SUBBASE - HOT-MIX ASPHALT, 4 ½" "**, paid in square yards.

[3] Designer Note 3: Use pay item **#30300112, "AGGREGATE SUBGRADE IMPROVEMENT, 12" "**, paid in square yards.

[4] Designer Note 4: 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.

[5] Designer Note 5: Use pay item **#40603240, "POLYMERIZED HOT-MIX ASPHALT BINDER COURSE, IL-19.0, N90"**, paid in tons.

[6] Designer Note 6: Use pay item **#35501316, "POLYMERIZED LEVELING BINDER (MACHINE METHOD), IL-4.75, N50"**, paid in tons.

[7] Designer Note 7: Use pay item **#35501319, "HOT-MIX ASPHALT BASE COURSE, 8 3/4" "**, paid for in square yards.

[8] Designer Note 8: Use pay item **#42000411, "PORTLAND CEMENT CONCRETE PAVEMENT, 9 ½" (JOINTED)",** paid in square yards.

If you have any questions or need additional information, please contact Jenpai Chang, Acting Pavement Design Engineer, at (847)705-4432.

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

Google

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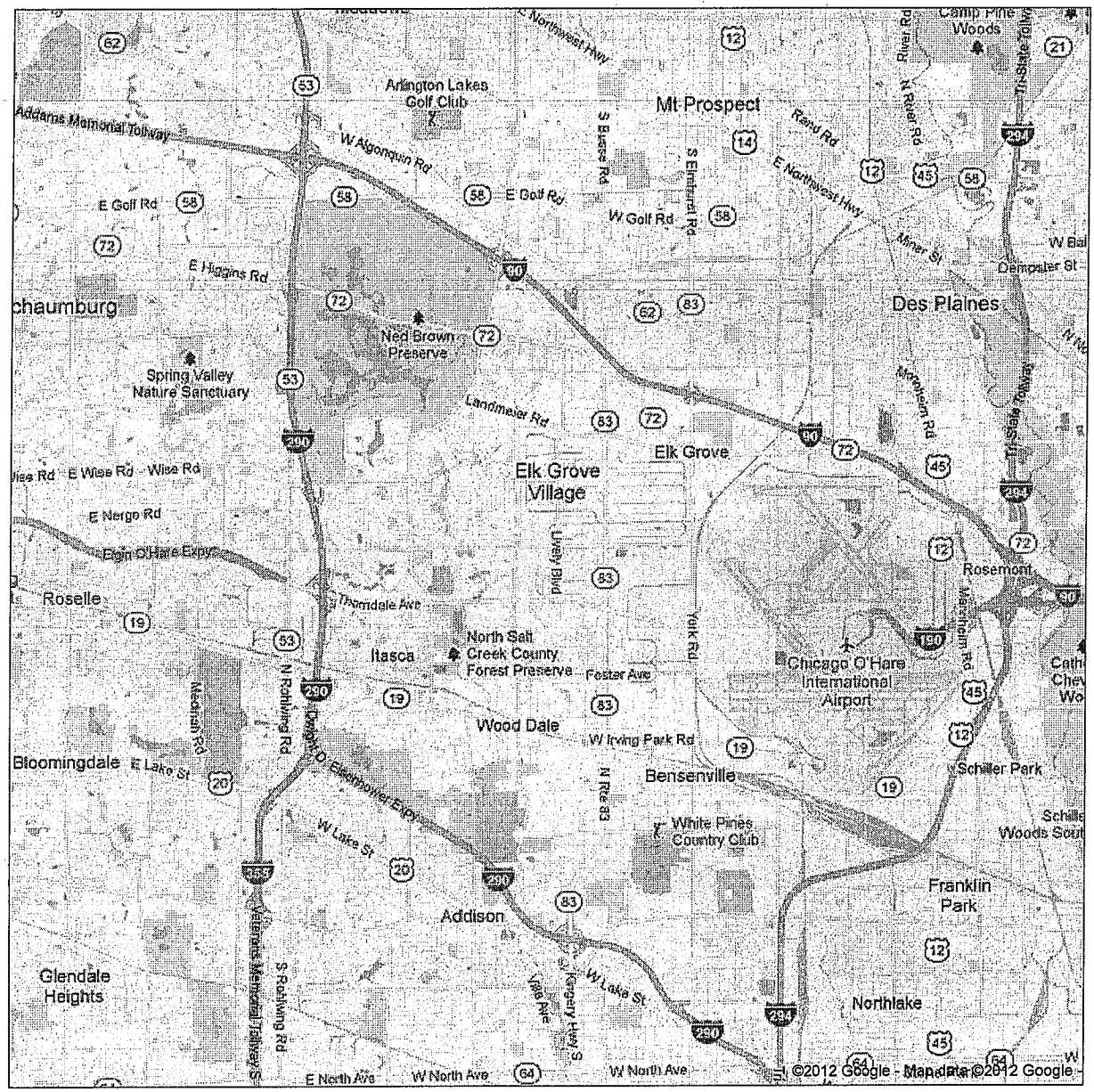

BDE 5401 Template (05/29/2012)

IDOT MECHANISTIC PAVEMENT DESIGN

Printed: 08/22/2012

PROJECT AND TRAFFIC INPUTS

(Enter Data in Gray Shaded Cells)

Route: Elgin O'Hare-West Bypass
Section:
County: Cook
Location: IL-83 (Elmhurst Rd)

Comments: Reconstruction
Design Date: 07/24/2012 JK
Modified Date: 08/10/2010 MR

<-- BY
<-- BY

	ADT	Year
Current:	28,500	2010
Future:	29,200	2030

READ ME

Facility Type: Other Marked State Route
# of Lanes = 6 or more

RESET

Road Class: I
Rural or Urban ? Urban
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	26,002	89.8%	P = 8%
SU =	250	1,564	5.4%	S = 37%
MU =	750	1,390	4.8%	M = 37%
Struct. Design ADT =		28,955	(2023)	

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) =	6.50	(Actual ADT)	TF rigid (Actual) =	8.83	(Actual ADT)
TF flexible (Min) =	2.92	(Min ADT Fig. 54-2.C)	TF rigid (Min) =	4.13	(Min ADT Fig. 54-2.C)

NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS

Full-Depth HMA Pavement

Use TF flexible = 6.50
PG Grade Lower Binder Lifts = PG 64-22 (Fig. 53-4.R)
HMA Mixture Temp. = 74.0 deg. F (Fig. 54-5.C)
Design HMA Mixture Modulus (E_{HMA}) = 720 ksi (Fig. 54-5.D)
Design HMA Strain (ε_{HMA}) = 70 (Fig. 54-5.E)
Full Depth HMA Design Thickness = 11.25 in. (Fig. 54-5.F)
Limiting Strain Criterion Thickness = 14.50 in. (Fig. 54-5.I)

Use Full-Depth HMA Thickness = 11.25 inches

JPC Pavement

Use TF rigid = 8.83
Edge Support = Tied Shoulder or C.&G.

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

CRC Pavement

Use TF rigid = 8.83
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 = 6.50
District = 3,4,5,6

HMA Overlay Design Thickness = 9.25 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	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%

PLAIN JOINTED PCC PAVEMENT

FILENAME-	IL-83 (Elmhurst R	22-Aug-12		
ROUTE-	IL-83	2:34 PM		
SECTION-				
COUNTY-	Cook			
LOCATION-	at Thorndale (EO Expy)			
DATE-	10-Aug-12			
PROJECT LENGTH (FT)	3716 =	0.7	MILES	
AVERAGE LANE WIDTH (FT)	12			
NUMBER OF LANES	6			
# OF EDGES	4			
INSIDE SHLDER WIDTH (FT)				
OUTSIDE SHLDER WIDTH (FT)				
# OF CENTERLINES	5			
RIGID THICKNESS-	10.25			
TRAFFIC FACTORS	MINIMUM	ACTUAL		
RIGID-	6.2	13.33		

TRAFFIC		Percentages
PV-	26150	89.80%
SU-	1573	5.40%
MU-	1398	4.80%

INITIAL COSTS

ITEM	QUANTITY	UNIT PRICE	COST
PAVEMENT (SQ YDS)	28,750	$48.80	$1,403,000
STAB SUBBASE (SQ YDS)	31,227	$15.00	$468,405
SHOULDERS (SQ YDS)	0		$0
SHOULDER SEAL (LN FT)	14,864		$0
SUBBASE GRAN MATL TY C (TONS)	0		$0
CONSTRUCTION INITIAL COST (PW)			$1,871,405
TOTAL REHABILITATION COST (PW)			$419,812
TOTAL LIFE CYCLE COST (PW)			$2,291,217
ANNUAL COST PER MILE			$133,512

MAINTENANCE COSTS:

ITEM		UNIT COST
PAVEMENT PATCHING (SQ YDS)	(Use Class A pricing for CRC)	$130.00
SHOULDER PATCHING (SQ YDS)		$85.00
SHLDR JT ROUT & SEAL (LF)		$1.00
CENTERLINE JT ROUT & SEAL (LF)		$1.00
POLICY HMA OVERLAY PVMT (SQ YDS)		$15.95
POLICY HMA OVERLAY SHLDR (SQ YDS)		$15.95
RANDOM CRACK ROUT & SEAL (LF)		$1.00
REFL TRANS CRACK ROUT & SEAL (LF)		$1.00
PARTIAL PVMT PATCH (SQ YDS)		$130.00

MAINTENANCE COSTS:	ITEM	QUANTITY	UNIT PRICE	COST	PW
Activity 1					
YEAR 10					
	PAVEMENT PATCHING 0.1% (SQ YDS)	29	$130.00	$3,770	
				$3,770	$2,805
Activity 2					
YEAR 15					
	PAVEMENT PATCHING 0.2% (SQ YDS)	58	$130.00	$7,540	
				$7,540	$4,840
Activity 3					
YEAR 20					
	PAVEMENT PATCHING 2.0% (SQ YDS)	575	$130.00	$74,750	
	SHOULDER PATCHING 0.5% (SQ YDS)	0	$85.00	$0	
	SHLDR JT ROUT & SEAL 100% (LF)	14,864	$1.00	$14,864	
	CENTERLINE JT ROUT & SEAL 100% (LF)	18,580	$1.00	$18,580	
				$108,194	$59,907
Activity 4					
YEAR 25					
	PAVEMENT PATCHING 3.0% (SQ YDS)	863	$130.00	$112,190	
	SHOULDER PATCHING 1.0% (SQ YDS)	0	$85.00	$0	
				$112,190	$53,582
Activity 5					
YEAR 30					
	PAVEMENT PATCHING 4.0% (SQ YDS)	1,150	$130.00	$149,500	
	SHOULDER PATCHING 1.5% (SQ YDS)	0	$85.00	$0	
	POLICY HMS OVERLAY OVMT (SQ YDS)	28,750	$15.95	$458,563	
	POLICY HMA OVERLAY SHLDR (SQ YDS)	0	$15.95	$0	
				$608,063	$250,522
Activity 6					
YEARS 35					
	SHLDR JT ROUT & SEAL 100% (LF)	14,864	$1.00	$14,864	
	CENTERLINE JT ROUT & SEAL 100% (LF)	18,580	$1.00	$18,580	
	RANDOM CRACK ROUT & SEAL 50% (LF)	11,148	$1.00	$11,148	
	REFL TRANS CRACK ROUT & SEAL 40%	7,135	$1.00	$7,135	
	PARTIAL PVMT PATCH 0.1% (SQ YDS)	29	$130.00	$3,770	
				$55,497	$19,724
Activity 7					
YEAR 40					
	PAVEMENT PATCHING 0.5% (SQ YDS)	144	$130.00	$18,720	
	SHOULDER PATCHING 0.5% (SQ YDS)	144	$130.00	$18,720	
	REFL TRANS CRACK ROUT & SEAL 60%	10,702	$1.00	$10,702	
	RANDOM CRACK ROUT & SEAL 50% (LF)	11,148	$1.00	$11,148	
	SHLDR JT ROUT & SEAL 100% (LF)	14,864	$1.00	$14,864	
	CENTERLINE JT ROUT & SEAL 100% (LF)	18,580	$1.00	$18,580	
				$92,734	$28,432
			Total Rehabilitation Cost (Present Worth)		$419,812

FULL-DEPTH FLEXIBLE
TRAFFIC FACTOR LESS THAN 15.0 (RURAL)
TRAFFIC FACTOR LESS THAN 10.0 (URBAN)

FULL DEOTH FLEXIBLE PAVEMENT

ROUTE-	IL-83	22-Aug-12	
SECTION-	0	2:34 PM	
COUNTY-	Cook		
LOCATION-	at Thorndale (EO Expy)		
PROJECT LENGTH (FT)	3716		
AVERAGE LANE WIDTH (FT)	12		
NUMBER OF LANES	6		
# OF EDGES	4		
INSIDE SHLDER WIDTH (FT)	0		
OUTSIDE SHLDER WIDTH (FT)	0		
# OF CENTERLINES	5		
PROJECT TYPE	2	1=RURAL, 2=URBAN	
PAVING WIDTH	1	1=SINGLE LANE, 2=DUAL LANE	
INTERSTATE / OTHER ROUTE	OTHER ROUTE		
FLEXIBLE THICKNESS-	12		

TRAFFIC FACTORS	MINIMUM	ACTUAL
FLEXIBLE	4.38	9.81

TRAFFIC

PV-	26150	89.80%
SU-	1573	5.40%
MU-	1398	4.80%

PAVEMENT OVERLAY THICKNESS	3.75
SHOULDER OVERLAY THICKNESS	1.75

INITIAL COSTS

ITEM	QUANTITY	UNIT PRICE	COST
SURFACE (SQ YDS)	28,750	$15.95	$458,563
POLY BINDER (SQ YDS)	28,750	$16.39	$471,213
BINDER (SQ YDS)	28,750	$29.28	$841,800
SHOULDERS (SQ YDS)	0		$0
SUBBASE GRAN MATL TY C (TONS)	0		$0

CONSTRUCTION INITIAL COST (PW)	$1,771,576
TOTAL REHABILITATION COST (PW)	$881,146
TOTAL LIFE CYCLE COST (PW)	$2,652,722
ANNUAL COST PER MILE	$154,578

MAINTENANCE COSTS:

ITEM		UNIT COST
RAND/THERM CRACK ROUT & SEAL (LF)		$1.00
SHLDR JT ROUT & SEAL (LF)		$1.00
CENTERLINE JT ROUT & SEAL (LF)		$1.00
PARTIAL PVMT PATCH (SQ YDS)		$90.00
2" MILL PVMT & SHLDR (SQ YDS)	(Use $3.00 for small quantity)	$1.75
2" OVERLAY PVMT & SHLDR (TONS)		$142.41
2" MILL PVMT ONLY (SQ YDS)	(Use $3.00 for small quantity)	$1.75
HMA SHOULDER PATCHING (SQ YDS)		$90.00
POLICY HMA OVERLAY PVMT (TONS)		$142.41
POLICY HMA OVERLAY SHLDR (TONS)		$142.41

MATERIAL TYPE/PERCENTAGE	PCC	15.8%

MAINTENANCE COSTS

	ITEM	QUANTITY	UNIT PRICE	COST	PW
Activity 1					
YEAR 5	RAND/THERM CRACK ROUT & SEAL 50% (LF)	2,044	$1.00	$2,044	
	SHLDR JT ROUT & SEAL 100% (LF)	14,864	$1.00	$14,864	
	CENTERLINE JT ROUT & SEAL 100% (LF)	18,580	$1.00	$18,580	
	PARTIAL PVMT PATCH 0.1% (SQ YDS)	29	$90.00	$2,610	
				$38,098	$32,863
Activity 2					
YEAR 10	PARTIAL PVMT PATCH 0.5% (SQ YDS)	144	$90.00	$12,960	
	RAND/THERM CRACK ROUT & SEAL 50% (LF)	2,044	$1.00	$2,044	
	SHLDR JT ROUT & SEAL 100% (LF)	14,864	$1.00	$14,864	
	CENTERLINE JT ROUT & SEAL 100% (LF)	18,580	$1.00	$18,580	
				$48,448	$36,050
Activity 3					
YEAR 15	2" MILL PVMT & SHLDR 100% (SQ YDS)	28,750	$1.75	$50,313	
	PARTIAL PVMT PATCH 1.0% (SQ YDS)	288	$90.00	$25,920	
	2" OVERLAY PVMT & SHLDR 100% (TONS)	3,220	$142.41	$458,563	
				$534,796	$343,286
Activity 4					
YEAR 20	SHLDR JT ROUT & SEAL 100% (LF)	14,864	$1.00	$14,864	
	CENTERLINE JT ROUT & SEAL 100% (LF)	18,580	$1.00	$18,580	
	RAND/THERM CRACK ROUT & SEAL 50% (LF)	2,044	$1.00	$2,044	
	PARTIAL PVMT PATCH 0.1% (SQ YDS)	29	$90.00	$2,610	
				$38,098	$21,095
Activity 5					
YEAR 25	SHLDR JT ROUT & SEAL 100% (LF)	14,864	$1.00	$14,864	
	CENTERLINE JT ROUT & SEAL 100% (LF)	18,580	$1.00	$18,580	
	RAND/THERM CRACK ROUT & SEAL 50% (LF)	2,044	$1.00	$2,044	
	PARTIAL PVMT PATCH 0.5% (SQ YDS)	144	$90.00	$12,960	
				$48,448	$23,139
Activity 6					
YEAR 30	2" MILL PVMT & SHLDR 100% (SQ YDS)	28,750	$1.75	$50,313	
	PARTIAL PVMT PATCH 2.0% (SQ YDS)	575	$90.00	$51,750	
	HMA SHLDR PATCHING 1.0% (SQ YDS)	0	$90.00	$0	
	POLICY HMA OVERLAY PVMT (TONS)	6,038	$142.41	$859,876	
	POLICY HMA OVERLAY SHLDR (TONS)	0	$142.41	$0	
				$961,939	$396,319
Activity 7					
YEAR 35	SHLDR JT ROUT & SEAL 100% (LF)	14,864	$1.00	$14,864	
	CENTERLINE JT ROUT & SEAL 100% (LF)	18,580	$1.00	$18,580	
	RAND/THERM CRACK ROUT & SEAL 50% (LF)	2,044	$1.00	$2,044	
	PARTIAL PVMT PATCH 0.1% (SQ YDS)	29	$90.00	$2,610	
				$38,098	$13,540
Activity 8					
YEAR 40	SHLDR JT ROUT & SEAL 100% (LF)	14,864	$1.00	$14,864	
	CENTERLINE JT ROUT & SEAL 100% (LF)	18,580	$1.00	$18,580	
	RAND/THERM CRACK ROUT & SEAL 50% (LF)	2,044	$1.00	$2,044	
	PARTIAL PVMT PATCH 0.5% (SQ YDS)	144	$90.00	$12,960	
				$48,448	$14,854

Total Rehabilitation Cost (Present Worth) $881,146

BDE 5401 Template (05/29/2012)

IDOT MECHANISTIC PAVEMENT DESIGN

Printed: 08/22/2012

PROJECT AND TRAFFIC INPUTS

(Enter Data in Gray Shaded Cells)

Route: Elgin O'Hare-West Bypass
Section:
County: Cook
Location: Oakton Street

Comments: Reconstruction

Design Date: 07/24/2012 JK <-- BY
Modified Date: <-- BY

	ADT	Year
Current:	29,600	2010
Future:	31,900	2030

READ ME

Facility Type: Unmarked State Route
# of Lanes = 4

RESET

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 =	No Min	29,074	93.5%	P = 32%
SU =	No Min	1,057	3.4%	S = 45%
MU =	No Min	964	3.1%	M = 45%
Struct. Design ADT =		31,095	(2023)	

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) =	5.47	(Actual ADT)	TF rigid (Actual) =	7.44	(Actual ADT)
TF flexible (Min) =	No Min	(Min ADT Fig. 54-2.C)	TF rigid (Min) =	No Min	(Min ADT Fig. 54-2.C)

NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS

Full-Depth HMA Pavement

Use TF flexible = 5.47
PG Grade Lower Binder Lifts = PG 64-22 (Fig. 53-4.R)
HMA Mixture Temp. = 74.0 deg. F (Fig. 54-5.C)
Design HMA Mixture Modulus (E_{HMA}) = 720 ksi (Fig. 54-5.D)
Design HMA Strain (ε_{HMA}) = 74 (Fig. 54-5.E)
Full Depth HMA Design Thickness = 10.75 in. (Fig. 54-5.F)
Limiting Strain Criterion Thickness = 14.50 in. (Fig. 54-5.I)

Use Full-Depth HMA Thickness = 10.75 inches

JPC Pavement

Use TF rigid = 7.44
Edge Support = Tied Shoulder or C.&G.

Rigid Pavt Thick. = 9.50 in. (Fig. 54-4.E)

CRC Pavement

Use TF rigid = 7.44
IBR value = 3

CRCP Thickness = 8.50 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 = 5.47
District = 3,4,5,6

HMA Overlay Design Thickness = 9.00 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%

PLAIN JOINTED PCC PAVEMENT

FILENAME-	Oakton Street	22-Aug-12	
ROUTE-		2:35 PM	
SECTION-			
COUNTY-	Cook		
LOCATION-	at Thorndale (EO Expy)		
DATE-	16-Aug-12		
PROJECT LENGTH (FT)	1754 =	0.33	MILES
AVERAGE LANE WIDTH (FT)	11		
NUMBER OF LANES	4		
# OF EDGES	4		
INSIDE SHLDER WIDTH (FT)			
OUTSIDE SHLDER WIDTH (FT)			
# OF CENTERLINES	2		
RIGID THICKNESS-	9.5		

TRAFFIC FACTORS	MINIMUM	ACTUAL
RIGID-	-	7.44

TRAFFIC		Percentages
PV-	29,074	93.5%
SU-	1,057	3.4%
MU-	964	3.1%

INITIAL COSTS

ITEM	QUANTITY	UNIT PRICE	COST
PAVEMENT (SQ YDS)	8,575	$50.39	$432,094
STAB SUBBASE (SQ YDS)	9,744		$0
SHOULDERS (SQ YDS)	0		$0
SHOULDER SEAL (LN FT)	7,016		$0
SUBBASE GRAN MATL TY C (TONS)	0		$0

CONSTRUCTION INITIAL COST (PW)	$432,094
TOTAL REHABILITATION COST (PW)	$110,666
TOTAL LIFE CYCLE COST (PW)	$542,760
ANNUAL COST PER MILE	$67,088

MAINTENANCE COSTS:

ITEM	UNIT COST
PAVEMENT PATCHING (SQ YDS) (Use Class A pricing for CRC)	$130.00
SHOULDER PATCHING (SQ YDS)	$85.00
SHLDR JT ROUT & SEAL (LF)	$1.00
CENTERLINE JT ROUT & SEAL (LF)	$1.00
POLICY HMA OVERLAY PVMT (SQ YDS)	$11.57
POLICY HMA OVERLAY SHLDR (SQ YDS)	$11.57
RANDOM CRACK ROUT & SEAL (LF)	$1.00
REFL TRANS CRACK ROUT & SEAL (LF)	$1.00
PARTIAL PVMT PATCH (SQ YDS)	$130.00

MAINTENANCE COSTS:

	ITEM	QUANTITY	UNIT PRICE	COST	PW
Activity 1 YEAR 10	PAVEMENT PATCHING 0.1% (SQ YDS)	9	$130.00	$1,170	
				$1,170	$871
Activity 2 YEAR 15	PAVEMENT PATCHING 0.2% (SQ YDS)	17	$130.00	$2,210	
				$2,210	$1,419
Activity 3 YEAR 20	PAVEMENT PATCHING 2.0% (SQ YDS)	172	$130.00	$22,360	
	SHOULDER PATCHING 0.5% (SQ YDS)	0	$85.00	$0	
	SHLDR JT ROUT & SEAL 100% (LF)	7,016	$1.00	$7,016	
	CENTERLINE JT ROUT & SEAL 100% (LF)	3,508	$1.00	$3,508	
				$32,884	$18,208
Activity 4 YEAR 25	PAVEMENT PATCHING 3.0% (SQ YDS)	257	$130.00	$33,410	
	SHOULDER PATCHING 1.0% (SQ YDS)	0	$85.00	$0	
				$33,410	$15,957
Activity 5 YEAR 30	PAVEMENT PATCHING 4.0% (SQ YDS)	343	$130.00	$44,590	
	SHOULDER PATCHING 1.5% (SQ YDS)	0	$85.00	$0	
	POLICY HMS OVERLAY OVMT (SQ YDS)	8,575	$11.57	$99,213	
	POLICY HMA OVERLAY SHLDR (SQ YDS)	0	$11.57	$0	
				$143,803	$59,247
Activity 6 YEARS 35	SHLDR JT ROUT & SEAL 100% (LF)	7,016	$1.00	$7,016	
	CENTERLINE JT ROUT & SEAL 100% (LF)	3,508	$1.00	$3,508	
	RANDOM CRACK ROUT & SEAL 50% (LF)	3,508	$1.00	$3,508	
	REFL TRANS CRACK ROUT & SEAL 40%	2,245	$1.00	$2,245	
	PARTIAL PVMT PATCH 0.1% (SQ YDS)	9	$130.00	$1,170	
				$17,447	$6,201
Activity 7 YEAR 40	PAVEMENT PATCHING 0.5% (SQ YDS)	43	$130.00	$5,590	
	SHOULDER PATCHING 0.5% (SQ YDS)	43	$130.00	$5,590	
	REFL TRANS CRACK ROUT & SEAL 60%	3,368	$1.00	$3,368	
	RANDOM CRACK ROUT & SEAL 50% (LF)	3,508	$1.00	$3,508	
	SHLDR JT ROUT & SEAL 100% (LF)	7,016	$1.00	$7,016	
	CENTERLINE JT ROUT & SEAL 100% (LF)	3,508	$1.00	$3,508	
				$28,580	$8,763
			Total Rehabilitation Cost (Present Worth)		$110,666

FULL-DEPTH FLEXIBLE
TRAFFIC FACTOR LESS THAN 15.0 (RURAL)
TRAFFIC FACTOR LESS THAN 10.0 (URBAN)

ROUTE-	0		22-Aug-12
SECTION-	0		2:35 PM
COUNTY-	Cook		
LOCATION-	at Thorndale (EO Expy)		
PROJECT LENGTH (FT)	1754		
AVERAGE LANE WIDTH (FT)	11		
NUMBER OF LANES	4		
# OF EDGES	4		
INSIDE SHLDER WIDTH (FT)	0		
OUTSIDE SHLDER WIDTH (FT)	0		
# OF CENTERLINES	2		
PROJECT TYPE	2	1=RURAL, 2=URBAN	
PAVING WIDTH	1	1=SINGLE LANE, 2=DUAL LANE	
INTERSTATE / OTHER ROUTE	OTHER ROUTE		
FLEXIBLE THICKNESS-	0		

TRAFFIC FACTORS	MINIMUM	ACTUAL
FLEXIBLE -		5.47

TRAFFIC

PV-	29074	93.5%
SU-	1057	3.4%
MU-	964	3.1%

PAVEMENT OVERLAY THICKNESS	3.75
SHOULDER OVERLAY THICKNESS	1.75

INITIAL COSTS

ITEM	QUANTITY	UNIT PRICE	COST
SURFACE (SQ YDS)	8,575	$11.57	$99,213
POLY BINDER (SQ YDS)	8,575	$14.07	$120,650
BINDER (SQ YDS)	8,575	$29.05	$249,104
SHOULDERS (SQ YDS)	0		$0
SUBBASE GRAN MATL TY C (TONS)	0		$0
CONSTRUCTION INITIAL COST (PW)			$468,967
TOTAL REHABILITATION COST (PW)			$212,735
TOTAL LIFE CYCLE COST (PW)			$681,702
ANNUAL COST PER MILE			$84,262

MAINTENANCE COSTS:

ITEM		UNIT COST
RAND/THERM CRACK ROUT & SEAL (LF)		$1.00
SHLDR JT ROUT & SEAL (LF)		$1.00
CENTERLINE JT ROUT & SEAL (LF)		$1.00
PARTIAL PVMT PATCH (SQ YDS)		$90.00
2" MILL PVMT & SHLDR (SQ YDS)	(Use $3.00 for small quantity)	$1.75
2" OVERLAY PVMT & SHLDR (TONS)		$103.30
2" MILL PVMT ONLY (SQ YDS)	(Use $3.00 for small quantity)	$1.75
HMA SHOULDER PATCHING (SQ YDS)		$90.00
POLICY HMA OVERLAY PVMT (TONS)		$103.30
POLICY HMA OVERLAY SHLDR (TONS)		$103.30

MATERIAL TYPE/PERCENTAGE	PCC	25.6%

FULL DEOTH FLEXIBLE PAVEMENT
MAINTENANCE COSTS

	ITEM	QUANTITY	UNIT PRICE	COST	PW
Activity 1					
YEAR 5	RAND/THERM CRACK ROUT & SEAL 50% (LF)	965	$1.00	$965	
	SHLDR JT ROUT & SEAL 100% (LF)	7,016	$1.00	$7,016	
	CENTERLINE JT ROUT & SEAL 100% (LF)	3,508	$1.00	$3,508	
	PARTIAL PVMT PATCH 0.1% (SQ YDS)	9	$90.00	$810	
				$12,299	$10,609
Activity 2					
YEAR 10	PARTIAL PVMT PATCH 0.5% (SQ YDS)	43	$90.00	$3,870	
	RAND/THERM CRACK ROUT & SEAL 50% (LF)	965	$1.00	$965	
	SHLDR JT ROUT & SEAL 100% (LF)	7,016	$1.00	$7,016	
	CENTERLINE JT ROUT & SEAL 100% (LF)	3,508	$1.00	$3,508	
				$15,359	$11,429
Activity 3					
YEAR 15	2" MILL PVMT & SHLDR 100% (SQ YDS)	8,575	$1.75	$15,006	
	PARTIAL PVMT PATCH 1.0% (SQ YDS)	86	$90.00	$7,740	
	2" OVERLAY PVMT & SHLDR 100% (TONS)	960	$103.30	$99,171	
				$121,917	$78,259
Activity 4					
YEAR 20	SHLDR JT ROUT & SEAL 100% (LF)	7,016	$1.00	$7,016	
	CENTERLINE JT ROUT & SEAL 100% (LF)	3,508	$1.00	$3,508	
	RAND/THERM CRACK ROUT & SEAL 50% (LF)	965	$1.00	$965	
	PARTIAL PVMT PATCH 0.1% (SQ YDS)	9	$90.00	$810	
				$12,299	$6,810
Activity 5					
YEAR 25	SHLDR JT ROUT & SEAL 100% (LF)	7,016	$1.00	$7,016	
	CENTERLINE JT ROUT & SEAL 100% (LF)	3,508	$1.00	$3,508	
	RAND/THERM CRACK ROUT & SEAL 50% (LF)	965	$1.00	$965	
	PARTIAL PVMT PATCH 0.5% (SQ YDS)	43	$90.00	$3,870	
				$15,359	$7,335
Activity 6					
YEAR 30	2" MILL PVMT & SHLDR 100% (SQ YDS)	8,575	$1.75	$15,006	
	PARTIAL PVMT PATCH 2.0% (SQ YDS)	172	$90.00	$15,480	
	HMA SHLDR PATCHING 1.0% (SQ YDS)	0	$90.00	$0	
	POLICY HMA OVERLAY PVMT (TONS)	1,801	$103.30	$186,050	
	POLICY HMA OVERLAY SHLDR (TONS)	0	$103.30	$0	
				$216,536	$89,213
Activity 7					
YEAR 35	SHLDR JT ROUT & SEAL 100% (LF)	7,016	$1.00	$7,016	
	CENTERLINE JT ROUT & SEAL 100% (LF)	3,508	$1.00	$3,508	
	RAND/THERM CRACK ROUT & SEAL 50% (LF)	965	$1.00	$965	
	PARTIAL PVMT PATCH 0.1% (SQ YDS)	9	$90.00	$810	
				$12,299	$4,371
Activity 8					
YEAR 40	SHLDR JT ROUT & SEAL 100% (LF)	7,016	$1.00	$7,016	
	CENTERLINE JT ROUT & SEAL 100% (LF)	3,508	$1.00	$3,508	
	RAND/THERM CRACK ROUT & SEAL 50% (LF)	965	$1.00	$965	
	PARTIAL PVMT PATCH 0.5% (SQ YDS)	43	$90.00	$3,870	
				$15,359	$4,709
	Total Rehabilitation Cost (Present Worth)				$212,735

First Cost Analysis of Widening Project

Date:	8/9/2012			Route	IL-83 Elmhurst Road
Quantities by:	MR	Checked by:		Section	
Unit prices by:	SP	Checked by:		County	Cook
		Net Length	1,030 FT	Project	Elgin O'Hare-West Bypass
				Contract	

Mechanistic Flexible

Area (Sq. Yd.)	Height (inches)	Weight (Tons)	Material		Unit Cost	Total	ITEM #
12,515	1.75	1226	Poly HMA **Surface** Course, MIX "F" N90	@	X	X	40603595
12,515	0.75	526	Poly HMA Leveling **Binder** course, IL-4.75, N50	@	X	X	40600827
5,695	8.75	2791	HMA **Binder** course, IL-19, N90	@	$85	$237,196.75	40603090
			Total			**$237,196.75**	

Modified AASHTO

Area (Sq. Yd.)	Height (inches)	Weight (Tons)	Material		Unit Cost	Total	ITEM #
12,515	1.75	1226	Poly HMA **Surface** Course, MIX "F" N90	@	X	X	40603595
12,515	0.75	526	Poly HMA Leveling **Binder** course, IL-4.75, N50	@	X	X	40600827
5,695	12.25	3907	HMA **Binder** course, IL-19, N90	@	$85	$332,075.45	40603090
			Total			**$332,075.45**	

Composite

Area (Sq. Yd.)	Height (inches)	Weight (Tons)	Material		Unit Cost	Total	ITEM #
12,515	1.75	1226	Poly HMA **Surface** Course, MIX "F" N90	@	X	X	40603595
12,515	0.75	526	Poly HMA Leveling **Binder** course, IL-4.75, N50	@	X	X	40600827
5,695	10	NA	PCC Base Course	@	$45	$256,275.00	35300500
			Total			**$256,275.00**	