




Illinois Department of Transportation

To: John Fortman Attn: District One
From: John D. Baranzelli
Subject: Pavement Design 
Date: July 26, 2012

FAP Route 186 (IL Route 134)
Section 08-00104-08-CH
Lake County
At Fairfield Road and From Fox Trail to Harrison Avenue

We have reviewed the pavement selection for the project, which was submitted to BDE by email dated July 11, 2012. Revisions were submitted to BDE on July 12, 2012. The project will reconstruct IL 134 and a portion of Fairfield Road. The life cycle cost analysis favored the rigid design by 31.3%. The approved pavement design for this project is as follows:

IL Route 134 at Fairfield Road & from Fox Trail to Harrison Avenue)

9 inches of PCC jointed pavement with tied PCC curb & 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, PE

Attn: Paul R. Niedernhofer

From: John Fortmann

By: Jose Dominguez

Subject: Pavement Analysis*

Date: July 11, 2012

*Route: FAU 186 IL-134 at Fairfield Road
Limits: Fox Trail and Harrison Ave.
Contract No.: 62960
Letting: 04CY13

Section: 08-00104-08-CH
County: Lake
Job No.: 08-00104-08-CH

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:

a.) Intersection improvement with pavement reconstruction of IL-134 at Fairfield Road for a total length of approximately 4,000 feet to accommodate one 12 foot through lane westbound, two 12 foot through lanes eastbound, one left turn lane, and one right turn lane.

b.) Pavement reconstruction of Fairfield Road at IL-134 for a total length of approximately 2,414 feet to provide two 12 foot through lanes in each direction, and one left turn lane.

A 20 year pavement analysis was performed on the above segment. We recommend a mechanistic-rigid pavement design based on the life cycle cost analysis which favors PCC pavement by 31.3%.

a.) IL-134 at Fairfield Road,

b.) Fairfield Road²

Tied PCC Curb and Gutter

Pavement Reconstruction

9" PCC Pavement (Jointed)¹

12" Aggregate Subgrade Improvement

John D. Baranzelli, PE
July 11, 2012
Page 2

¹Designer Note 1: Transverse contraction joints should be reduced to a maximum of 14 foot spacing for 9" PCC pavement which is paid for as "PCC PVT 9" JOINTED" (42000401), paid in square yards.

²Designer Note 2: Fairfield Road is subject to local jurisdictional approval and concurrence.

If you have any questions or need additional information, please contact Melchor Mangoba at 847-705-4255.

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

SECTION	COUNTY	SHEET
08-00104-08-CH	LAKE	1 OF 2
ILLINOIS CONTRACT NO. 62960		

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

PLANS FOR PROPOSED FEDERAL AID HIGHWAY

CH. 49 (FAIRFIELD ROAD)
ROADWAY WIDENING AND
INTERSECTION IMPROVEMENTS
SECTION 08-00104-08-CH
PROJECT XXXX

LAKE COUNTY
JOB NO: XXXX

FOR INDEX OF SHEETS, SEE SHEET NO. 2
FOR LIST OF HIGHWAY STANDARDS, SEE SHEET NO. 2

DESIGN DESIGNATION:
IL RTE 134 = PRINCIPAL ARTERIAL
FAIRFIELD ROAD = MINOR ARTERIAL

ADT:
IL RTE 134 = 30,000 (2030)
FAIRFIELD ROAD = 31,000 (2030)

DESIGN SPEED:
IL RTE 134 = 45 MPH
FAIRFIELD ROAD:
NORTH LEG = 45 MPH
SOUTH LEG = 50 MPH

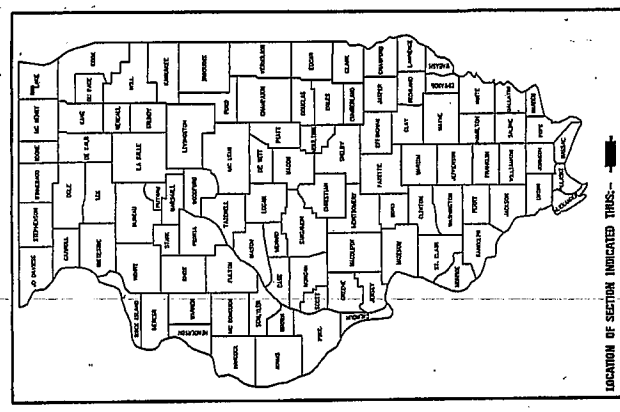


FULL SIZE PLANS HAVE BEEN PREPARED USING STANDARD ENGINEERING SCALES. REDUCED SIZE PLANS WILL NOT CONFORM TO STANDARD SCALES. IN MAKING MEASUREMENTS ON REDUCED PLANS, THE ABOVE SCALES MAY BE USED.

JULIE (JOINT UTILITY LOCATION INFORMATION FOR EXCAVATION)
1-800-892-0123 OR 811

PLANS PREPARED BY
HDR ENGINEERING INC.
FOR
MARTIN G. BUEHLER, P.E.
DIRECTOR OF TRANSPORTATION/COURTY ENGINEER
LAKE COUNTY DIVISION OF TRANSPORTATION

CONTRACT NO. 62960

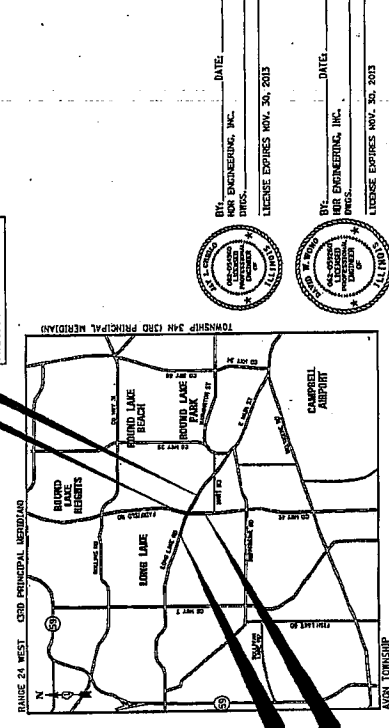


LOCATION OF SECTION INDICATED THERE- -

STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION	
APPROVED _____ 2013	DIRECTOR OF TRANSPORTATION/COURTY ENGINEER LAKE COUNTY DIVISION OF TRANSPORTATION
PASSED _____ 2013	DISTRICT 1 ENGINEER OF LOCAL ROADS & STREETS
DESIGNED FOR DR	BY: HDR ENGINEERING, INC.
BASED ON LIMITED	DATE: _____
REVIEW	LICENSE EXPIRES NOV. 30, 2013
IDENTITY DIRECTOR OF HIGHWAYS, REGION 1 ENGINEER	BY: HDR ENGINEERING, INC.
	DATE: _____
	LICENSE EXPIRES NOV. 30, 2013

PRINTED BY THE AUTHORITY
OF THE STATE OF ILLINOIS

HDR
HDR Engineering, Inc.
DESIGN TEAM REGISTRATION NUMBER 154001070
8500 N. Bryn Mawr Ave., Suite 900
Chicago, IL 60631
773-380-1300



LOCATION MAP
SCALE = N.T.S.

PROJECT GROSS AND NET LENGTH:
FAIRFIELD ROAD = 4042 FEET (0.77 MILES)
IL ROUTE 134 = 4636 FEET (0.88 MILES)

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

Route: IL-101	Comments: Reconstruction of IL 101
Section: SR-001 to SR-002	
County: LaSalle	Design Date: 06/07/2011
Location: SR Fairfield Road	Modified Date: 06/29/2012

Facility Type: Other Marked State Route	# of Lanes = 2 of 3
Part of future 4 lanes or more?	No
One Way Street?	No
Road Class:	II
Subgrade Support Rating (SSR):	P501
Construction Year:	2003
Design Period (DP) =	20 years

← BY	ADT	Year
Current:	2993	2003
Future:	2993	2050

Structural Design Traffic			
Minimum ADT	Actual ADT	Actual % of Total ADT	% of ADT in Design Lane
PV = 0	14,060	96.0%	P = 50%
SU = 250	293	2.0%	S = 50%
MU = 750	293	2.0%	M = 50%
Struct. Design ADT =		14,645	(2023)

TRAFFIC FACTOR CALCULATION

FLEXIBLE PAVEMENT		RIGID PAVEMENT	
Cpv =	0.15	Cpv =	0.15
Csu =	112.06	Csu =	135.78
Cmu =	385.44	Cmu =	567.21
TF flexible (Actual) =	1.48 (Actual ADT)	TF rigid (Actual) =	2.08 (Actual ADT)
TF flexible (Min) =	3.17 (Min ADT Fig. 54-2.C)	TF rigid (Min) =	4.59 (Min ADT Fig. 54-2.C)

NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS

Full-Depth HMA Pavement		JPC Pavement	
Use TF flexible =	3.17	Use TF rigid =	4.59
PG Grade Lower Binder Lifts =	PG 62-22 (Fig. 53-4.R)	Edge Support =	Shoulder or C.&G.
HMA Mixture Temp. =	73.0 deg. F (Fig. 54-5.C)	Rigid Pavt Thick. =	9.00 in. (Fig. 54-4.E)
Design HMA Mixture Modulus (E _{HMA}) =	760 ksi (Fig. 54-5.D)	CRCP Pavement	
Design HMA Strain (ε _{HMA}) =	86 (Fig. 54-5.E)	Use TF rigid =	4.59
Full Depth HMA Design Thickness =	9.50 in. (Fig. 54-5.F)	IBR value =	
Limiting Strain Criterion Thickness =	12.50 in. (Fig. 54-5.I)	CRCP Thickness =	7.75 in. (Fig. 54-4.N)
Use Full-Depth HMA Thickness =	9.50 inches	TF MUST BE > 60 FOR CRCP	

RECONSTRUCTION ONLY (SUPPLEMENTAL) PAVEMENT DESIGN CALCULATIONS

HMA Overlay of Rubblized PCC		Unbonded Concrete Overlay	
Use TF flexible =	3.17	Review 54-4.03 for limitations and special considerations.	
District =		JPCP Thickness =	NA inches
HMA Overlay Design Thickness =	8.00 in. (Fig. 54-5.U)	CONTACT BMPR FOR ASSISTANCE	

DESIGN TABLES FROM BDE MANUAL CHAPTER 54 - PAVEMENT DESIGN

Class I Roads 4 lanes or more Part of a future 4 lanes or more One-way Streets with ADT > 3500	Class II Roads 2 lanes with ADT > 2000 One way Street with ADT <= 3500	Class III Roads 2 Lanes (ADT 750 -2000)	Class IV Roads 2 Lanes (ADT < 750)
--	---	--	---

Facility Type	Min. Str. Design Traffic (Fig 54-2.C)		
	PV	SU	MU
	Interstate or Supplemental Freeway	0	500
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

Number of Lanes	Design Lane Distribution Factors For Structural Design Traffic (Fig. 54-2.B)					
	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%

PLAIN JOINTED PCC PAVEMENT

FILENAME- IL:134 at Fairfield
 ROUTE- IL 134
 SECTION- 08-00104-08-CH
 COUNTY- Lake
 LOCATION- Fairfield Road
 DATE- 18-Jun-12

30-Aug-12
 9:05 AM

PROJECT LENGTH (FT) 4000
 AVERAGE LANE WIDTH (FT) 12
 NUMBER OF LANES 2
 # OF EDGES 2
 INSIDE SHOULDER WIDTH (FT) 0
 OUTSIDE SHOULDER WIDTH (FT) 0
 # OF CENTERLINES 2
 RIGID THICKNESS- 9
 TRAFFIC FACTORS

MILES 0.76

RIGID- 2.08
 ACTUAL

MINIMUM 2.08
 PERCENTAGES
 PV- 96.00%
 SJ- 2.00%
 MU- 2.00%

TRAFFIC
 PV- 14060
 SJ- 293
 MU- 293

INITIAL COSTS

ITEM	QUANTITY	UNIT PRICE	COST
PAVEMENT (SQ YDS)	16,000	\$36.12	\$577,920
STAB SUBBASE (SQ YDS)	17,333	\$0.00	\$0
SHOULDERS (SQ YDS)	0	\$0.00	\$0
SHOULDER SEAL (LN FT)	8,000	\$2.00	\$16,000
SUBBASE GRAN MAT'LTY C (TONS)	0	\$0.00	\$0
CONSTRUCTION INITIAL COST (PW)			\$593,920
TOTAL REHABILITATION COST (PW)			\$167,364
TOTAL LIFE CYCLE COST (PW)			\$761,284
ANNUAL COST PER MILE			\$40,659

MAINTENANCE COSTS:

ITEM	QUANTITY	UNIT PRICE	COST
PAVEMENT PATCHING (SQ YDS)	8,000	\$110.00	\$880,000
SHOULDER PATCHING (SQ YDS)	8,000	\$85.00	\$680,000
SHLDR JT ROUT & SEAL (LF)	8,000	\$0.65	\$5,200
CENTERLINE JT ROUT & SEAL (LF)	8,000	\$0.70	\$5,600
POLICY HMA OVERLAY P/MT (SQ YDS)	16,000	\$10.06	\$160,960
POLICY HMA OVERLAY SHLDR (SQ YDS)	0	\$0.65	\$0
RANDOM CRACK ROUT & SEAL (LF)	8,000	\$10.06	\$80,480
REFL TRANS CRACK ROUT & SEAL (LF)	8,000	\$0.65	\$5,200
PARTIAL P/MT PATCH (SQ YDS)	8,000	\$0.65	\$5,200
CONSTRUCTION INITIAL COST (PW)			\$593,920
TOTAL REHABILITATION COST (PW)			\$167,364
TOTAL LIFE CYCLE COST (PW)			\$761,284
ANNUAL COST PER MILE			\$40,659

MAINTENANCE COSTS:	ITEM	QUANTITY	UNIT PRICE	COST	PW
Activity 1 YEAR 10	PAVEMENT PATCHING 0.1% (SQ YDS)	16	\$110.00	\$1,760	\$1,310
Activity 2 YEAR 15	PAVEMENT PATCHING 0.2% (SQ YDS)	32	\$110.00	\$3,520	\$2,259
Activity 3 YEAR 20	PAVEMENT PATCHING 2.0% (SQ YDS)	320	\$110.00	\$35,200	
	SHOULDER PATCHING 0.5% (SQ YDS)	0	\$85.00	\$0	
	SHLDR JT ROUT & SEAL 100% (LF)	8,000	\$0.65	\$5,200	
	CENTERLINE JT ROUT & SEAL 100% (LF)	8,000	\$0.70	\$5,600	
Activity 4 YEAR 25	PAVEMENT PATCHING 3.0% (SQ YDS)	460	\$110.00	\$52,800	\$25,470
	SHOULDER PATCHING 1.0% (SQ YDS)	0	\$85.00	\$0	
Activity 5 YEAR 30	PAVEMENT PATCHING 4.0% (SQ YDS)	640	\$110.00	\$70,400	\$25,217
	SHOULDER PATCHING 1.5% (SQ YDS)	0	\$85.00	\$0	
	POLICY HMA OVERLAY OVMT (SQ YDS)	16,000	\$10.06	\$160,960	
	POLICY HMA OVERLAY SHLDR (SQ YDS)	0	\$10.06	\$0	
Activity 6 YEARS 35	SHLDR JT ROUT & SEAL 100% (LF)	8,000	\$0.65	\$5,200	\$95,320
	CENTERLINE JT ROUT & SEAL 100% (LF)	8,000	\$0.70	\$5,600	
	RANDOM CRACK ROUT & SEAL 50% (LF)	6,000	\$0.65	\$3,900	
	REFL TRANS CRACK ROUT & SEAL 40%	3,840	\$0.65	\$2,496	
	PARTIAL P/MT PATCH 0.1% (SQ YDS)	16	\$110.00	\$1,760	
Activity 7 YEAR 40	PAVEMENT PATCHING 0.5% (SQ YDS)	80	\$110.00	\$8,800	\$6,737
	SHOULDER PATCHING 0.5% (SQ YDS)	80	\$110.00	\$8,800	
	REFL TRANS CRACK ROUT & SEAL 60%	5,760	\$0.65	\$3,744	
	RANDOM CRACK ROUT & SEAL 50% (LF)	6,000	\$0.65	\$3,900	
	SHLDR JT ROUT & SEAL 100% (LF)	8,000	\$0.65	\$5,200	
	CENTERLINE JT ROUT & SEAL 100% (LF)	8,000	\$0.70	\$5,600	
Total Rehabilitation Cost (Present Worth)				\$36,044	\$11,051
Total Rehabilitation Cost (Present Worth)					\$167,364

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

30-Aug-12
 9:06 AM

FULL DEPTH FLEXIBLE PAVEMENT

MAINTENANCE COSTS

PW

COST

UNIT PRICE

QUANTITY

ITEM

ACTIVITY

DESCRIPTION

Activity 1
 YEAR 5 RAND/THERM CRACK ROUT & SEAL 50% (LF)
 SHLDR JT ROUT & SEAL 100% (LF)
 CENTERLINE JT ROUT & SEAL 100% (LF)
 PARTIAL PVMT PATCH 0.1% (SQ YDS)
 2,200 \$0.50 \$1,100
 8,000 \$4.00 \$32,000
 8,000 \$4.00 \$32,000
 16 \$85.00 \$1,360
 \$10,460

Activity 2
 YEAR 10 PARTIAL PVMT PATCH 0.5% (SQ YDS)
 RAND/THERM CRACK ROUT & SEAL 50% (LF)
 SHLDR JT ROUT & SEAL 100% (LF)
 CENTERLINE JT ROUT & SEAL 100% (LF)
 80 \$85.00 \$6,800
 2,200 \$0.50 \$1,100
 8,000 \$4.00 \$32,000
 8,000 \$4.00 \$32,000
 \$15,900

Activity 3
 YEAR 15 2" MILL PVMT & SHLDR 100% (SQ YDS)
 PARTIAL PVMT PATCH 1.0% (SQ YDS)
 2" OVERLAY PVMT & SHLDR 100% (TONS)
 16,000 \$1.65 \$26,400
 160 \$85.00 \$13,600
 1,792 \$89.82 \$160,960
 \$200,960

Activity 4
 YEAR 20 SHLDR JT ROUT & SEAL 100% (LF)
 CENTERLINE JT ROUT & SEAL 100% (LF)
 RAND/THERM CRACK ROUT & SEAL 50% (LF)
 PARTIAL PVMT PATCH 0.1% (SQ YDS)
 8,000 \$0.50 \$4,000
 8,000 \$0.50 \$4,000
 2,200 \$0.50 \$1,100
 16 \$85.00 \$1,360
 \$10,460

Activity 5
 YEAR 25 SHLDR JT ROUT & SEAL 100% (LF)
 CENTERLINE JT ROUT & SEAL 100% (LF)
 RAND/THERM CRACK ROUT & SEAL 50% (LF)
 PARTIAL PVMT PATCH 0.3% (SQ YDS)
 8,000 \$0.50 \$4,000
 8,000 \$0.50 \$4,000
 2,200 \$0.50 \$1,100
 80 \$85.00 \$6,800
 \$15,900

Activity 6
 YEAR 30 2" MILL PVMT & SHLDR 100% (SQ YDS)
 PARTIAL PVMT PATCH 2.0% (SQ YDS)
 HMA SHLDR PATCHING 1.0% (SQ YDS)
 POLICY HMA OVERLAY SHLDR (TONS)
 16,000 \$1.65 \$26,400
 320 \$85.00 \$27,200
 0 \$0 \$0
 3,360 \$89.82 \$301,800
 0 \$89.82 \$0
 \$355,400

Activity 7
 YEAR 35 SHLDR JT ROUT & SEAL 100% (LF)
 CENTERLINE JT ROUT & SEAL 100% (LF)
 RAND/THERM CRACK ROUT & SEAL 50% (LF)
 PARTIAL PVMT PATCH 0.1% (SQ YDS)
 8,000 \$0.50 \$4,000
 8,000 \$0.50 \$4,000
 2,200 \$0.50 \$1,100
 16 \$85.00 \$1,360
 \$10,460

Activity 8
 YEAR 40 SHLDR JT ROUT & SEAL 100% (LF)
 CENTERLINE JT ROUT & SEAL 100% (LF)
 RAND/THERM CRACK ROUT & SEAL 50% (LF)
 PARTIAL PVMT PATCH 0.5% (SQ YDS)
 8,000 \$0.50 \$4,000
 8,000 \$0.50 \$4,000
 2,200 \$0.50 \$1,100
 80 \$85.00 \$6,800
 \$15,900

Total Rehabilitation Cost (Present Worth)

\$318,253

08-001004-08-CH
 IL 134
 Lake
 Fairfield Road

PROJECT LENGTH (FT) 4000
 AVERAGE LANE WIDTH (FT) 12
 NUMBER OF LANES 3
 # OF EDGES 2
 INSIDE SHLDR WIDTH (FT) 0
 OUTSIDE SHLDR WIDTH (FT) 0
 # OF CENTERLINES 2
 1=RURAL, 2=URBAN
 1=SINGLE LANE, 2=DUAL LANE
 OTHER ROUTE
 MINIMUM 9.5
 ACTUAL 1.48
 FLEXIBLE 6.34

TRAFFIC
 PV- 14060 96.00%
 SU- 293 2.00%
 MU- 293 2.00%

PAVEMENT OVERLAY THICKNESS
 SHOULDER OVERLAY THICKNESS
 INITIAL COSTS
 ITEM QUANTITY UNIT PRICE COST
 SURFACE (SQ YDS) 16,000 \$10.06 \$160,960
 POLY BINDER (SQ YDS) 16,000 \$0 \$0
 BINDER (SQ YDS) 16,000 \$32.51 \$520,160
 SHOULDRS (SQ YDS) 0 \$0 \$0
 SUBBASE GRAN MATL TY C (TONS) 0 \$0 \$0

CONSTRUCTION INITIAL COST (PW)
 TOTAL REHABILITATION COST (PW)
 TOTAL LIFE CYCLE COST (PW)
 ANNUAL COST PER MILE

MAINTENANCE COSTS:
 ITEM UNIT COST
 RAND/THERM CRACK ROUT & SEAL (LF) \$0.50
 SHLDR JT ROUT & SEAL (LF) \$0.50
 CENTERLINE JT ROUT & SEAL (LF) \$0.50
 PARTIAL PVMT PATCH (SQ YDS) \$85.00
 2" MILL PVMT & SHLDR (SQ YDS) \$1.65
 2" OVERLAY PVMT & SHLDR (TONS) \$89.82
 2" MILL PVMT ONLY (SQ YDS) \$0.50
 HMA SHOULDER PATCHING (SQ YDS) \$1.65
 POLICY HMA OVERLAY PVMT (TONS) \$89.82
 POLICY HMA OVERLAY SHLDR (TONS) \$89.82

MATERIAL TYPE/PERCENTAGE PCC 31.3%