



Illinois Department of Transportation

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

A handwritten signature in black ink, appearing to be 'J.D. Baranzelli', enclosed in a hand-drawn oval.

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.

SECTION 08-0000-09-01
 COUNTY LAKE
 TOTAL SHEETS 10
 SHEETS NO. 09
 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

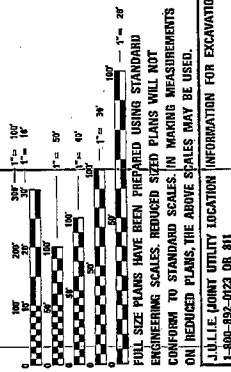
LAKE COUNTY
 JOB NO: XXXX

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

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

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

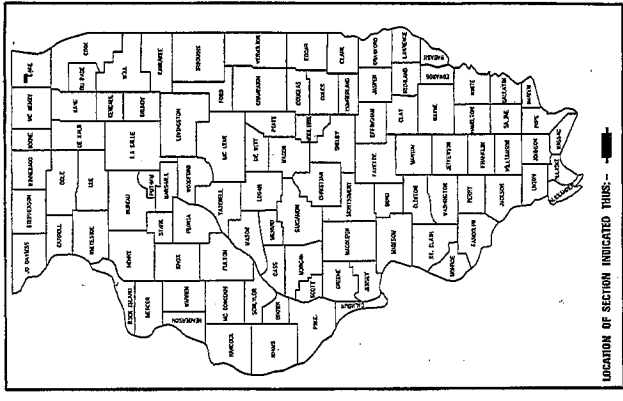
DESIGN SPEED:
 IL RTE 134
 FAIRFIELD ROAD: = 45 MPH
 NORTH LEG = 45 MPH
 SOUTH LEG = 50 MPH



JULIE JOHNSON UTILITY LOCATION INFORMATION FOR EXCAVATION
 1-800-492-0123 OR 811

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

CONTRACT NO. 62960



LOCATION OF SECTION INDICATED THIS: [Symbol]

STATE OF ILLINOIS
 DEPARTMENT OF TRANSPORTATION

APPROVED _____ 2012
 DIRECTOR OF TRANSPORTATION/COUNTY ENGINEER
 LAKE COUNTY DIVISION OF TRANSPORTATION

PASSED _____ 2013
 DISTRICT 1 ENGINEER OF LOCAL ROADS & STREETS

RELEASED FOR BID _____ 2013
 BASED ON LIMITED REVIEW

DEPUTY DIRECTOR OF HIGHWAYS, REGION 1 ENGINEER

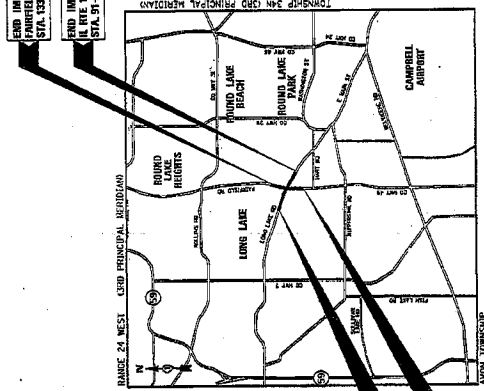
PRINTED BY THE AUTHORITY
 OF THE STATE OF ILLINOIS

HDR
 HDR Engineering, Inc.
 8550 N. 87th Street, Suite 800
 Chicago, IL 60631
 773-386-1900
 DESIGN FIRM REGISTRATION NUMBER 184-00070

PROJECT LOCATED IN
 LAKE COUNTY, ILLINOIS

BY: HDR ENGINEERING, INC. DATE: _____
 DMS. LICENSE EXPIRES NOV. 30, 2013

DIVISION OF HIGHWAYS
 LICENSE EXPIRES NOV. 30, 2013



LOCATION MAP
 SCALE = 1" = 1 MILE

PROJECT CROSS AND NET LENGTH:
 FAIRFIELD ROAD = 4942 FEET (0.77 MILES)
 IL ROUTE 134 = 4636 FEET (0.88 MILES)

PROJECT AND TRAFFIC INPUTS

(Enter Data in Gray Shaded Cells)

Route: IL 134
 Section: 08-00104-08-CH
 County: Lake
 Location: at Fairfield Road

Comments: Reconstruction of IL 134
 Design Date: 06/07/2012 SJP
 Modified Date: 06/20/2012 MPR

<- BY	ADT	Year
Current:	9,600	2008
Future:	17,000	2030

READ ME

Facility Type: Other Marked State Route
 # of Lanes = 2 or 3
 Part of future 4 lanes or more? No
 One Way Street? No
 Road Class: II
 Subgrade Support Rating (SSR): Poor
 Construction Year: 2013
 Design Period (DP) = 20 years



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

Cpv = 0.15
 Csu = 112.06
 Cmu = 385.44
 TF flexible (Actual) = 1.48 (Actual ADT)
 TF flexible (Min) = 3.17 (Min ADT Fig. 54-2.C)

RIGID PAVEMENT

Cpv = 0.15
 Csu = 135.78
 Cmu = 567.21
 TF rigid (Actual) = 2.08 (Actual ADT)
 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 64-22 (Fig. 53-4.R)	Edge Support = Tied 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)	
Design HMA Strain (ε _{HMA}) = 86 (Fig. 54-5.E)	
Full Depth HMA Design Thickness = 9.50 in. (Fig. 54-5.F)	
Limiting Strain Criterion Thickness = 14.50 in. (Fig. 54-5.I)	
Use Full-Depth HMA Thickness = 9.50 inches	
	CRCP Pavement
	Use TF rigid = 4.59
	IBR value = 3
	CRCP Thickness = 7.75 in. (Fig. 54-4.N)

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 = 3,4,5,6	
HMA Overlay Design Thickness = 8.00 in. (Fig. 54-5.U)	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)		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 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- L 134 at Fairfield
 ROUTE- 26-104-12
 SECTION- L 134
 COUNTY- 08-00104-08-CH
 LOCATION- Lake
 DATE- Fairfield Road
 15-Jun-12

PROJECT LENGTH (FT) 4000 =
 AVERAGE LANE WIDTH (FT) 12
 NUMBER OF LANES 3
 # OF EDGES 2
 INSIDE SHOULDER WIDTH (FT) 0
 OUTSIDE SHOULDER WIDTH (FT) 0
 # OF CENTERLINES 2
 RIGID THICKNESS 9
 TRAFFIC FACTORS
 MINIMUM 4.59
 ACTUAL 2.08

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

MAINTENANCE COSTS:

ITEM	QUANTITY	UNIT PRICE	COST	PW
Activity 1 YEAR 10 PAVEMENT PATCHING 0.1% (SQ YDS)	16	\$110.00	\$1,760	
Activity 2 YEAR 15 PAVEMENT PATCHING 0.2% (SQ YDS)	32	\$110.00	\$3,520	\$1,310
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	
			\$46,000	\$25,470
Activity 4 YEAR 25 PAVEMENT PATCHING 3.0% (SQ YDS)	480	\$110.00	\$52,800	
SHOULDER PATCHING 1.0% (SQ YDS)	0	\$85.00	\$0	
			\$52,800	\$25,217
Activity 5 YEAR 30 PAVEMENT PATCHING 4.0% (SQ YDS)	640	\$110.00	\$70,400	
SHOULDER PATCHING 1.5% (SQ YDS)	0	\$85.00	\$0	
POLICY HMA OVERLAY OVMT (SQ YDS)	16,000	\$10.08	\$160,960	
POLICY HMA OVERLAY SHLDR (SQ YDS)	0	\$10.08	\$0	
			\$231,360	\$95,320
Activity 6 YEARS 35 SHLDR JT ROUT & SEAL 100% (LF)	8,000	\$0.65	\$5,200	
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 PVMT PATCH 0.1% (SQ YDS)	16	\$110.00	\$1,760	
			\$18,956	\$6,737
Activity 7 YEAR 40 PAVEMENT PATCHING 0.5% (SQ YDS)	80	\$110.00	\$8,800	
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	
			\$36,044	\$11,051
Total Rehabilitation Cost (Present Worth)				\$167,364

QUANTITY	UNIT PRICE	COST
16,000	\$36.12	\$577,920
17,333	\$0.00	\$0
0	\$0.00	\$0
8,000	\$2.00	\$16,000
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	\$40,859

ITEM	UNIT COST
PAVEMENT PATCHING (SQ YDS)	\$110.00
SHOULDER PATCHING (SQ YDS)	\$85.00
SHLDR JT ROUT & SEAL (LF)	\$0.65
CENTERLINE JT ROUT & SEAL (LF)	\$0.70
POLICY HMA OVERLAY PVMT (SQ YDS)	\$10.08
POLICY HMA OVERLAY SHLDR (SQ YDS)	\$10.08
RANDOM CRACK ROUT & SEAL (LF)	\$0.65
REFL TRANS CRACK ROUT & SEAL (LF)	\$0.65
PARTIAL PVMT PATCH (SQ YDS)	\$110.00

MAINTENANCE COSTS:

PAVEMENT PATCHING (SQ YDS)
 SHOULDER PATCHING (SQ YDS)
 SHLDR JT ROUT & SEAL (LF)
 CENTERLINE JT ROUT & SEAL (LF)
 POLICY HMA OVERLAY PVMT (SQ YDS)
 POLICY HMA OVERLAY SHLDR (SQ YDS)
 RANDOM CRACK ROUT & SEAL (LF)
 REFL TRANS CRACK ROUT & SEAL (LF)
 PARTIAL PVMT PATCH (SQ YDS)

(Use Class A pricing for CRC)

FULL DEPTH FLEXIBLE
 TRAFFIC FACTOR LESS THAN 1.0 (RURAL)
 TRAFFIC FACTOR LESS THAN 10.0 (URBAN)

ROUTE- L 134
 SECTION- 08-00104-08-CH
 COUNTY- Lake
 LOCATION- 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
 PROJECT TYPE 1
 PAVING WIDTH 1
 INTERSTATE / OTHER ROUTE 1
 FLEXIBLE THICKNESS- 9.5
 TRAFFIC FACTORS- MINIMUM 6.34 ACTUAL 1.48

TRAFFIC PV- 14060
 SU- 293
 MU- 293

INITIAL COSTS
 SURFACE (SQ YDS) 16,000
 POLY BINDER (SQ YDS) 16,000
 BINDER (SQ YDS) 16,000
 SHOULDERS (SQ YDS) 0
 SUBBASE GRAN MATL. TY C (TONS) 0

CONSTRUCTION INITIAL COST (PW) \$861,120
 TOTAL REHABILITATION COST (PW) \$318,253

TOTAL LIFE CYCLE COST (PW) \$999,373
 ANNUAL COST PER MILE \$53,637

MAINTENANCE COSTS:
 RAND/ITHERM CRACK ROUT & SEAL (LF) \$0.60
 SHLDR JT ROUT & SEAL (LF) \$0.50
 CENTERLINE JT ROUT & SEAL (LF) \$0.50
 PARTIAL PVMT PATCH (SQ YDS) \$95.00
 2" MILL PVMT & SHLDR (SQ YDS) \$1.65
 2" OVERLAY PVMT & SHLDR (TONS) \$99.82
 2" MILL PVMT ONLY (SQ YDS) \$1.65
 HMA SHOULDER PATCHING (SQ YDS) \$95.00
 POLICY HMA OVERLAY PVMT (TONS) \$99.82
 POLICY HMA OVERLAY SHLDR (TONS) \$99.82

MATERIAL TYPE/PERCENTAGE PCC 31.3%

26-Jul-12 1:55 PM
 FULL DEPTH FLEXIBLE PAVEMENT MAINTENANCE COSTS
 ITEM QUANTITY UNIT PRICE COST PW

Activity 1
 YEAR 5 RAND/ITHERM CRACK ROUT & SEAL 50% (LF) 2,200 \$0.50 \$1,100
 SHLDR JT ROUT & SEAL 100% (LF) 8,000 \$0.50 \$4,000
 CENTERLINE JT ROUT & SEAL 100% (LF) 8,000 \$0.50 \$4,000
 PARTIAL PVMT PATCH 0.1% (SQ YDS) 16 \$85.00 \$1,360
 \$10,460 \$9,023

Activity 2
 YEAR 10 PARTIAL PVMT PATCH 0.5% (SQ YDS) 80 \$85.00 \$6,800
 RAND/ITHERM CRACK ROUT & SEAL 50% (LF) 2,200 \$0.50 \$1,100
 SHLDR JT ROUT & SEAL 100% (LF) 8,000 \$0.50 \$4,000
 CENTERLINE JT ROUT & SEAL 100% (LF) 8,000 \$0.50 \$4,000
 \$15,900 \$11,831

Activity 3
 YEAR 15 2" MILL PVMT & SHLDR 100% (SQ YDS) 16,000 \$1.65 \$26,400
 PARTIAL PVMT PATCH 1.0% (SQ YDS) 160 \$85.00 \$13,600
 2" OVERLAY PVMT & SHLDR 100% (TONS) 1,792 \$89.82 \$160,960
 \$200,960 \$128,986

Activity 4
 YEAR 20 SHLDR JT ROUT & SEAL 100% (LF) 8,000 \$0.50 \$4,000
 CENTERLINE JT ROUT & SEAL 100% (LF) 8,000 \$0.50 \$4,000
 RAND/ITHERM CRACK ROUT & SEAL 50% (LF) 2,200 \$0.50 \$1,100
 PARTIAL PVMT PATCH 0.1% (SQ YDS) 16 \$85.00 \$1,360
 \$10,460 \$5,792

Activity 5
 YEAR 25 SHLDR JT ROUT & SEAL 100% (LF) 8,000 \$0.50 \$4,000
 CENTERLINE JT ROUT & SEAL 100% (LF) 8,000 \$0.50 \$4,000
 RAND/ITHERM CRACK ROUT & SEAL 50% (LF) 2,200 \$0.50 \$1,100
 PARTIAL PVMT PATCH 0.5% (SQ YDS) 80 \$85.00 \$6,800
 \$15,900 \$7,584

Activity 6
 YEAR 30 2" MILL PVMT & SHLDR 100% (SQ YDS) 16,000 \$1.65 \$26,400
 PARTIAL PVMT PATCH 2.0% (SQ YDS) 320 \$85.00 \$27,200
 HMA SHLDR PATCHING 1.0% (SQ YDS) 0 \$85.00 \$0
 POLICY HMA OVERLAY PVMT (TONS) 3,360 \$89.82 \$301,800
 POLICY HMA OVERLAY SHLDR (TONS) 0 \$89.82 \$0
 \$355,400 \$146,425

Activity 7
 YEAR 35 SHLDR JT ROUT & SEAL 100% (LF) 8,000 \$0.50 \$4,000
 CENTERLINE JT ROUT & SEAL 100% (LF) 8,000 \$0.50 \$4,000
 RAND/ITHERM CRACK ROUT & SEAL 50% (LF) 2,200 \$0.50 \$1,100
 PARTIAL PVMT PATCH 0.1% (SQ YDS) 16 \$85.00 \$1,360
 \$10,460 \$3,717

Activity 8
 YEAR 40 SHLDR JT ROUT & SEAL 100% (LF) 8,000 \$0.50 \$4,000
 CENTERLINE JT ROUT & SEAL 100% (LF) 8,000 \$0.50 \$4,000
 RAND/ITHERM CRACK ROUT & SEAL 50% (LF) 2,200 \$0.50 \$1,100
 PARTIAL PVMT PATCH 0.5% (SQ YDS) 80 \$85.00 \$6,800
 \$15,900 \$4,875

Total Rehabilitation Cost (Present Worth) \$318,253