Illinois Department of Transportation

To:	John Fortman	Attn: District One
From:	John D. Baranzelli	
Subject:	Pavement Design	
Date:	July 12, 2012	

FAU Route 2710 (Des Plaines River Road)
Section 52-N
Cook County
At Robinson Road

We have reviewed the pavement design for the above captioned section submitted to BDE on May 16, 2012. The life cycle cost analysis favored the rigid design by over 10%. The approved pavement design is as follows:

Des Plaines River Road at Robinson Road [New Construction]

8.75 inches of jointed PCC pavement with tied PCC curb & gutter
12 inches of Aggregate Subgrade Improvement

Robinson Road at Des Plaines River Road [Widening]

7.25 inches of HMA Pavement [Full Depth] with tied PCC curb & gutter
2 inches of HMA Surface Course Mix "D", N50
5.25 inches of HMA Binder Course IL 19.0, N50
12 inches of Aggregate Subgrade Improvement

Robinson Road is subject to local jurisdictional approval and concurrence.

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: Diane O'Keefe

By: Jose Dominguez

Subject: Pavement Analysis*

Date: May 16, 2012

*Route: FAU 2710 Des Plaines River Rd
Limits: Robinson Rd
Contract No.: 60T17
Letting: 06 CY13

Section: 52-N
County: Cook
Job No.: P-91-720-09

We are submitting the pavement analysis for the above captioned location for your review and approval. Please note that the total pavement area for reconstruction exceeds 4,750 Square Yards. The improvement involves the following scope of work:

a.) Pavement reconstruction of Des Plaines River Rd at Robinson Road for a total length of approximately 1,211 feet to accommodate two 12 foot thru lanes in either direction and one left turn lane.

b.) Pavement widening and resurfacing of Robinson Road at Des Plaines River Road for a total length of approximately 175 feet to provide two 12 foot turn lanes and one 13 foot thru 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 over 21%.

a.) Des Plaines River Rd at Robinson Road
Tied PCC Curb and Gutter
Pavement Reconstruction
- 8 ¾" PCC Pavement (Jointed)*
- 12" Aggregate Subgrade Improvement

b.) Robinson Road at Des Plaines River Road ****
PCC Curb and Gutter
Proposed Pavement Widening
- 7 ¼" HMA Pavement (Full Depth)
  - 2 HMA Surface Course Mix "D", N50**
  - 5 ¼" HMA Binder Course IL 19.0 N50 ***
- 12" Aggregate Subgrade Improvement

Existing Pavement Resurfacing
2" Cold Milling of Existing HMA Pavement
2" Hot-Mix Asphalt Surface Course, Mix "D", N50**

* Designer Note 1: Transverse contraction joints should be reduced to a maximum of 13.5 foot spacing for 8 ¾" PCC pavement which is paid for as **"PCC PVT 8 ¾" JOINTD"** (42000316).

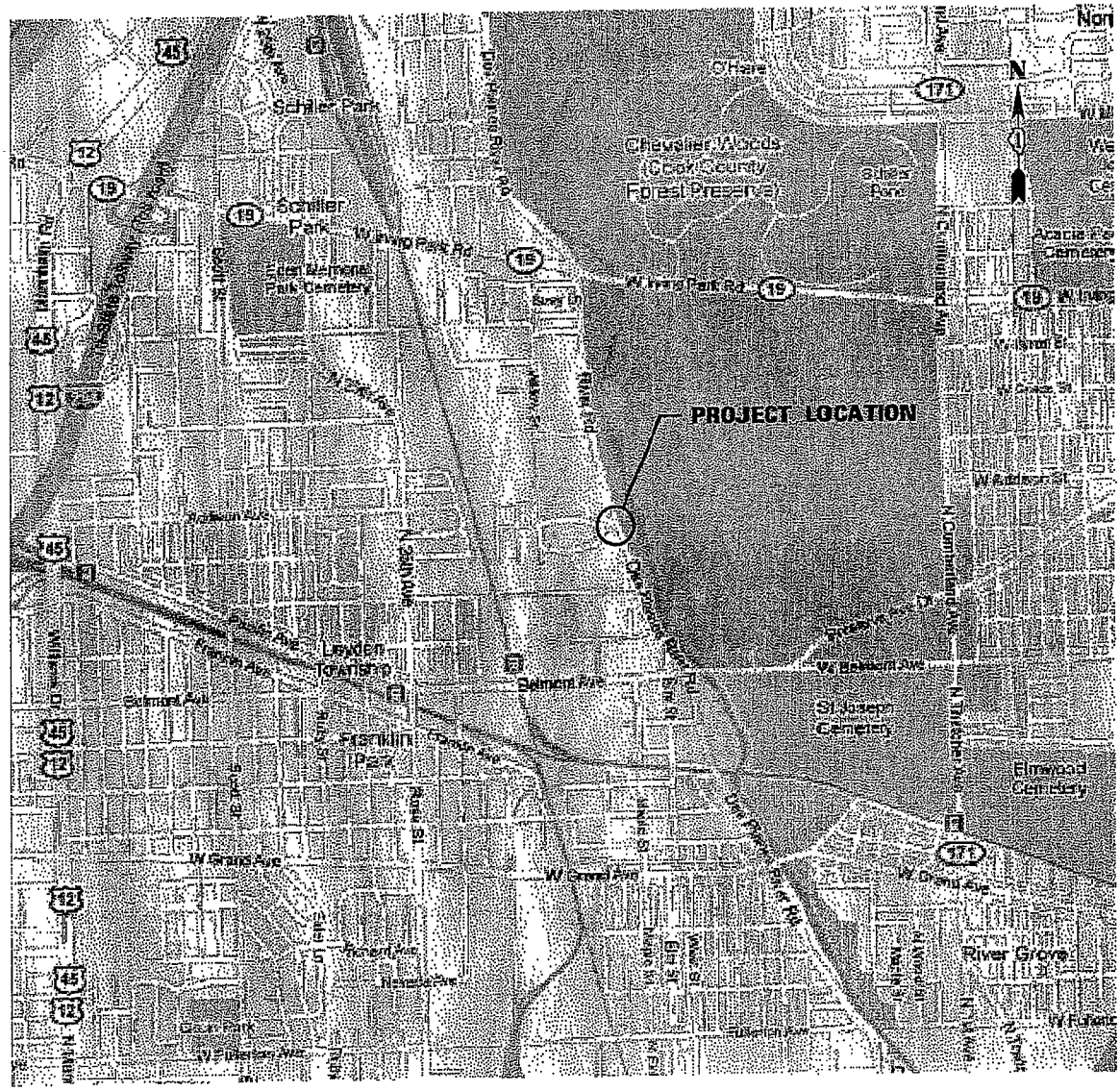
** Designer Note 2: Use pay item #40603335 **"HMA SC "D" N50"** paid for in tons.

*** Designer Note 3: Use pay item #35501305 **"HMA Base CSE 5 1/4"** paid for in square yards.

**** Designer Note 4: Robinson Road is subject to local jurisdictional approval and concurrence.

If you have any questions or need additional information, please contact Mr. Tom Matousek at (847)705-4255.

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



PROJECT LOCATION MAP

EXHIBIT E–1

DES PLAINES RIVER

Spreadsheet by Uehle - Rev. 11/02

MECHANISTIC PAVEMENT DESIGN

FOR TF ONLY

Date: 5/12/12

INPUT (Enter Data In Gray Shaded Cells)

Route: Des Plaines River Rd
Section: 52-N
County: Cook
Location: at Robinson Rd

Comments: Des Plaines River Rd Design

Designer: MK

	ADT	Year
Current:	24500	2008
Future:	26000	2030

Facility Type: Unmarked State Route

# of Lanes = 4

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	23,991	94.0%	P = 32%
SU =	No Min	1,149	4.5%	S = 45%
MU =	No Min	383	1.5%	M = 45%
Struct. Design ADT =		25523	(2023)	

FLEXIBLE & RIGID PAVEMENT CALCULATIONS AND ADDITIONAL INPUT

Flexible Pavement

Cpv =	0.15	
Csu =	133	
Cmu =	483	
TF flexible (Actual)=	3.06	(Actual ADT)
TF flexible (Min)=	No Min	(Min ADT Fig 54-2C)
Use TF flexible =	3.06	
AC Type =	20	
AC Mixture Tempurature =		deg. F (Figure 54-5C)
Design AC Mixture Modulus (Eac)=		ksi (Figure 54-5D)
Design Asphalt Concrete Microstrain =	73.9	(Figure 54-5E)
Asphalt Concrete Thickness =		in. (Figure 54-5F)

Rigid Pavement

Cpv =	0.15	
Csu =	144	
Cmu =	696	
TF rigid (Actual)=	3.91	(Actual ADT)
TF rigid (Min)=	No Min	(Min ADT Fig 54-2C)
Use TF rigid =	3.91	
		Shoulder or C. &G.
Rigid Pavt Thick. =		in. (Figure 54-4D)

DESIGN TABLES FROM BD&E PAVEMENT DESIGN CH. 54 AND PAVEMENT DESIGN MANUAL

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 54-2C)		
Facility Type	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

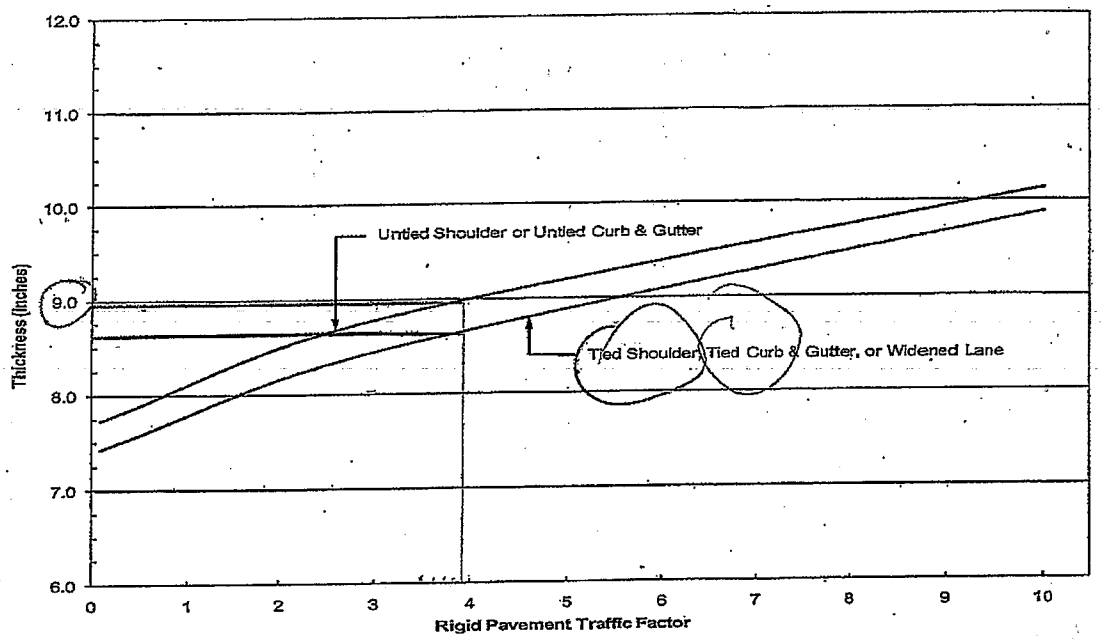
	Traffic Factor ESAL Coefficients			
	Rigid (Fig. 54-4C)		Flexible (Fig. 54-5B)	
Class	Csu	Cmu	Csu	Cmu
I	143.81	696.42	132.50	482.53
II	135.78	567.21	112.06	385.44
III	129.58	562.47	109.14	384.35
IV(ADT>400)	127.75	555.90	109.14	384.35
IV(ADT<=400)	127.75	555.90	9.86	78.84

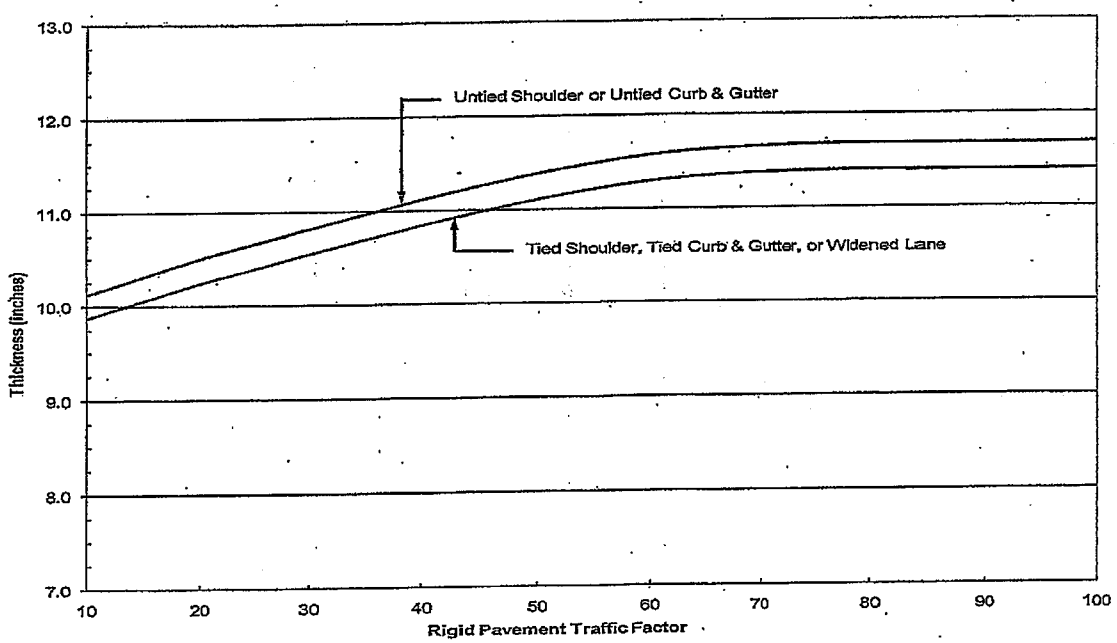
Class Table for 2 or 3 lanes (not future 4 lane & not one-way street)

ADT	Class
0 - 749	IV
750 - 2000	III
>2000	II

	Figure 54-2B Percentage of ADT in Design Lane					
	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%

D.P. Kiver





Note: Use of untied shoulder design requires BDE approval.

RIGID PAVEMENT DESIGN CHART
(Mechanistic Design: SSR = Poor)

Figure 54-4.E

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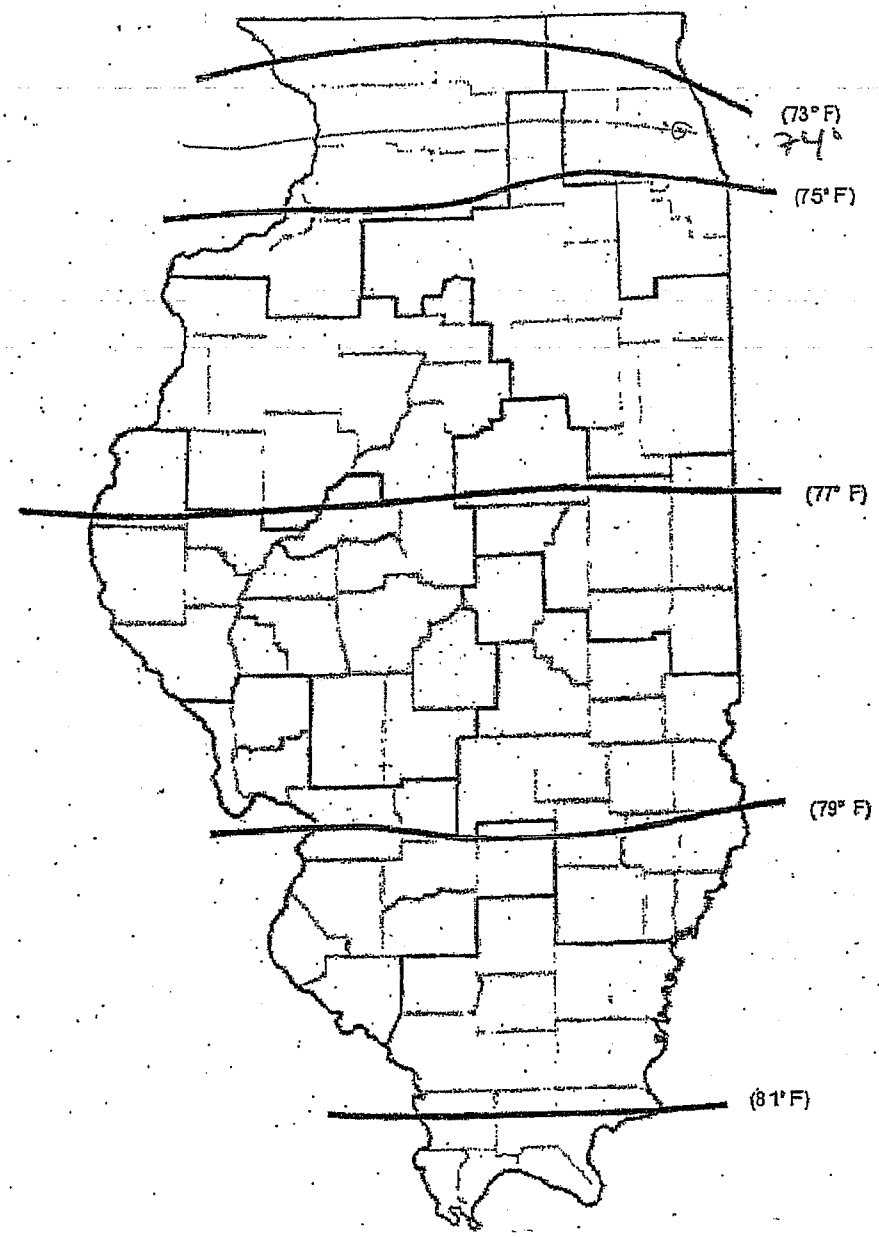
D.P. Ruwer



Note: The minimum design HMA mixture temperature will be 73 °F.

HMA MIXTURE TEMPERATURE
(Mechanistic Design: Flexible Pavement)

Figure 54-5.C

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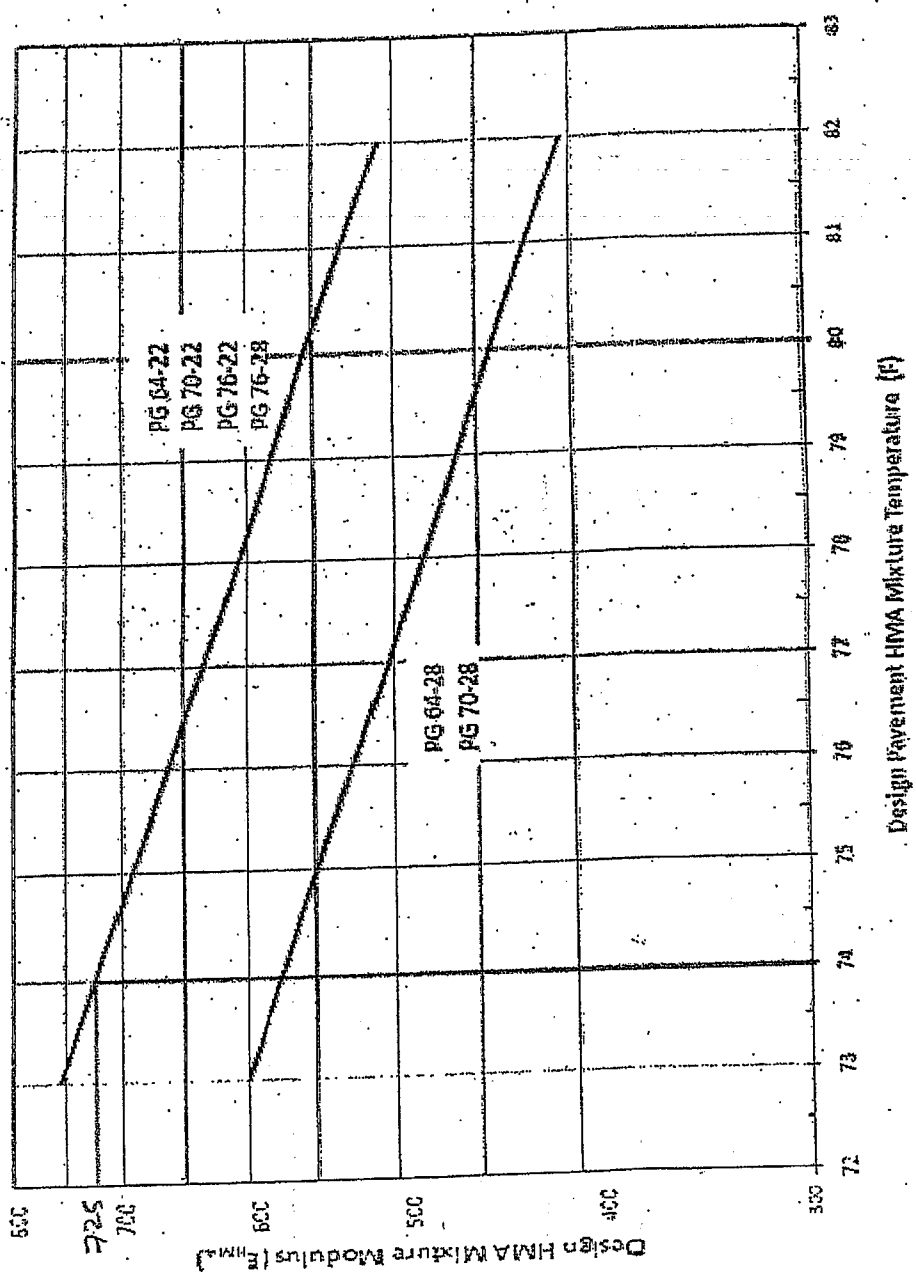
D.K. Kuker

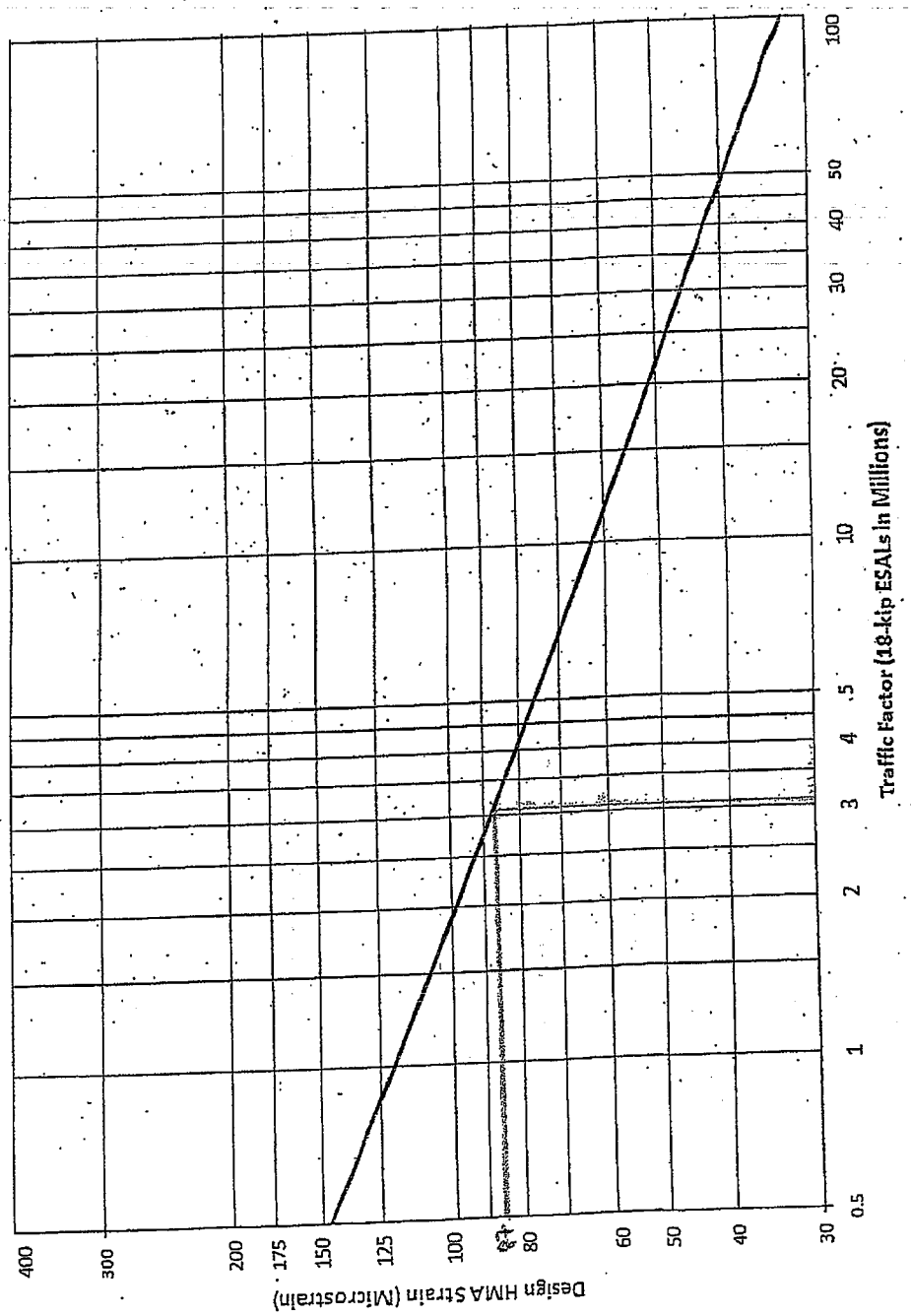


HMA MIXTURE MODULUS (E_{HMA})
(Mechanistic Design: Flexible Pavement)

Figure 54-5.D

HARD COPIES UNCONTROLLED

D.R. River



DESIGN HMA STRAIN
(Mechanistic Design: Flexible Pavement)

Figure 54-5.E

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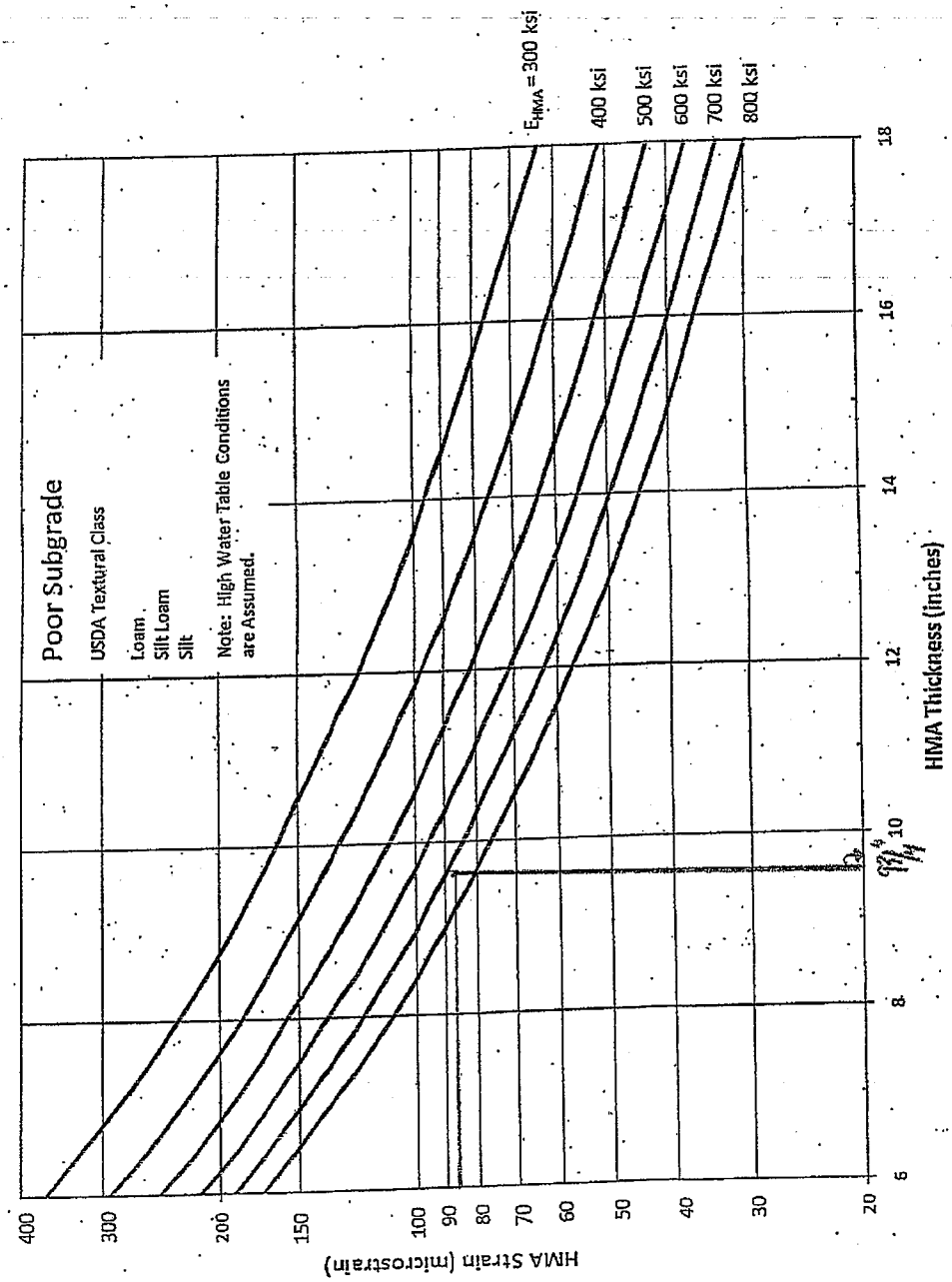
D.P. Ruzer



HMA THICKNESS DESIGN CHART
(Mechanistic Design: Flexible Pavement: SSR = Poor)

Figure 54-5.F

HARD COPIES UNCONTROLLED

MECHANISTIC PAVEMENT DESIGN

Date 16-May-12
Calcs by: MK
Checked by:
Class I Roads and Streets
Urban X Rural
Limits of Analysis Station 106+19.38 to Station 118+26.95
Length 1211 Feet 0.23 Miles

Route Des Plaines River Rd
Section 52-N
Cook County
Location Robinson Rd

Structural Design Traffic
PV = 23991
SU = 1149
MU = 383

Percent of S.D.T. in Design Lane
P = 94.00%
S = 4.50%
U = 1.50%

MINIMUM SUBGRADE SUPPORT RATING - "POOR"

Flexible Pavement Design Actual TF_F = 3.06 Minimum TF_F = N/A

Selected Design AC Type
Design AC Mixture Temp 74 °F
Design AC Microstrain 87
Design E_{AC} 725 KSI
AC Thickness 9.75 Inch

Rigid Pavement Design Actual TF_F = 3.91 Minimum TF_F = N/A
Extended Lane 9 Inch
15' Panel PCC Thickness for:
Tied Shoulder 0 Inch
Untied Shoulder 0 Inch

Figure 5.05

RIGID PAVEMENT

Date: 16-May-12 Route es Plaines River F

Quantities by MK Checked by: [redacted] Section 52-N

Unit Prices by [redacted] SJP Checked by: [redacted] Cook County

Net Length 1211 Lin. Ft. = 0.23 Miles

Number Lanes 4 Urban X Rural

ITEMIZED CONSTRUCTION COST

Quantity	Units	Item		Unit Cost	Total Cost
6459	Sq. Yds.	9 Inch Jointed PCC	@	$37.26	$240,662
6862	Sq. Yds.	4-Inch (Stabilized/Granular Subbase)	@	$0.00	$0
0	Sq. Yds.	PCC Shoulder	@	$0.00	$0
	Lin. Ft.	Pipe Underdrains	@		
0		Subbase Gran. Mat., Type C	@	$0.00	$0
2,422	Lin. Ft.	100% Shoulder Joint Seal	@	$2.00	$4,844

Total Cost of Original Pavement Construction $245,506

ITEMIZED MAINTENANCE AND REHABILITATION ACTIVITY COST

REHABILITATION ACTIVITY 1 - YEAR 10

6	Sq. Yds.	0.1% Full Depth PCC Pavement Patching	@	$130.00	$780

Total Cost of Rehabilitation Activity 1 $780

Figure 5.05a(1)

RIGID PAVEMENT (Cont.)

Route Des Plaines River Rd

Section 52-N

Cook County

REHABILITATION ACTIVITY 2 - YEAR 15

			Unit Cost	Total Cost
13 Sq. Yds.	0.2% Full Depth PCC Pavement Patching	@	$130.00	$1,690

Total Cost of Rehabilitation Activity 2 $1,690

REHABILITATION ACTIVITY 3 - YEAR 20

			Unit Cost	Total Cost
129 Sq. Yds.	2% Full Depth PCC Pavement Patching	@	$0.00	$16,770
0 Sq. Yds.	0.5% Full Depth PCC Pavement Patching	@	$85.00	$0
2422 Lin. Ft.	100% Longitudunal/ Shoulder Joint Routing & Sealing	@	$1.00	$2,422
1211 Lin. Ft.	100% Centerline Joint Routing & Sealing	@	$1.00	$1,211

Total Cost of Rehabilitation Activity 3 $20,403

FIGURE 5.05a(2)

RIGID PAVEMENT (Cont.)

Route Des Plaines River Rd

Section 52-N

Cook County

REHABILITATION ACTIVITY 4 - YEAR 25

			Unit Cost	Total Cost
194 Sq. Yds.	3.0% Full Depth PCC Pavement Patching	@	$130.00	$25,220
0 Sq. Yds.	1.0% Full Depth PCC Pavement Patching	@	$85.00	$0

Total Cost of Rehabilitation Activity 4 $25,220

REHABILITATION ACTIVITY 5 - YEAR 30

			Unit Cost	Total Cost
258 Sq. Yds.	3.0% Full Depth PCC Pavement Patching	@	$85.00	$0
0 Sq. Yds.	1.0% Full Depth PCC Pavement Patching	@	$9.38	$60,585
6,459 Sq. Yds.	Policy HMA Overlay - Pavement	@	$9.38	$60,585
0 Sq. Yds.	Policy HMA Overlay - Shoulder	@	$9.38	$0

Total Cost of Rehabilitation Activity 5 $94,125

REHABILITATION ACTIVITY 6 - YEAR 35

			Unit Cost	Total Cost
2,422 Lin. Ft.	100% Longitudinal Shoulder Joint Routing & Sealing	@	$1.00	$2,422
1211 Lin. Ft.	100% Centerline Joint Routing & Sealing	@	$1.00	$1,211
2,422 Lin. Ft.	50% Random Crack Routing & Sealing - Assume 100ft/station	@	$1.00	$2,422
1,550 Lin. Ft.	40% Reflective Transverse Crack Routing & Sealing	@	$1.00	$1,550
6 Sq. Yds.	0.1% Partial-Depth Pavement Patching (Mill & Fill Surface-Interstates; Mill & Fill 2.5in. Non-Interstates)		$130.00	$780

Total Cost of Rehabilitation Activity 6 $8,385

Figure 5.05a(3)

RIGID PAVEMENT (Cont.)

Route Des Plaines River Rd

Section 52-N

Cook County

REHABILITATION ACTIVITY 7 - YEAR 40

			Unit Cost	Total Cost
32 Sq. Yds.	0.5% Full Depth PCC Pavement Patching	@	$130.00	$4,160
32 Sq. Yds.	0.5% Partial Depth Pavement Patching	@	$130.00	$4,160
	(Mill & Fill Surface-Interstates; Mill & Fill 2.5in. Non-Interstates)			
2,325 Lin. Ft.	60% Reflective Transverse Crack Routing & Sealing	@	$1.00	$2,325
2,422 Lin. Ft.	50% Random Crack Routing & Sealing - Assume 100ft/station	@	$1.00	$2,422
2,422 Lin. Ft.	100% Longitudunal/ Shoulder Joint Routing & Sealing	@	$1.00	$2,422
1,211 Lin. Ft.	100% Centerline Joint Routing & Sealing	@	$1.00	$1,211
	Total Cost of Rehabilitation Activity 7			$16,700

RIGID PAVEMENT (Cont.)

Route Des Plaines River Rd

Section 52-N

Cook County

ANNUAL COST DETERMINATION

Present Worth Calculation:

Total Cost of Original Pavement Construction $245,506

Present Worth of Rehab Activity 1	$780	x 0.7441 =	$580
Present Worth of Rehab Activity 2	$1,690	x 0.6419 =	$1,085
Present Worth of Rehab Activity 3	$20,403	x 0.5537 =	$11,297
Present Worth of Rehab Activity 4	$25,220	x 0.4776 =	$12,045
Present Worth of Rehab Activity 5	$94,125	x 0.4120 =	$38,780
Present Worth of Rehab Activity 6	$8,385	x 0.3554 =	$2,980
Present Worth of Rehab Activity 7	$16,700	x 0.3066 =	$5,120

Total Life Cycle Cost (Present Worth) $71,887

Annual Cost Per Mile Calculation

Total PW	x CRF_n /	Length		= Annual Cost / Year-Mile
$71,887	x0.04079 /	0.23	Mi.	$56,289 per Yr.-Mi.

FLEXIBLE PAVEMENT

Date: 16-May-12 Route Des Plaines River Rd

Quantities by MK Checked by: Section 52-N

Unit Prices by SJP Checked by: Cook County

Net Length 1211 Lin. Ft. = 0.23 Miles

Number Lanes 4 Urban X Rural

Single Lane Paving X Dual Lane Paving

ITEMIZED CONSTRUCTION COST

Quantity	Units	Item		Unit Cost	Total Cost
6,459	Sq. Yds.	Class I Surface Course	@	$9.38	$60,585
6,459	Sq. Yds.	Class I Binder Course	@	$21.13	$136,479
0	Sq. Yds.	Stabilized Shoulders	@	$0.00	$0
	Lin. Ft.	Pipe Underdrains	@		
0		Subbase Gran. Matl., Type C	@	$0.00	$0
6,459	Sq. Yds.	Poly Binder	@	$9.49	$61,296

Total Cost of Original Pavement Construction $258,360

ITEMIZED MAINTENANCE AND REHABILITATION ACTIVITY COST

REHABILITATION ACTIVITY 1 - YEAR 5

				Unit Cost	Total Cost
666	Lin. Ft.	50% Random/Thermal Cracking & Sealing (Assume 110ft/station)	@	$1.00	$666
2422	Lin. Ft.	100% Longitudinal Shoulder Joint Routing & Sealing	@	$1.00	$2,422
1211	Lin. Ft.	100% Centerline Joint Rounting & Sealing	@	$1.00	$1,211
6	Sq. Yds.	0.1% Partial-Depth Pavement Patching Mill & Fill Surface	@	$90.00	$540

Total Cost of Rehabilitation Activity 1 $4,839

FIGURE 5.05b(1)

FLEXIBLE PAVEMENT (Cont.)

Route Des Plaines River Rd

Section 52-N

Cook County

REHABILITATION ACTIVITY 2 - YEAR 10

				Unit Cost	Total Cost
32	Sq. Yds.	0.5% Partial-depth HMA Pavement Patching - Mill & Fill Surface	@	$90.00	$2,880
666	Lin. Ft.	50% Random/ Thermal Crack Routing & Sealing (Assume 110ft/station)	@	$1.00	$666
2422	Lin. Ft.	100% Longitudinal Shoulder Joint Routing & Sealing	@	$1.00	$2,422
1211	Lin. Ft.	100% Centerline Joint Rounting & Sealing	@	$1.00	$1,211

Total Cost of Rehabilitation Activity 2 $7,179

REHABILITATION ACTIVITY 3 - YEAR 15

				Unit Cost	Total Cost
6,459	Sq. Yds.	2.00in. Milling - Pavement & Shoulder	@	$1.75	$11,303
65	Sq. Yds.	1.0% Partial-depth Pavement Patching (Mill & Fill Addition 2.00in.)	@	$90.00	$5,850
723	Sq. Yds.	2.00in. HMA Overlay Pavement & Shoulder	@	$83.75	$60,551

Total Cost of Rehabilitation Activity 3 $77,704

FIGURE 5.05b(2)

FLEXIBLE PAVEMENT (Cont.)

Route Des Plaines River Rd

Section 52-N

Cook County

				Unit Cost	Total Cost
REHABILITATION ACTIVITY 4 - YEAR 20					
2422	Lin. Ft.	100% Longitudinal Shoulder Joint Routing & Sealing	@	$1.00	$2,422
1211	Lin. Ft.	100% Centerline Joint Rounting & Sealing	@	$1.00	$1,211
666	Lin. Ft.	50% Random/ Thermal Crack Routing & Sealing (Assume 110ft/station)	@	$1.00	$666
6	Sq. Yds.	0.1% Partial-Depth HMA Pavement Patching (Mill & Fill Surface)	@	$90.00	$540
		Total Cost of Rehabilitation Activity 4			$4,839
				Unit Cost	Total Cost
REHABILITATION ACTIVITY 5 - YEAR 25					
2422	Lin. Ft.	100% Longitudinal Shoulder Joint Routing & Sealing	@	$1.00	$2,422
1211	Lin. Ft.	100% Centerline Joint Rounting & Sealing	@	$1.00	$1,211
666	Lin. Ft.	50% Random/ Thermal Crack Routing & Sealing (Assume 110ft/station)	@	$1.00	$666
32	Sq. Yds.	0.5% Partial-Depth Pavement Patching (Mill & Fill Surface)	@	$90.00	$2,880
		Total Cost of Rehabilitation Activity 5			$7,179
				Unit Cost	Total Cost
REHABILITATION ACTIVITY 6 - YEAR 30					
6,459	Sq. Yds.	2.00in. Milling (Pavement only-Std Design Pavement & Shoulder-Limiting Strain Criteria Design)	@	$1.75	$11,303
129	Sq. Yds.	2.0% Partial-Depth HMA Pavement Patching (Mill & Fill Additional 2.00in. All Designs)	@	$90.00	$11,610
0	Sq. Yds.	1.0% Full-Depth HMA Shoulder Patching (Mill & Fill Surface-Standard Design Mill & Fill Additional 2.00in.-Limiting Strain Criteria Design)	@	$90.00	$0
1,356	Tons	HMA Overlay Pvmt (3.75in. - Std Design 2.00in.-Limiting Strain Criterion Design)	@	$83.75	$113,565
0	Tons	HMA Overlay Shoulder (1.75in. - Standard Design; 2.00in.-Limiting Strain Criterion Design)	@	$83.75	$0
		Total Cost of Rehabilitation Activity 6			$136,478

FIGURE 5.05b(3)

FLEXIBLE PAVEMENT (Cont.)

Route Des Plaines River Rd

Section 52-N

Cook County

REHABILITATION ACTIVITY 7 - YEAR 35

				Unit Cost	Total Cost
2422	Lin. Ft.	100% Longitudinal Shoulder Joint Routing & Sealing	@	$1.00	$2,422
1211	Lin. Ft.	100% Centerline Joint Rounting & Sealing	@	$1.00	$1,211
666	Lin. Ft.	50% Random/ Thermal Crack Routing & Sealing (Assume 110ft/station)	@	$1.00	$666
6	Sq. Yds.	0.1% Partial-Depth HMA Pavement Patching (Mill & Fill Surface)	@	$90.00	$540
		Total Cost of Rehabilitation Activity 7			$4,839

REHABILITATION ACTIVITY 8 - YEAR 40

				Unit Cost	Total Cost
2422	Lin. Ft.	100% Longitudinal Shoulder Joint Routing & Sealing	@	$1.00	$2,422
1211	Lin. Ft.	100% Centerline Joint Rounting & Sealing (Single Lane and Dual Lane Paving)	@	$1.00	$1,211
666	Lin. Ft.	50% Random/ Thermal Crack Routing & Sealing (Assume 110ft/station)	@	$1.00	$666
32	Sq. Yds.	0.5% Partial-Depth Pavement Patching (Mill & Fill Surface)	@	$90.00	$2,880
		Total Cost of Rehabilitation Activity 8			$7,179

Figure 5.05b(4) - continued

FLEXIBLE PAVEMENT (Cont.)

Route Des Plaines River Rd

Section 52-N

Cook County

ANNUAL COST DETERMINATION

Present Worth Calculation:

Total Cost of Original Pavement Construction			$258,360
Present Worth of Rehab Activity 1	$4,839	x 0.7441 =	$4,174
Present Worth of Rehab Activity 2	$7,179	x 0.6419 =	$5,342
Present Worth of Rehab Activity 3	$77,704	x 0.5537 =	$49,878
Present Worth of Rehab Activity 4	$4,839	x 0.4776 =	$2,679
Present Worth of Rehab Activity 5	$7,179	x 0.4120 =	$3,429
Present Worth of Rehab Activity 6	$136,478	x 0.3554 =	$56,229
Present Worth of Rehab Activity 7	$4,839	x 0.3066 =	$1,720
Present Worth of Rehab Activity 8	$7,179	x 0.3066 =	$2,201
Total Life Cycle Cost (Present Worth)			$125,652

Annual Cost Per Mile Calculation

Total PW	x CRF_n /	Length		= Annual Cost / Year-Mile	
$125,652	x0.04079 /	0.23	Mi.	$68,104	per Yr.-Mi.

MATERIAL TYPE/PERCENTAGE	PCC	21.0%

PLAIN JOINTED PCC PAVEMENT

FILENAME-	Des Plaines River	18-May-12	
ROUTE-	FAU 2710	11:04 AM	
SECTION-	62-N		
COUNTY-	Cook		
LOCATION-	Robinson Rd		
DATE-	12-May-12		
PROJECT LENGTH (FT)	1211 =	0.23	MILES
AVERAGE LANE WIDTH (FT)	12		
NUMBER OF LANES	4		
# OF EDGES	2		
INSIDE SHLDER WIDTH (FT)	0		
OUTSIDE SHLDER WIDTH (FT)	0		
# OF CENTERLINES	1		
RIGID THICKNESS-	9		
TRAFFIC FACTORS	MINIMUM	ACTUAL	
RIGID-	N/A	3.91	

TRAFFIC

		Percentages
PV-	23801	84.00%
SU-	1149	4.50%
MU-	383	1.50%

INITIAL COSTS

ITEM	QUANTITY	UNIT PRICE	COST
PAVEMENT (SQ YDS)	6,459	$37.25	$240,882
STAB SUBBASE (SQ YDS)	6,882	$0.00	$0
SHOULDERS (SQ YDS)	0	$0.00	$0
SHOULDER SEAL (LN FT)	2,422	$2.00	$4,844
SUBBASE GRAN MATL TY C (TONS)	0	$0.00	$0

CONSTRUCTION INITIAL COST (PW)	$245,506
TOTAL REHABILITATION COST (PW)	$71,887
TOTAL LIFE CYCLE COST (PW)	$317,393
ANNUAL COST PER MILE	$56,289

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)		$9.38
POLICY HMA OVERLAY SHLDR (SQ YDS)		$9.38
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)	6	$130.00	$780	
				$780	$580
Activity 2 YEAR 15					
	PAVEMENT PATCHING 0.2% (SQ YDS)	13	$130.00	$1,690	
				$1,690	$1,085
Activity 3 YEAR 20					
	PAVEMENT PATCHING 2.0% (SQ YDS)	129	$130.00	$16,770	
	SHOULDER PATCHING 0.5% (SQ YDS)	0	$85.00	$0	
	SHLDR JT ROUT & SEAL 100% (LF)	2,422	$1.00	$2,422	
	CENTERLINE JT ROUT & SEAL 100% (LF)	1,211	$1.00	$1,211	
				$20,403	$11,297
Activity 4 YEAR 25					
	PAVEMENT PATCHING 3.0% (SQ YDS)	194	$130.00	$25,220	
	SHOULDER PATCHING 1.0% (SQ YDS)	0	$85.00	$0	
				$25,220	$12,045
Activity 5 YEAR 30					
	PAVEMENT PATCHING 4.0% (SQ YDS)	258	$130.00	$33,540	
	SHOULDER PATCHING 1.5% (SQ YDS)	0	$85.00	$0	
	POLICY HMS OVERLAY OVMT (SQ YDS)	6,459	$9.38	$60,585	
	POLICY HMA OVERLAY SHLDR (SQ YDS)	0	$9.38	$0	
				$94,125	$38,780
Activity 6 YEARS 35					
	SHLDR JT ROUT & SEAL 100% (LF)	2,422	$1.00	$2,422	
	CENTERLINE JT ROUT & SEAL 100% (LF)	1,211	$1.00	$1,211	
	RANDOM CRACK ROUT & SEAL 50% (LF)	2,422	$1.00	$2,422	
	REFL TRANS CRACK ROUT & SEAL 40%	1,550	$1.00	$1,550	
	PARTIAL PVMT PATCH 0.1% (SQ YDS)	6	$130.00	$780	
				$8,385	$2,980
Activity 7 YEAR 40					
	PAVEMENT PATCHING 0.5% (SQ YDS)	32	$130.00	$4,160	
	SHOULDER PATCHING 0.5% (SQ YDS)	32	$130.00	$4,160	
	REFL TRANS CRACK ROUT & SEAL 60%	2,325	$1.00	$2,325	
	RANDOM CRACK ROUT & SEAL 50% (LF)	2,422	$1.00	$2,422	
	SHLDR JT ROUT & SEAL 100% (LF)	2,422	$1.00	$2,422	
	CENTERLINE JT ROUT & SEAL 100% (LF)	1,211	$1.00	$1,211	
				$16,700	$5,120
			Total Rehabilitation Cost (Present Worth)		$71,887

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

FULL DEOTH FLEXIBLE PAVEMENT

ROUTE-	FAU 2710	16-May-12
SECTION-	52-N	11:04 AM
COUNTY-	Cook	
LOCATION-	Robinson Rd	

PROJECT LENGTH (FT)	1211	
AVERAGE LANE WIDTH (FT)	12	
NUMBER OF LANES	4	
# OF EDGES	2	
INSIDE SHLDER WIDTH (FT)	0	
OUTSIDE SHLDER WIDTH (FT)	0	
# OF CENTERLINES	1	
PROJECT TYPE	2	1=RURAL, 2=URBAN
PAVING WIDTH	2	1=SINGLE LANE, 2=DUAL LANE
INTERSTATE / OTHER ROUTE	OTHER ROUTE	
FLEXIBLE THICKNESS-	9.75	

TRAFFIC FACTORS	MINIMUM	ACTUAL
FLEXIBLE	N/A	3.00

TRAFFIC

PV-	23991	0.94
SU-	1149	0.045
MU-	383	0.015

PAVEMENT OVERLAY THICKNESS	
SHOULDER OVERLAY THICKNESS	

INITIAL COSTS

ITEM	QUANTITY	UNIT PRICE	COST
SURFACE (SQ YDS)	6,459	$9.38	$60,585
POLY BINDER (SQ YDS)	6,459	$9.49	$61,298
BINDER (SQ YDS)	6,459	$21.13	$136,478
SHOULDERS (SQ YDS)	0		$0
SUBBASE GRAN MATL TY C (TONS)	0		$0

CONSTRUCTION INITIAL COST (PW)	$258,360
TOTAL REHABILITATION COST (PW)	$125,652
TOTAL LIFE CYCLE COST (PW)	$384,012
ANNUAL COST PER MILE	$68,104

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)	$83.75
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)	$83.75
POLICY HMA OVERLAY SHLDR (TONS)	$83.75

MATERIAL TYPE/PERCENTAGE PCC 21.0%

MAINTENANCE COSTS

	ITEM	QUANTITY	UNIT PRICE	COST	PW
Activity 1					
YEAR 5	RAND/THERM CRACK ROUT & SEAL 50% (LF)	666	$1.00	$666	
	SHLDR JT ROUT & SEAL 100% (LF)	2,422	$1.00	$2,422	
	CENTERLINE JT ROUT & SEAL 100% (LF)	1,211	$1.00	$1,211	
	PARTIAL PVMT PATCH 0.1% (SQ YDS)	6	$90.00	$540	
				$4,839	$4,174
Activity 2					
YEAR 10	PARTIAL PVMT PATCH 0.5% (SQ YDS)	32	$90.00	$2,880	
	RAND/THERM CRACK ROUT & SEAL 50% (LF)	666	$1.00	$666	
	SHLDR JT ROUT & SEAL 100% (LF)	2,422	$1.00	$2,422	
	CENTERLINE JT ROUT & SEAL 100% (LF)	1,211	$1.00	$1,211	
				$7,179	$5,342
Activity 3					
YEAR 15	2" MILL PVMT & SHLDR 100% (SQ YDS)	6,459	$1.75	$11,303	
	PARTIAL PVMT PATCH 1.0% (SQ YDS)	65	$90.00	$5,850	
	2" OVERLAY PVMT & SHLDR 100% (TONS)	723	$83.75	$60,551	
				$77,704	$49,678
Activity 4					
YEAR 20	SHLDR JT ROUT & SEAL 100% (LF)	2,422	$1.00	$2,422	
	CENTERLINE JT ROUT & SEAL 100% (LF)	1,211	$1.00	$1,211	
	RAND/THERM CRACK ROUT & SEAL 50% (LF)	666	$1.00	$666	
	PARTIAL PVMT PATCH 0.1% (SQ YDS)	6	$90.00	$540	
				$4,839	$2,679
Activity 5					
YEAR 25	SHLDR JT ROUT & SEAL 100% (LF)	2,422	$1.00	$2,422	
	CENTERLINE JT ROUT & SEAL 100% (LF)	1,211	$1.00	$1,211	
	RAND/THERM CRACK ROUT & SEAL 50% (LF)	666	$1.00	$666	
	PARTIAL PVMT PATCH 0.5% (SQ YDS)	32	$90.00	$2,880	
				$7,179	$3,429
Activity 6					
YEAR 30	2" MILL PVMT & SHLDR 100% (SQ YDS)	6,459	$1.75	$11,303	
	PARTIAL PVMT PATCH 2.0% (SQ YDS)	129	$90.00	$11,610	
	HMA SHLDR PATCHING 1.0% (SQ YDS)	0	$90.00	$0	
	POLICY HMA OVERLAY PVMT (TONS)	1,356	$83.75	$113,585	
	POLICY HMA OVERLAY SHLDR (TONS)	0	$83.75	$0	
				$136,478	$56,229
Activity 7					
YEAR 35	SHLDR JT ROUT & SEAL 100% (LF)	2,422	$1.00	$2,422	
	CENTERLINE JT ROUT & SEAL 100% (LF)	1,211	$1.00	$1,211	
	RAND/THERM CRACK ROUT & SEAL 50% (LF)	666	$1.00	$666	
	PARTIAL PVMT PATCH 0.1% (SQ YDS)	6	$90.00	$540	
				$4,839	$1,720
Activity 8					
YEAR 40	SHLDR JT ROUT & SEAL 100% (LF)	2,422	$1.00	$2,422	
	CENTERLINE JT ROUT & SEAL 100% (LF)	1,211	$1.00	$1,211	
	RAND/THERM CRACK ROUT & SEAL 50% (LF)	666	$1.00	$666	
	PARTIAL PVMT PATCH 0.5% (SQ YDS)	32	$90.00	$2,880	
				$7,179	$2,201

Total Rehabilitation Cost (Present Worth) $125,652

ROBINSON RD

Spreadsheet by Uehle - Rev. 11/02

MECHANISTIC PAVEMENT DESIGN

FOR TF ONLY

Date: 5/15/12

INPUT (Enter Data in Gray Shaded Cells)

Route: Robinson Road
Section: 52-N
County: Cook
Location: Des Plaines River Road

Comments: Widening of Robinson Road

Designer: SJP

Facility Type: Unmarked State Route

	ADT	Year
Current:	2000	2008
Future:	2000	2030

# 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: 2014
Design Period (DP) = 20 years

	Minimum ADT	Structural Design Traffic: Actual ADT	Actual %of Total ADT	% of ADT in Design Lane	
PV =	No Min	2,517	92.3%	P =	50%
SU =	No Min	196	7.2%	S =	50%
MU =	No Min	14	0.5%	M =	50%
Struct. Design ADT =		2727	(2024)		

FLEXIBLE & RIGID PAVEMENT CALCULATIONS AND ADDITIONAL INPUT

Flexible Pavement			Rigid Pavement		
Cpv =	0.15		Cpv =	0.15	
Csu =	112		Csu =	136	
Cmu =	385		Cmu =	567	
TF flexible (Actual)=	0.28	(Actual ADT)	TF rigid (Actual)=	0.35	(Actual ADT)
TF flexible (Min)=	No Min	(Min ADT Fig 54-2C)	TF rigid (Min)=	No Min	(Min ADT Fig 54-2C)
Use TF flexible =	0.50	Per BDE 54-5.01(h)-1g	Use TF rigid =	0.35	
AC Type =	20			Tied	Shoulder or C. &G.
AC Mixture Tempurature =	80.0	deg. F (Figure 54-5C)	Rigid Pavt Thick =	~~8.00~~	in. (Figure 54-4D)
Design AC Mixture Modulus (Eac)=	550	ksi (Figure 54-5D)			
Design Asphalt Concrete Microstrain =	134.4	(Figure 54-5E)			
Asphalt Concrete Thickness =	~~0.00~~	in. (Figure 54-5F)			

DESIGN TABLES FROM BD&E PAVEMENT DESIGN CH. 54 AND PAVEMENT DESIGN MANUAL

Class I Roads

Part o
One-wa

Interstate
Othe
Ur

ROBINSON RD. (WIDENING & RESURFACING)

+ 7 1/4" FULL DEPTH HMA

- RESURFACING!

Class IV Roads
2 Lanes (ADT < 750)

Class Table for One-Way Streets

ADT	Class
- 3500	II
>3501	I

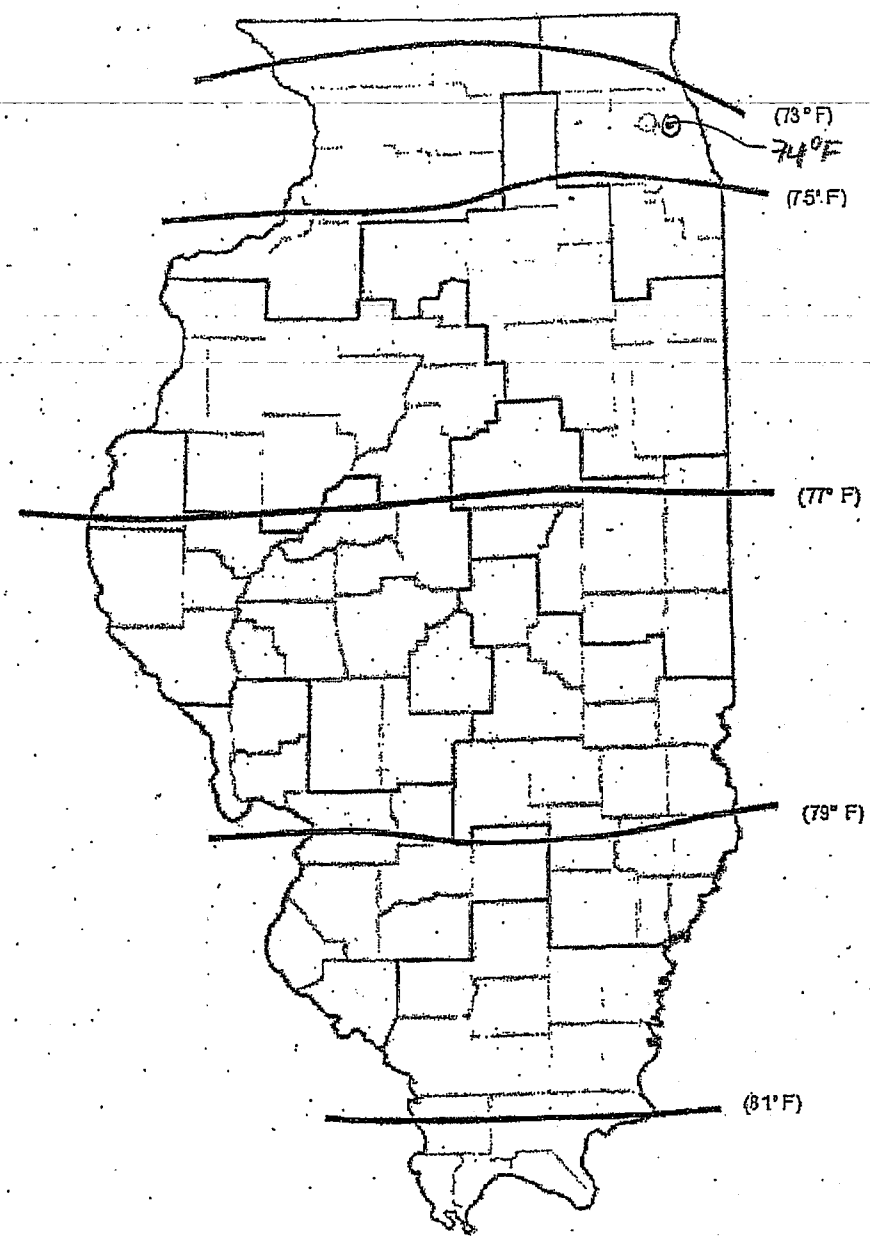
Class Table for 2 or 3 lanes not future 4 lane & not one-way street)

ADT	Class
- 749	IV
- 2000	III
2000	II

Figure 54-2B Percentage of ADT in Design Lane

Number of Lanes	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%

ROBINSON RD



Note: The minimum design HMA mixture temperature will be 73 °F.

HMA MIXTURE TEMPERATURE
(Mechanistic Design: Flexible Pavement)

Figure 54-5.C

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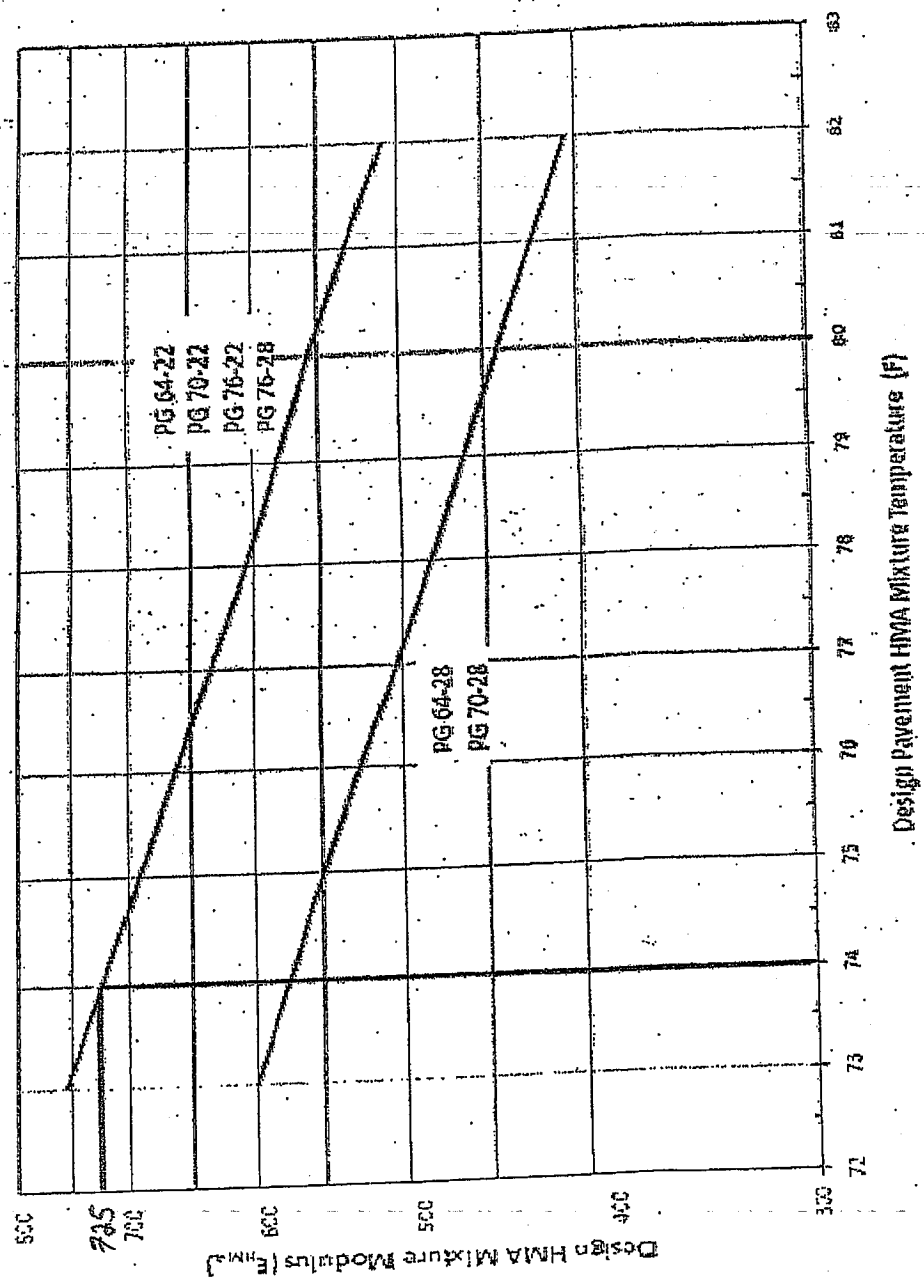
Robinson R.D



HMA MIXTURE MODULUS (E_{HMA})
(Mechanistic Design: Flexible Pavement)

Figure 54-5.D

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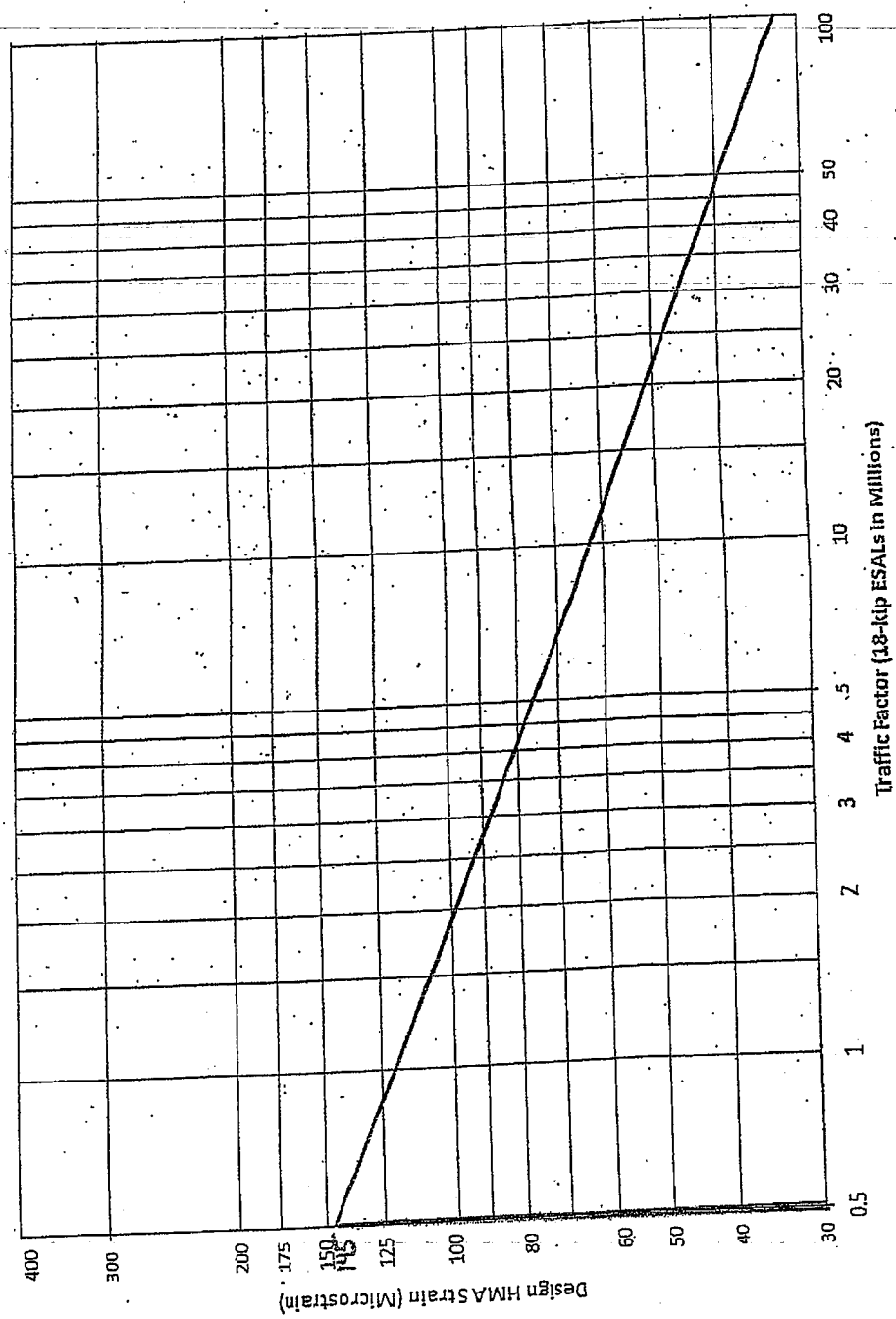
ROBINSON KO



DESIGN HMA STRAIN
(Mechanistic Design: Flexible Pavement)

Figure 54-5.E

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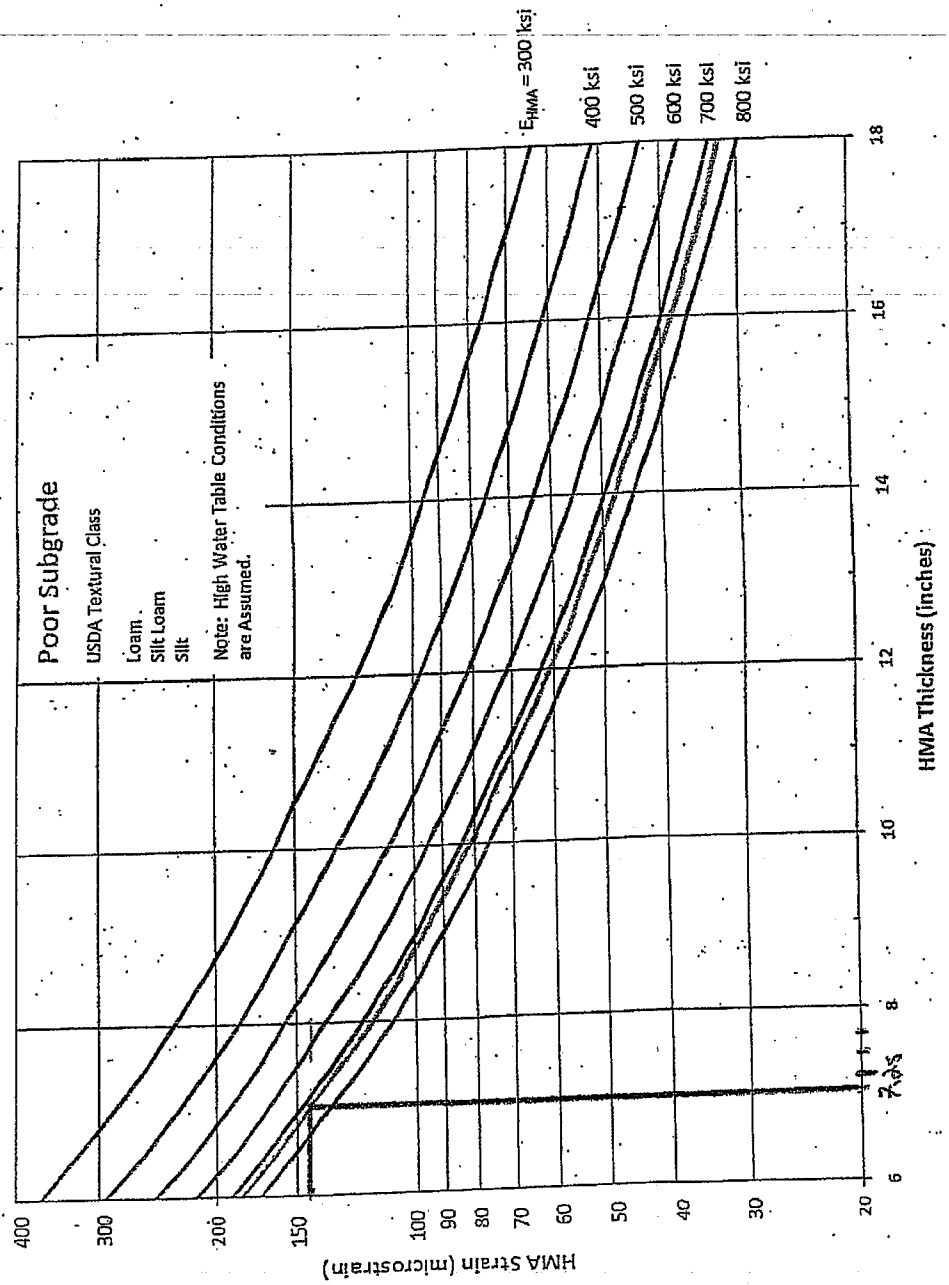

HMA THICKNESS DESIGN CHART
(Mechanistic Design: Flexible Pavement: SSR = Poor)

Figure 54-5.F

7.25" FULL DEPTH HMA

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