



# Illinois Department of Transportation

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To: Omer Osman                      Attn: District Nine  
From: John D. Baranzelli         *John D. Baranzelli*  
Subject: Pavement Design  
Date: April 2, 2012

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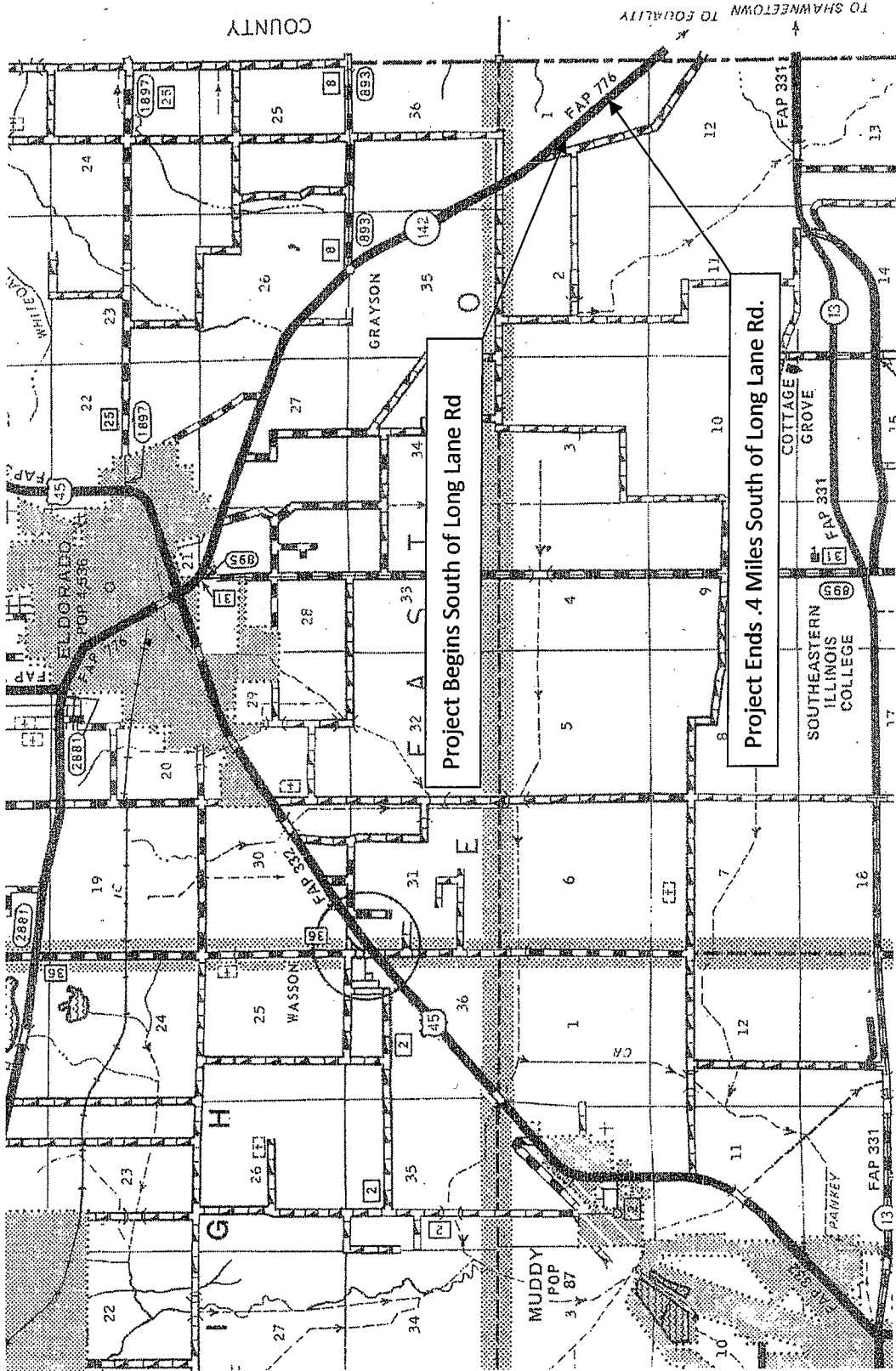
FAP Route 776 (IL Route 142)  
Section 125R-1  
Saline County  
From Willow Creek mine entrance south (SB lane only)

We have reviewed the pavement selection for the above captioned section, which was submitted with your memorandum dated March 23, 2012. The approved pavement design is as follows:

IL Route 142 SB only (Pavement Reconstruction)

13 inches of HMA Pavement  
2 inches of Polymerized HMA Surface Course, Mix "C", N105  
2.25 inches of Polymerized HMA Binder Course, IL-19.0, N105  
8.75 inches of HMA Binder Course, IL-19.0, N90  
16 inches of Lime Stabilization

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



COUNTY

TO SHAWNEETOWN TO EQUALITY

Project Begins South of Long Lane Rd.

Project Ends .4 Miles South of Long Lane Rd.

ELDORADO  
POP 1536

MUDDY  
POP 3187

SOUTHEASTERN  
ILLINOIS  
COLLEGE

COTTAGE  
GROVE

WATSON

GRAYSON

WASSON

G

H

I

F 32 A S T

E

CR

PAMKEY

FAP 145

FAP 2881

FAP 95

FAP 25

FAP 23

FAP 21

FAP 20

FAP 19

FAP 16

FAP 13

FAP 12

FAP 11

FAP 10

FAP 9

FAP 8

FAP 7

FAP 6

FAP 5

FAP 4

FAP 3

FAP 2

FAP 1

FAP 142

FAP 145

FAP 2881

FAP 25

FAP 23

FAP 21

FAP 20

FAP 19

FAP 16

FAP 13

FAP 12

FAP 11

FAP 10

FAP 9

FAP 8

FAP 7

FAP 6

FAP 5

FAP 4

FAP 3

FAP 2

FAP 1

FAP 142

FAP 145

FAP 2881

FAP 25

FAP 23

FAP 21

FAP 20

FAP 19

FAP 16

FAP 13

FAP 12

FAP 11

FAP 10

FAP 9

FAP 8

FAP 7

FAP 6

FAP 5

FAP 4

FAP 3

FAP 2

FAP 1

FAP 142

FAP 145

FAP 2881

FAP 25

FAP 23

FAP 21

FAP 20

FAP 19

FAP 16

FAP 13

FAP 12

FAP 11

FAP 10

FAP 9

FAP 8

FAP 7

FAP 6

FAP 5

FAP 4

FAP 3

FAP 2

FAP 1

FAP 142

FAP 145

FAP 2881

FAP 25

FAP 23

FAP 21

FAP 20

FAP 19

FAP 16

FAP 13

FAP 12

FAP 11

FAP 10

FAP 9

FAP 8

FAP 7

FAP 6

FAP 5

FAP 4

FAP 3

FAP 2

FAP 1

FAP 142

FAP 145

FAP 2881

FAP 25

FAP 23

FAP 21

FAP 20

FAP 19

FAP 16

FAP 13

FAP 12

FAP 11

FAP 10

FAP 9

FAP 8

FAP 7

FAP 6

FAP 5

FAP 4

FAP 3

FAP 2

FAP 1

FAP 142

FAP 145

FAP 2881

FAP 25

CALC. BY: J. Aybar

DATE: 2/22/12

IDOT DISTRICT 9

ROUTE: FAP 776 (IL 142)

SECTION: 126R-1

COUNTY: SALINE

CHECKED BY: \_\_\_\_\_

DATE: \_\_\_\_\_

QUANTITY COMPUTATIONS

CONTRACT NO.: 78291

JOB NO.: C-99-019-12

JOB DESCRIPTION: Prop. Special project on IL 142 from Mine Haul Rd. to 0.4 mile South of Mine Haul Rd. at Sta. 210+08 to Sta. 238+45

EXIST 2010	2012 (1.020)	2022 (1.105)	2032 (1.220)
ADT 3900	3978	4396	4854
4.6% SL 180	184	203	225
35.9% MU 1400	1428	1578	1742
PV 2320	2366	2614	2887
(IROADS)	PROJECTED PRESENT DATA	PROJECTED 10 YR DATA	PROJECTED 20 YR DATA

MINE WILL BE OPERATING AT A RATE OF 150 LOADED TRUCKS PER DAY. MINE WILL NOT OPERATE WEEKENDS. THIS IS A CLASS II ROAD

• NORMAL TF

(ASSUME: SUBTRACT 200 TPD FROM TOTAL MU, USE 10YR TRAFFIC.)

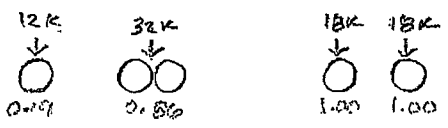
$$TF = 20 \left[ \frac{(0.15 \times 0.5 \times 2614) + (112.06 \times 0.5 \times 203) + (385.44 \times 0.5 \times 1246)}{1,000,000} \right]$$

EQN 54-5.2

TF = 5.03

• MINE TRAFFIC TF

MINE TRUCKS ARE LOADED AT 80 KIPS  
TYPICAL AXLE LOAD DISTRIBUTION:



EQUAL VALUES

[EQUIVALENCY FACTOR → 3.00]

SHEET TOTAL

SHEET 1 OF 2

DESCRIPTION	UNIT	CODE NUMBER
FLEXIBLE PAVEMENT DESIGN		

REVISED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

CALC. BY: J. Aybar  
DATE: 2/22/12

IDOT  
DISTRICT 9

ROUTE: FAP 776 (IL 142)  
SECTION: 125R-1  
COUNTY: SALINE  
CONTRACT NO.: 78291  
JOB NO.: C-99-019-12

CHECKED BY: \_\_\_\_\_  
DATE: \_\_\_\_\_

QUANTITY COMPUTATIONS

JOB DESCRIPTION: Prop. Special project on IL 142 from Mine Haul Rd. to 0.4 mile South of Mine Haul Rd. at Sta. 210+08 to Sta. 238+46

MINE OPERATES 5 DAYS A WEEK (NO WEEKENDS). 24 HRS A DAY.  
YEAR 2012 WILL HAVE 261 WORKDAYS. ASSUME HOLIDAYS ON  
NEW YEARS, 4TH OF JULY, MEMORIAL DAY, THANKSGIVING AND CHRISTMAS

256 WORKDAYS / YEAR

$$TF_{MINE} = \frac{(150)(3.05)(256)(20)}{1,000,000} \quad \therefore TF_{MINE} = 2.34$$

•  $TF_{DESIGN} = 2.34 + 5.03$

∴  $TF_{DESIGN} = 7.37$

ACCURATE FOR DESIGN FIG. 54-2C

• SSR (SUBGRADE SUPPORT RATING) → POOR

• ASPHALT BINDER GRADE PG 64-22

• HMA MIXTURE TEMPERATURE 80.5°F 54-5C

• HMA MIXTURE MODULUS ( $E_{HMA}$ ) 54-5.D

$E_{HMA} = 3110$

• HMA STRAIN

[69 MICROSTRAIN]

• HMA PAVEMENT THICKNESS 54-5 F

[USE 13 INCHES]

SHEET TOTAL

SHEET 2 OF 2

DESCRIPTION	UNIT	CODE NUMBER
FLEXIBLE PAVEMENT DESIGN		

REVISED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

CALC. BY: J. Aybar  
 DATE: 2/22/12

**IDOT  
 DISTRICT 9**

ROUTE: FAP 776 (IL 142)  
 SECTION: 125R-1  
 COUNTY: SALINE  
 CONTRACT NO.: 78291  
 JOB NO.: C-99-019-12

CHECKED BY: \_\_\_\_\_  
 DATE: \_\_\_\_\_

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ADT 3900	3978	4396	4854
SH 180	184	203	225
MI 1400	1428	1578	1742
<u>PV 2320</u>	<u>2366</u>	<u>2614</u>	<u>2887</u>
(I ROADS)	PROJECTED PRESENT DATA	PROJECTED 10 YR DATA	PROJECTED 20 YR DATA

MINE WILL BE OPERATING AT A RATE OF 150 LOADED TRUCKS PER DAY.  
 MINE WILL NOT OPERATE WEEKENDS. THIS IS A CLASS II ROAD.

• NORMAL TF

(ASSUME: SUBTRACT 300 TPD FROM TOTAL MI. USE 10 YR TRAFFIC DATA)

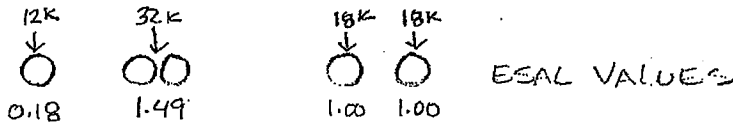
$$TF = 2.0 \left[ \frac{(0.15)(0.5)(2614) + (135.78)(0.5)(203) + (567.21)(0.5)(1246)}{1,000,000} \right]$$

[TF = 7.35]

• MINE TRAFFIC FACTOR

MINE TRUCKS ARE LOADED AT 80% K12

TYPICAL AXLE LOAD DISTRIBUTION



EQUIVALENCY FACTOR

[3.67]

<b>SHEET TOTAL</b>

SHEET 1 OF 2

DESCRIPTION	UNIT	CODE NUMBER
RIGID PAVEMENT DESIGN		

REVISED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

CALC. BY: J. Aybar  
DATE: 2/22/17

IDOT  
DISTRICT 9

ROUTE: FAP 776 (IL 142)  
SECTION: 125R-1  
COUNTY: SALINE  
CONTRACT NO.: 78291  
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YEAR 2012 WILL HAVE 261 WORKDAYS. ASSUME HOLIDAYS ON  
NEW YEARS, JULY 4TH, MEMORIAL DAY, THANKS GIVING AND  
CHRISTMAS.

USE 256 WORKDAYS / YEAR

$$TF = \frac{(150)(3.67)(256)(20)}{1,000,000} \therefore [TF = 2.82]_{\text{Mile}}$$

• DESIGN TRAFFIC FACTOR

$$2.82 + 7.35 \therefore [TF = 10.17]_{\text{DSG}}$$

• SSR [POOR]

• EDGE SUPPORT  
[TIED SHOULDER]

• PAVEMENT THICKNESS FIG. 511-4 E  
9.8 INCHES [USE 10 INCHES]

SHEET TOTAL

SHEET 2 OF 2

DESCRIPTION	UNIT	CODE NUMBER
RIGID PAVEMENT DESIGN (PCC)		

REVISED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

**PROJECT AND TRAFFIC INPUTS**

(Enter Data in Gray Shaded Cells)

Route: ILL 142  
 Section: 125R-1  
 County: Saline  
 Location: Near Willow Creek Mine entrance

Comments:  
 Design Date: 02/14/2012 C Stein <-- BY  
 Modified Date: <-- BY

	ADT	Year
Current:	-	-
Future:	-	-

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: 2012  
 Design Period (DP) = 20 years

	Structural Design Traffic			% of ADT In Design Lane
	Minimum ADT	Actual ADT	Actual % of Total ADT	
PV =	0	2,614	64.3%	P = 50%
SU =	250	203	5.0%	S = 50%
MU =	750	1,246	30.7%	M = 50%
Struct. Design ADT =	4,063		(2022)	

**TRAFFIC FACTOR CALCULATION**

**FLEXIBLE PAVEMENT**

Cpv = -  
 Csu = -  
 Cmu = -  
 TF flexible (Actual) = - (Actual ADT)  
 TF flexible (Min) = - (Min ADT Fig 54-2.C)

**RIGID PAVEMENT**

Cpv = -  
 Csu = -  
 Cmu = -  
 TF rigid (Actual) = - (Actual ADT)  
 TF rigid (Min) = - (Min ADT Fig 54-2.C)

**ADDITIONAL DESIGN INPUTS AND FLEXIBLE & RIGID PAVEMENT THICKNESS CALCULATIONS**

**HMA Pavement**

**JPCP Pavement**

Goto Map

Goto Map

Use TF flexible = 7.37  
 PG Grade Lower Binder Lifts = PG 64-22 (Figure 53-4.R)  
 HMA Mixture Temp. = 80.5 deg. F (Figure 54-5.C)  
 Design HMA Mixture Modulus (E<sub>HMA</sub>) = 544 ksi (Figure 54-5.D)  
 Design HMA Strain (ε<sub>HMA</sub>) = 68 (Figure 54-5.E)  
 Full Depth HMA Design Thickness = 12.95 in. (Figure 54-5.F)  
 Limiting Strain Criterion Thickness = 16.75 in. (Figure 54-5.I)  
 Use Full Depth HMA Thickness = 12.95 inches

Use TF rigid = 10.17  
 Edge Support = Tied Shoulder or C.&G.  
 Rigid Pavt Thick. = 9.89 in. (Figure 54-4.E)  
 10.00

13.00

**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	2 lanes with ADT > 2000	2 Lanes	2 Lanes
Part of a future 4 lanes or more	One way Street with ADT <= 3500	(ADT 750 -2000)	(ADT < 750)
One-way Streets with ADT > 3500			

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 (Figure 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%

