



Illinois Department of Transportation

To: Eric S. Therkildsen Attn: District Two
From: John D. Baranzelli 
Subject: Pavement Design Exception
Date: May 8, 2012

FAP Route 734 (IL Route 2)
Section 77-2-1 & 77-2B-2
Winnebago County
From north of Latham Road to north of Roscoe Road

We have reviewed the pavement design for the above captioned section, which was submitted by email dated April 6, 2012. Based on life cycle costs, the rigid was the most cost-effective. The district requested using the HMA option to match the adjacent section of IL 2.

Because the difference in life cycle costs exceeded 10%, the flexible pavement design request was forwarded to the Director of Highways for approval. Approval was granted on May 7, 2012.

The approved pavement design is as follows:

IL Route 2 From north of Latham Road to north of Roscoe Road

11 inches of HMA Pavement (Full Depth)
2 inches of Polymerized HMA Surface Course, Mix "D," N70
3 inches of Polymerized HMA Binder Course, IL-19.0, N70
6 inches of HMA Binder Course, IL-19.0, N70
16 inches of Sub-base Granular Material, Type CA

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



Illinois Department of Transportation

To: Director of Highways
From: John D. Baranzelli
Subject: Pavement Design Exception
Date: May 2, 2012

FAP Route 734 (IL Route 2)
Section 77-2-1 & 77-2B-2
Winnebago County
From north of Latham Road to north of Roscoe Road

Calculations favor a rigid design for IL Route 2. Since the cost differential exceeds 10%, an exception request must be approved by the Director of Highways. The district would like to use the flexible design based on the following reasons:

- The adjacent southern section of the IL 2 roadway project, is presently under construction utilizing a flexible design; and
- HMA pavement will provide easier stage construction, especially for the two intersections within the project.

The recommended pavement reconstruction for IL Route 2 would be:

IL Route 2 From north of Latham Road to north of Roscoe Road

11 inches of HMA Pavement (Full Depth)
2 inches of Polymerized HMA Surface Course, Mix "D," N70
3 inches of Polymerized HMA Binder Course, IL-19.0, N70
6 inches of HMA Binder Course, IL-19.0, N70
16 inches of Sub-base Granular Material, Type CA

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

Concur _____

Discuss _____
Director of Highways



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Illinois Department of Transportation

Memorandum

To: John Baranzelli Attn: Paul Niedernhofer
From: Eric S. Therildsen By: Jay Howell *Jay Maxwell*
Subject: Pavement Design
Date: March 26, 2012

FAP Route 734 (IL 2)
Section 77-2-1 & 77-2B-2
Winnebago County
Job No. D-92-005-89
Contract No. 84983
IL 2 from north of Latham road to north of Roscoe road

Attached is the pavement selection analysis for the subject section. This section consists of approximately 94,400 square yards of new pavement. This project was initially part of the expressway construction of IL 2 from Elmwood road to Roscoe road and was broken down to two parts due to lack of funding. The first section is presently under construction using 12.5" full depth HMA pavement.

Due to the change in the pavement design chapter in the BDE manual, we decided to reevaluate the pavement design for this section using the new design criteria.

Mechanistic Pavement Design indicates that jointed PCC pavement presents the lower first and life cycle costs, providing a 16.7%% annual cost savings versus a flexible pavement design.

Although the jointed PCC pavement is less costly compared to full depth HMA pavement, the District recommends the selection of the full depth HMA for the following reasons:

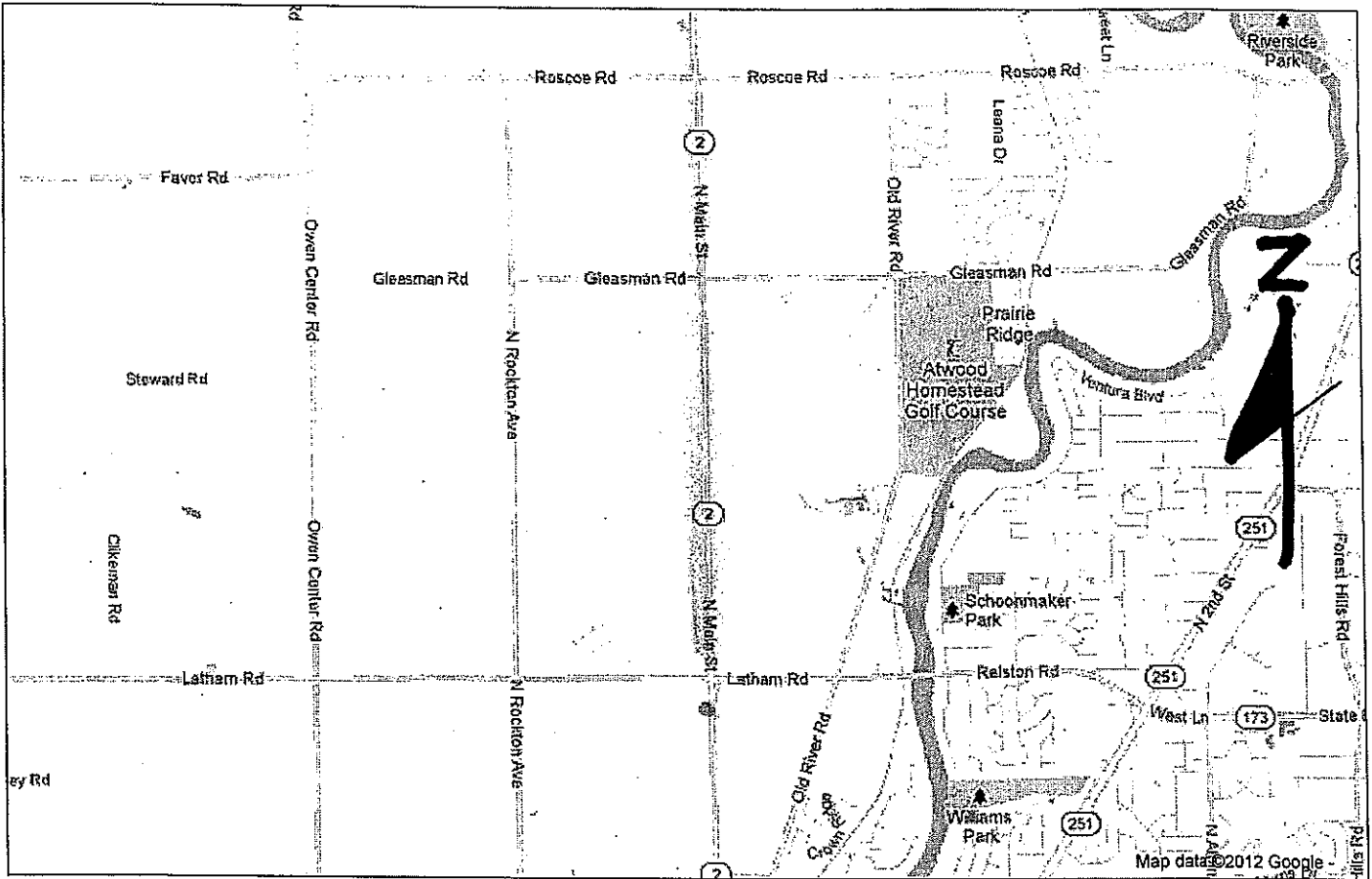
- HMA pavement was selected for the south section and using the same pavement will provide continuity.
- HMA will provide easier material to stage during construction; hence there are two major intersections that will need to be reconstructed with this section, Gleaseman road and Roscoe road.

If you have any questions, please contact Sam Abdullah at 815/284-5935.

Attachments

Google

To see all the details that are visible on the screen, use the "Print" link next to the map.



Version 1.0 **PROJECT AND TRAFFIC INPUTS** (Enter Data in Gray Shaded Cells)

Route: IL 2 Comments: processed as a supplemental freeway [district request]
 Section: 77-2-1 & 77-2B-2
 County: Winnebago Design Date: 04/27/2012 PRN
 Location: north of Latham Rd to north of Roscoe Rd Modified Date: <-- BY <-- BY

| | |
|----------|------|
| ADT | Year |
| Current: | - |
| Future: | - |

Facility Type: Interstate or Supplemental Freeway
 # of Lanes = 4

Road Class: I

Subgrade Support Rating (SSR): Poor
 Construction Year: 2015
 Design Period (DP) = 20 years

RESET

| Structural Design Traffic | | | |
|---------------------------|------------|-----------------------|-------------------------|
| Minimum ADT | Actual ADT | Actual % of Total ADT | % of ADT in Design Lane |
| PV = 0 | 10,370 | 96.1% | P = 32% |
| SU = 500 | 210 | 1.9% | S = 45% |
| MU = 1500 | 210 | 1.9% | M = 45% |

Struct. Design ADT = 10,790 (2025)

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) = 1.17 (Actual ADT) | | TF rigid (Actual) = 1.60 (Actual ADT) | |
| TF flexible (Min) = 7.11 (Min ADT Fig. 54-2.C) | | TF rigid (Min) = 10.05 (Min ADT Fig. 54-2.C) | |

NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS

| Full-Depth HMA Pavement | JPCP Pavement |
|------------------------------------------------------------------------|----------------------------------------------------|
| Use TF flexible = 7.11 | Use TF rigid = 10.05 |
| PG Grade Lower Binder Lifts = PG 64-22 (Fig. 53-4.R) | Edge Support = Tied Shoulder or C.&G. |
| HMA Mixture Temp. = 73.4 deg. F (Fig. 54-5.C) | Rigid Pavt Thick. = 10.00 in. (Fig. 54-4.E) |
| Design HMA Mixture Modulus (E _{HMA}) = 740 ksi (Fig. 54-5.D) | |
| Design HMA Strain (ε _{HMA}) = 69 (Fig. 54-5.E) | |
| Full Depth HMA Design Thickness = 11.25 in. (Fig. 54-5.F) | CRC Pavement (TF > 60) |
| Limiting Strain Criterion Thickness = 14.00 in. (Fig. 54-5.I) | Use TF rigid = 10.05 |
| Use Full-Depth HMA Thickness = 11.25 inches | IBR value = 3 |
| | CRCP Thickness = 999.00 in. (Fig. 54-4.M) |

TF MUST BE > 60 FOR CRCP

RECONSTRUCTION ONLY (SUPPLEMENTAL) PAVEMENT DESIGN CALCULATIONS

| HMA Overlay of Rubblized PCC | Unbonded Concrete Overlay |
|--------------------------------------------------------------|------------------------------------------------------------|
| Use TF flexible = 7.11 | Review 54-4.03 for limitations and special considerations. |
| District = 3,4,5,6 | |
| HMA Overlay Design Thickness = 9.50 in. (Fig. 54-5.U) | JPCP Thickness = 999.00 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 | 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% |

| | C | D | E | F | G | H | I | J | K | L | M |
|----|--------------------------------------------------------------------------------------|--------------|------------------------------|----------------------------|---------------------------------------------|-----------------|-------------|----------|---------------------------------|-----------------|---|
| 5 | MECHANISTIC PAVEMENT DESIGN | | | | | | | | | | |
| 6 | DATE: | 03/26/12 | | | ROUTE: | FAP 734 ((IL 2) | | | | | |
| 7 | CALC. BY: | Sam Abdullah | | | SECTION: | 77-2-1&77-2B-2 | | | | | |
| 8 | CHECKED BY: | | | | COUNTY: | Winnebago | | | | | |
| 9 | | | | | | | | | | | |
| 10 | LIMITS OF ANALYSIS | | | | | | | | | | |
| 11 | STATION | 839 + 00 | | TO STATION | 1016 + 00 | | OMISSIONS | 0 | | | |
| 12 | NET LENGTH | 17700 FEET | | 3.352 MILES | | | | | | | |
| 13 | | | | | | | | | | | |
| 14 | 4 TRAFFIC LANES | | | | 2 CENTERLINE JNTS | | | | 12 FT LANES (AV) | | |
| 15 | 2 WAY TRAFFIC | | | | 4 SHOULDER JOINTS | | | | 4 : 1 FORESLOPES | | |
| 16 | | | | | | | | | 0 FT GUTTER FLAG | | |
| 17 | SHOULDER WIDTHS | | | | | | | | | | |
| 18 | OUTSIDE SHDR (RT) | | 10 FEET PAVED | | 0 FEET AGGREGATE | | | | | | |
| 19 | MEDIAN SHDR (RT) | | 4 FEET PAVED | | 0 FEET AGGREGATE | | | | | | |
| 20 | MEDIAN SHDR (LT) | | 4 FEET PAVED | | 0 FEET AGGREGATE | | | | | | |
| 21 | OUTSIDE SHDR (LT) | | 10 FEET PAVED | | 0 FEET AGGREGATE | | | | | | |
| 22 | | | | | | | | | | | |
| 23 | 1 if URBAN | | | | 1 FOR INTERSTATE OR SUPPL. FREEWAYS | | | | | | |
| 24 | 2 | | | | 2 FOR ALL OTHER STATE MARKED ROUTES | | | | | | |
| 25 | 2 if RURAL | | | | 3 FOR ALL UNMARKED STATE ROUTES | | | | | | |
| 26 | CLASS | I | | ROADS & STREETS | | | | | | | |
| 27 | | | | | | | | | | | |
| 28 | MIN SUBGRADE SUPPORT RATING: | | POOR | | POOR | | | | | | |
| 29 | | | | | FAIR | | | | | | |
| 30 | | | | | GRANULAR | | | | | | |
| 30 | STRUCTURAL DESIGN TRAFFIC | | | | STRUCTURAL TRAFFIC USED | | | | DESIGN LANE | | |
| 31 | PV = | 10370 | | PV = | 0 | | PV = | 32 % | | | |
| 32 | SU = | 210 | | SU = | 500 | | SU = | 45 % | | | |
| 33 | MU = | 270 | | MU = | 1500 | | MU = | 45 % | | | |
| 34 | DESIGN ADT = | 10850 | | | | | | | | | |
| 35 | SELECT AN OPTION BELOW | | | | | | | | | | |
| 36 | | | | | | | | | | | |
| 37 | | | 3 | | ENTER 1 IF YOU WANT THICKNESS COMPS. ONLY | | | | | | |
| 38 | | | | | ENTER 2 IF YOU WANT FIRST COST ONLY | | | | | | |
| 39 | | | | | ENTER 3 IF YOU WANT 45yr. LIFE CYCLE COST | | | | | | |
| 39 | JOINTED PLAIN CONCRETE PAVEMENT | | | | | | | | | | |
| 40 | | | | | | | | | | | |
| 41 | ESALS | 7.9000 | | MILLION | TFR = | | 10.05 | | | | |
| 42 | | | | | EXTENDED LANE = | | | | INCHES | | |
| 43 | 15 FT PCC PANEL THICKNESS FOR | | | | TIED SHOULDER = | | 10.00 | | INCHES | | |
| 44 | | | | | UNTIED SHOULDER = | | | | INCHES | | |
| 45 | | | | | | | | | | | |
| 46 | | | | | FIRST COST: | | \$7,852,912 | | | | |
| 47 | | | | | 45 YR LIFE CYCLE COST: | | \$1,505,853 | | | | |
| 48 | | | | | ANNUAL COST PER MILE: | | \$114,368 | | | | |
| 49 | FLEXIBLE PAVEMENT DESIGN | | | | | | | | | | |
| 50 | SINGLE | | LANE PAVING (SINGLE OR DUAL) | | | | | | | | |
| 51 | TV = | 0.3555 | | MILLION | TFR = | | 7.11 | | | | |
| 52 | DESIGN AC MIXTURE TEMP = | 73.4 | | DEG F (73 DEG MIN) | | | | | AC = 64-22 | | |
| 53 | DESIGN Eac = | 744 | | KSI | | | | | DESIGN AC MICROSTRAIN = 69 | | |
| 54 | TOTAL THICKNESS = | 11 | | IN | | | | | SURFACE COURSE THICKNESS = 2 | | |
| 55 | | | | | FIRST COST: | | \$8,732,211 | | TOP BINDER COURSE THICKNESS = 3 | | |
| 56 | | | | | 45 YR LIFE CYCLE COST: | | \$2,198,029 | | | | |
| 57 | | | | | ANNUAL COST PER MILE: | | \$133,487 | | | | |
| 58 | | | | | PERCENT DIF = (DIF IN COST)/(LOWEST COST) = | | 16.7% | | | | |
| 59 | CONTINUOUSLY REINFORCED PAVEMENT | | | | | | | | | | |
| 60 | TV = | 0.0000 | | MILLION | TFR = | | | | | | |
| 61 | | | | | EXTENDED LANE = | | | | INCHES | | |
| 62 | 15 FT PCC PANEL THICKNESS FOR | | | | TIED SHOULDER = | | | | INCHES | | |
| 63 | | | | | UNTIED SHOULDER = | | | | INCHES | | |
| 64 | | | | | | | | | | | |
| 65 | | | | | FIRST COST: | | \$8,629,645 | | | | |
| 66 | | | | | 45 YR LIFE CYCLE COST: | | \$475,114 | | | | |
| 67 | | | | | ANNUAL COST PER MILE: | | \$111,277 | | | | |
| 68 | | | | | PERCENT DIF = (DIF IN COST)/(LOWEST COST) = | | 2.8% | | = Jointed PCC | | |
| 69 | | | | | | | 20.0% | | = HMA | | |
| 70 | | | | | | | | | | | |
| 71 | JOINTED PLAIN CONCRETE PAVEMENT & UNBONDED JOINTED PLAIN CONCRETE OVERLAY | | | | | | | | | | |
| 72 | | | | | | | | | | | |
| 73 | DATE: | 03/26/12 | | | TRAFFIC LANES | | | ROUTE: | | FAP 734 ((IL 2) | |
| 74 | QUANTITIES BY: | Sam Abdullah | | | CHKD BY: | | | SECTION: | | 77-2-1&77-2B-2 | |
| 75 | UNIT PRICE BY: | | | | CHKD BY: | | | COUNTY: | | COUNTY | |
| 76 | SPECIFICATIONS | | | | | | | | | | |
| 77 | NET LENGTH | 17700 FEET | | 3.352 MILES | | | | | | | |
| 78 | | | | | | | | | | | |
| 79 | NUMBER OF TRAFFIC LANES | 4 | | LANE WIDTH (AVE) = | | 12 FT | | | | | |
| 80 | | | RURAL | | | | | | | | |
| 81 | GUTTER FLAG WIDTH (FT) = | 0 | | PAVED SHLD WIDTH (TOTAL) = | | 28 FT | | | | | |
| 82 | | | | | | | | | | | |

| C | D | E | F | G | H | I | J | K | L | M |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------------------------------------------------------------------|-------------|-----------|-----------|---------------|---|---------------|---|
| 10 | LIMITS OF ANALYSIS | | | | | | | | | |
| 11 | STATION | 839 + 00 | TO STATION | | 1016 + 00 | OMISSIONS | | 0 | | |
| 12 | NET LENGTH | 17700 FEET | | 3.352 MILES | | | | | | |
| 13 | | | | | | | | | | |
| 83 | ITEMIZED CONSTRUCTION COST - JOINTED PLAIN CONCRETE PAVEMENT | | | | | | | | | |
| 84 | | | | | | | | | | |
| 85 | QUANTITY | UNIT | ITEM | | UNIT COST | | COST | | | |
| 86 | 94400 | SQ. YD. | 10 INCH JOINTED PCC MAINLINE | | \$44.85 | | = \$4,233,840 | | | |
| 87 | | | | | | | | | | |
| 88 | 0 | SQ. YD. | 4 Inch Stabilized Sub-Base +++ | | \$11.10 | | = \$0 | | | |
| 89 | | | | | | | | | | |
| 90 | 153400 | SQ. YD. | 16 Inch Improved Sub-Grade (CA) +++ | | \$11.10 | | = \$1,702,740 | | | |
| 91 | +++ - Combined into 16 inch Composite Aggregate Layer, the top 4" will be CA 6 or CA 10 over minimum 12" of crushed Breaker Run, (6" top size, 70-90% by wt. passing 4" sieve and d15-40% by wt. passing 2" sieve). District Two Geotechnical Engineer Recommendation. | | | | | | | | | |
| 92 | | | | | | | | | | |
| 93 | 55067 | SQ. YD. | 10 INCH PCC SHOULDER | | \$34.80 | | = \$1,916,332 | | | |
| 94 | | | | | | | | | | |
| 95 | 0 | SQ. YD. | 0 inch - HMA Surface Removal | | \$1.50 | | = \$0 | | | |
| 96 | | | | | | | | | | |
| 97 | 0.0 | TON | 0 inch - HMA BINDER, PG62-28, IL19.0, N70 | | \$45.00 | | = \$0 | | | |
| 98 | | | | | | | | | | |
| 99 | 0.0 | TON | 0 inch - HMA LEVEL BINDER PG 7777 | | \$45.00 | | = \$0 | | | |
| 100 | | | | | | | | | | |
| 101 | 0 | SQ. YD. | 0 inch - Pavement Removal | | \$9.00 | | = \$0 | | | |
| 102 | | | | | | | | | | |
| 103 | 0 | CU. YD. | 0 inch - Earth Excavation | | \$11.50 | | = \$0 | | | |
| 104 | NOTE: assumes 26" new Pvt less removal of 13.5" equals 12.5" of Earth Ex. | | | | | | | | | |
| 105 | | | | | | | | | | |
| 106 | TOTAL COST OF ORIGINAL JOINTED PAVEMENT CONSTRUCTION | | | | | | | | = \$7,852,912 | |
| 107 | | | | | | | | | | |
| 108 | PRESENT COSTS OF FUTURE MAINT. AND REHABILITATION WORK | | | | | | | | | |
| 109 | JOINTED PLAIN CONCRETE PAVEMENT | | | | | | | | | |
| 110 | UNIT | ITEM | | UNIT COST | | | | | | |
| 111 | 94400 | SQ. YD. | FULL-DEPTH PCC PAVEMENT PATCHING, Class B | | \$135.00 | | | | | |
| 112 | Activity 1, 2, 3, 4, 5, and 7. | | | | | | | | | |
| 113 | | | | | | | | | | |
| 114 | 11894 | TON | POLICY HMA OVERLAY of PAVEMENT (See BDE Chapter 53-4.04 for thickness) | | \$88.40 | | | | | |
| 115 | Activity 5 | | | | | | | | | |
| 116 | Poly, HMA SC, MIX D, N70 | | | | | | | | | |
| 117 | | | | | 2.25 | INCHES | | | | |
| 118 | 6938 | TON | POLICY HMA OVERLAY of SHOULDER (See BDE Chapter 53-4.04 for thickness) | | \$81.90 | | | | | |
| 119 | Activity 5 | | | | | | | | | |
| 120 | HMA SC, MIX C, N50 | | | | | | | | | |
| 121 | | | | | 2.25 | INCHES | | | | |
| 122 | 70800 | LIN. FT. | RANDOM CRACK ROUTING & SEALING | | \$1.25 | | | | | |
| 123 | Note: For random crack routing and sealing, assume 100 ft/station per lane | | | | | | | | | |
| 124 | Activity 6 and 7 | | | | | | | | | |
| 125 | | | | | | | | | | |
| 126 | 56640 | LIN. FT. | REFLECTIVE TRANSVERSE CRACK ROUTING & SEALING | | \$1.00 | | | | | |
| 127 | Activity 6 and 7 | | | | | | | | | |
| 128 | | | Joint spacing = | | 15 | FEET | | | | |
| 129 | 94400 | SQ. YD. | PARTIAL-DEPTH PAVEMENT PATCHING | | \$42.00 | | | | | |
| 130 | Activity 6 and 7 | | | | | | | | | |
| 131 | Poly, HMA SC, MIX D, N70 | | | | | | | | | |
| 132 | (Mill & Fill Surface - Interstate; Mill & Fill 2.50 in. -Non-Interstate) | | | | | | | | | |
| 133 | 70800 | LIN. FT. | LONGITUDINAL SHOULDER JOINT ROUTING AND SEALING | | \$0.80 | | | | | |
| 134 | Activity 3, 6 and 7 | | | | | | | | | |
| 135 | | | | | | | | | | |
| 136 | 35400 | LIN. FT. | CENTERLINE JOINT ROUTING AND SEALING | | \$0.95 | | | | | |
| 137 | Activity 3, 6 and 7 | | | | | | | | | |
| 138 | | | | | | | | | | |
| 139 | 55067 | SQ. YD. | FULL-DEPTH PCC SHOULDER PATCHING, Class C | | \$125.00 | | | | | |
| 140 | Activity 3, 4 and 5 | | | | | | | | | |
| 141 | | | | | | | | | | |
| 142 | MAINTENANCE AND REHABILITATION ACTIVITY for JOINTED PLAIN CONCRETE AND UNBONDED JOINTED PLAIN CONCRETE OVERLAY (Fig. 54-7.A) | | | | | | | | | |
| 143 | | | | | | | | | | |
| 144 | REHABILITATION ACTIVITY 1 - YEAR 10 | | | | | | | | | |
| 145 | | | | | | | | | | |
| 146 | 94 | SQ. YD. | 0.10% FULL-DEPTH PCC PAVEMENT PATCHING, Class B | | \$135.00 | | = \$12,690 | | | |
| 147 | TOTAL COST OF REHABILITATION ACTIVITY 1 | | | | | | | | = \$12,690 | |
| 148 | REHABILITATION ACTIVITY 2 - YEAR 15 | | | | | | | | | |
| 149 | | | | | | | | | | |
| 150 | 189 | SQ. YD. | 0.20% FULL-DEPTH PCC PAVEMENT PATCHING, Class B | | \$135.00 | | = \$25,515 | | | |
| 151 | TOTAL COST OF REHABILITATION ACTIVITY 2 | | | | | | | | = \$25,515 | |
| 152 | | | | | | | | | | |

FIRST COSTS

| | C | D | E | F | G | H | I | J | K | L | M | |
|-----|---------------------------------------------------------------------------|------------|------------|-------------------------------------------------------------------------------------------------------------|---|-----------|-----------|-----------|---|-------------|-------------|-----------|
| 10 | LIMITS OF ANALYSIS | | | | | | | | | | | |
| 11 | STATION | 839 + 00 | TO STATION | | | 1016 + 00 | OMISSIONS | | 0 | | | |
| 12 | NET LENGTH | 17700 FEET | | 3.352 MILES | | | | | | | | |
| 13 | | | | | | | | | | | | |
| 153 | REHABILITATION ACTIVITY 3 - YEAR 20 | | | | | | | | | | | |
| 154 | | | | | | | | | | | | |
| 155 | 1888 | SQ. YD. | 2.00% | FULL-DEPTH PCC PAVEMENT PATCHING, Class B | | | | \$135.00 | = | \$254,880 | | |
| 156 | | | | | | | | | | | | |
| 157 | 275 | SQ. YD. | 0.50% | FULL-DEPTH PCC SHOULDER PATCHING, Class C | | | | \$125.00 | = | \$34,375 | | |
| 158 | | | | | | | | | | | | |
| 159 | 70800 | LIN. FT. | 100.00% | LONGITUDINAL SHOULDER JOINT ROUTING & SEALING | | | | \$0.80 | = | \$56,640 | | |
| 160 | | | | | | | | | | | | |
| 161 | 35400 | LIN. FT. | 100.00% | CENTERLINE JOINT ROUTING & SEALING | | | | \$0.95 | = | \$33,630 | | |
| 162 | | | | | | | | | | | | |
| 163 | TOTAL COST OF REHABILITATION ACTIVITY 3 | | | | | | | | | \$379,525 | | |
| 164 | REHABILITATION ACTIVITY 4 - YEAR 25 | | | | | | | | | | | |
| 165 | | | | | | | | | | | | |
| 166 | 2832 | SQ. YD. | 3.00% | FULL-DEPTH PCC PAVEMENT PATCHING, Class B | | | | \$135.00 | = | \$382,320 | | |
| 167 | | | | | | | | | | | | |
| 168 | 551 | SQ. YD. | 1.00% | FULL-DEPTH PCC SHOULDER PATCHING, Class C | | | | \$125.00 | = | \$68,875 | | |
| 169 | | | | | | | | | | | | |
| 170 | TOTAL COST OF REHABILITATION ACTIVITY 4 | | | | | | | | | \$451,195 | | |
| 171 | REHABILITATION ACTIVITY 5 - YEAR 30 | | | | | | | | | | | |
| 172 | | | | | | | | | | | | |
| 173 | 3776 | SQ. YD. | 4.00% | FULL-DEPTH PCC PAVEMENT PATCHING, Class B | | | | \$135.00 | = | \$509,760 | | |
| 174 | | | | | | | | | | | | |
| 175 | 826 | SQ. YD. | 1.50% | FULL-DEPTH PCC SHOULDER PATCHING, Class C | | | | \$125.00 | = | \$103,250 | | |
| 176 | | | | | | | | | | | | |
| 177 | 11894 | TON | 100.00% | POLICY HMA OVERLAY OF PAVEMENT (See 53-4.04 for required thickness) | | | 2.25 | \$88.40 | = | \$1,051,430 | | |
| 178 | | | | | | | | | | | | |
| 179 | 6938 | TON | 100.00% | POLICY HMA OVERLAY OF SHOULDER (See 53-4.04 for required thickness) | | | 2.25 | \$81.90 | = | \$568,222 | | |
| 180 | | | | | | | | | | | | |
| 181 | TOTAL COST OF REHABILITATION ACTIVITY 5 | | | | | | | | | \$2,232,662 | | |
| 182 | | | | | | | | | | | | |
| 183 | REHABILITATION ACTIVITY 6 - YEAR 35 | | | | | | | | | | | |
| 184 | | | | | | | | | | | | |
| 185 | 70800 | LIN. FT. | 100.00% | LONGITUDINAL SHOULDER JOINT ROUTING & SEALING | | | | \$0.80 | = | \$56,640 | | |
| 186 | | | | | | | | | | | | |
| 187 | 35400 | LIN. FT. | 100.00% | CENTERLINE JOINT ROUT & SEAL | | | | \$0.95 | = | \$33,630 | | |
| 188 | | | | | | | | | | | | |
| 189 | 35400 | LIN. FT. | 50.00% | Random Crack Routing & Sealing (See Note) | | | | \$1.25 | = | \$44,250 | | |
| 190 | | | | | | | | | | | | |
| 191 | 22656 | LIN. FT. | 40.00% | Reflective Transverse Crack Routing & Sealing | | | | \$1.00 | = | \$22,656 | | |
| 192 | | | | | | | | | | | | |
| 193 | 94 | SQ. YD. | 0.10% | PARTIAL-DEPTH PAVEMENT PATCHING (Mill & Fill Surface - Interstate; Mill & Fill 2.50 In. -Non-Interstate) | | | 2.50 | \$42.00 | = | \$3,948 | | |
| 194 | | | | | | | | | | | | |
| 195 | TOTAL COST OF REHABILITATION ACTIVITY 6 | | | | | | | | | \$161,124 | | |
| 196 | | | | | | | | | | | | |
| 197 | REHABILITATION ACTIVITY 7 - YEAR 40 | | | | | | | | | | | |
| 198 | | | | | | | | | | | | |
| 199 | 472 | SQ. YD. | 0.50% | FULL-DEPTH PCC PAVEMENT PATCHING, Class B | | | | \$135.00 | = | \$63,720 | | |
| 200 | | | | | | | | | | | | |
| 201 | 70800 | LIN. FT. | 100.00% | LONGITUDINAL SHOULDER JOINT ROUTING & SEALING | | | | \$0.80 | = | \$56,640 | | |
| 202 | | | | | | | | | | | | |
| 203 | 35400 | LIN. FT. | 100.00% | CENTERLINE JOINT ROUT & SEAL | | | | \$0.95 | = | \$33,630 | | |
| 204 | | | | | | | | | | | | |
| 205 | 33984 | LIN. FT. | 60.00% | Reflective Transverse Crack Routing & Sealing | | | | \$1.00 | = | \$33,984 | | |
| 206 | | | | | | | | | | | | |
| 207 | 35400 | LIN. FT. | 50% | Random Crack Routing & Sealing (See Note) | | | | \$1.25 | = | \$44,250 | | |
| 208 | | | | | | | | | | | | |
| 209 | 472 | SQ. YD. | 0.50% | PARTIAL-DEPTH PAVEMENT PATCHING (Mill & Fill Surface - Interstate; Mill & Fill 2.50 In. -Non-Interstate) | | | 2.50 | \$42.00 | = | \$19,824 | | |
| 210 | | | | | | | | | | | | |
| 211 | TOTAL COST OF REHABILITATION ACTIVITY 7 | | | | | | | | | \$252,048 | | |
| 212 | | | | | | | | | | | | |
| 213 | ANNUAL COST DETERMINATION | | | | | | | | | | | |
| 214 | JOINTED PLAIN CONCRETE PAVEMENT & UNBONDED JOINTED PLAIN CONCRETE OVERLAY | | | | | | | | | | | |
| 215 | | | | | | | | | | | | |
| 216 | PRESENT WORTH CALCULATIONS | | | | | | | | | | | |
| 217 | | | | | | | | | | | | |
| 218 | TOTAL COST OF ORIGINAL PAVEMENT CONSTRUCTION | | | | | | | | | = | \$7,852,912 | |
| 219 | | | | | | | | | | | | |
| 220 | PRESENT WORTH: REHABILITATION ACTIVITY 1 - YEAR 10 | | | | | | | \$12,690 | X | 0.7441 | = | \$9,443 |
| 221 | | | | | | | | | | | | |
| 222 | REHABILITATION ACTIVITY 2 - YEAR 15 | | | | | | | \$25,515 | X | 0.6419 | = | \$16,378 |
| 223 | | | | | | | | | | | | |
| 224 | REHABILITATION ACTIVITY 3 - YEAR 20 | | | | | | | \$379,525 | X | 0.5537 | = | \$210,143 |
| 225 | | | | | | | | | | | | |
| 226 | REHABILITATION ACTIVITY 4 - YEAR 25 | | | | | | | \$451,195 | X | 0.4776 | = | \$215,491 |
| 227 | | | | | | | | | | | | |

| | C | D | E | F | G | H | I | J | K | L | M | |
|-----|--------------------------------------------------------------------------------------------------------|---------------------------------------------|---------------------------------------------------------------|---------------------------|---|------------|----------------|-------------------|-----------|-----------------------------------------------|-----------|-------------|
| 10 | LIMITS OF ANALYSIS | | | | | | | | | | | |
| 11 | STATION | 839 + 00 | TO STATION | | | 1016 + 00 | | | OMISSIONS | 0 | | |
| 12 | NET LENGTH | 17700 FEET | | 3.352 MILES | | | | | | | | |
| 13 | | | | | | | | | | | | |
| 228 | REHABILITATION ACTIVITY 5 - YEAR 30 | | | | | | \$2,232,662 | X | 0.4120 | = | \$919,857 | |
| 229 | | | | | | | | | | | | |
| 230 | REHABILITATION ACTIVITY 6 - YEAR 35 | | | | | | \$161,124 | X | 0.3554 | = | \$57,263 | |
| 231 | | | | | | | | | | | | |
| 232 | REHABILITATION ACTIVITY 7 - YEAR 40 | | | | | | \$252,048 | X | 0.3066 | = | \$77,278 | |
| 233 | | | | | | | | | | | | |
| 234 | | | | | | | | | | TOTAL REHABILITATION COST (PRESENT WORTH) | = | \$1,505,853 |
| 235 | | | | | | | | | | | | |
| 236 | ANNUAL COST PER MILE CALCULATION - | | | | | | | | | | | |
| 237 | (JOINTED PLAIN CONCRETE PAVEMENT & UNBONDED JOINTED PLAIN CONCRETE OVERLAY) | | | | | | | | | | | |
| 238 | | | | | | | | | | | | |
| 239 | Annual Cost per Mile ==> $A = D + M + CRF_n \times [C + R1(PWF_n1) + R2(PWF_n2) + \dots + Rn(PWF_nn)]$ | | | | | | | | | | | |
| 240 | D = Admin & Overhead per mile; M = total annual maintenance cost per mile | | | | | | | | | | | |
| 241 | C = Initial Construction Cost per mile = | | | | | | \$2,342,564 | | | | | |
| 242 | D + M = | | | | | | \$505,000 | Annually per Mile | | | | |
| 243 | CRF(n) => n= number of years, usually 45. | | | | | | | | | | | |
| 244 | CRF(45) = $(0.03(1+0.03)^{45}) / [(1+0.03)^{45} - 1] =$ | | | | | | | | | | | |
| 245 | 0.040785176 | | | | | | | | | | | |
| 246 | | | | | | | | | | | | |
| 247 | Rehabilitation cost per mile and capital Recovery factor | | | | | | | | | | | |
| 248 | R1(PWF10) = | \$9,443 | \$2,817 | | | | | | | | | |
| 249 | R2(PWF15) = | \$16,378 | \$4,886 | A = ---- = *\$114,367.72* | | | | | | | | |
| 250 | R3(PWF20) = | \$210,143 | \$62,687 | annual cost per mile | | | | | | | | |
| 251 | R4(PWF25) = | \$215,491 | \$64,282 | | | | | | | | | |
| 252 | R5(PWF30) = | \$919,857 | \$274,398 | | | | | | | | | |
| 253 | R6(PWF35) = | \$57,263 | \$17,082 | | | | | | | | | |
| 254 | R7(PWF40) = | \$77,278 | \$23,052 | ANNUAL COST PER MILE = | | | | | | | | |
| 255 | TOTAL = | | | | | | \$449,204 | = \$114,368 | | | | |
| 256 | end of - JOINTED PLAIN CONCRETE PAVEMENT & UNBONDED JOINTED PLAIN CONCRETE OVERLAY | | | | | | | | | | | |
| 257 | | | | | | | | | | | | |
| 258 | FULL DEPTH HMA PAVEMENT & HMA OVERLAY OF RUBBLIZED PCC PAVEMENT | | | | | | | | | | | |
| 259 | DATE: | 03/26/12 | TRAFFIC LANES | | | ROUTE: | FAP 734 (IL 2) | | | | | |
| 260 | QUANTITIES BY: | Sam Abdullah | CHKD BY: | SECTION: | | | 77-2-1&77-2B-2 | | | | | |
| 261 | UNIT PRICE BY: | 0 | CHKD BY: | COUNTY: | | | COUNTY | | | | | |
| 262 | SPECIFICATIONS | | | | | | | | | | | |
| 263 | | | | | | | | | | | | |
| 264 | NET LENGTH | 17700 FEET | | 3.352 MILES | | | | | | | | |
| 265 | | | | | | | | | | | | |
| 266 | NUMBER OF TRAFFIC LANES | 4 | | LANE WIDTH (AVE) | | 12 FT | | | | | | |
| 267 | RURAL | | | | | | | | | | | |
| 268 | PLACE A 1 OR 2 | 1 = SINGLE LANE PAVING 2 = DUAL LANE PAVING | | | | | | | | | | |
| 269 | | | | | | | | | | | | |
| 270 | GUTTER FLAG WIDTH (FT) | 0 | | BIT SHDR WIDTH (TOTAL) | | 28 FT | | | | | | |
| 271 | | | | | | | | | | | | |
| 272 | ITEMIZED CONSTRUCTION COST - HMA | | | | | | | | | | | |
| 273 | QUANTITY | UNIT | ITEM | | | UNIT COST | COST | | | | | |
| 274 | 94,400.00 | SQ. YD. | 11 inch - HMA FULL DEPTH PAVEMENT - MAINLINE | | | \$49.95 | = | \$4,715,280 | | | | |
| 275 | | | 2 inch - SURFACE COURSE: Polymerized HMA, Mix 'D', N70 | | | | | | | | | |
| 276 | | | 3 inch - Top Binder Polymerized HMA BC, IL 19.0, N70 | | | | | | | | | |
| 277 | | | 6 inch - Lower BINDER: Lower TWO Lifts - HMA, BC, IL19.0, N70 | | | | | | | | | |
| 278 | | | | | | | | | | | | |
| 279 | 153,400.00 | SQ. YD. | 16 inch - Improved SUBGRADE, Type CA | | | \$11.10 | = | \$1,702,740 | | | | |
| 280 | | | | | | | | | | | | |
| 281 | 55,066.67 | SQ. YD. | 8 inch - HMA SHOULDER 2" - HMA, Mix 'D', N70 | | | \$37.50 | = | \$2,065,013 | | | | |
| 282 | | | | | | | | | | | | |
| 283 | 299.23 | TON | Bituminous Materials (Prime Coat) -- 2 coats | | | \$750.00 | = | \$224,250 | | | | |
| 284 | | | | | | | | | | | | |
| 285 | 224.20 | TON | AGGREGATE (Prime Coat) | | | \$22.00 | = | \$4,928 | | | | |
| 286 | | | | | | | | | | | | |
| 287 | 4.00 | EACH | Test Strip - Ask Steve Hefel | | | \$5,000.00 | = | \$20,000 | | | | |
| 288 | | | | | | | | | | | | |
| 289 | - | SQ. YD. | 0.00 inch - HMA Surface Removal | | | \$2.00 | = | \$0 | | | | |
| 290 | | | | | | | | | | | | |
| 291 | - | SQ. YD. | 0.00 inch - Pavement Removal | | | \$11.00 | = | \$0 | | | | |
| 292 | | | | | | | | | | | | |
| 293 | - | CU. YD. | 0.00 inch - Earth Excavation | | | \$11.50 | = | \$0 | | | | |
| 294 | NOTE: assumes 23.75" new Pvt less removal of 13.5" equals 10.5 of Earth Ex. | | | | | | | | | | | |
| 295 | | | | | | | | | | TOTAL COST OF ORIGINAL PAVEMENT CONSTRUCTION: | = | \$8,732,211 |
| 296 | | | | | | | | | | | | |

FIRST COSTS

| | C | D | E | F | G | H | I | J | K | L | M |
|-----|------------------------------------------------------------------|----------|------------|---------------------------------------------------------------------------------|-----------|---------------------------------------------|---|--------------------|---|-----------|---|
| 10 | LIMITS OF ANALYSIS | | | | | | | | | | |
| 11 | STATION | 839 + 00 | TO STATION | | 1016 + 00 | | | OMISSIONS | 0 | | |
| 12 | NET LENGTH | 17700 | FEET | | 3,352 | MILES | | | | | |
| 13 | | | | | | | | | | | |
| 297 | PRESENT COSTS OF FUTURE MAINTENANCE AND REHABILITATION WORK | | | | | | | | | | |
| 298 | | | | | | | | | | | |
| 299 | | UNIT | | ITEM | | | | | | UNIT COST | |
| 300 | 19,824.00 | TON | | HMA Overlay - Pavement | | | | 3.75 | | \$88.50 | |
| 301 | | | | Activity 6 | | | | | | | |
| 302 | | | | (3.75 in. - Standard Design; 2.00 in. Limiting Strain Criterion) | | | | | | | |
| 303 | | | | | | | | | | | |
| 304 | 5,396.53 | TON | | HMA Overlay - Shoulder | | | | 1.75 | | \$82.35 | |
| 305 | | | | Activity 6 | | | | | | | |
| 306 | | | | (1.75 in. - Standard Design; 2.00 in. Limiting Strain Criterion) | | | | | | | |
| 307 | | | | | | | | | | | |
| 308 | 70800 | LIN. FT. | | LONGITUDINAL SHOULDER JOINT ROUTING AND SEALING | | | | | | \$0.80 | |
| 309 | | | | Activity 1, 2, 4, 5, 7, and 8 | | | | | | | |
| 310 | | | | | | | | | | | |
| 311 | 35400 | LIN. FT. | | CENTERLINE JOINT ROUTING AND SEALING | | | | | | \$0.95 | |
| 312 | | | | Activity 1, 2, 4, 5, 7, and 8 | | | | | | | |
| 313 | | | | | | | | | | | |
| 314 | 77880 | LIN. FT. | | RANDOM / THERMAL CRACK ROUTING AND SEALING (assume 110 ft/station per lane) | | | | | | \$1.00 | |
| 315 | | | | Activity 1, 2, 4, 5, 7, and 8 | | | | | | | |
| 316 | | | | | | | | | | | |
| 317 | 55,066.67 | SQ. YD. | | PARTIAL-DEPTH SHOULDER PATCHING (As follows) | | Pavement Design - | | standard | | \$35.00 | |
| 318 | | | | Activity 6 | | | | | | | |
| 319 | | | | Standard Design ==> Mill & Fill Surface | | | 2 | INCHES | | | |
| 320 | | | | Limiting Strain Design ==> Mill & Fill Additional 2.00" | | | | HMA SC C N50 | | | |
| 321 | | | | | | | | | | | |
| 322 | 149,466.67 | SQ. YDS. | | 2-INCH MILLING - Pavement & Shoulder | | | | | | \$2.10 | |
| 323 | | | | Activity 3 | | | | | | | |
| 324 | | | | | | | | | | | |
| 325 | 94400 | SQ. YDS. | | 2-INCH MILLING (note) | | Pavement Design - standard | | HMA SC REM 2" | | \$2.00 | |
| 326 | | | | NOTE: Pavement only - Standard ==> Pavement & Shoulder - Limiting Strain | | | | | | | |
| 327 | | | | Activity 6 | | | | | | | |
| 328 | | | | | | | | | | | |
| 329 | 10,572.80 | TONS | | 2-INCH HMA OVERLAY PAVEMENT | | | | P HMA SC mix D N70 | | \$97.90 | |
| 330 | | | | Activity 3 | | | | | | | |
| 331 | | | | | | | | | | | |
| 332 | 6,167.47 | TONS | | 2-INCH HMA OVERLAY SHOULDER | | | | HMA SC mix C N50 | | \$62.60 | |
| 333 | | | | Activity 3 | | | | | | | |
| 334 | | | | | | | | | | | |
| 335 | 94,400.00 | SQ. YDS. | | PARTIAL-DEPTH PAVEMENT PATCHING (Mill & Fill Surface) | | | | | | | |
| 336 | | | | Activity 1, 2, 4, and 5 | | 2" - HMA SC REM, 2" - P HMA SC D N70. | | | | \$41.00 | |
| 337 | | | | Activity 7 and 8 | | 3.75" - HMA SC REM, 3.75" - P HMA SC D N70. | | | | \$56.00 | |
| 338 | | | | | | | | | | | |
| 339 | 94,400.00 | SQ. YDS. | | PARTIAL-DEPTH PAVEMENT PATCHING (Mill & Fill Additional 2.00 in. - All Designs) | | | | | | \$26.00 | |
| 340 | | | | Activity 3 and 6 | | HMA SC REM 2", 2"- P HMA BC IL-19 N70 | | | | | |
| 341 | | | | | | | | | | | |
| 342 | | | | | | | | | | | |
| 343 | MAINTENANCE AND REHABILITATION ACTIVITY COST - FLEXIBLE PAVEMENT | | | | | | | | | | |
| 344 | | | | | | | | | | | |
| 345 | REHABILITATION ACTIVITY 1 - YEAR 5 | | | | | | | | | | |
| 346 | | | | | | | | | | | |
| 347 | 70800 | LIN. FT. | 100.00% | LONGITUDINAL SHOULDER JOINT ROUTING & SEALING | | | | \$0.80 | = | \$56,640 | |
| 348 | | | | | | | | | | | |
| 349 | 35400 | LIN. FT. | 100.00% | CENTERLINE JOINT ROUT & SEAL (SINGLE LANE PAVING) | | | | \$0.95 | = | \$33,630 | |
| 350 | | | | | | | | | | | |
| 351 | 38940 | LIN. FT. | 50.00% | RANDOM / THERMAL CRACK ROUTING AND SEALING | | | | \$1.00 | = | \$38,940 | |
| 352 | | | | | | | | | | | |
| 353 | 94 | SQ. YDS. | 0.10% | PARTIAL-DEPTH PAVEMENT PATCHING | | | | \$41.00 | = | \$3,854 | |
| 354 | | | | (Mill & Fill Surface) | | 2 inches | | | | | |
| 355 | | | | | | | | | | | |
| 356 | | | | | | | | | | | |
| 357 | REHABILITATION ACTIVITY 2 - YEAR 10 | | | | | | | | | | |
| 358 | | | | | | | | | | | |
| 359 | 70800 | LIN. FT. | 100.00% | LONGITUDINAL SHOULDER JOINT ROUTING & SEALING | | | | \$0.80 | = | \$56,640 | |
| 360 | | | | | | | | | | | |
| 361 | 35400 | LIN. FT. | 100.00% | CENTERLINE JOINT ROUT & SEAL (SINGLE LANE PAVING) | | | | \$0.95 | = | \$33,630 | |
| 362 | | | | | | | | | | | |
| 363 | 38940 | LIN. FT. | 50.00% | RANDOM / THERMAL CRACK ROUTING AND SEALING | | | | \$1.00 | = | \$38,940 | |
| 364 | | | | | | | | | | | |
| 365 | 472 | SQ. YDS. | 0.50% | PARTIAL-DEPTH PAVEMENT PATCHING | | | | \$41.00 | = | \$19,352 | |
| 366 | | | | (Mill & Fill Surface) | | 2 inches | | | | | |
| 367 | | | | | | | | | | | |
| 368 | | | | | | | | | | | |
| 369 | REHABILITATION ACTIVITY 3 - YEAR 15 | | | | | | | | | | |
| 370 | | | | | | | | | | | |
| 371 | 149467 | SQ. YDS. | | 2-INCH MILLING - Pavement & Shoulder | | | | \$2.10 | = | \$313,881 | |

| | C | D | E | F | G | H | I | J | K | L | M | | | |
|-----|------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|------------|---|-----------|-------------|---|-----------|---|-------------|---|-----|--------------|----------------------|
| 10 | LIMITS OF ANALYSIS | | | | | | | | | | | | | |
| 11 | STATION | 839 + 00 | TO STATION | | 1016 + 00 | | | OMISSIONS | | 0 | | | | |
| 12 | NET LENGTH | 17700 | FEET | | 3,352 | MILES | | | | | | | | |
| 13 | | | | | | | | | | | | | | |
| 447 | ANNUAL COST DETERMINATION - FLEXIBLE PAVEMENT | | | | | | | | | | | | | |
| 448 | | | | | | | | | | | | | | |
| 449 | PRESENT WORTH CALCULATIONS | | | | | | | | | | | | | |
| 450 | | | | | | | | | | | | | | |
| 451 | | | | | | | | | | | | | | |
| 452 | TOTAL COST OF ORIGINAL PAVEMENT CONSTRUCTION | | | | | | | | | | | | | |
| 453 | PRESENT WORTH | REHABILITATION ACTIVITY 1 - YEAR 5 | | | | \$133,064 | X | 0.8626 | = | \$114,781 | | | | |
| 454 | | | | | | | | | | | | | | |
| 455 | | REHABILITATION ACTIVITY 2 - YEAR 10 | | | | \$148,562 | X | 0.7441 | = | \$110,545 | | | | |
| 456 | | | | | | | | | | | | | | |
| 457 | | REHABILITATION ACTIVITY 3 - YEAR 15 | | | | \$1,122,717 | X | 0.6419 | = | \$720,672 | | | | |
| 458 | | | | | | | | | | | | | | |
| 459 | | REHABILITATION ACTIVITY 4 - YEAR 20 | | | | \$133,064 | X | 0.5537 | = | \$73,678 | | | | |
| 460 | | | | | | | | | | | | | | |
| 461 | | REHABILITATION ACTIVITY 5 - YEAR 25 | | | | \$148,562 | X | 0.4776 | = | \$70,953 | | | | |
| 462 | | | | | | | | | | | | | | |
| 463 | | REHABILITATION ACTIVITY 6 - YEAR 30 | | | | \$2,456,040 | X | 0.4120 | = | \$1,011,888 | | | | |
| 464 | | | | | | | | | | | | | | |
| 465 | | REHABILITATION ACTIVITY 7 - YEAR 35 | | | | \$134,474 | X | 0.3554 | = | \$47,792 | | | | |
| 466 | | | | | | | | | | | | | | |
| 467 | | REHABILITATION ACTIVITY 8 - YEAR 40 | | | | \$155,642 | X | 0.3056 | = | \$47,720 | | | | |
| 468 | | | | | | | | | | | | | | |
| 469 | | | | | | | | | | | | | | |
| 470 | | | | | | | | | | | | | | |
| 471 | | | | | | | | | | | | | | |
| 472 | ANNUAL COST PER MILE CALCULATION - FLEXIBLE PAVEMENT. | | | | | | | | | | | | | |
| 473 | | | | | | | | | | | | | | |
| 474 | ANNUAL COST PER MILE CALCULATION - FLEXIBLE PAVEMENT | | | | | | | | | | | | | |
| 475 | Annual Cost per Mile => $A = D + M + CRF_n \times [C + R_1(PWF_n1) + R_2(PWF_n2) + \dots + R_n(PWF_nn)]$ | | | | | | | | | | | | | |
| 476 | | D = Admin & Overhead per mile; M = total annual maintenance cost per mile | | | | | | | | | | | | |
| 477 | | C = Construction Cost per mile = \$2,604,863 | | | | | | | | | | | | |
| 478 | | D + M = \$505,000 Annually per Mile | | | | | | | | | | | | |
| 479 | | CRF(n) => n= number of years, usually 45. | | | | | | | | | | | | |
| 480 | | CRF(45) = $(0.03(1+0.03)^{45}) / [(1+0.03)^{45} - 1] = 0.040785176$ | | | | | | | | | | | | |
| 481 | | | | | | | | | | | | | | |
| 482 | Rehabilitation cost per mile and capital Recovery factor | | | | | | | | | | | | | |
| 483 | R1(PWF5) = | \$114,781 | \$34,240 | | | | | | | | | A = | \$133,487.00 | annual cost per mile |
| 484 | R1(PWF10) = | \$110,545 | \$32,976 | | | | | | | | | | | |
| 485 | R2(PWF15) = | \$720,672 | \$214,980 | | | | | | | | | | | |
| 486 | R3(PWF20) = | \$73,678 | \$21,979 | | | | | | | | | | | |
| 487 | R4(PWF25) = | \$70,953 | \$21,166 | | | | | | | | | | | |
| 488 | R5(PWF30) = | \$1,011,888 | \$301,851 | | | | | | | | | | | |
| 489 | R6(PWF35) = | \$47,792 | \$14,257 | | | | | | | | | | | |
| 490 | R7(PWF40) = | \$47,720 | \$14,235 | | | | | | | | | | | |
| 491 | TOTAL = | \$2,198,029 | \$655,683 | | | | | | | | | | | |
| 492 | | | | | | | | | | | | | | |
| 493 | End of - FULL-DEPTH HMA PAVEMENT & HMA OVERLAY OF RUBBLIZED PCC PAVEMENT | | | | | | | | | | | | | |
| 494 | | | | | | | | | | | | | | |

| | C | D | E | F | G | H | I | J | K | L | M |
|-----|-----------------------------------------------------------------------------------------------------------|--------------|------------------------------------------------------------------------|----------------------------|-----------|-----------|----------------|---|---|---|---|
| 10 | LIMITS OF ANALYSIS | | | | | | | | | | |
| 11 | STATION | 839 + 00 | TO STATION | | 1016 + 00 | OMISSIONS | | 0 | | | |
| 12 | NET LENGTH | 17700 FEET | | 3.352 MILES | | | | | | | |
| 13 | | | | | | | | | | | |
| 495 | CONTINUOUSLY REINFORCED CONCRETE PAVEMENT & UNBONDED CONTINUOUSLY REINFORCED CONCRETE PAVEMENT | | | | | | | | | | |
| 496 | | | | | | | | | | | |
| 497 | DATE: | 03/26/12 | TRAFFIC LANES | | ROUTE: | | FAP 734 (IL 2) | | | | |
| 498 | QUANTITIES BY: | Sam Abdullah | CHKD BY: | | SECTION: | | 77-2-1&77-2B-2 | | | | |
| 499 | UNIT PRICE BY: | | CHKD BY: | | COUNTY: | | | | | | |
| 500 | SPECIFICATIONS | | | | | | | | | | |
| 501 | NET LENGTH | 17700 FEET | | 3.352 MILES | | | | | | | |
| 502 | | | | | | | | | | | |
| 503 | NUMBER OF TRAFFIC LANES | 4 | | LANE WIDTH (AVE) = | | 12 FT | | | | | |
| 504 | GUTTER FLAG WIDTH (FT) = | RURAL | | PAVED SHLD WIDTH (TOTAL) = | | 28 FT | | | | | |
| 505 | | 0 | | | | | | | | | |
| 506 | | | | | | | | | | | |
| 507 | ITEMIZED CONSTRUCTION COST - CONTINUOUSLY REINFORCED CONCRETE PAVEMENT | | | | | | | | | | |
| 508 | | | | | | | | | | | |
| 509 | QUANTITY | UNIT | ITEM | | UNIT COST | | COST | | | | |
| 510 | 94400 | SQ. YD. | 10 INCH Continuously Reinforced Concrete Pavement | | \$42.00 | | = \$3,964,800 | | | | |
| 511 | 106200 | SQ. YD. | 4 Inch Stabilized Sub-Base | | \$11.10 | | = \$1,178,820 | | | | |
| 512 | 95,383.33 | SQ. YD. | 12 Inch Improved Sub-Grade (CA) | | \$12.30 | | = \$1,173,211 | | | | |
| 513 | 55067 | SQ. YD. | 10 INCH PCC SHOULDER | | \$42.00 | | = \$2,312,814 | | | | |
| 514 | 0 | SQ. YD. | 0.0 inch - HMA Surface Removal | | \$1.50 | | = \$0 | | | | |
| 515 | 0.0 | TON | 0.0 inch - HMA BINDER, PG62-28, IL19.0, N70 | | \$45.00 | | = \$0 | | | | |
| 516 | 0.0 | TON | HMA LEVEL BINDER PG ???? | | \$45.00 | | = \$0 | | | | |
| 517 | 0 | CU. YD. | FURNISHED EXCAVATION | | \$15.00 | | = \$0 | | | | |
| 518 | 0 | CU. YD. | Earth Excavation | | \$11.50 | | = \$0 | | | | |
| 519 | | | | | | | | | | | |
| 520 | TOTAL COST OF ORIGINAL JOINTED PAVEMENT CONSTRUCTION | | | | | | | | | | |
| 521 | = \$8,629,845 | | | | | | | | | | |
| 522 | | | | | | | | | | | |
| 523 | PRESENT COSTS OF FUTURE MAINT. AND REHABILITATION WORK | | | | | | | | | | |
| 524 | | | | | | | | | | | |
| 525 | | UNIT | ITEM | | UNIT COST | | | | | | |
| 526 | 94400 | SQ. YD. | FULL-DEPTH PCC PAVEMENT PATCHING, Class A | | \$135.00 | | | | | | |
| 527 | Activity 1, 2, 3, 4, 5, and 7. | | | | | | | | | | |
| 528 | 0 | TON | POLICY HMA OVERLAY of PAVEMENT (See BDE Chapter 53-4.04 for thickness) | | \$82.00 | | | | | | |
| 529 | Activity 5 | | | | | | | | | | |
| 530 | Poly, HMA SC, MIX D, N70 | | | | | | | | | | |
| 531 | 0 | TON | POLICY HMA OVERLAY of SHOULDER (See BDE Chapter 53-4.04 for thickness) | | \$115.00 | | | | | | |
| 532 | Activity 5 | | | | | | | | | | |
| 533 | HMA SC, MIX C, N50 | | | | | | | | | | |
| 534 | 70800 | LIN. FT. | RANDOM CRACK ROUTING & SEALING | | \$1.25 | | | | | | |
| 535 | [Note: For random-crack routing and sealing, assume 100 ft/station per lane] | | | | | | | | | | |
| 536 | Activity 6 and 7 | | | | | | | | | | |
| 537 | 94400 | SQ. YD. | PARTIAL-DEPTH PAVEMENT PATCHING | | \$75.00 | | | | | | |
| 538 | Activity 6 and 7 | | | | | | | | | | |
| 539 | Poly, HMA SC, MIX D, N70 | | | | | | | | | | |
| 540 | (Mill & Fill Surface, See Activity 5 thickness above) | | | | | | | | | | |
| 541 | 70800 | LIN. FT. | LONGITUDINAL SHOULDER JOINT ROUTING AND SEALING | | \$1.00 | | | | | | |
| 542 | Activity 3, 6 and 7 | | | | | | | | | | |
| 543 | 35400 | LIN. FT. | CENTERLINE JOINT ROUTING AND SEALING | | \$1.00 | | | | | | |
| 544 | Activity 3, 6 and 7 | | | | | | | | | | |
| 545 | 55067 | SQ. YD. | FULL-DEPTH PCC SHOULDER PATCHING, Class C | | \$130.00 | | | | | | |
| 546 | Activity 4 and 5 | | | | | | | | | | |
| 547 | | | | | | | | | | | |
| 548 | MAINT. AND REHABILITATION ACTIVITY COST | | | | | | | | | | |
| 549 | UNBONDED JOINTED PLAIN CONCRETE OVERLAY | | | | | | | | | | |
| 550 | REHABILITATION ACTIVITY 1 - YEAR 10 | | | | | | | | | | |
| 551 | 94 | SQ. YD. | 0.10% FULL-DEPTH PCC PAVEMENT PATCHING, Class A | | \$135.00 | | = \$12,690 | | | | |
| 552 | TOTAL COST OF REHABILITATION ACTIVITY 1 | | | | | | | | | | |
| 553 | \$12,690 | | | | | | | | | | |

FIRST COSTS

| | C | D | E | F | G | H | I | J | K | L | M | |
|-----|-------------------------------------|----------|------------|------------------------------------------------------------------------------------------|-----------|-------|---|-----------|---|----------------------------------------------|-------------|-----------|
| 10 | LIMITS OF ANALYSIS | | | | | | | | | | | |
| 11 | STATION | 839 + 00 | TO STATION | | 1016 + 00 | | | OMISSIONS | | | 0 | |
| 12 | NET LENGTH | 17700 | FEET | | 3.352 | MILES | | | | | | |
| 13 | | | | | | | | | | | | |
| 567 | REHABILITATION ACTIVITY 2 - YEAR 15 | | | | | | | | | | | |
| 568 | | | | | | | | | | | | |
| 569 | 189 | SQ. YD. | 0.20% | FULL-DEPTH PCC PAVEMENT PATCHING, Class A | | | | \$135.00 | = | \$25,515 | | |
| 570 | | | | | | | | | | | | |
| 571 | | | | | | | | | | TOTAL COST OF REHABILITATION ACTIVITY 2 | \$25,515 | |
| 572 | REHABILITATION ACTIVITY 3 - YEAR 20 | | | | | | | | | | | |
| 573 | | | | | | | | | | | | |
| 574 | 472 | SQ. YD. | 0.50% | FULL-DEPTH PCC PAVEMENT PATCHING, Class A | | | | \$135.00 | = | \$63,720 | | |
| 575 | | | | | | | | | | | | |
| 576 | 70800 | LIN. FT. | 100.00% | LONGITUDINAL SHOULDER JOINT ROUTING & SEALING | | | | \$0.80 | = | \$56,640 | | |
| 577 | | | | | | | | | | | | |
| 578 | 35400 | LIN. FT. | 100.00% | CENTERLINE JOINT ROUTING & SEALING | | | | \$0.95 | = | \$33,630 | | |
| 579 | | | | | | | | | | | | |
| 580 | | | | | | | | | | TOTAL COST OF REHABILITATION ACTIVITY 3 | \$153,990 | |
| 581 | REHABILITATION ACTIVITY 4 - YEAR 25 | | | | | | | | | | | |
| 582 | | | | | | | | | | | | |
| 583 | 708 | SQ. YD. | 0.75% | FULL-DEPTH PCC PAVEMENT PATCHING, Class A | | | | \$135.00 | = | \$95,580 | | |
| 584 | | | | | | | | | | | | |
| 585 | 275 | SQ. YD. | 0.50% | FULL-DEPTH PCC SHOULDER PATCHING, Class C | | | | \$125.00 | = | \$34,375 | | |
| 586 | | | | | | | | | | | | |
| 587 | | | | | | | | | | TOTAL COST OF REHABILITATION ACTIVITY 4 | \$129,955 | |
| 588 | REHABILITATION ACTIVITY 5 - YEAR 30 | | | | | | | | | | | |
| 589 | | | | | | | | | | | | |
| 590 | 2832 | SQ. YD. | 3.00% | FULL-DEPTH PCC PAVEMENT PATCHING, Class A | | | | \$135.00 | = | \$382,320 | | |
| 591 | | | | | | | | | | | | |
| 592 | 551 | SQ. YD. | 1.00% | FULL-DEPTH PCC SHOULDER PATCHING, Class C | | | | \$125.00 | = | \$68,875 | | |
| 593 | | | | | | | | | | | | |
| 594 | 0 | TON | 100.00% | POLICY HMA OVERLAY OF PAVEMENT (See 53-4.04 for required thickness) | | | | \$88.40 | = | \$0 | | |
| 595 | | | | | | | | | | | | |
| 596 | | | | | | | | | | | | |
| 597 | 0 | TON | 100.00% | POLICY HMA OVERLAY OF SHOULDER (See 53-4.04 for required thickness) | | | | \$81.90 | = | \$0 | | |
| 598 | | | | | | | | | | | | |
| 599 | | | | | | | | | | | | |
| 600 | | | | | | | | | | TOTAL COST OF REHABILITATION ACTIVITY 5 | \$451,195 | |
| 601 | REHABILITATION ACTIVITY 6 - YEAR 35 | | | | | | | | | | | |
| 602 | | | | | | | | | | | | |
| 603 | 70800 | LIN. FT. | 100.00% | LONGITUDINAL SHOULDER JOINT ROUTING & SEALING | | | | \$0.80 | = | \$56,640 | | |
| 604 | | | | | | | | | | | | |
| 605 | 35400 | LIN. FT. | 100.00% | CENTERLINE JOINT ROUT & SEAL | | | | \$0.95 | = | \$33,630 | | |
| 606 | | | | | | | | | | | | |
| 607 | 35400 | LIN. FT. | 50.00% | Random Crack Routing & Sealing (See Note Above) | | | | \$1.25 | = | \$44,250 | | |
| 608 | | | | | | | | | | | | |
| 609 | 94 | SQ. YD. | 0.10% | PARTIAL-DEPTH PAVEMENT PATCHING (Mill & Fill Surface, See Activity 5 thickness above) | | | | \$42.00 | = | \$3,948 | | |
| 610 | | | | | | | | | | | | |
| 611 | | | | | | | | | | | | |
| 612 | | | | | | | | | | TOTAL COST OF REHABILITATION ACTIVITY 6 | \$138,468 | |
| 613 | REHABILITATION ACTIVITY 7 - YEAR 40 | | | | | | | | | | | |
| 614 | | | | | | | | | | | | |
| 615 | 472 | SQ. YD. | 0.50% | FULL-DEPTH PCC PAVEMENT PATCHING, Class A | | | | \$135.00 | = | \$63,720 | | |
| 616 | | | | | | | | | | | | |
| 617 | 70800 | LIN. FT. | 100.00% | LONGITUDINAL SHOULDER JOINT ROUTING & SEALING | | | | \$0.80 | = | \$56,640 | | |
| 618 | | | | | | | | | | | | |
| 619 | 35400 | LIN. FT. | 100.00% | CENTERLINE JOINT ROUT & SEAL | | | | \$0.95 | = | \$33,630 | | |
| 620 | | | | | | | | | | | | |
| 621 | 35400 | LIN. FT. | 50% | Random Crack Routing & Sealing (See Note) | | | | \$1.25 | = | \$44,250 | | |
| 622 | | | | | | | | | | | | |
| 623 | 472 | SQ. YD. | 0.50% | PARTIAL-DEPTH PAVEMENT PATCHING (Mill & Fill Surface, See Activity 5 thickness above) | | | | \$42.00 | = | \$19,824 | | |
| 624 | | | | | | | | | | | | |
| 625 | | | | | | | | | | TOTAL COST OF REHABILITATION ACTIVITY 7 | \$218,064 | |
| 626 | ANNUAL COST DETERMINATION | | | | | | | | | | | |
| 627 | | | | | | | | | | | | |
| 628 | PRESENT WORTH CALCULATIONS | | | | | | | | | | | |
| 629 | | | | | | | | | | | | |
| 630 | | | | | | | | | | TOTAL COST OF ORIGINAL PAVEMENT CONSTRUCTION | \$8,629,645 | |
| 631 | | | | | | | | | | | | |
| 632 | | | | | | | | \$12,690 | X | 0.7441 | = | \$9,443 |
| 633 | | | | | | | | | | | | |
| 634 | | | | | | | | \$25,515 | X | 0.6419 | = | \$16,378 |
| 635 | | | | | | | | | | | | |
| 636 | | | | | | | | \$153,990 | X | 0.5537 | = | \$85,264 |
| 637 | | | | | | | | | | | | |
| 638 | | | | | | | | \$129,955 | X | 0.4776 | = | \$62,067 |
| 639 | | | | | | | | | | | | |
| 640 | | | | | | | | \$451,195 | X | 0.4120 | = | \$185,892 |
| 641 | | | | | | | | | | | | |

| | C | D | E | F | G | H | I | J | K | L | M |
|-----|-------------------------------------------------------------------------------------------------------------|-------------------------------------|------------|----------------------------------------------|-----------|-----------|---|-----------|---|----------|-----------|
| 10 | LIMITS OF ANALYSIS | | | | | | | | | | |
| 11 | STATION | 839 + 00 | TO STATION | | 1016 + 00 | | | OMISSIONS | | 0 | |
| 12 | NET LENGTH | 17700 FEET | | 3.352 | MILES | | | | | | |
| 13 | | | | | | | | | | | |
| 642 | | REHABILITATION ACTIVITY 6 - YEAR 35 | | | | \$138,468 | X | 0.3554 | = | \$49,212 | |
| 643 | | | | | | | | | | | |
| 644 | | REHABILITATION ACTIVITY 7 - YEAR 40 | | | | \$218,064 | X | 0.3066 | = | \$66,858 | |
| 645 | | | | | | | | | | | |
| 646 | TOTAL REHABILITATION COST (PRESENT WORTH) | | | | | | | | | = | \$475,114 |
| 647 | | | | | | | | | | | |
| 648 | ANNUAL COST PER MILE CALCULATION - | | | | | | | | | | |
| 649 | CONTINUOUSLY REINFORCED CONCRETE & UNBONDED CONTINUOUSLY REINFORCED CONCRETE OVERLAY | | | | | | | | | | |
| 650 | | | | | | | | | | | |
| 651 | Annual Cost per Mile ==> $A = D + M + CRF_n \times [C + R_1(PWF_n1) + R_2(PWF_n2) + \dots + R_n(PWF_nn)]$ | | | | | | | | | | |
| 652 | D = Admin & Overhead per mile; M = total annual maintenance cost per mile | | | | | | | | | | |
| 653 | C = Initial Construction Cost per mile = \$2,574,267 | | | | | | | | | | |
| 654 | D + M = \$505.00 Annually per Mile | | | | | | | | | | |
| 655 | CRF(n) => n= number of years, usually 45. | | | | | | | | | | |
| 656 | $CRF(45) = \{0.03(1+0.03)^{45}\} / \{(1+0.03)^{45} - 1\} = 0.040785176$ | | | | | | | | | | |
| 657 | | | | | | | | | | | |
| 658 | | | | | | | | | | | |
| 659 | Rehabilitation cost per mile and capital Recovery factor | | | | | | | | | | |
| 660 | R1(PWF10) = | \$9,443 | \$2,817 | | | | | | | | |
| 661 | R2(PWF15) = | \$16,378 | \$4,886 | A = --- = \$ 111,277.37 annual cost per mile | | | | | | | |
| 662 | R3(PWF20) = | \$85,264 | \$25,435 | | | | | | | | |
| 663 | R4(PWF25) = | \$62,067 | \$18,515 | | | | | | | | |
| 664 | R5(PWF30) = | \$185,892 | \$55,453 | | | | | | | | |
| 665 | R6(PWF35) = | \$49,212 | \$14,680 | | | | | | | | |
| 666 | R7(PWF40) = | \$66,858 | \$19,944 | ANNUAL COST PER MILE = \$111,277 | | | | | | | |
| 667 | TOTAL = \$141,729 | | | | | | | | | | |
| 668 | | | | | | | | | | | |