To: Anthony J. Quigley  
Attn: John Baczek
From: Jack A. Elston  
By: Michael Brand
Subject: Pavement Design Approval
Date: February 16, 2019

Route: IL 47  
Job No.: D-91-309-12
Section: 107N-4  
Contract No.: 60T21
County: Kane  
Target Letting: 01-2019
Limits: at Main Street

We have reviewed the pavement design for the above referenced project which was submitted on December 3, 2018, with supplemental information provided on January 15, 2019. The scope of the project is to reconstruct IL 47 and Main Street to accommodate additional channelization and raise the profile of the intersection approximately 5 feet to improve sight distance.

We concur with the District’s determination this is a “special design” as the intersection is “high-stress”, and as such, a life cycle cost analysis is not required. We also concur with the District’s selection of full-depth HMA.

In summary, the approved pavement designs are as follows:

IL 47
12.25” Full-Depth HMA Pavement with HMA Shoulders (some PCC C&G)
12” Aggregate Subgrade Improvement

Main Street
11.25” Full-Depth HMA Pavement with HMA Shoulders (some PCC C&G)
12” Aggregate Subgrade Improvement

If you have any questions, please contact Mike Brand at (217) 782-7651.
To: Jack Elston                                         Attn: Michael Brand
From: Jose A. Dominguez                                By: Ojas Patel
Subject: Pavement Analysis

Date: December 3, 2018

"Route: Illinois Route 47
Limits: at Main Street
Section: 107N-4
Current target: 01CY19

County: Kane
Contract No.: 60T21
Job No.: D-91-309-12

We have completed the pavement analysis for the above captioned location. Review by the Central Office is required since the total pavement area for reconstruction exceeds 4,750 Square Yards. The following is the scope of the project:

Reconstruction of IL 47 and Main Street to accommodate additional channelization and raise the profile of the intersection.

A 20-year pavement analysis was performed for the above roadway segments. This intersection is a "High Stress" location since the design lane MU ADT exceeds 200 vehicles and the approach grade of the south leg of IL 47 exceeds 3.5%. As such, this pavement design will be classified as a "Special Design" per BDE Figure 54-1A. A mechanistic-flexible pavement design is recommended for ease of construction due to the complexity of construction staging as the profile is being raised by over 5 feet. In addition, Stone Matrix Asphalt is recommended for this high stress location. The recommended pavement is:

**IL 47**
HMA Shoulder/Portions PCC Curb and Gutter
12 ¼" Full Depth HMA¹, ⁴
  2" Polymerized HMA Surface Course, SMA, 9.5, N80
  2 ⅛" Polymerized HMA Binder Course, IL-19.0, N90
  8" HMA Base Course, IL-19.0, N90
12" Aggregate Subgrade Improvement³

**Main Street⁵**
HMA Shoulder/Portions PCC Curb and Gutter
11 ¾" Full Depth HMA², ⁴
  2" Polymerized HMA Surface Course, SMA, 9.5, N80
  2 ⅛" Polymerized HMA Binder Course, IL-19.0, N90
  7" HMA Base Course, IL-19.0, N90
12" Aggregate Subgrade Improvement³
1 Designer Note 1: Use pay item 40701926, HOT-MIX ASPHALT PAVEMENT (FULL-DEPTH), 12 ¾” paid for in square yards.

2 Designer Note 2: Use pay item 40701906, HOT-MIX ASPHALT PAVEMENT (FULL-DEPTH), 11 ¾” paid for in square yards.

3 Designer Note 3: Use pay item 30300112, AGGREGATE SUBGRADE IMPROVEMENT, 12", paid in square yards.

4 Designer Note 4: Refer to the District One, Bureau of Materials’ “Hot-Mix Asphalt – Mix Selection” tables to determine the corresponding HMA mix table requirements for the plans.

5 Designer Note 5: Main Street is subject to local jurisdictional approval and concurrence.

If you have any questions or need additional information, please contact Ojas Patel, Pavement Design Engineer, at (847)705-4550.

By: Jose A. Dominguez, P.E.
Project Support Engineer
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

PROPOSED
HIGHWAY PLANS

FAP ROUTE 326 (IL 47)
SECTION 107N-4
AT MAIN STREET (C.H. 10)
PROJECT NO.: EKJD(697)
INTERSECTION IMPROVEMENT, TRAFFIC
SIGNAL INSTALLATION, BRIDGE REPLACEMENT
KANE COUNTY

C-91-309-12

PROJECT BEGINS
STATION 320 +00 MARK STREET

PROJECT ENDS
STATION 320 +90 MARK STREET

STATEMENT
STATION 350 +50 REMOVAL AND REPLACE
CULVERT. NO. 004-2918 (PROP.)

STATION 350 +70 REMOVAL AND REPLACE
SINGLE SPAN SUSPENSION
STRUCT NO. 245-3394 (PROP.)
450-3816 (EXTN.)

STATION LOCATION:
STATION 310 +90 MARK ST.

LOCALITY:
BLACKBERRY TOWNSHIP

LOCATION MAP TO SCALE
1" = 5000'

GROSS LENGTH = 3300 FT = 0.64 MILE
NET LENGTH = 3100 FT = 0.64 MILE

PROJECT MANAGER: SERIN KELLER (847) 705-4555

CONTRACT NO. 60T21
**EXISTING TYPICAL SECTION**

**IL 47**

STA. 492+30 TO STA. 493+95

**LEGEND**

1. HOT-MIX ASPHALT CONCRETE SURFACE & BINDER COURSE
2. HOT-MIX ASPHALT CONCRETE BASE COURSE
3. PCP PAVEMENT
4. GRANULAR SUBBASE
5. HMA SHOULDERS
6. AGGREGATE SHOULDER
7. AGGREGATE SHOULDER, TYPE B
8. SCAPE / DITCH
9. BELIZ CURB & GUTTER
10. SML24 CURB & GUTTER
11. HMA SURFACE COURSE REMOVAL, 2 1/4"

**IL 47**

**EXISTING TYPICAL SECTION**

STA. 493+95 TO STA. 500+00

* HMA SURFACE COURSE REMOVAL FROM STA. 492+30.00 TO STA. 493+30.00
* HMA SURFACE COURSE REMOVAL FROM STA. 500+00.00 TO STA. 508+00.00

STATE OF ILLINOIS

DEPARTMENT OF TRANSPORTATION

4MILHOUSE

DEPARTMENT OF TRANSPORTATION

IL BTL 47

TYPICAL SECTIONS

SCALE 1/4" = 1'-0"

SHEET NO. 1 OF 16 SHEETS 1 STS.

IL061700

ILLINOIS 82-83
**IL 47**

**PROPOSED TYPICAL SECTION**

STA. 493+30.00 TO STA. 493+35.25

- **EXISTING HOT-MIX ASPHALT CONCRETE SURFACE & BINDER COURSE**
- **EXISTING HOT-MIX ASPHALT CONCRETE BASE COURSE**
- **EXISTING PCC PAVEMENT**
- **EXISTING GRAVELLY SUBBASE**
- **EXISTING HMA SHOULDER**
- **EXISTING AGGREGATE SHOULDER**
- **PROPOSED AGGREGATE SHOULDER, TYPE B**
- **PROPOSED GRAVEL / DITCH**
- **PROPOSED 6/12 CURB & GUTTER**
- **PROPOSED 6/12 CURB & GUTTER**
- **PROPOSED POLYMERIZED HMA SURFACE COURSE, SHA, R-5, 40%, 2''**
- **PROPOSED POLYMERIZED HMA BINDER COURSE, IL-190, 40%, 2 1/4''**
- **PROPOSED POLYMERIZED HMA BINDER COURSE, IL-190, 40%, 2 1/4''**
- **PROPOSED AGGREGATE SUBGRADE IMPROVEMENT 12''**
- **PROPOSED HMA SHOULDER 8''**
- **PROPOSED HOT-MIX ASPHALT SURFACE COURSE, MX-5, 40%, 1 1/2''**
- **PROPOSED LEVELING BINDER MACHINE METHOD, MX-5, 3/4''**
- **NOT USED**
- **PROPOSED 4" REINFORCED SLAB**
- **PROPOSED RETAINING WALL**
- **PROPOSED STEEL RAILING, SM**
- **PROPOSED PIPE UNDERGRAIN TYPE 2, 4''**

**IL 47**

**PROPOSED TYPICAL SECTION**

STA. 493+30.00 TO STA. 493+35.25

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

**RTE 47**

**TYPICAL SECTIONS**

**SECTION**

STA. 493+30.00 TO STA. 493+35.25

**COUNT**

- **SHA**
- **TRAFFIC**
- **HEAVY**
- **LOAD**

**CONTRACT NO. 60**
IL 47
PROPOSED BRIDGE TYPICAL SECTION
STA. 502+07.88 TO STA. 502+80.06

IL 47
PROPOSED TYPICAL SECTION
STA. 503+07.34 TO 507+00.00

LEGEND
1. EXISTING HOT-MIX ASPHALT CONCRETE SURFACE & BINDER COURSE
2. EXISTING HOT-MIX ASPHALT CONCRETE BASE COURSE
3. EXISTING PCC PAVEMENT
4. EXISTING GRANULAR SUBBASE
5. EXISTING HMA SHOULDER
6. PROPOSED AGGREGATE SHOULDER
7. PROPOSED AGGREGATE SHOULDER, TYPE B
8. PROPOSED SNAKE / DITCH
9. PROPOSED 6X12 CURB & GUTTER
10. PROPOSED 6X12 CURB & GUTTER 24"
11. PROPOSED POLYMERIZED HMA SURFACE COURSE, SMA, 9.5, HMA, 2"
12. PROPOSED POLYMERIZED HMA BINDER COURSE, IL: 18.0, HMA, 2⅛" C-400
13. PROPOSED SMA BASE COURSE, IL-18.0, HMA, 7"
14. PROPOSED POLYMERIZED HMA BASE COURSE, MIX 0.5 NTO, 1 1/2"
15. PROPOSED LEVELING BINDER MIXTURE METHOD, NTO, 3/4"
16. PROPOSED HMA SHOULDERS 8"
17. PROPOSED POLYMERIZED HMA SURFACE COURSE, MIX 0.5 NTO, 1 1/2"
18. PROPOSED STEEL RAILING, SMA
19. PROPOSED PIPE UNDERDRAINS TYPE 2, 4"

* WHEN THE SUPER ELEVATION RATE OF THE PAVEMENT IS BETWEEN 3% AND 4%, THE SHOULDER SHALL BE SLOPED AT 4%. WHEN THE SUPER ELEVATION RATE OF THE PAVEMENT EXCEEDS 4%, THE SHOULDER SHALL BE SLOPED SO THAT THE ALGEBRAIC DIFFERENCE BETWEEN THE PAVEMENT AND SHOULDER MILL NOT BE GREATER THAN 8%.
IL 47
PROPOSED TYPICAL SECTION
STA. 507+00.00 TO 508+00.00

LEGEND
1. EXISTING HOT-MIX ASPHALT CONCRETE SURFACE & BINDER COURSE
2. EXISTING HOT-MIX ASPHALT CONCRETE BASE COURSE
3. EXISTING PCC PAVEMENT
4. EXISTING GRANULAR SUBBASE
5. EXISTING NHA SHOULDER
6. EXISTING AGGREGATE SHOULDER
7. PROPOSED AGGREGATE SHOULDER, TYPE B
8. PROPOSED SWALE / DITCH
9. PROPOSED 8.12 CURB & GUTTER
10. PROPOSED 6X2 CURB & GUTTER
11. PROPOSED POLYMERIZED NHA SURFACE COURSE, SMA, 5.5, MDO, 2.0
12. PROPOSED POLYMERIZED NHA BINDER COURSE, IL-19.0, MDO, 2.1/4"
13. PROPOSED NHA BASE COURSE, IL-19.0, MDO, 7.0
14. PROPOSED AGGREGATE SUBGRADE IMPROVEMENT 12"
15. PROPOSED NHA SHOULDERS 8"
16. PROPOSED HOT-MIX ASPHALT SURFACE COURSE, NEX "D", NTO, 1.1/2"
17. PROPOSED LEVELING BINDER MACHINE METHODS, NTO, 3/4"
18. NOT USED
19. PROPOSED MOMENT SLAB
20. PROPOSED RETAINING WALL
21. PROPOSED STEEL RAILING, SMA
22. PROPOSED PIPE UNDERDRAINS TYPE 2, 4"

* WHEN THE SUPERELEVATION RATE OF THE PAVEMENT IS BETWEEN 0.0% AND 47.0%, THE SHOULDER SHALL BE SLOPED AT 47%. WHEN THE SUPERELEVATION RATE OF THE PAVEMENT EXCEEDS 47%, THE SHOULDER SHALL BE SLOPED SO THAT THE ALGEBRAIC DIFFERENCE BETWEEN THE PAVEMENT AND SHOULDER WILL NOT BE GREATER THAN 8%. MATCH EXISTING S.E. AT STA. 508+00.00
MAIN STREET
EXISTING TYPICAL SECTION
STA. 187+91.39 TO 200+33

LEGEND
1. ALTY MIX ASPHALT CONCRETE SURFACE & Binder Course
2. HY-Mix ASPHALT CONCRETE BASE Course
3. FPC Pavement
4. GRANULAR SUBBASE
5. HMA Shoulder
6. AGRICATE SHOULDER
7. AGRICATE SHOULDER TYPE B
8. DRAINAGE DITCH
9. 8" R.C. CURB & GUTTER
10. 6" R.C. CURB & GUTTER
11. HMA Surface Course Removal 2.25'

MAIN STREET
EXISTING TYPICAL SECTION
STA. 207+51 TO 213+28

HMA Surface Course Removal From
STA. 193+00 TO STA. 193+10.00
HMA Surface Course Removal From
STA. 209+00.00 TO STA. 210+00.00
**PROJECT AND TRAFFIC INPUTS**

*Enter Data in Gray Shaded Cells*

---

**Route:** IL 47

**Comments:** IL 47 @ Main Street

**Section:** 107N-4

**County:** Kane

**Location:** at Main Street

**Facility Type:** Other Marked State Route

<table>
<thead>
<tr>
<th># of Lanes</th>
<th>Part of future 4 lanes or more?</th>
<th>One Way Street?</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 or 3</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

**Road Class:** II

**Subgrade Support Rating (SSR):** Poor

**Construction Year:** 2019

**Design Period (DP):** 20 years

---

**TRAFFIC FACTOR CALCULATION**

<table>
<thead>
<tr>
<th>Flexible Pavement</th>
<th>Rigid Pavement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cpv = 0.15</td>
<td>Cpv = 0.15</td>
</tr>
<tr>
<td>Csu = 112.06</td>
<td>Csu = 135.78</td>
</tr>
<tr>
<td>Cmu = 385.44</td>
<td>Cmu = 567.21</td>
</tr>
</tbody>
</table>

**Flexible (Actual):** TF = 8.59

**Flexible (Min):** TF = 3.17

**Rigid (Actual):** TF = 12.07

**Rigid (Min):** TF = 4.59

---

**NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS**

**Full-Depth HMA Pavement**

- Use TF flexible = 8.59
- PG Grade Lower Binder Lifts = PG 64-22
- HMA Mixture Temp. = 76.5 deg. F
- Design HMA Mixture Modulus (E(hma)) = 650 ksi
- Design HMA Strain (fhma) = 65
- Full Depth HMA Design Thickness = 12.25 in.
- Limiting Strain Criterion Thickness = 14.75 in.

**JPC Pavement**

- Use TF rigid = 12.07
- Edge Support = Tied Shoulder or C&G.

**CRC Pavement**

- Use TF rigid = 12.07
- IBR value = 3

**Unbonded Concrete Overlay**

- Use HMA Overlay Design Thickness = 9.50 in.
- Limiting Strain Criterion Thickness = 999.00 inches

**CRCP Thickness = 9.00 in.**

**TC MUST BE > 60 FOR CRCP**

---

**RECONSTRUCTION ONLY (SUPPLEMENTAL) PAVEMENT DESIGN CALCULATIONS**

**HMA Overlay of Rubblized PCC**

- Use TF flexible = 8.59
- HMA Overlay Design Thickness = 9.50 in.

**Unbonded Concrete Overlay**

- Use TF rigid = 12.07
- Review 54-4.03 for limitations and special considerations.

---

**DESIGN TABLES FROM BDE MANUAL CHAPTER 54 - PAVEMENT DESIGN**

**ONE WAY STREETS (ADT < 750)**

<table>
<thead>
<tr>
<th>Class</th>
<th>One Way Traffic (Fig 54-2.C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV</td>
<td>SU</td>
</tr>
<tr>
<td>0</td>
<td>500</td>
</tr>
<tr>
<td>1000</td>
<td>1500</td>
</tr>
</tbody>
</table>

**2 LANE ROADS (ADT 750 - 2000)**

<table>
<thead>
<tr>
<th>Class</th>
<th>One Way Traffic (Fig 54-2.C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Csu</td>
<td>Cmu</td>
</tr>
<tr>
<td>135.78</td>
<td>567.21</td>
</tr>
</tbody>
</table>

**2 LANE ROADS (ADT > 2000)**

<table>
<thead>
<tr>
<th>Class</th>
<th>One Way Traffic (Fig 54-2.C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Csu</td>
<td>Cmu</td>
</tr>
<tr>
<td>129.58</td>
<td>562.47</td>
</tr>
</tbody>
</table>

---

**TC MUST BE > 60 FOR CRCP**

**CONTACT BMPR FOR ASSISTANCE**

---

**Design Lane Distribution Factors For Structural Design Traffic (Fig. 54-2.B)**

<table>
<thead>
<tr>
<th>Number of Lanes</th>
<th>Rural</th>
<th>Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Lane Ramp</td>
<td>P 100%</td>
<td>S 100%</td>
</tr>
<tr>
<td>2 or 3</td>
<td>S 50%</td>
<td>M 50%</td>
</tr>
<tr>
<td>4</td>
<td>M 20%</td>
<td>S 40%</td>
</tr>
<tr>
<td>6 or more</td>
<td>M 20%</td>
<td>S 40%</td>
</tr>
</tbody>
</table>
### PROJECT AND TRAFFIC INPUTS

#### IDOT MECHANISTIC PAVEMENT DESIGN

**Route:** Main Street  
**Section:** 107N-4  
**County:** Kane  
**Location:** at IL 47

**Comments:** IL 47 @ Main Street  
**Design Date:** 10/30/2018  
**ONP** <- BY  
**Modify Date:** <- BY  
**ADT**  
**Year**

- **Current:** 3,100  
- **Future:** 7,000

**IDOT MECHANISTIC PAVEMENT DESIGN**

**Printed:** 03/05/2019

---

**PROJECT AND TRAFFIC INPUTS**

**Enter Data in Gray Shaded Cells**

### Route and Traffic Inputs

- **Route:** Main Street  
- **Comments:** IL 47 @ Main Street  
- **Section:** 107N-4  
- **County:** Kane  
- **Location:** at IL 47

**Design Date:** 10/30/2018  
**ONP** <- BY  
**Modify Date:** <- BY  
**ADT**  
**Year**

- **Current:** 3,100  
- **Future:** 7,000

---

**FACILITY TYPE**

- **Unmarked State Route**

- **# of Lanes =** 2 or 3

- **Part of future 4 lanes or more?** No

- **One Way Street?** No

---

**ROAD CLASS**

- **Urban PV =** No

- **Subgrade Support Rating (SSR):** Poor

- **Construction Year:** 2019

- **Design Period (DP) =** 20 years

---

**TRAFFIC FACTOR CALCULATION**

<table>
<thead>
<tr>
<th>Flexible Pavement</th>
<th>Rigid Pavement</th>
</tr>
</thead>
<tbody>
<tr>
<td>$C_{pv}$ = 0.15</td>
<td>$C_{pv}$ = 0.15</td>
</tr>
<tr>
<td>$C_{su}$ = 112.06</td>
<td>$C_{su}$ = 135.78</td>
</tr>
<tr>
<td>$C_{mu}$ = 385.44</td>
<td>$C_{mu}$ = 567.21</td>
</tr>
<tr>
<td>$TF_{flexible}$ (Actual) = 5.09</td>
<td>$TF_{rigid}$ (Actual) = 7.31</td>
</tr>
</tbody>
</table>

### NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS

**Full-Depth HMA Pavement**

- Use $TF_{flexible}$ = 5.09

**JPC Pavement**

**Rigid Pavement**

- Use $TF_{rigid}$ = 7.31

**Flexible Pavement (Fig. 54-5.B)**

**Rigid Pavement (Fig. 54-4.C)**

### RECONSTRUCTION ONLY (SUPPLEMENTAL) PAVEMENT DESIGN CALCULATIONS

**HMA Overlay of Rubblized PCC**

| Use $TF_{flexible}$ | **5.09** |

**Unbonded Concrete Overlay**

**Rigid Pavement (Fig. 54-4.E)**

**Flexible Pavement (Fig. 54-5.B)**

**Rigid Pavement (Fig. 54-4.C)**

### DESIGN TABLES FROM BDE MANUAL CHAPTER 54 - PAVEMENT DESIGN

#### Traffic Factor ESAL Coefficients

<table>
<thead>
<tr>
<th>Class</th>
<th>$C_{su}$</th>
<th>$C_{mu}$</th>
<th>$C_{su}$</th>
<th>$C_{mu}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>143.81</td>
<td>598.42</td>
<td>132.50</td>
<td>482.53</td>
</tr>
<tr>
<td>II</td>
<td>135.78</td>
<td>567.21</td>
<td>112.06</td>
<td>385.44</td>
</tr>
<tr>
<td>III</td>
<td>129.58</td>
<td>562.47</td>
<td>109.14</td>
<td>384.35</td>
</tr>
<tr>
<td>IV</td>
<td>129.58</td>
<td>562.47</td>
<td>109.14</td>
<td>384.35</td>
</tr>
</tbody>
</table>

#### Design Lane Distribution Factors For Structural Design Traffic (Fig. 54-2.B)

<table>
<thead>
<tr>
<th>Number of Lanes</th>
<th>Rural</th>
<th>Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Lane Ramp</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>2 or 3</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>4</td>
<td>32%</td>
<td>45%</td>
</tr>
<tr>
<td>6 or more</td>
<td>20%</td>
<td>40%</td>
</tr>
</tbody>
</table>

### CONTACT BMPR FOR ASSISTANCE