

# **Interstate and Primary PCC Pavement Overlays Review**

**Final Report  
for  
MLR-23-01**

December 2023  
Construction & Materials Bureau



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for  
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By

Todd D. Hanson, PE  
Concrete Materials Engineer  
[todd.hanson@iowadot.us](mailto:todd.hanson@iowadot.us)

Construction & Materials Bureau  
Iowa Department of Transportation  
Ames, Iowa 50010

December 2023

## TECHNICAL REPORT DOCUMENTATION PAGE

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|---|---|---|------------------|
| <b>1. Report No.</b><br>MLR-23-01   | <b>2. Government Accession No.</b>                          | <b>3. Recipient's Catalog No.</b>                         |                  |
| <b>4. Title and Subtitle</b><br>Interstate and Primary PCC Pavement Overlays Review   |   | <b>5. Report Date:</b> December 2023                      |                  |
|   |   | <b>6. Performing Organization Code</b>                    |                  |
| <b>7. Author(s)</b><br>Todd Hanson, Concrete Materials Engineer, <a href="https://orcid.org/0000-0002-4832-1124">https://orcid.org/0000-0002-4832-1124</a>  |   | <b>8. Performing Organization Report No.</b><br>MLR-23-01 |                  |
| <b>9. Performing Organization Name and Address</b><br>Iowa Department of Transportation<br>Construction & Materials Bureau<br>800 Lincoln Way<br>Ames, Iowa 50010   |   | <b>10. Work Unit No.</b>                                  |                  |
|   |   | <b>11. Contract or Grant No.</b>                          |                  |
| <b>12. Sponsoring Agency Name and Address</b><br>Iowa Department of Transportation<br>800 Lincoln Way<br>Ames, IA 50010   |   | <b>13. Type of Report and Period Covered</b>              |                  |
|   |   | <b>14. Sponsoring Agency Code</b>                         |                  |
| <b>15. Supplementary Notes</b>  |   |   |                  |
| <b>16. Abstract</b><br>Iowa has a long history of PCC pavement overlays. Several research projects were placed over the years, which led to a variety of different designs and features. The objective of this study was to perform a review of concrete overlays performance on the interstate and primary system and determine any best practices or lessons learned. |   |   |                  |
| <b>17. Key Words</b><br>PCC overlay, whitetopping, unbonded overlay, bonded overlay   |   | <b>18. Distribution Statement</b><br>No restrictions.     |                  |
| <b>19. Security Classif. (of this report)</b><br>Unclassified   | <b>20. Security Classif. (of this page)</b><br>Unclassified | <b>21. No. of Pages</b><br>220                            | <b>22. Price</b> |

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### **DISCLAIMER**

The contents of this report reflect the views of the author(s) and do not necessarily reflect the official views or policies of the Iowa Department of Transportation. This report does not constitute a standard, specification, or regulation.

## Introduction

Iowa has a long history of PCC pavement overlays. As early as 1932, there were various PCC resurfacing projects, as it was called at the time, over brick and PCC pavement. Most of these designs included welded wire fabric on top of the existing pavement. Unfortunately, there are not any records indicating the performance of any of the projects.

Several research projects were placed over the years. The first whitetopping project was placed on the Storm Lake airport in 1971. This overlay is still in service with several areas of patched panels. In 1973, a research project<sup>1</sup> in Greene County kicked off the modern era of bonded and unbonded overlays. In 1994, thin bonded overlay research project with 65 test sections was placed on IA 21 in Iowa county. In 2002, an overlay and widening research project with over 100 test sections was placed on IA 13 in Delaware county.

## Objectives

A recent 2017 study<sup>2</sup> by the National Concrete Pavement Technology Center at Iowa State University mainly concentrated on PCC overlays on the secondary system. Using pavement management data, the research concluded that 89% of all overlays in Iowa are good to excellent. Another 2014 study<sup>3</sup> was conducted by the National Concrete Pavement Technology Center on performance of overlays in the United States. The objective of this study was to perform a review of concrete overlays performance on the interstate and primary system and determine any best practices or lessons learned. A map and project information can be found in Appendix A. Construction history and project reviews can be found in Appendix B.

## Concrete Overlay History

Iowa has a long history of PCC pavement overlays. As early as 1932, there were various PCC resurfacing projects, as it was called at the time, over brick and PCC pavement. Most of these designs included welded wire fabric on top of the existing pavement. Unfortunately, there are not any records indicating the performance of any of the projects. In 1949, a 6-inch PCC resurfacing project on US 30 in Benton County was one of the early projects to utilize widening with the overlay. Designs on these early PCC resurfacing projects may be found in Appendix C.



Figure 1 – Benton County US 30 Bonded Overlay 1949

## Concrete Overlay Designs

The Iowa DOT classifies concrete overlays in the following categories:

- Whitetopping – PCC over HMA Pavement
- Unbonded – PCC over Composite Pavement
- Bonded – PCC over PCC Pavement.

There have been multiple design features incorporated and changed over the years. A variety of joint spacing and thicknesses have also been utilized.

## Review of Iowa County IA 21 Research Project

In 1994, Dr. James Cable developed a research project<sup>4</sup> on IA 21 in Iowa County. This whitetopping research project included 65 different test sections with thicknesses of 2, 4, 6, and 8 inch and joint spacing of 2, 4, 6, 12, and 15 feet. Also, three different types of base preparations were used on the project, including patching and scarifying, patching only, and cold in place recycling. A few sections were placed with monofilament or fibrillated polypropylene microfibers. The test section layout may be found in Appendix D.

A two-year review in 1996 showed some distress in the 2-inch sections. Eventually, some of the 2-inch sections were patched and later overlaid with HMA in 2002, 2006, and 2009. However, a 2023 review showed that most of the 4-inch test sections and all of the 6-inch test sections were in good condition, regardless of joint spacing. Approximately, four miles of the 4-, 6-, and 8-inch PCC overlay sections are performing well, after 29 years of service.



Figure 2 – 6-inch Overlay 12 x 12 ft. Joint Spacing



Figure 3 – 8-inch overlay 12 x 15 ft. Joint Spacing

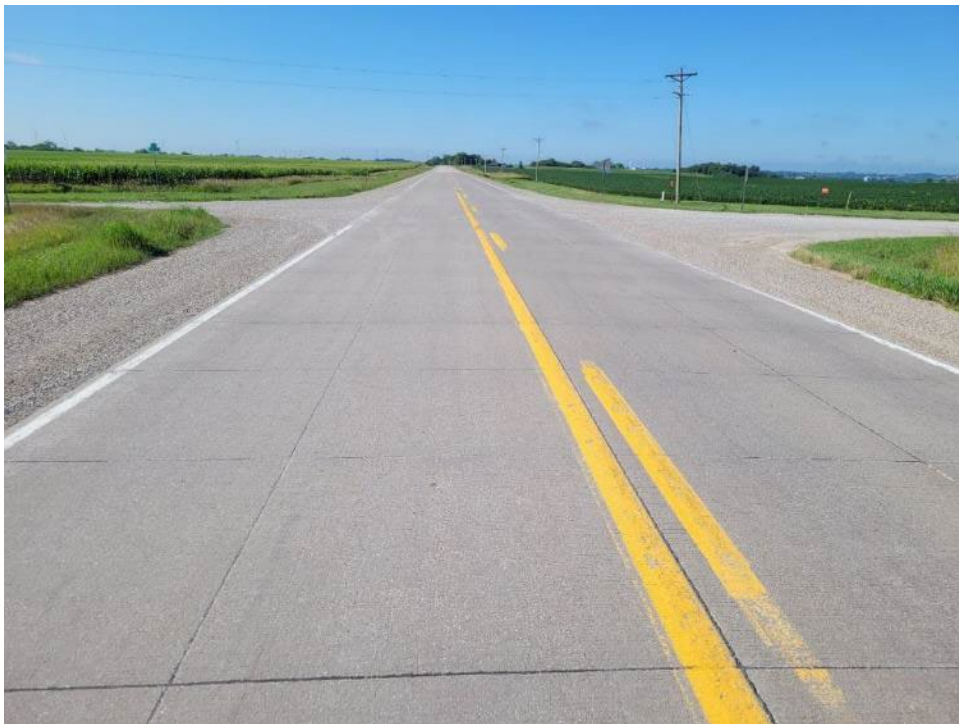


Figure 4 – 6-inch overlay 6 x 6 ft. Joint Spacing





Figure 5 – 4-inch overlay 4 x 4 ft. Joint Spacing



Figure 6 – 4-inch overlay 2 x 2 ft. Joint Spacing



Figure 7 – 4-inch Overlay 4 x 4 ft. Joint Spacing exhibiting some joint deterioration.

A possible reason why the test sections still are performing very well may be because the overlay was placed the same width as the existing pavement, without widening or tied shoulders. Another factor may be for the test sections, 4 inches or thicker test, all joints were sealed.

#### [Review of Delaware IA 13 Overlay Research Project](#)

In 2002, Dr. Cable developed another research project<sup>5</sup> on IA 13 in Delaware County. This project was a widening and unbonded overlay of a composite pavement. The old widening units were removed and a 6 foot by 8-inch-thick widening was added to each side. There were 191 test sections of 3.5-inch and 4.5-inch overlay, varying panel size, macro fibers, microfibers, tied shoulders, and untied shoulders.

The longitudinal joint former was used to form the joint between the widening units and overlay. There were issues with cracking within a short time period, due to lack of a formed joint. This coupled with the widening unit heaving caused issues on this overlay. In areas, the widening units are inversely sloped toward the outside wheel path making it difficult to remove snow.



Figure 8 – Delaware IA 13 Unbonded Overlay Construction



Figure 9 – Delaware IA 13 Widening Unit Heaving

## Review of Sac IA 175 Unbonded Overlay Experimental Project

Another experimental overlay was placed on IA 175 in Sac County in 2007. This project was a 4.5 inch unbonded overlay with 2 feet by 8-inch-thick widening on each side. The existing pavement had 2-foot HMA widening on each side in the 1980s. Engineering fabric was used over the HMA widening units and no visible cracking was observed in the pavement prior to the PCC overlay. No reinforcing steel was used to tie the widening units to the overlay.

Cracking occurred in the outside wheel paths in less than two years. It was assumed that the old HMA widening unit was heaving causing the cracking. However, it was later discovered that the outside widening unit was heaving that cause the cracking. This problem led to the use of the 60-inch reinforcing steel bar across the old widening and tied to the new widening.

The district sealed all the cracking and there has not been a lot of patching required. Even with all the cracking, the overlay still rides fairly well at the time of this report.



Figure 10 – Sac IA 175 UBOL Left Shoulder Crossslope 1.66%



Figure 11 – Sac IA 175 UBOL Left Shoulder Crossslope 1.13%



Figure 12 – Sac IA 175 UBOL Left Shoulder Crossslope 1.13%

## Review of Whitetopping Overlays

Review of the Iowa County IA 21 whitetopping overlay showed how well some of the test sections are performing after 29 years.

Another whitetopping project that has been in service for more than 40 years is the Adair County I-80 westbound overlay, in 1979. The design was to mill 8 inches of HMA and replace with 10 inches of PCC. Overall, the overlay is in good condition with a few patched areas. The pavement was diamond ground in 2020.



Figure 13 – Adair I-80 WB Whitetopping Overlay Paved 1979 (Picture 2023)

Review of other whitetopping overlays include Montgomery US 71 and Cass US 71 projects. Built in 2006 and 2007, respectively, both 8-inch overlays are in very good condition. The Montgomery County whitetopping has HMA shoulders and the Cass County whitetopping has tied PCC shoulders.

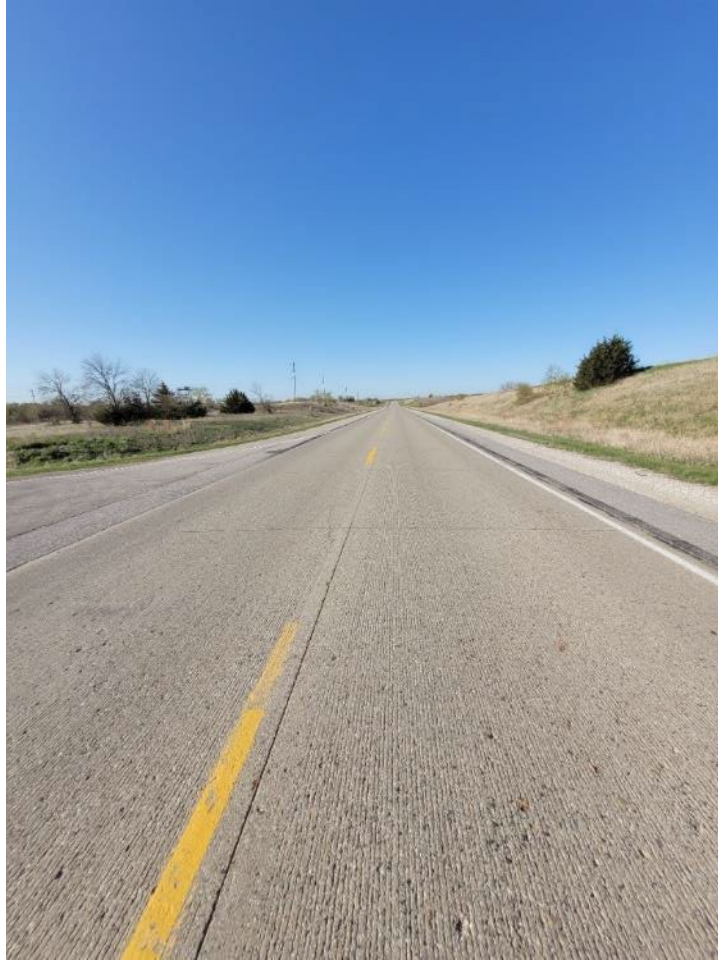


Figure 14 – Montgomery County US 71 Built 2006 (Picture 2023)



Figure 15 – Cass US 71 Built 2007 (Picture 2023)

One project to note that includes both whitetopping and unbonded overlay sections is on US 71 in the Clay/Dickinson counties. It is interesting to note that the whitetopping areas of the overlay are performing well, while areas of the unbonded overlay are experiencing longitudinal cracking and panel movement. The sections of whitetopping overlay used a 36-inch tie bar, while the sections of unbonded overlay have a 6-foot #5 reinforcing tie steel.





Figure 16 – Clay/Dickinson US 71 Whitetopping Overlay Built 2012 (Picture 2023)



Figure 17 – Clay/Dickinson US 71 Unbonded Overlay Built 2012 (Picture 2023)



Figure 18 – Clay US 71 Whitetopping Built 2015



Figure 19 – Clay US 71 Whitetopping Built 2016

### Review of Unbonded Overlays

Many of the unbonded overlays have been placed over old 1920s and 1930s pavements that were built 18 to 20 foot wide and were widened and resurfaced in the 1950s. After the early cracking found on the Sac IA 175 overlay, it was decided to staple a 60-inch reinforcing bar across the old widening unit into the new widening/shoulder. With the exception of the US 71 Clay unbonded overlays placed in 2015 and 2016, nearly all of the unbonded overlays exhibit some type of longitudinal cracking and/or panel movement in the interior slabs.

Many of the unbonded overlays placed between 2002 and 2014 were thin at 5 inches or less. Also, between 2004 and 2014, all joints were left after sawing without any joint filler material. This likely caused issues with joint infilling, which led to problems with panels moving.

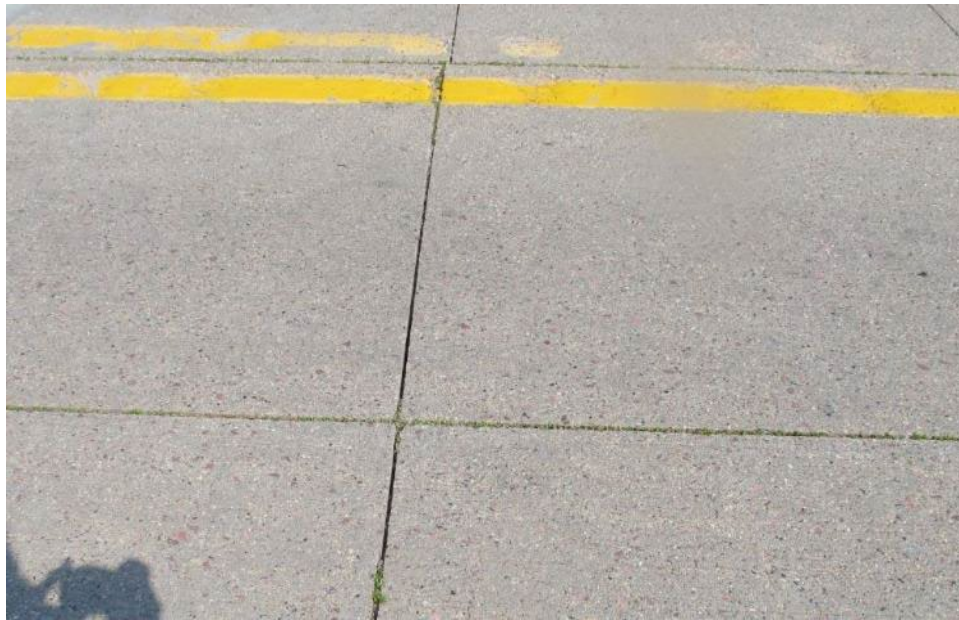


Figure 20 – Osceola IA 9 panel movement



Figure 21 – Grundy IA 14 Longitudinal Cracking and Shattered Panels

A thicker overlay did not seem to prevent the cracking with the longer reinforcing tie steel. On the Dallas US 169 unbonded overlay, this 7 inch unbonded overlay with 12 x 12-foot panels and tied shoulders with a 60-inch reinforcing bar exhibits quite a bit of longitudinal cracking. Most of the cracks have been sealed and there is very little patching. The cracking does not seem to affect the ride of the pavement, currently. The as constructed shoulder cross slope was 2 percent. Checking shoulder cross slope near the areas with longitudinal cracking indicated shoulder cross slope anywhere from 0.9% to 1.48%. Thus, the shoulders appear to heave, causing cracking off the end of the 60-inch reinforcing steel.



Figure 22 – Dallas US 169 UBOL Longitudinal Cracking



Figure 23 – Dallas US 169 UBOL Shoulder Cross Slope 1.40%

However, on the Clay US 71 overlays placed in 2015 and 2016, which include both whitetopping and unbonded overlays, both overlay types are in very good condition. As noted earlier, the unbonded overlay placed on Clay/Dickinson US 71 had a few areas of longitudinal cracking. The main difference between the 2012 overlay and the newer overlays was the joint spacing. The 2012 unbonded overlay has 6 x 6-foot panels, with a 6-foot #5 reinforcing steel over the old widening into the tied 4 x 6-foot shoulder. While the 2015 and 2016 overlays have 8 x 9-foot panels with a 6-foot #5 reinforcing steel across the old widening into the 8 x 7-foot shoulder. This design places the sawed joint directly over the old 18-foot original pavement edge.

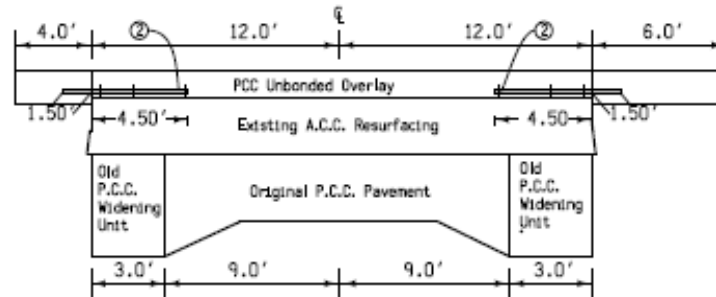
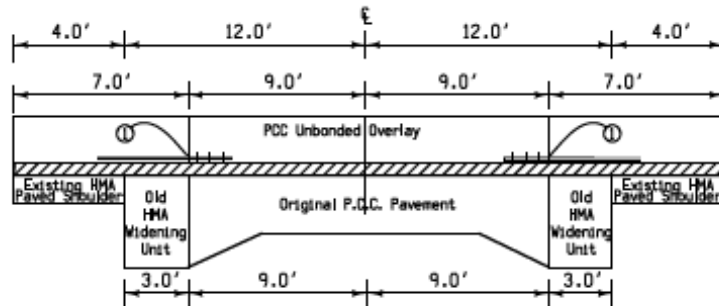


Figure 24 – Clay/Dickinson US 71 2012 UBOL typical



Notes:

Figure 25 – Clay US 71 2015-16 UBOL typical



Figure 26 – Clay US 71 2015 UBOL



Figure 27 – Clay US 71 2016 UBOL

The 9 inch unbonded overlays in Fremont and Mills counties placed in 2009 are both performing very good. There are no patches or longitudinal cracking noted during a review in 2023. Interesting to note, the driving lane was widened to 14 foot, or 2 foot over the existing shoulder. No cracking was noted, however, HMA shoulders were used, so there was no tie steel used between the shoulder and the overlay.



Figure 28 – Fremont County I-29 NB Unbonded Overlay (2023)





Figure 29 – Mills County I-29 NB Unbonded Overlay (2023)

### Review of Bonded Overlays

Many of the early bonded overlays were placed on existing pavements in poor condition. Thus, any issues in the underlying pavement reflected through the overlay in short time. Also, many of the early bonded overlay projects were fast track projects<sup>6</sup>, utilizing Type III cements and insulating blankets for rapid strength gain. However, the very high temperatures and rapid hydration of the Portland cement resulted in non-durable paste, leading to durability issues.

A bonding grout was required for bonded PCC overlays until the April 2003 specification revision. Issues with bonding grout drying out can cause debonding of the overlay. It was found that when the existing PCC surface is in surface saturated dry condition, bonding with the PCC overlay is more than adequate.

Another issue affecting performance of bonded PCC overlays is the alignment of sawed joints in overlay with those in the existing pavement. All joints must be aligned directly over the existing joints to prevent random cracking. All joints need to be sawn full depth of the overlay and transverse joints need to be sawed as wide as the existing joints.

Currently, there is only one bonded concrete overlay projects remaining on the interstate and primary system. Placed in 1994, the Franklin County IA 3 bonded overlay project is the last remaining bonded overlay on the primary system. This bonded overlay was also a fast-track project, however, it was placed in cooler conditions in the fall and likely the concrete temperatures were not as elevated. Thus, the pavement exhibited better performance than the fast-track overlays placed in the summer.



Figure 30 – Poweshiek I-80 Bonded Overlay 1984 with Grout on Existing Pavement



Figure 31- Franklin Co. IA 3 Bonded Overlay

The existing concrete pavement should be in fairly good condition prior to placement of a bonded PCC overlay. Otherwise, any defects in the existing pavement will be mirrored through the overlay, in a very short time period.

### Existing Pavement Prior to Overlay Design

For whitetopping and unbonded overlays, the condition of the HMA creates a critical component impacting the performance of the PCC overlay. The existing HMA layer may be oxidized with large number of thermal cracks. If the thermal cracks are unable to be removed by milling or filling, these thermal cracks can lock in the overlay, causing cracking in the PCC overlay.

On several projects, after milling was completed and haul trucks drove on the surface, the existing HMA layer deteriorated in areas. On the Woodbury I-29 unbonded overlay project, the HMA layer de-bonded from the PCC surface below during milling operations. HMA resurfacing was added as extra work to alleviate some of these issues. A non-woven geotextile interlayer has also been used to fix short areas of deterioration.



Figure 32 – HMA deterioration on US 71 Cass Whitetopping Project

The condition of existing PCC pavement, prior to a bonded PCC overlay, was discussed in the Review of Bonded Overlays section.

### Design Features of Overlays

During this review, several design features were noted that have impact on the performance of the overlay. One of the best features noted was using full depth pavement at the beginning (BOP) or end (EOP) of the project and transition between overlay types. Using full depth pavement at the BOP or EOP is especially important if the transition pavement is HMA. Using full depth pavement prevents the panels from migrating due to traffic.



Figure 33 – Clay/Dickinson US 71 NB panels migrating in driving lane at BOP against HMA pavement.

Using full depth pavement transition between overlay types also improves performance of the overlay. This is especially needed if there is a difference in joint spacing. For instance, an unbonded overlay with 6 x 6-foot panels butted to a whitetopping overlay with other joint spacing, such as 12 x 12 foot or 9 x 8 foot. The full depth panel prevents misaligned joints from extending into adjacent panels.

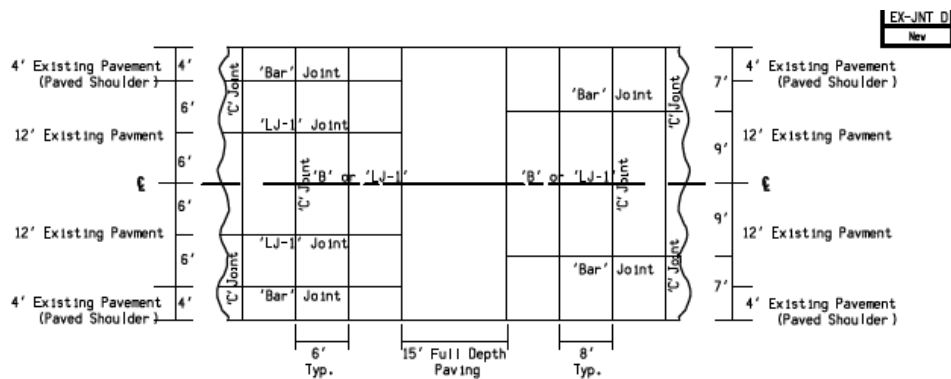


Figure 34 – Full depth transition between overlay types typical



Figure 35 – Full depth transition panel US 71 Clay County

A typical design feature of unbonded overlays where the existing pavement had been widened and widened again with the overlay that has caused performance issues is the use of 60-inch reinforcing steel stapled to the existing pavement over the widening unit, extending into the new widening. This seems to cause issues on nearly all of these unbonded overlays where it has been used.

On many of the projects that exhibit longitudinal cracking in the wheel path, it has been observed that the shoulder has heaved and is not at the cross slope as placed. Many times, the shoulder is approximately 1 percent lower cross slope than that as placed. Apparently, this tends to raise the outside panel resulting in a crack developing off the end of the tie steel in the wheel path.

Prior to 2011, a #4 reinforcing steel bar 60 inches long was placed over the existing widening and into the new widening unit. From 2011 to 2014 a #5 bar was used and a #4 from 2015 and later. It was noted that the #5 bar may be too rigid and standards were changed back to the #4 bar. Although, it does not appear that changing to a smaller diameter bar has helped eliminate longitudinal cracking. Most all are stapled to the existing pavement and panels throughout the middle are moving with direction of traffic.



Figure 36 – Typical tie steel on unbonded overlay with existing widening.



Figure 37 – Closeup of steel, stapled to existing pavement.



Figure 38 – Shoulder slope 3.3%, Paved 4%



Figure 39 – Typical cracking off end of steel in wheel path.

Observations indicate that the outside panels and shoulder appear to be locked in place with the steel stapled to the existing pavement. On several projects, the center panels are moving with traffic. On two lane pavements, there are areas where the panels are moving at each other and

becomes an area where the panels buckle. Note in Figure 38 that the panels have moved approximately 1 inch from the left and approximately 1 ½ inches from the right, resulting in the between joint to buckle.



Figure 40 – Interior panels moving towards each other and blowup.

### Future Overlay Design Details

Several alternate designs have been placed in the last few years that likely will address the issues found with the 60-inch reinforcing steel. One method used on the Marshall County IA 14 project was a 36-inch reinforcing steel was stapled across the existing widening unit. The overlay was placed full width and the shoulders were not tied.

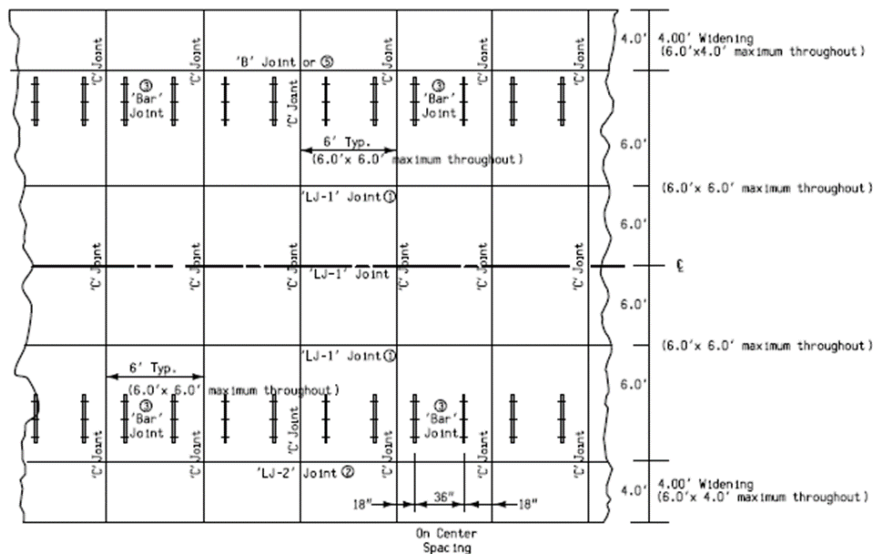


Figure 41 – Marshall County IA 14 Overlay Typical





Figure 42 – Marshall County IA 14 Overlay

The use of macro fibers has been tried successfully on a few county projects in Worth and Buchanan counties. Based on the success of those projects, test sections utilizing macro fibers and various joint spacing were placed on the Woodbury IA 31 whitetopping overlay in 2020.

| Begin Sta. | End Sta. | Length feet | PCC SY | PCC CY | Fiber lbs | Transverse Sawcut Spacing FT | Longitudinal Sawcut Spacing FT |
|------------|----------|-------------|--------|--------|-----------|------------------------------|--------------------------------|
| 43+76      | 50+00    | 624         | 2079.8 | 359.7  | 1438.7    | 6                            | 6                              |
| 142+00     | 152+00   | 1000        | 3333.0 | 576.4  | 2305.6    | 15                           | 12                             |
| 152+00     | 162+00   | 1000        | 3333.0 | 576.4  | 2305.6    | 12                           | 12                             |
| 162+00     | 172+00   | 1000        | 3333.0 | 576.4  | 2305.6    | 9                            | 12                             |
| 172+00     | 182+00   | 1000        | 3333.0 | 576.4  | 2305.6    | 9                            | 6                              |
| 182+00     | 192+00   | 1000        | 3333.0 | 576.4  | 2305.6    | 6                            | 6                              |
| 423+00     | 441+00   | 1800        | 5999.4 | 1037.5 | 4150.1    | 6                            | 6                              |

Figure 43 – Woodbury IA 31 Overlay 2020 Macro Fiber Test Sections

In 2022, the adjacent Cherokee IA 31 whitetopping project was placed with 4 lbs. macro fibers per cubic yard. The shoulders were tied with a #4 x 36” reinforcing steel bar at 30-inch center to center. The joint spacing utilized 12 x 12-foot panels.

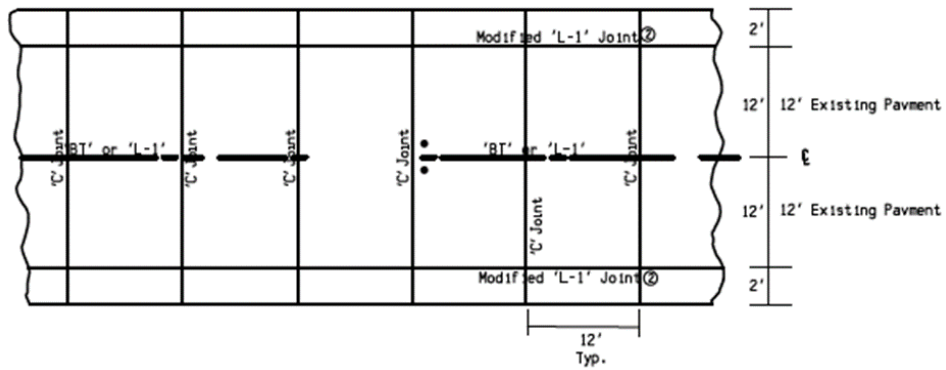


Figure 44 – Cherokee IA 31 Whitetopping with Macro Fibers



Figure 45 – Cherokee IA 31 Whitetopping with Macro Fibers

In 2022, an unbonded overlay on US 63 in Tama and Blackhawk counties was placed with 5 lbs. of macro fiber per cubic yard. No reinforcing steel was used in the project. The existing pavement was rubblized in 1998, prior to an HMA overlay. The joint spacing utilized 6 x 6-foot panels.

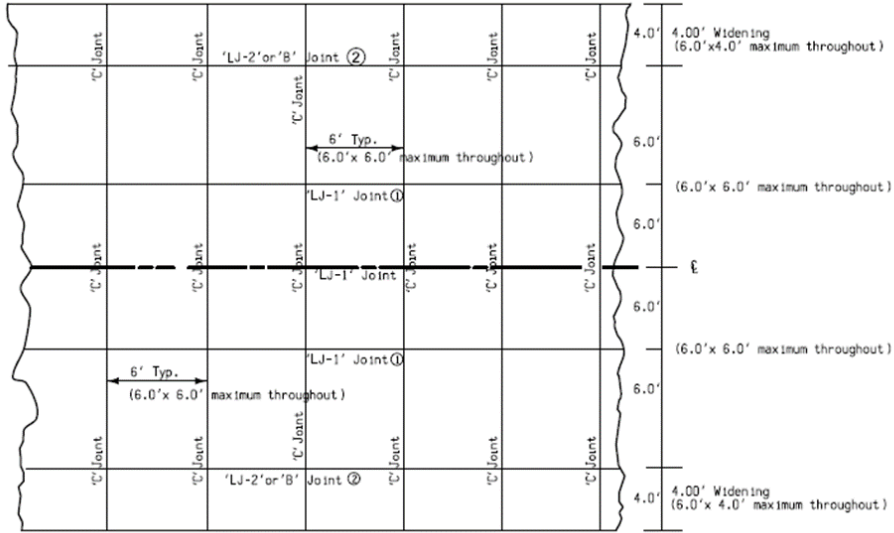


Figure 46 – Cherokee IA 31 Overlay Typical

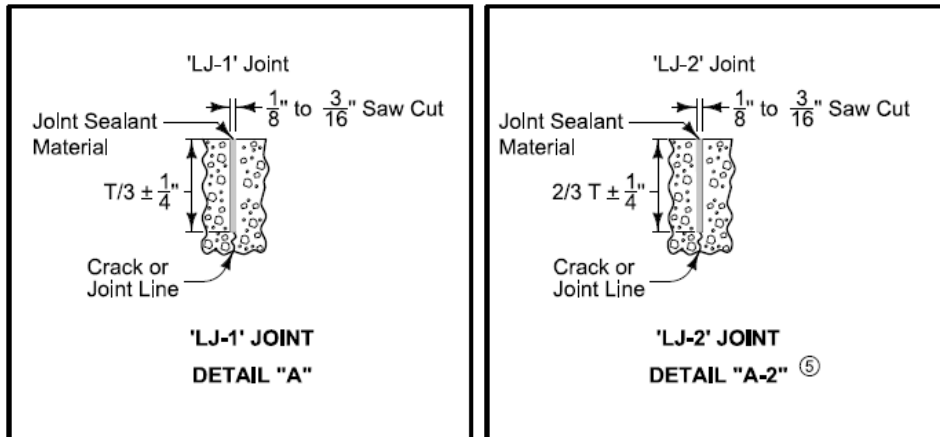


Figure 47 – LJ-1 and LJ-2 Joint Typical



Figure 48 – Tama/Blackhawk US 63 Overlay with 5 lbs. macro fiber per cubic yard.

In 2023, the Plymouth IA 3 whitetopping project utilized 4 lbs. of macro fiber per cubic yard. Similar to the Cherokee IA 31 whitetopping, the modified L-1 joint was used to tie the shoulders. Joint spacing was increased to 12 x 12-foot panels.

Utilizing fibers should be the future design for overlays. The fibers allow wider joint spacing, keep any cracking tight, reduce panel movement, and may eliminate the need for reinforcing to tie shoulders or bridge old widening units. These projects should be monitored regularly for performance and incorporated into current overlay designs.

### Overlay Construction

During construction of overlays, the superelevated curves are typically corrected to the proper cross slope. When this is done with the overlay, the concrete can become much thicker than the design thickness on the outside of the curve. On the Woodbury I29 northbound overlay in 2008, the thickness on the outside of the curve reached up to 15 inches in some locations. The design was a 9 inch unbonded overlay, requiring the longitudinal joints to be sawed at T/3, or 3 inches. Sawing at 3 inches was not adequate on the thickened outside edge of the pavement, which should have been 5 inches based on the concrete placed.

This led to longitudinal cracking right away. Cracking also occurred in the inside lane from due to the widened slab over the shoulder and differential settlement. Approximately 3763 feet of cracking in the left lane and 9242 feet of cracking in the right lane was cross stitched.



Figure 49 – Woodbury I-29 NB Longitudinal Cracking – passing lanes.

Two similar projects were let the next construction season on I-29 in Fremont and Mill counties. Fortunately, the same contractor placed those overlays and developed a spreadsheet with pavement depths in order to assure the longitudinal joints were sawed at T/3.

### Patching Overlays

Patching of PCC overlays falls into two categories, patching the overlay and full depth patching. When there are just a shattered panel or two, the overlay itself may be patched. However, many times the reason for the shattered panel is because the overlay is typically less than design thickness at that location. It may be possible to remove some of the HMA, if thick enough, to achieve a thicker patch replacement. If the HMA is thin or has deteriorated, a full depth patch may be required.



Figure 50 – Shattered panel. Typically overlay is thin in these areas.

If panels are moving, a full depth patch to the bottom of the existing pavement is recommended to prevent further movement. Many times, the old existing pavement may have longitudinal steel making it difficult to saw through the old pavement at the depth below. On the Clay/Dickinson US 71 project, the patch was pinned to the existing pavement below. These overlays should continue to be monitored to see if the panel movement has reduced significantly.

Full depth patches were placed approximately every 500 to 1000 feet on the Osceola IA 9 project in 2023 to prevent movement. West of US 59 the pavement seemed to exhibit more movement than east of US 59. A saw and seal project was also let on the Osceola IA 9 project. This project should be monitored for performance after the patching and sealing project.



Figure 51 – Full depth PCC patch in overlay



Figure 52 – Patch, existing original pavement left in place and pins.

Regardless of the type of patching, it is imperative to not add room on the ends to the patch. This allows more movement of the panels, leading to further patching issues. Patches should be placed tight to the next panel.



Figure 53 – Panel placed with 1 inch gap. Do NOT leave space.

### Observations and Conclusions

Based on review of overlays on the interstate and primary system, the following observations were noted:

- Nearly all whitetopping overlays are in good condition, with minimal cracking and very little panel movement.
- There is substantially less cracking when the overlay is placed the same width as the existing pavement.
- Longitudinal joints sawed less than T/3 based on concrete placed causes cracking.
- The 60-inch reinforcing steel over existing widening and tie shoulders has caused longitudinal cracking on nearly all overlays where it was used.
- There are less issues with cracking when the smaller 36-inch reinforcing steel is used.
- Condition of the HMA interlayer may impact project progress if issues are found during milling.
- Unfilled joints cause issues with incompressible material and may be the cause of buckling with panel movement.
- Leaving room for movement with patches promotes further panel movement.

### Recommendations

Based on observations during review of concrete overlays on the interstate and primary system, the following recommendations are discussed below:

- Place overlay same width as existing pavement.
- Use 6-inch minimum thickness.
- Use maximum size reinforcing steel of #4 x 36-inch length.
- Use macro fibers at 4 lbs./cy. Fibers help reduce cracking and panel movement.



- When fibers used, joint spacing may increase to 12 x 12 ft on 6-inch for whitetopping overlays and 9 x 8 ft with 7 x 8 ft. shoulders on 6-inch unbonded overlays with existing widening (18-foot original pavement).
- Fill all joints to prevent infilling.
- Saw longitudinal joints T/3 – based on thickness placed.
- Use full depth transition sections to existing pavement and overlay type change.
- Use full depth patches at locations with panel buckling to prevent further movement.

Since there have been some more recent changes with rehabilitation and designs with fibers, it is recommended to monitor the following projects to see how these changes impact long term performance.

- Osceola IA 9 overlay with full depth patches and joint filling.
- Tama/Blackhawk US 63 overlay with fibers and no reinforcing steel.
- Marshall IA 14 overlay, reinforcing stapled over old widening unit and untied shoulders.
- Plymouth IA 3 overlay with fibers and shoulders tied.

The National Concrete Pavement Technology Center has developed several guides for developing an overlay design<sup>7</sup> and specification requirements<sup>8</sup>. Use of these guides as well as recommendations found during this study should be implemented to improve overlay performance.

## References

- <sup>1</sup>Betterton, R.H. and Knutson, M.J., 1973, *Five Year Performance Study of Fibrous Concrete Pavement Overlay Research in Greene County, HR-165*, Iowa Department of Transportation, Ames, Iowa
- <sup>2</sup>Gross, J., King, D., et al, 2017, *Concrete Overlay Performance on Iowa's Roadways, IHRB TR-698*, National Concrete Pavement Technology Center, Iowa State University, Ames, IA.
- <sup>3</sup>Fick, G. and D. Harrington. 2014. *Performance History of Concrete Overlays in the United States*. National Concrete Pavement Technology Center, Iowa State University, Ames, IA.
- <sup>4</sup>Cable, J. K., J. M. Hart, and T. J. Ciha. 2001. *Thin Bonded Overlay Evaluation Construction Report*. Civil and Construction Engineering, Iowa State University, Ames, IA.
- <sup>5</sup>Cable, J.K., et al, *Design and Construction Procedures for Concrete Overlay and Widening of Existing Pavements, TR-511*, 2005, Center for Portland Cement Concrete Pavement Technology, Iowa State University, Ames, Iowa
- <sup>6</sup>Calvert, G., Lane, O.J., Andersen, C., 1990, *Thin Bonded Overlay with Fast Track Concrete, HR-531*, Iowa Department of Transportation, Ames, Iowa
- <sup>7</sup>Harrington, D. and G. Fick. 2014. *Guide to Concrete Overlays, Third Edition*. National Concrete Pavement Technology Center, Iowa State University, Ames, IA.
- <sup>8</sup>Fick, G. and D. Harrington. 2015. *Guide Specifications for Concrete Overlays*. National Concrete Pavement Technology Center, Iowa State University, Ames, IA.

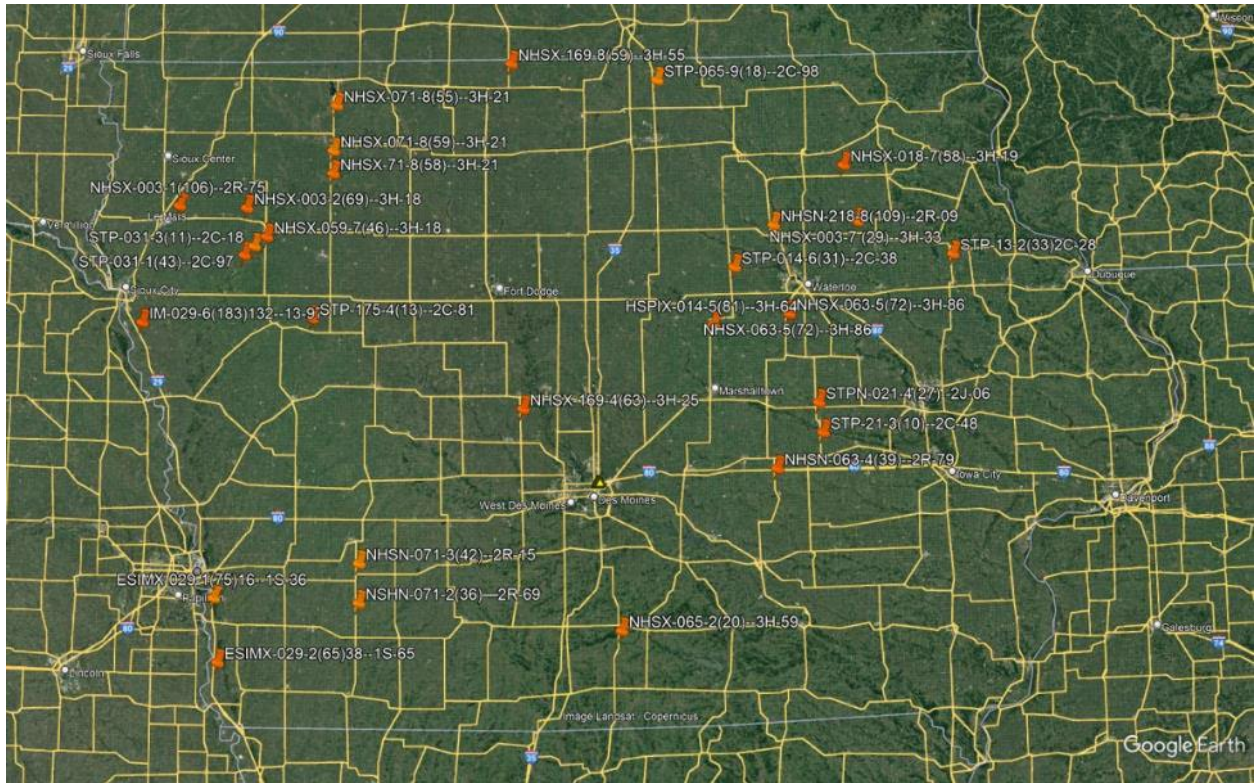
## Acknowledgements

The author would like to thank the following for their input and review:

John Hart, Chris Brakke, Kevin Merryman, and Elijah Gansen from the Iowa Department of Transportation. Greg Mulder and Lee Shepard from the Iowa Concrete Paving Association. Peter Taylor, Leif Wathne, and Dan King from the National Concrete Pavement Technology Center. Craig Hughes from Cedar Valley Corporation and Jason Meihost from Croell, Inc.

Appendix A – Iowa Primary Overlays Project Information

## Google Map of Interstate and Primary PCC Overlays



## Interstate & Primary Overlay Project History Table

| Iowa DOT Interstate & Primary PCC Overlays |              |          |               |                         |          |   |                |         |             |                |  |                        |                    |  |            |
|--|--------------|----------|---------------|-------------------------|----------|---|----------------|---------|-------------|----------------|--|------------------------|--------------------|--|------------|
| Existing Pavement                          | Overlay Type | District | County        | PROJECT NO.             | Route    | DESCRIPTION   | LENGTH (Miles) | S.V.    | ORIG CONST. | OVERLAY CONST. | ORIG. THICK/ WIDTH   | OVERLAY THICKNESS (in) | JOINT SPACING (ft) | PROJECT NOTES  | CONTRACTOR |
| HMA  | WT           | 4        | Adair         | IR-80-2(82086-14-01     | I-80     | I-80 WB. MP 83.85 to MP 97.25   | 5.000          |         | 1979        | 1979           | 10   | 10                     | 20                 | 10'x24'  | GCC        |
| PCC  | BOL          | 4        | Pottawattamie | I-EACR-80-1(126)        | I-80     | I-80 EBL Avooca to Shelby   | 4.492          | 63,246  | 1966        | 1979           | 3  | 3                      | 20                 | 3' replaced no later than 1990 (new PCC)   | KCC        |
| HMA  | WT           | 4        | Adair         | IM-80-2(89188-14-01     | I-80     | I-80 EBL (T. Lane off) MP 85.75 to MP 98.86                                 | 8.100          |         | 1981        | 1981           | 10   | 10                     | 20                 | 10'x12.5' overlaid with 4" HMA in 2009   | GCC        |
| PCC  | BOL          | 1        | Poweshiek     | IR-80-5(106)            | I-80     | I-80 fr 1 mi. E of IA 146 E approx. 9 mi. to I-25                           | 9.084          | 127,900 | 1984        | 1984           | 10" PCC  | 4                      | 20                 | 4 overlaid with 4" HMA in 2007   | MAN        |
| PCC  | BOL          | 3        | Buena Vista   | IR-71-7(132)            | U.S. 71  | U.S. 71 - Jct. IA 3 to Jct. IA 10   | 6.800          | 95,773  | 1949        | 1986           | 4  | 4                      | 20                 | 4" Bonded Fast Track RESEARCH Project  | CFC        |
| PCC  | BOL          | 4        | Pottawattamie | IR-80-4(167)            | I-80     | I-80 (WB) Shelby intchge. MLE E to Avooca intchge. US 59                    | 4.134          | 53,600  | 1946        | 1988           | 6  | 6                      | 20                 | 6' replaced no later than 2005 (new PCC)   | FJ         |
| PCC  | BOL          | 6        | Scott         | IR-280-9(97)            | I-280    | I-280 SBL fr 1/2 IA 22, N to US 6   | 7.250          | 137,390 | 1972        | 1989           | 5  | 5                      | 20                 | 5.0 C.I. replaced sometime after 2011 (new PCC)  | CVC        |
| PCC  | BOL          | 6        | Scott         | IR-280-8(98)            | I-280    | I-280 (NBL) fr I-80 SE to Mississippi river bridge                          | 1.000          | 19,242  | 1973        | 1990           | 5  | 5                      | 20                 | 5.0 C.I. replaced 2011?  | VCC        |
| PCC  | BOL          | 6        | Scott         | IR-280-8(98)            | I-280    | I-280 (NBL) fr I-80 SE to Mississippi river bridge                          | 7.230          | 142,863 | 1973        | 1990           | 5  | 5                      | 20                 | 5.0 C.I. replaced 2011?  | VCC        |
| PCC  | BOL          | 1        | Hamilton      | IR-35-5(54)133-12-40    | I-35     | I-35 N of intchge. with Co. rd D41 N to intchge. IA                         | 4.022          | 65,259  | 1967        | 1991           | 5  | 5                      | 20                 | 5.0 C.I. replaced 2003? (New PCC)  | FCC        |
| PCC  | BOL          | 1        | Hamilton      | IR-35-5(56)133-12-40    | I-35     | I-35 fr 2 mi. N of IA 175 intchge. N approx. 1 mi. N of Co. rd D41 intchge. | 6.052          | 111,469 | 1967        | 1992           | 8" PCC   | 5                      | 20                 | 5.0 C.I. SB lane replaced sometime after 2011 (New PCC)  | FJ         |
| PCC  | BOL          | 2        | Franklin      | NHS-3-5(50)19-35        | IA 3     | From 3 mi. W. of Jct 541, E. 1.8 mi. & 2.0 mi. W. of Jct 541                | 2.900          | 40,260  | 1970        | 1994           | 9" PCC   | 3                      | 20                 |  | CVC        |
| HMA  | WT           | 6        | Iowa          | SFP-21-3(10)-2C-48      | IA 21    | IA 21 fr Jct. of US 6 N to Jct. of IA 212                                   | 7.000          |         | 1961        | 1994           | 3" HMA 1964<br>0.5" HMA 7" CTB 1994                                      | 2, 4, 6                | Various            | Ver. 204" DOT RESEARCH Project<br>Thin sections resurfaced   | MAN        |
| Comp                                       | UBOL         | 6        | Delaware      | SFP-13-2(3)2C-28        | IA 13    | IA 13 fr NCL of Manchester N to IA 3  | 9.845          |         | 1937        | 2002           | 3" HMA 1982<br>2" HMA 1964<br>10-7-10-18"<br>1937                        | 3.5 to 4.5             | 4 to 6'            | 3.5-4.5"x28" RESEARCH Project  | FCC        |
| HMA  | WT           | 4        | Montgomery    | NSHN-071-2(16)-2R-69    | U.S. 71  | U.S. 71 from US 24 North to Cass Co. line                                   | 12.574         | 177,035 | 1972        | 2005           | 2" HMA 1981<br>9" HMA 24" 1972   | 8                      | 14                 | 8" 24"<br>3" milled  | MAN        |
| Comp                                       | UBOL         | 3        | Sac           | SFP-175-4(13)-2C-81     | IA 175   | IA 175 from 6th Co. line E to W. Jct US 71                                  | 8.977          | 122,246 | 1939        | 2006           | 4" HMA 24" 1986<br>10-7.5-10-20"<br>1939                                 | 4.5                    | 7                  | 4.5" 28"<br>1896 HMA widening w/eng. fabric over joint   | CVC        |
| HMA  | WT           | 4        | Cass          | NHSN-071-3(42)-3R-15    | U.S. 71  | U.S. 71 from Montgomery Co. line N. to Co. rd G 45                          | 10.560         |         | 1972        | 2007           | 2" HMA 1981<br>9" HMA 24" 1972   | 8                      | 14                 | 8" x 32' (12' with 4" tied lanes)<br>3" milled   | FLY        |
| Comp                                       | UBOL         | 3        | Woodbury      | IM-029-6(18)132-13-97   | I-29     | I-29 from Monroes Co. line N to Sergeant Buif interchange (NBL)             | 14.144         | 236,138 | 1959        | 2008           | 3" HMA 1989<br>10" 24" PCC 1959  | 9.5                    | 15                 | 3" Milled<br>9" 26" FD inside Shldr. paved integral. 7" Out Shldr.<br>14' driving lane over 12' existing & Shldr.  | CVC        |
| HMA  | WT           | 2        | Bremer        | NHSN-218-8(109)-2R-09   | U.S. 218 | U.S. 218 Along Wisniewsky Bypass (MP 186.57 to 189.46)                      | 7.750          | 279,840 | 1958        | 2009           | 11.5" 24" HMA  | 8.5                    | 14                 | 8.5" x 32' (12' with 4" tied lanes)  | MAN        |
| Comp                                       | UBOL         | 4        | Fremont       | ESIMK-029-1(75)16-15-36 | I-29     | N. of Co. rd. I-24 (PCC overlay) NBL/HMA                                    | 4.340          | 66,170  | 1972        | 2009           | 8" 24"<br>CRK/4" CTB   | 9                      | 15                 | 1" HMA interlayer<br>9" 26" (6" tied FD PCC Shoulders 10 R HMA)<br>shoulder COARSEN  | GOD        |
| Comp                                       | UBOL         | 4        | Millis        | ESIMK-029-2(65)38-15-55 | I-29     | I-29 from 3 mi. E. of N. Jct US 24 N. to Pottawattamie Co. line (NBL)       | 5.700          | 102,473 | 1971        | 2009           | 8" HMA<br>8" CRK/4"  | 9                      | 15                 | 8" HMA interlayer<br>9" 26" (6" tied FD PCC Shoulders + 10ft HMA)<br>8" 24" (6" tied FD PCC Shoulders + 10ft HMA)<br>5.5" 28" (4.5" tied FD PCC long joints) | CVC        |
| Comp                                       | UBOL         | 3        | Oceola        | SFP-009-3(21)-2C-72     | IA 9     | IA 9 from E. of relocated IA 60 E. to W. of Jct Co. rd L-58                 | 8.700          | 136,497 | 1931        | 2009           | 1.5" HMA 1983<br>3" HMA 1981<br>3" PCC widen 1956<br>10-7-10-18"<br>1931 | 5.5                    | 5                  | 4" bars @ 30" CTR<br>9.5" x 2' Widening  | FLYNN      |

## Interstate & Primary Overlay Project History Table (continued)

| Iowa DOT Interstate & Primary PCC Overlays |           |   |                    |                       |        |   |       |         |      |      |     |    |  |        |
|--|-----------|---|--------------------|-----------------------|--------|---|-------|---------|------|------|-----|----|--|--------|
|  |           |   |                    |                       |        |   |       |         |      |      |     |    |  |        |
| Comp HMA                                   | UBOL & WT | 3 | Clay               | NHSK-071-8(89)-3H-21  | US 71  | US 71: From Co. Rd. 855 N. to 15th St. in Spencer | 7:740 | 138,911 | 1991 | 2015 | 6   | 8  | 6" x 32" (6 x 6" ML and 4 x 6" Shldr) panels<br>Shoulders UBOL<br>#4 bars 36" @ 60" UBOL<br>2" Milling   | CVC    |
| Comp HMA                                   | UBOL & WT | 3 | Clay               | NHSK-71-8(88)-3H-21   | US 71  | US 71: Buena Vista Co. Line N. to Co. Rd. B53     | 6.95  | 123895  | 1991 | 2016 | 6   | 6  | 6" x 32" (6 x 6" ML and 4 x 6" Shldr) WT<br>#4 bars 36" @ 30" CTR WT<br>2" Milling                       | CVC    |
| Comp HMA                                   | UBOL & WT | 3 | Clay               | NHSK-71-8(88)-3H-21   | US 71  | US 71: Buena Vista Co. Line N. to Co. Rd. B53     | 6.95  | 123895  | 1991 | 2016 | 6   | 6  | 6" x 32" (6 x 6" ML and 4 x 6" Shldr) panels<br>Shoulders UBOL<br>#4 bars 36" @ 60" UBOL<br>2" Milling   | CVC    |
| Comp HMA                                   | UBOL      | 6 | Benton             | STPN-021-4(27)-2J-06  | IA 21  | IA 21: From E 66 N. to Just S. US 30              | 3.46  | 62080   | 1979 | 2016 | 5.5 | 6  | 6" x 32" (6 x 6" ML and 4 x 6" Shldr)<br>Interlayer 2016<br>8" PCC                                       | MAN    |
| Comp HMA                                   | UBOL      | 4 | Dallas<br>Boone    | NHSK-169-4(63)-3H-25  | US 169 | US 169 From IA 141 N to US 30                     | 13.02 | 299862  | 1940 | 2018 | 7   | 12 | 7" x 32" (12 x 12" ML and 4 x 12" Shldr)<br>#4 bars 36" @ 60" CTR<br>Geotextile Interlayer               | MAN    |
| Comp HMA                                   | UBOL      | 1 | Marshall<br>Grundy | HSPX-014-5(81)-3H-64  | IA 14  | IA 14 From Co. Rd. E18 N. to W. JCT IA 175        | 11.28 | 155401  | 1992 | 2019 | 6   | 6  | 6" x 32" (6 x 6" ML and 4 x 6" Shldr)<br>1" milling<br>Shoulder/Widening not tied                        | CVC    |
| HMA  | WT        | 3 | Woodbury           | STP-031-1(43)-2C-97   | IA 31  | IA 31 From E. JCT US 20 N. to Co. Rd. 066         | 8.2   | 137007  | 1995 | 2020 | 6   | 6  | 6" x 32" (6 x 6" ML and 4 x 6" Shldr)<br>#4 x 36" @ 30" c-c<br>3" Milling<br>Fiber Test Sections         | CVC    |
| HMA  | WT        | 3 | Cherokee           | STP-031-3(11)-2C-18   | IA 31  | Washtato US 99                                    | 10.17 | 162607  |      | 2022 | 6   | 12 | Fibers 4 lb/cy<br>3" Milling<br>Euclid Turf Strand SF Fibers<br>#4 x 36" @ 30" c-c                       | CVC    |
| HMA  | WT        | 3 | Plymouth           | NHSK-003-1(106)-2R-75 | IA 3   | Lamar to Remsen                                   | 8.72  | 181506  |      | 2022 | 6   | 6  | 6" x 32" (6 x 6" ML and 4 x 6" Shldr)<br>#4 x 36" @ 30" c-c<br>2" Milling<br>12 x 12 test section        | Croell |
| Comp HMA                                   | UBOL      | 1 | Tama               | NHSK-063-5(72)-3H-86  | US 63  | From Traer to 0.5 mi S of IA 98                   | 13.14 | 25286   |      | 2022 | 5   | 6  | 6" x 32" (6 x 6" ML and 4 x 6" Shldr)<br>3" Milling<br>Fibers 5 lb/cy - Forta Ferro                      | Croell |
| HMA  | WT        | 3 | Plymouth           | NHSK-003-1(104)-2R-75 | IA 3   | Remsen to Cherokee Co Line                        | 5.36  | 75050   |      | 2023 | 6   | 12 | 6" x 36" (12 x 12" ML & 6 x 12" Shldr)<br>2" Milling<br>#4 x 36" @ 30" c-c<br>Fibers 4 lb/cy Forta Ferro | Croell |

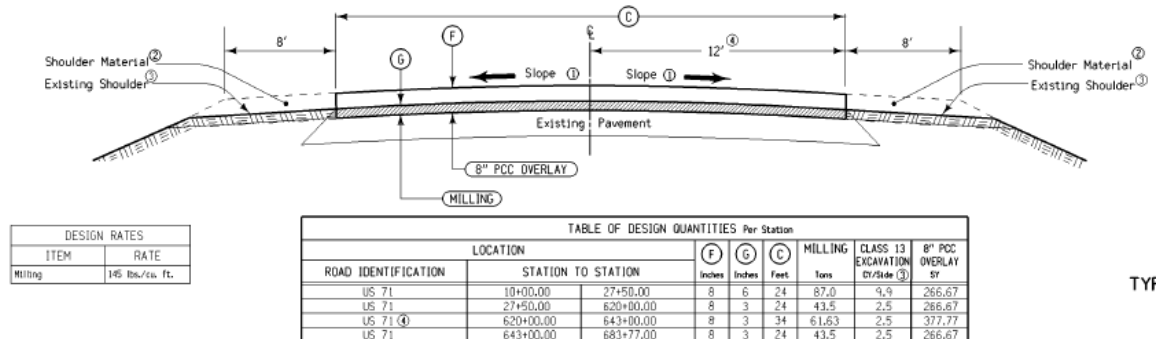
## Interstate & Primary Overlay Project History Table (continued)

| Iowa DOT Interstate & Primary PCC Overlays |            |   |           |                       |          |   |        |         |      |        |        |     |          |          |        |
|--|------------|---|-----------|-----------------------|----------|---|--------|---------|------|--------|--------|-----|----------|----------|--------|
| Comp                                       | UBOL       | 2 | Worth     | STP-065-018)-2C-38    | U.S. 65  | U.S. 65 from IA 9 in Nanny N. to Co. Rd 105               | 1928-9 | 1928-9  | 2009 | 1928-9 | 1928-9 | 5   | 5        | 5        | FLYNN  |
| Comp                                       | UBOL       | 2 | Chickasaw | NHSX-018-7(18)-3H-19  | U.S. 18  | U.S. 18 from ECL of Fredericksburg E. to West Union       | 1938   | 350,367 | 2011 | 1938   | 1938   | 4   | 5        | 5        | MAN    |
| Comp                                       | WT NB      | 3 | Clay      | NHSX-071-8(15)-3H-21  | U.S. 71  | U.S. 71 from US 18 North to SCL of Milford-NBL            | 1954   | 362,271 | 2012 | 1954   | 1954   | 6   | 6        | 6        | MAN    |
| HMA  | UBOL SB    | 3 | Clay      | NHSX-071-8(15)-3H-21  | U.S. 71  | U.S. 71 from US 18 North to SCL of Milford-SBL            | 1992   |         | 2012 | 1992   | 1992   | 6   | 6        | 6        | MAN    |
| Comp                                       | UBOL       | 1 | Grundy    | STP-014-6(131)-2C-38  | IA 14    | IA 14 from 5 mile South of US 20 North to IA 57           | 1954   | 119,469 | 2013 | 1954   | 1954   | 4.5 | 5.5      | 5.5      | CFI    |
| Comp                                       | UBOL       | 2 | Fayette   | NHSX-003-7(19)-3H-33  | IA 3     | IA 3 from West County Line to North City Limits of Okwain | 1930   | 154,787 | 2013 | 1930   | 1930   | 5   | 5        | 5        | Croell |
| Comp                                       | UBOL       | 5 | Lucas     | NHSX-065-2(10)-3H-59  | U.S. 65  | U.S. 65, From Wayne Co. Line N. to US 34                  | 1954   | 154,994 | 2013 | 1954   | 1954   | 5   | 5.5 x .5 | 5.5 x .5 | MAN    |
| Comp                                       | UBOL       | 2 | Kossuth   | NHSX-169-8(19)-3H-55  | U.S. 169 | U.S. 169, E. Jct. IA 9 N to Minnesota State Line          | 1940   | 144,302 | 2014 | 1940   | 1940   | 5   | 5        | 5        | Croell |
| Comp                                       | UBOL       | 1 | Poweshiek | NHSX-063-4(19)-2H-79  | U.S. 63  | US 63 from NCL Montezuma North to just south of I-80      | 1987   | 132,379 | 2014 | 1987   | 1987   | 5   | 5        | 5        | Croell |
| Comp                                       | UBOL       | 3 | Cherokee  | NHSX-059-7(16)-3H-18  | U.S. 59  | US 59 from DA Co. Line N. to IA 3                         | 1991   | 309,384 | 2014 | 1991   | 1991   | 6   | 6        | 6        | CVC    |
| Comp HMA                                   | UBOL & VIT | 3 | Cherokee  | NHSX-003-2(16)-3H-18  | IA 3     | Iowa 3, Plymouth Co to ECL of Clifton                     | 1937   | 145,951 | 2015 | 1937   | 1937   | 6   | 6        | 6        | KNIFE  |
| Comp                                       | UBOL       | 1 | Polk      | STPH-069-4(100)-2J-77 | U.S. 69  | US 69: From just N of 118th Ave N. to just S. of IA 210   | 1921   | 124,510 | 2015 | 1921   | 1921   | 5   | 5        | 5        | FLN    |
| Comp HMA                                   | UBOL & VIT | 3 | Clay      | NHSX-071-8(15)-3H-21  | U.S. 71  | US 71: From Co. Rd. 833 N to 15th St in Spencer           | 1951   | 138,911 | 2015 | 1951   | 1951   | 6   | 6        | 6        | CVC    |



Appendix B - Primary Overlays Project Construction History and Review

|                 |   |                     |  |
|-----------------|---|---------------------|--|
| <b>Year</b>     | 2006  | <b>Overlay Type</b> | Whitetopping                           |
| <b>County</b>   | Montgomery                                  | <b>Design</b>       | 8" – 24 ft. CD 14 ft. HMA<br>Shoulders |
| <b>Route</b>    | US 71                                       | <b>Milling</b>      | 3" milling                             |
| <b>Project</b>  | NSHN-071-2(36)—2R-69                        | <b>Interlayer</b>   | Existing HMA                           |
| <b>Location</b> | U.S. 71 from US34 North<br>to Cass Co. line | <b>Tie Bars</b>     | n/a                                    |



Notes:

- ① Finished slope shall match existing pavement except that the maximum allowable slope is 3.0 %, minimum allowable slope is 2.0 %. Section may be modified as directed by the Engineer through areas of special shaping.
- ② Shoulder material as specified elsewhere in these plans. See Typical 7153M for more details.
- ③ Top 4" of existing shoulder material will be removed from BOP to Sta 27+50. Top 1" of existing shoulder material will be removed from Sta. 27+50 to EOP. Shoulder will be reconstructed as per Typical 7153M. Per side per station.
- ④ 10' climbing lane on right. Includes 400' tapers at each end.

Construction

Some issues with HMA failing during construction. Several areas patched with new HMA.



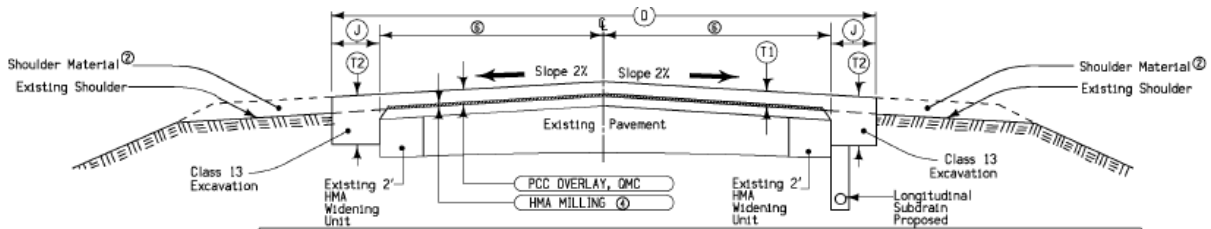


### Review 2023

Overall, in good condition. A few areas with cracking just off centerline (~4 to 5 locations). Some issues with centerline rumble strips went through transverse joints and were patched.



|                 |                                |                     |                                  |
|-----------------|--------------------------------|---------------------|----------------------------------|
| <b>Year</b>     | 2007                           | <b>Overlay Type</b> | UBOL                             |
| <b>County</b>   | Sac                            | <b>Design</b>       | 4.5" x 28 ft. (7 x 7 ft. panels) |
| <b>Route</b>    | IA 175                         | <b>Milling</b>      | 1/2" at CL – 2% cross slope      |
| <b>Project</b>  | STP-175-4(13)--2C-81           | <b>Interlayer</b>   | Existing HMA                     |
| <b>Location</b> | Ida Co. line E to W. Jct US 71 | <b>Tie Bars</b>     | None                             |



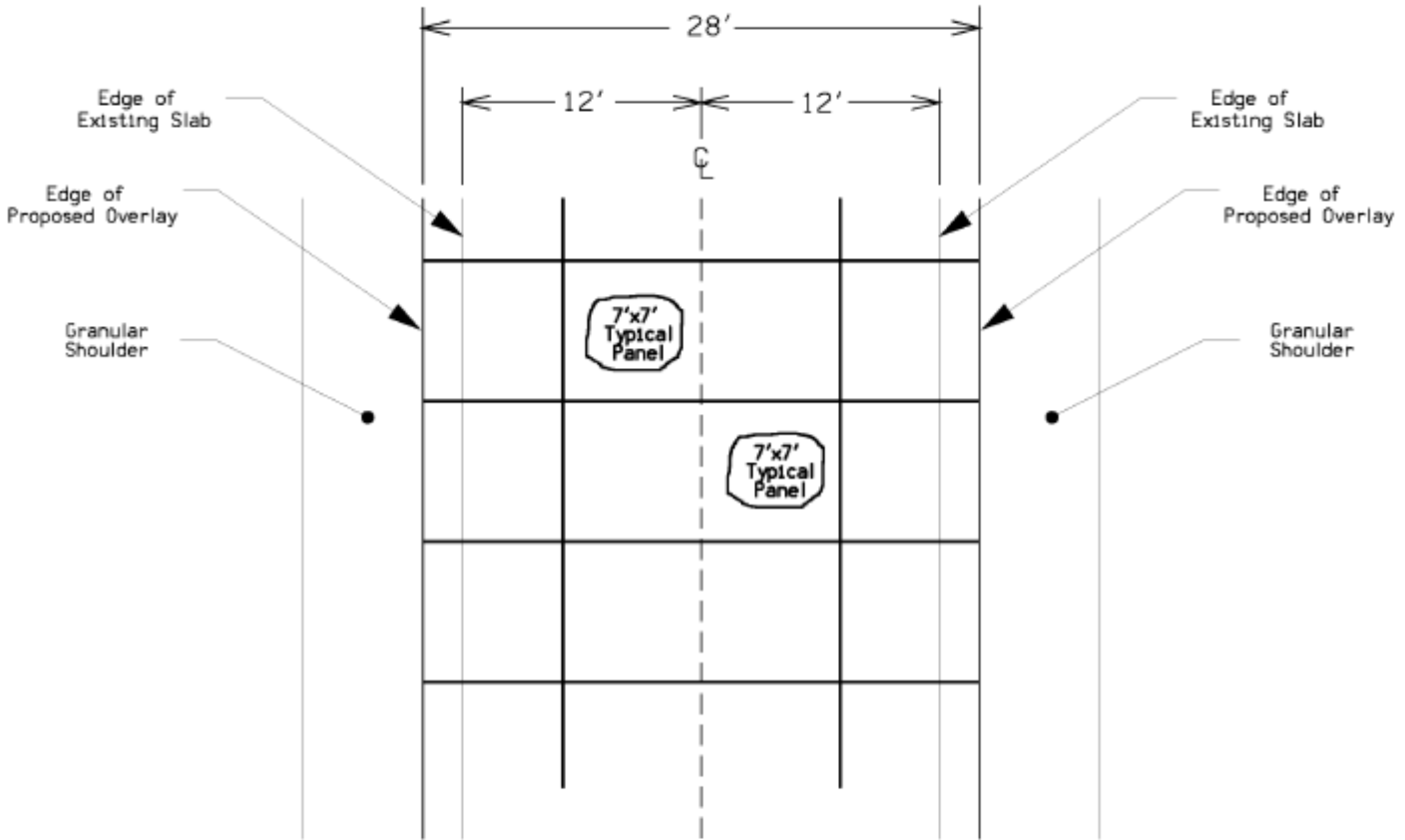
| LOCATION            |                    | Per Station |    |    |     | PCC OVERLAY, GMC (PLACE) | PCC OVERLAY, GMC (FURNISH) | MILLING  | CLASS 13 |      |
|---------------------|--------------------|-------------|----|----|-----|--------------------------|----------------------------|----------|----------|------|
| ROAD IDENTIFICATION | STATION TO STATION | D           | J  | T1 | T2  | Sq. Yds.                 | Sq. Yds.                   | Sq. Yds. | Cu. Yds. |      |
| IA 175 (Div. 1)     | 2373+57            | 2533+80.1   | 28 | 2  | 4.5 | 8.0                      | 311.1                      | 46.91    | 266.67   | 4.32 |
| IA 175 (Div. 2)     | 2533+80.1          | 2568+00     | 28 | 2  | 4.5 | 8.0                      | 311.1                      | 46.91    | 266.67   | 4.32 |
| IA 175 (Div. 2)     | 2568+00            | 2575+51.7   | 28 | 1  | 4.5 | 8.0                      | 311.1                      | 45.06    | 288.89   | 2.16 |
| IA 175 (Div. 2)     | 86+20.0            | 100+60.7    | 28 | 1  | 4.5 | 8.0                      | 311.1                      | 45.06    | 288.89   | 2.16 |
| IA 175 (Div. 1)     | 100+80.7           | 332+93.6    | 28 | 2  | 4.5 | 8.0                      | 311.1                      | 46.91    | 266.67   | 4.32 |
| IA 39 (Div. 2)      | 3+52.9             | 7+26.1      | 28 | 2  | 4.5 | 8.0                      | 311.1                      | 46.91    | 266.67   | 4.32 |

Notes:

- ① Refer to tabulation listing of superelevated curves and Standard Road Plans for additional requirements through superelevated curves.
- ② Shoulder material as specified elsewhere in these plans; refer to typical 7135 on B.01 for "Type 'B' Granular Surfaced Shoulders."
- ③ Quantity includes PCC widening units to be placed with PCC overlay and based on 5 inch thickness for irregularities.
- ④ Mill the existing HMA pavement 1/2" deep at centerline, and to a 2% cross slope except in areas of superelevation and as shown on typical MW-1.
- ⑤ Includes both sides.
- ⑥ Existing pavement width is 24' except in Div. 2 (corporate limits of Odebolt) where it is 26'.

|          |
|----------|
| 2610     |
| MODIFIED |

# IA 175 / IA 39



| JOINTS  |  |
|---------|--|
| ————    | Sawn (saw-cut width = $\frac{1}{8}$ ", saw-cut depth = $1\frac{1}{2}$ ") |
| - - - - | Permissable Construction, Unsawn   |





## 2008 Cracking

Quite a bit of longitudinal cracking showed up the next year after construction. It was noted that the outside shoulders appeared to be heaving based on the cross slope.





Driving lane panel cross slope 2.09%



Shoulder panel cross slope 1.31%

## 2017 Patching Project

Many of the areas needing patching were not at design thickness of 4.5 inches. Note in the picture that the overlay is 3 inches where patching.



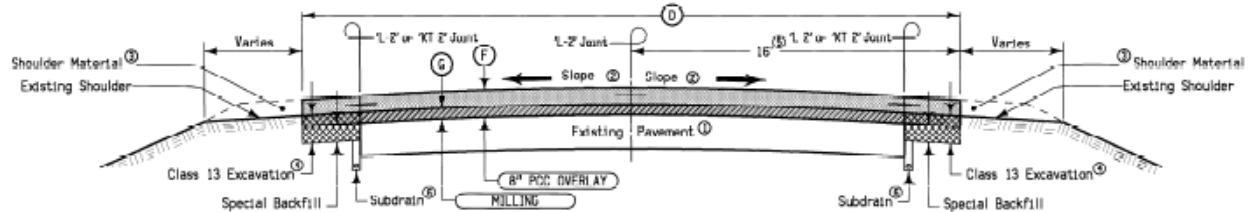
## 2021 Review

After most of the cracking occurred, the district filled the longitudinal cracks with hot pour sealant. Even with all the cracking that occurred early, the pavement continues to ride fairly well. There are likely areas that need to be patched.





|                 |                                       |                     |                              |
|-----------------|---------------------------------------|---------------------|------------------------------|
| <b>Year</b>     | 2007                                  | <b>Overlay Type</b> | Whitetopping                 |
| <b>County</b>   | Cass                                  | <b>Design</b>       | 8" x 32 ft. (12 x 14 ft. CD) |
| <b>Route</b>    | US 71                                 | <b>Milling</b>      | 3" Milled                    |
| <b>Project</b>  | NHSN-071-3(42)--2R-15                 | <b>Interlayer</b>   | Existing HMA                 |
| <b>Location</b> | Montgomery Co. line N. to Co. Rd G-43 | <b>Tie Bars</b>     | L-2 #5                       |



| DESIGN RATES     |                  |
|------------------|------------------|
| ITEM             | RATE             |
| Milling          | 145 lbs./cu. ft. |
| Special Backfill | 140 lbs./cu. ft. |

| TABLE OF DESIGN QUANTITIES Per Station |                         |        |        |      |         |            |          |         |         |
|--|-------------------------|--------|--------|------|---------|------------|----------|---------|---------|
| LOCATION                               |                         | (F)    | (G)    | (D)  | MILLING | CLASS 13   | SPECIAL  | 6" PCC  | 6" PCC  |
| ROAD IDENTIFICATION                    | STATION TO STATION      | INCHES | INCHES | FEET | SF      | EXCAVATION | BACKFILL | OVERLAY | OVERLAY |
| US 71                                  | 683+77.00 (D) 894+84.68 | 8      | 3      | 32   | 266.7   | 22.2       | 28       | 355.56  | 79.01   |
| US 71                                  | (D) 100+00.00 434+90.00 | 8      | 3      | 32   | 266.7   | 22.2       | 28       | 355.56  | 79.01   |
| US 71                                  | 564+21.00 582+91.00     | 8      | 6      | 32   | 266.7   | 22.2       | 14       | 355.56  | 79.01   |

Modified

Notes:

- (1) Existing pavement width is 24 ft.
- (2) Finished slope shall match existing pavement except that the maximum allowable slope is 3.0% minimum allowable slope is 2.0%. Section may be modified as directed by the Engineer through arrow of special sloping.
- (3) Shoulder material as specified elsewhere in these plans refer to Typical 7110M.
- (4) 6" depth 4' wide, 6" to be replaced with Special Backfill for subdrain work prior to PCC overlay. (Both sides)
- (5) Includes 4" PCC paved shoulder. Refer to Typical 2205M for climbing lane details.
- (6) Refer to Typical PCC-4 for details. See Tab 104-1 for locations.
- (7) Equation Sta. 894+84.68 Back - Sta. 100+00.00 Road
- (8) Refer to Detail Sheet 003 for details.

Construction

There were areas where the HMA was in poor condition and new HMA was placed. A shortage of haul trucks caused the paving machine to move slowly waiting for concrete. There are several areas where the grout box material was dropped into the pavement. These areas have major popouts from the light particles in the gravel source.









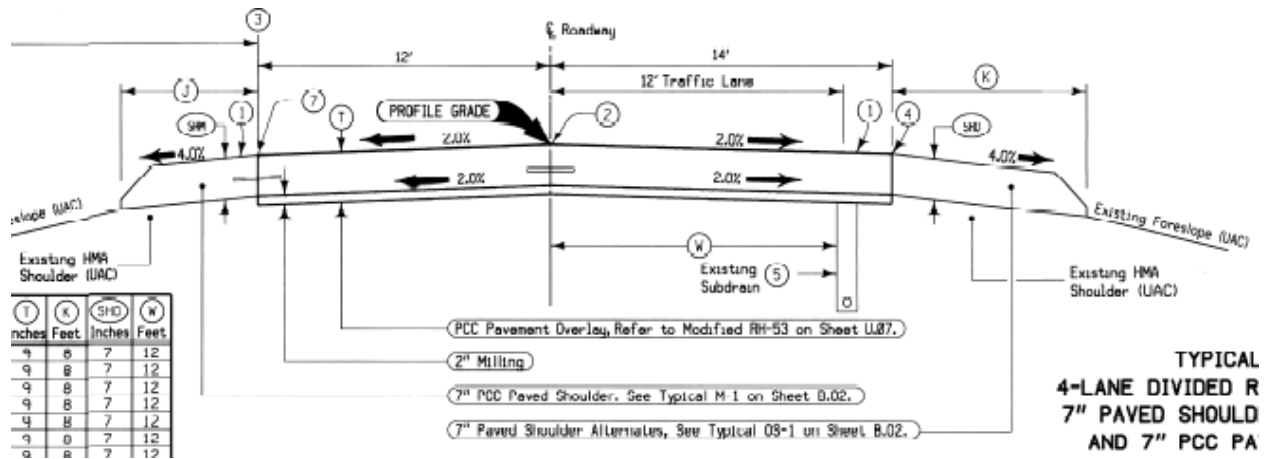
## 2023 Review

Overall, in good condition. There are approximately 3 to 4 areas with cracking at quarter point. There are also areas where milled rumble strips went through transverse joints and blew out edge.





|                 |                                 |                     |  |
|-----------------|---------------------------------|---------------------|--|
| <b>Year</b>     | 2008                            | <b>Overlay Type</b> | UBOL   |
| <b>County</b>   | Woodbury                        | <b>Design</b>       | 9" x 26' FD Inside Shoulder integral. 7" Outside Shoulder. |
| <b>Route</b>    | I-29 NB                         | <b>Milling</b>      | 2" Milling   |
| <b>Project</b>  | IM-029-6(183)132--13-97         | <b>Interlayer</b>   | Existing HMA   |
| <b>Location</b> | Monona Co. Line N to Sgt. Bluff | <b>Tie Bars</b>     | #5   |



**NOTES**

- ① Shoulder rumble strip required. Refer to Sheets U.08 and U.10 for details.
- ② "L-2" Joint required. See Standard Road Plan RH-51.
- ③ The median shoulder may be placed with the 26-ft. wide I-29 NB main-line pavement.
- ④ For the PCC alternate, use "L-1", "KT-1", or "BT-1" joint. See Standard Road Plan RH-51.
- ⑤ UAC and protect existing subdrains.
- ⑥ Profile grade for this project is located on the centerline of the NB lanes.
- ⑦ Use "L-2", "K-2", or "BT-2" joints. See Standard Road Plan RH-51.

During milling of the HMA, there were a few areas where the HMA peeled off the existing concrete.

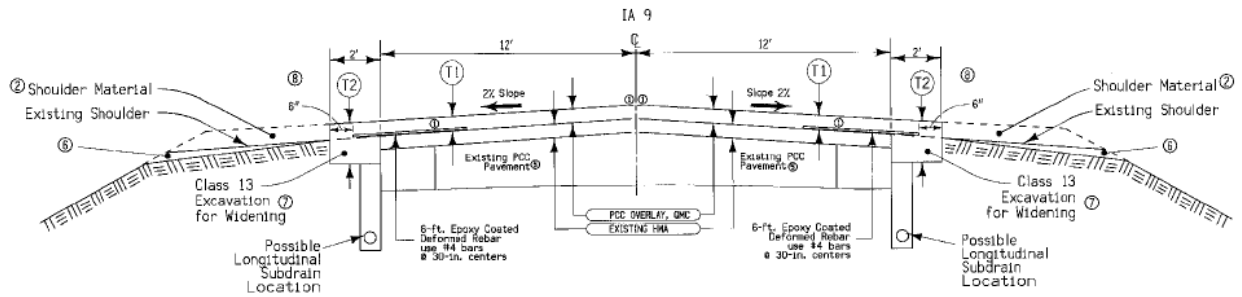




Section 2 Cross stitching 9242 feet right, 3763 feet left.



|                 |                     |                     |                                   |
|-----------------|---------------------|---------------------|-----------------------------------|
| <b>Year</b>     | 2009                | <b>Overlay Type</b> | UBOL                              |
| <b>County</b>   | Osceola             | <b>Design</b>       | 5.5"x28' (4.5x4.5x5' long joints) |
| <b>Route</b>    | IA 9                | <b>Milling</b>      | None                              |
| <b>Project</b>  | STP-009-2(21)—2C-72 | <b>Interlayer</b>   | Existing HMA Surface              |
| <b>Location</b> | IA 60 E. to L-58    | <b>Tie Bars</b>     | #4 bars 6' @30" CTR               |



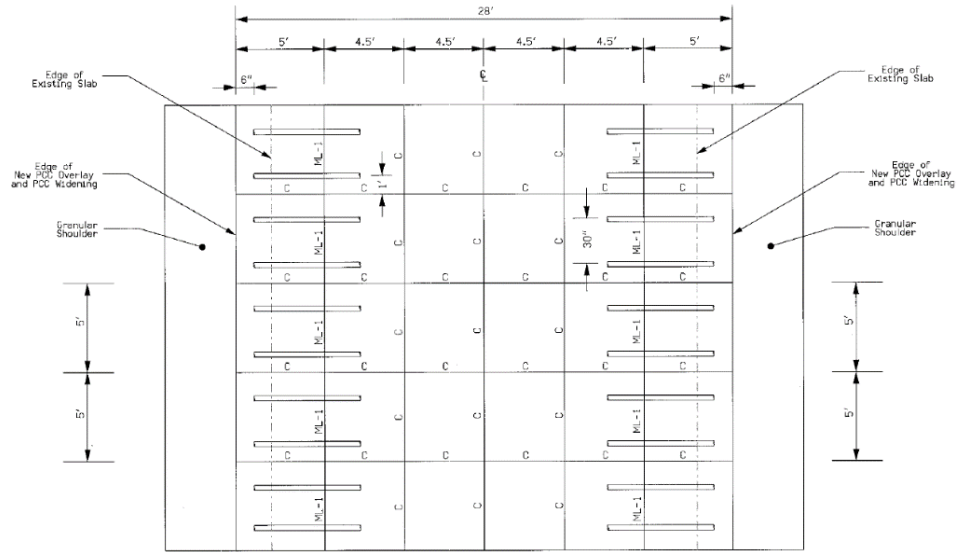
| ROAD IDENTIFICATION | LOCATION  | STATION TO STATION | Per Station |   |     |     | PCC OVERLAY, GMC (PLACE) Cu. Yds. | PCC OVERLAY, GMC (FURNISH) Cu. Yds. ③ | CLASS 13 EXCAVATION Cu. Yds. ④ |
|---------------------|-----------|--------------------|-------------|---|-----|-----|-----------------------------------|---------------------------------------|--------------------------------|
|                     |           |                    | ①           | ② | ⑤   | ⑥   |                                   |                                       |                                |
| IA 9                | 102+09    | 360+31.4           | 28          | 2 | 5.5 | 9.5 | 311.11                            | 56.79                                 | 4.94                           |
| IA 9                | 762+99.47 | 839+58.21          | 28          | 2 | 5.5 | 9.5 | 311.11                            | 56.79                                 | 4.94                           |
| IA 9                | 848+89.11 | 935+58.5           | 28          | 2 | 5.5 | 9.5 | 311.11                            | 56.79                                 | 4.94                           |
| IA 9                | 943+71.5  | 1043+25            | 28          | 2 | 5.5 | 9.5 | 311.11                            | 56.79                                 | 4.94                           |

TYPICAL UNBONI

Notes:

- ① Longitudinal joints shall be located at centerline, 4.5-ft. L. and Rt. of centerline and 9.0-ft. L. and Rt. of centerline. A modified "L-1" MK-II joint shall be located at 9.0-ft. L. and Rt. of centerline with a 9-ft. long reinforcing bar. Transverse joints shall be located at 5.0-ft. spacings.  
Each 6-ft. rebar shall be attached to the existing HMA surface in at least 3 locations. Connectors shall be no less than 12-in. apart and no more than 15-in. apart. See Sheet U01 for a plan view of the required joint layout.
- ② Shoulder material as specified elsewhere in these plans; refer to typical 7135 on Sheet B.1 for "Type 'B' Granular Surfaced Shoulders."
- ③ Quantity is estimated using a 6-in. thickness over the existing 24-ft. wide pavement and a 10-in. thickness for the integral 2-ft. widening units.
- ④ Includes both sides.
- ⑤ Existing total pavement width is 24'.
- ⑥ Earth Shoulder Construction: Place and compact Class 13 Excavation in this area to build up the shoulder and eliminate the secondary ditch along the edge of the existing shoulder. Slope shall be adjusted as directed by the Engineer.
- ⑦ Any existing HMA edgecut or fillet material within 2-ft. of the edge of the existing pavement shall be considered Class 13 Excavation except at paved county road intersections.
- ⑧ Existing HMA fillet material that is located 2-ft. or more from the edge of existing pavement will be tabulated as Additional Class 13 Excavation at Entrances and Driveway Road Intersections. See Tab A300.13 on Sheet C.8.





Construction

Some issues with late sawing causing cracking off end of saw joints.



## 2021 Review

Panels moving, especially west of US 59. Maintenance placed patches with foam on either side to accommodate slab movement. We noted that now the slabs will move even more. District will let a patching project to add full depth patches in areas to prevent slab migration.





Longitudinal cracking



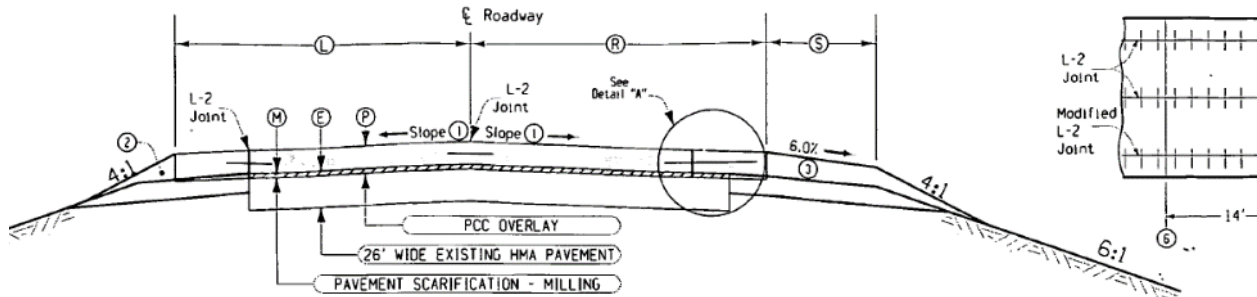
PCC overlay in better condition east of US 59.



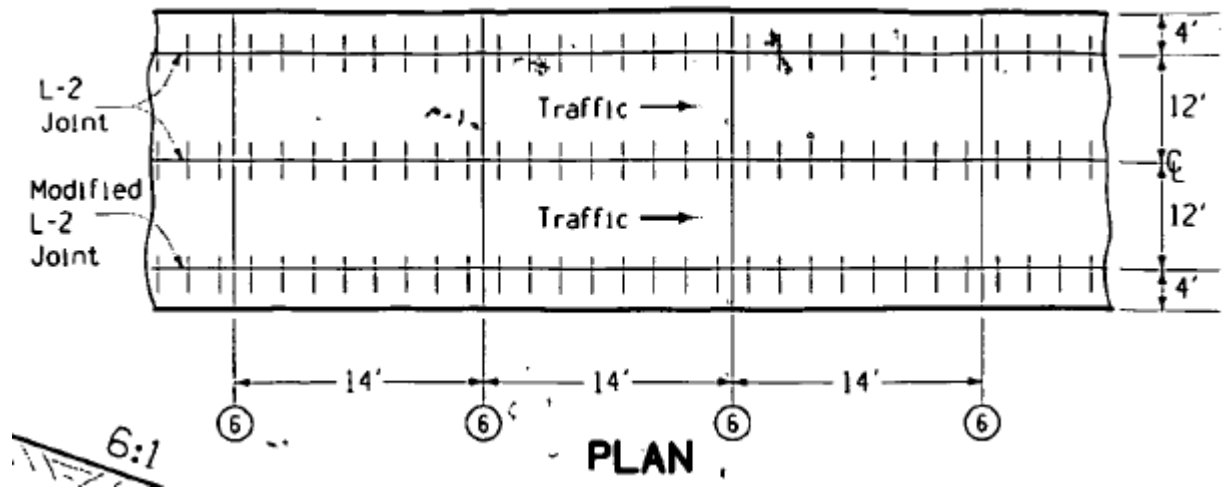
2023

Project let in 2023 included 4293.3 SY of 10-foot x 28-foot x 17-inch full depth patching and 8.9 miles of joint sealing for the entire project. Full depth patches were selected try to stop panel movement.

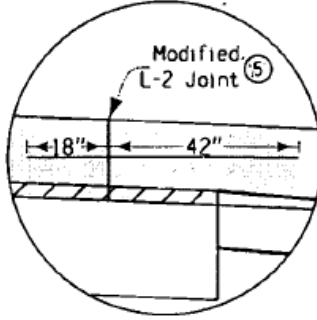
|                 |                        |                     |                                   |
|-----------------|------------------------|---------------------|-----------------------------------|
| <b>Year</b>     | 2009                   | <b>Overlay Type</b> | WT                                |
| <b>County</b>   | Bremer                 | <b>Design</b>       | 8.5" x 32' (12' with 4' Shoulder. |
| <b>Route</b>    | US 218                 | <b>Milling</b>      | Scarify Existing                  |
| <b>Project</b>  | NHSN-218-8(109)--2R-09 | <b>Interlayer</b>   | Existing HMA                      |
| <b>Location</b> | Waverly Bypass         | <b>Tie Bars</b>     | Modified L-2 5' bar               |



| Location                |                    | P         | E      | M      | L    | R    | S    | PCC Pavement Sq. Yds. | *Pavement Scarification Sq. Yds. | Pavement Scarification Tons |      |
|-------------------------|--------------------|-----------|--------|--------|------|------|------|-----------------------|----------------------------------|-----------------------------|------|
| Road Identification     | Station To Station | Inches    | Inches | Inches | Feet | Feet | Feet |                       |                                  |                             |      |
| <b>Northbound Lanes</b> |                    |           |        |        |      |      |      |                       |                                  |                             |      |
| U.S. 218                | 319+44.00          | 328+25.00 | 8.5    | 11.5   | 1.5  | 16   | 16   | 6                     | 3132                             | 2838                        | 223  |
| U.S. 218                | 336+75.00          | 496+66.38 | 8.5    | 11.5   | 1.5  | 16   | 16   | 6                     | 56,858                           | 46,197                      | 3538 |
| U.S. 218                | 506+25.00          | 514+52.97 | 8.5    | 11.5   | 1.5  | 16   | 16   | 6                     | 2944                             | 2392                        | 188  |
| U.S. 218                | 523+36.66          | 550+63.78 | 8.5    | 11.5   | 1.5  | 16   | 16   | 6                     | 9696                             | 7878                        | 227  |
| U.S. 218                | 559+64.78          | 658+85.00 | 8.5    | 11.5   | 1.5  | 16   | 16   | 6                     | 35,236                           | 28,629                      | 2255 |
| U.S. 218                | 666+85.00          | 713+85.00 | 8.5    | 11.5   | 1.5  | 16   | 16   | 6                     | 16,711                           | 13,578                      | 1069 |
| <b>Southbound Lanes</b> |                    |           |        |        |      |      |      |                       |                                  |                             |      |
| U.S. 218                | 311+26.00          | 496+66.38 | 8.5    | 11.5   | 1.5  | 16   | 16   | 6                     | 65,921                           | 55,854                      | 4399 |
| U.S. 218                | 506+25.00          | 514+83.43 | 8.5    | 11.5   | 1.5  | 16   | 16   | 6                     | 3052                             | 2480                        | 195  |
| U.S. 218                | 523+67.12          | 550+63.78 | 8.5    | 11.5   | 1.5  | 16   | 16   | 6                     | 9588                             | 7790                        | 613  |
| U.S. 218                | 559+64.78          | 658+85.00 | 8.5    | 11.5   | 1.5  | 16   | 16   | 6                     | 35,236                           | 28,629                      | 2255 |
| U.S. 218                | 666+85.00          | 713+85.00 | 8.5    | 11.5   | 1.5  | 16   | 16   | 6                     | 16,711                           | 13,578                      | 1069 |
| TOTALS                  |                    |           |        |        |      |      |      | 255,085               | 209,843                          | 16,131                      |      |



DETAIL "A"



Construction









## 2023 Review

Overall, in good condition. An area on the north end of the southbound lanes exhibits some issues at the joints. There are a few random areas of longitudinal cracking in the driving lane.







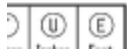
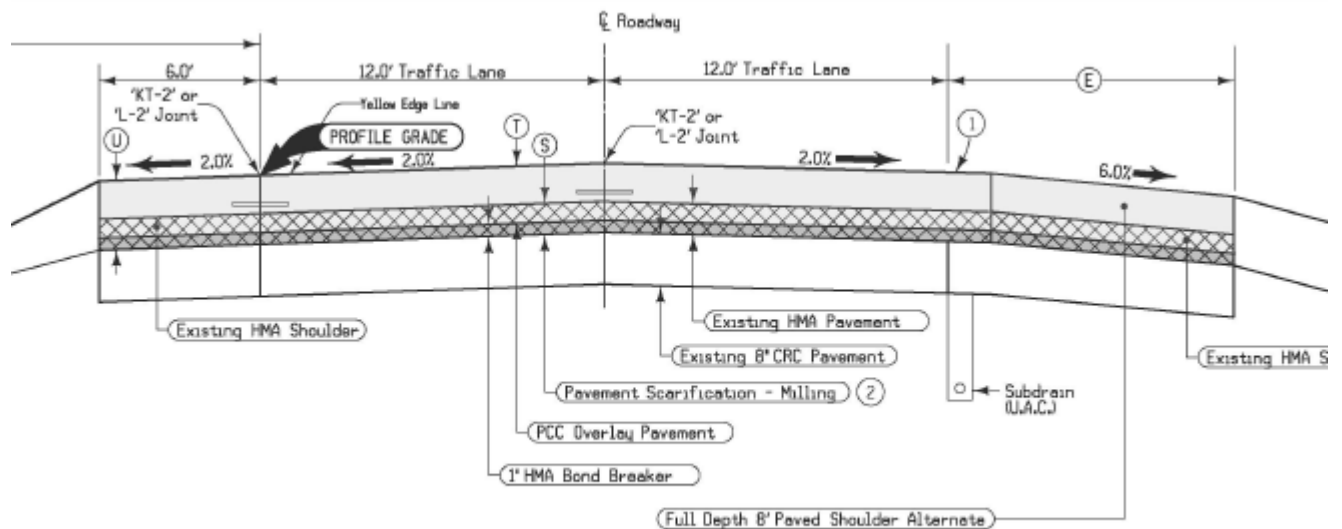
2023 Review

Pavement in very good condition. No issues with cracking.





|                 |  |                     |                                     |
|-----------------|--|---------------------|-------------------------------------|
| <b>Year</b>     | 2009   | <b>Overlay Type</b> | UBOL                                |
| <b>County</b>   | Mills  | <b>Design</b>       | 9" x 26' (8' & 6' HMA Shoulders) CD |
| <b>Route</b>    | I-29   | <b>Milling</b>      | 4-5" Existing HMA removed           |
| <b>Project</b>  | ESIMX-029-2(65)38--1S-65                                     | <b>Interlayer</b>   | 1" New HMA                          |
| <b>Location</b> | 3 miles N. of N. Jct US34<br>N. to Pottawattamie Co.<br>line | <b>Tie Bars</b>     | L-2                                 |



| LOCATION NORTHBOUND LANES |                                      | MW   | M    | S      | T      | U      | E    |
|---------------------------|--------------------------------------|------|------|--------|--------|--------|------|
| ROAD IDENTIFICATION       | STATION TO STATION                   | Feet | Feet | Inches | Inches | Inches | Feet |
| Mills Co.                 | EQN: STA. 865+69.20 = STA. 860+71.80 |      |      |        |        |        |      |
| I-29 NBL                  | 701+31.00 862+65.16                  | 50   | UAC  | 5.0    | 9.0    | 10.0   | 10.0 |
|                           | 863+58.63 944+44.40                  | 50   | UAC  | 5.0    | 9.0    | 10.0   | 10.0 |
| Pott. Co.                 | EQN: STA. 944+44.40 = STA. 00+00.00  |      |      |        |        |        |      |
| I-29 NBL                  | 00+00.00 60+24.60                    | 50   | UAC  | 4.0    | 9.0    | 10.0   | 10.0 |



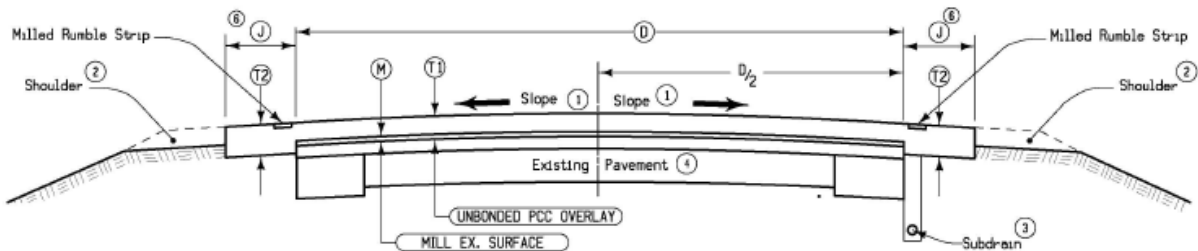
2023 Review

Pavement in very good condition. No issues with cracking.





|                 |                       |                     |                                   |
|-----------------|-----------------------|---------------------|-----------------------------------|
| <b>Year</b>     | 2009                  | <b>Overlay Type</b> | UBOL                              |
| <b>County</b>   | Worth                 | <b>Design</b>       | 5.5"x28' (4.5x4.5x5' long joints) |
| <b>Route</b>    | US 65                 | <b>Milling</b>      | 0.5" Milling – Paved Half Width   |
| <b>Project</b>  | STP-065-9(18)--2C-98  | <b>Interlayer</b>   | Existing HMA                      |
| <b>Location</b> | IA 9 N. to Co. Rd 105 | <b>Tie Bars</b>     | #4 bars 6' @ 30" CTR              |

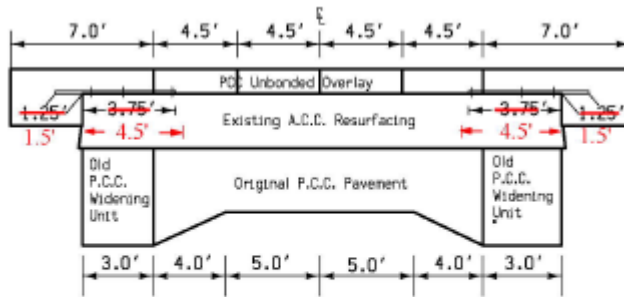
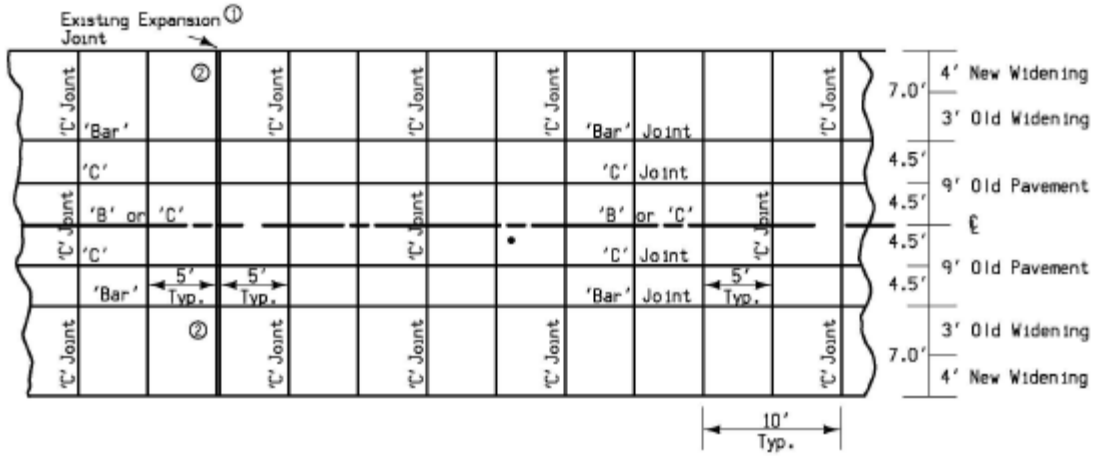


| LOCATION            |                       | M      | T1     | D    | T2     | J    | PCC OVERLAY QMC (Furnish) Cu. Yds. | PCC OVERLAY QMC (Place) Sp. Yds. | REMARKS                                       |
|---------------------|-----------------------|--------|--------|------|--------|------|------------------------------------|----------------------------------|---|
| ROAD IDENTIFICATION | STATION TO STATION    | Inches | Inches | Feet | Inches | Feet |                                    |                                  |   |
| US 65               | 2329+00.05 2331+25.05 | 0.5    | 5.0    | 24   | 8.0    | 4    | 129.2                              | 800.0                            | 225' to BOP                                   |
| US 65               | 2331+25.05 2434+22.00 | 0.5    | 5.0    | 24   | 8.0    | 4    | 4405.1                             | 28137.9                          | BOP to 1st Bridge Approach                    |
| US 65               | 2436+14.00 2447+03.05 | 0.5    | 5.0    | 24   | 8.0    | 4    | 626.0                              | 3872.2                           | End 2nd Bridge Approach to 1st Reconstruction |
| US 65               | 2462+79.00 2575+61.00 | 0.5    | 5.0    | 24   | 8.0    | 4    | 6460.7                             | 40113.8                          | End 1st Reconstruction to Town Section        |
| US 65               | 2575+61.00 2629+28.00 | 2.0    | 5.0    | 24   | 8.0    | 4    | 2482.0                             | 19,082.7                         | Town Section                                  |
| US 65               | 2629+28.00 2667+38.00 | 0.5    | 5.0    | 24   | 8.0    | 4    | 2120.5                             | 13,546.7                         | Town Section to 3rd Bridge Approach           |
| US 65               | 2669+28.00 2767+06.00 | 0.5    | 5.0    | 24   | 8.0    | 4    | 5427.7                             | 34,766.2                         | 4th Bridge Approach to 5th Bridge Approach    |
| US 65               | 2786+82.99 2908+06.00 | 0.5    | 5.0    | 24   | 8.0    | 4    | 6625.8                             | 43,104.0                         | End 2nd Reconstruction to 225' from EOP       |
| US 65               | 2908+06.00 2910+31.00 | 0.5    | 5.0    | 24   | 8.0    | 4    | 129.2                              | 800.0                            | 225' to EOP                                   |
| 370th St.           | Total Area = 2054.5   |        |        |      |        |      | 50.7                               | 228.3                            | Quantity subtracted to get TOTAL              |
| 390th St.           | Total Area = 2051.6   |        |        |      |        |      | 50.7                               | 228.0                            | Quantity subtracted to get TOTAL              |
| 430th St.           | Total Area = 2054.5   |        |        |      |        |      | 50.7                               | 228.3                            | Quantity subtracted to get TOTAL              |
| <b>TOTAL:</b>       |                       |        |        |      |        |      | <b>29,569.0</b>                    | <b>183,448.9</b>                 |   |

Notes:

Modified

- ① Finished slope shall match existing pavement except that the maximum allowable slope is 3.0% minimum allowable slope is 2.0%. Section may be modified as directed by the Engineer through areas of special shaping.  
Refer to tabulation listing of superelevated curves and Standard Road Plans for additional requirements through superelevated curves.
- ② Refer to other drawings for details of shoulder design and construction.
- ③ Refer to Standard Road Plan RF-19C. Subdrain on one side only.
- ④ PCC Pavement with PCC Widening Units and HMA Resurfacing
- ⑤ Quantities include partially paved shoulders based on T2 of 8.5 Inches for irregularities.
- ⑥ See Typical TL-1, TL-2 and 'J' Sheets for locations where ② is omitted for turn lanes.



- Notes:
- ① Extend existing expansion joints in kind in new pavement.
  - ② Place CF joint in overlay.

Construction

Overlay was placed half width at a time.



2013 Review

Areas of cracking and broken panels.



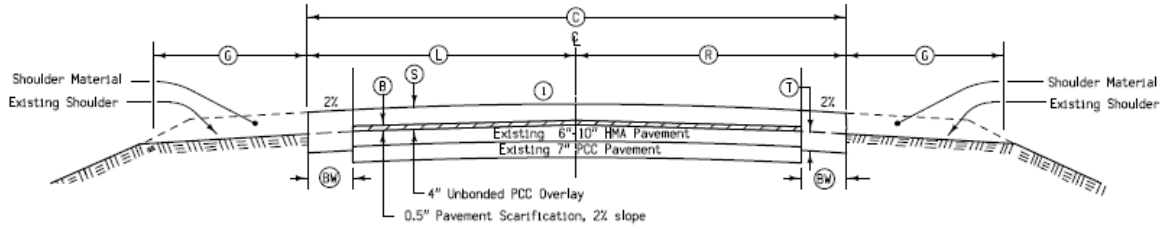
2021 Review

Areas of blowups due to panel movement.



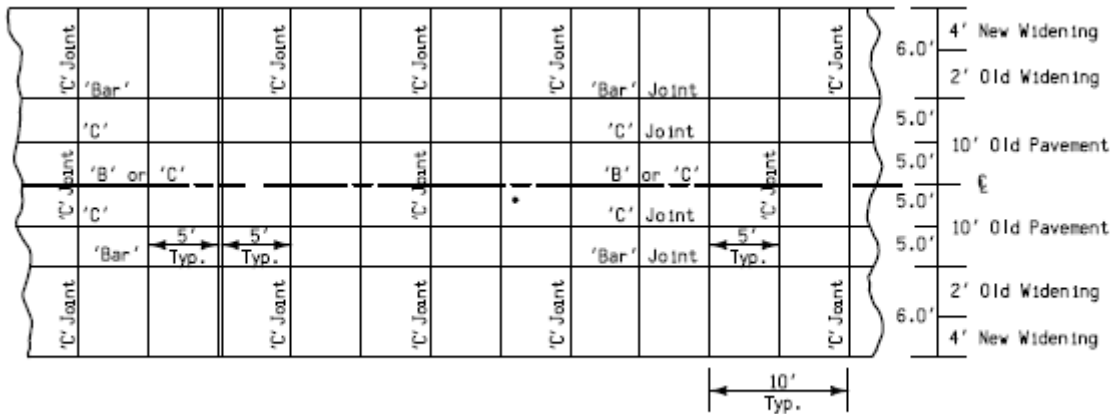
2023 - Patching project let in 2023 with 2536.4 SY of 10-inch full depth patching and 293 patches by count.

|                 |  |                     |   |
|-----------------|--|---------------------|---|
| <b>Year</b>     | 2011                                   | <b>Overlay Type</b> | UBOL  |
| <b>County</b>   | Chickasaw-Fayette                      | <b>Design</b>       | 4" x 32' (4" x 24' & 4' x 8" widening) - Paved half width |
| <b>Route</b>    | US 18                                  | <b>Milling</b>      | 0.5" Milled 2%  |
| <b>Project</b>  | NHSX-018-7(58)--3H-19                  | <b>Interlayer</b>   | Existing HMA  |
| <b>Location</b> | ECL of Fredericksburg E. to West Union | <b>Tie Bars</b>     | #5 bars 6' @ 30" CTR                                      |

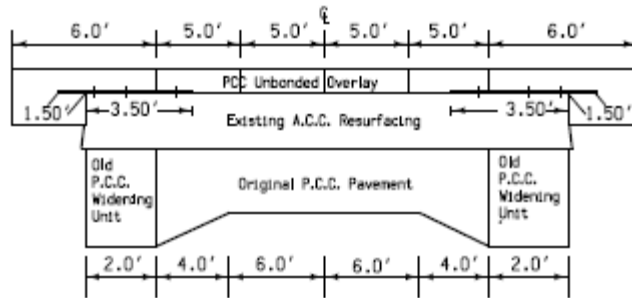


| Location            |                     | Overlay Quantities (2) Per Station |        |      |      |      |          |          |        |      |      | Remarks |                   |
|---------------------|---------------------|------------------------------------|--------|------|------|------|----------|----------|--------|------|------|---------|-------------------|
| Road Identification | Station To Station  | S                                  | B      | C    | L    | H    | Class 13 |          | T      | BW   | G    |         | Granular Shoulder |
|                     |                     | Inches                             | Inches | Feet | Feet | Feet | Du. Yds. | Du. Yds. | Inches | Feet | Feet | Tons    |                   |
| US 18               | 346+55.4 - 416+37   | 4                                  | 0.5    | 32   | 16   | 16   | 12.35    |          | 49.38  | 4    | 4    | 6       | 33.97             |
| US 18               | 420+08 - 78+66.0*   | 4                                  | 0.5    | 32   | 16   | 16   | 12.35    |          | 49.38  | 4    | 4    | 6       | 33.97             |
| US 18               | 82+74 - 99+92.9     | 4                                  | 0.5    | 32   | 16   | 16   | 12.35    |          | 49.38  | 4    | 4    | 6       | 33.97             |
| US 18               | 99+42.9 - 100+42.9  | Vari                               | 0.5    | 32   | 16   | 16   | 12.35    |          | 54.32  | 4    | 4    | 6       | 35.87             |
| US 18               | 100+42.9 - 108+68.8 | 5                                  | 0.5    | 32   | 16   | 16   | 12.35    |          | 59.28  | 4    | 4    | 6       | 37.77             |
| US 18               | 108+68.8 - 109+18.8 | Vari                               | 0.5    | 32   | 16   | 16   | 12.35    |          | 54.32  | 4    | 4    | 6       | 35.87             |
| US 18               | 109+18.8 - 340+33   | 4                                  | 0.5    | 32   | 16   | 16   | 12.35    |          | 49.38  | 4    | 4    | 6       | 33.97             |
| US 18               | 346+82 - 701+87.27  | 4                                  | 0.0    | 32   | 16   | 16   | 12.35    |          | 49.38  | 4    | 4    | 6       | 33.97             |

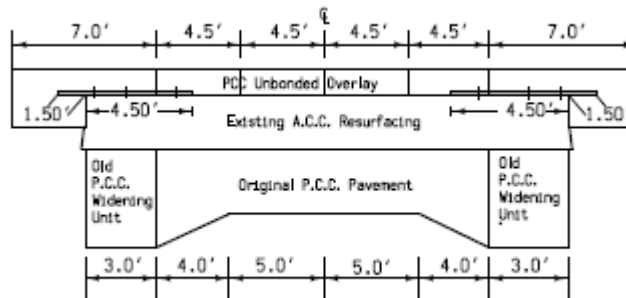
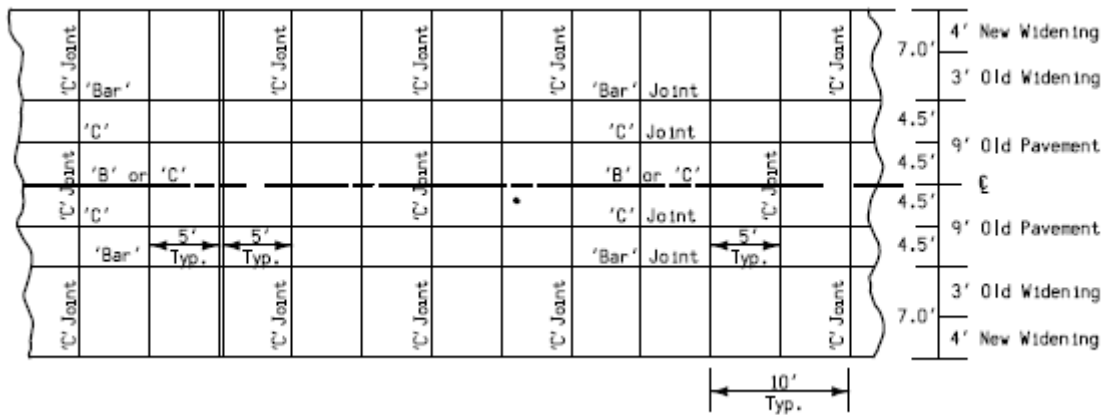
Sta. 346 to W-14







W-14 to EOP



Construction

Placed half width other lane open to traffic. Used a modified drop off.





2017 Cracking



2021 Review

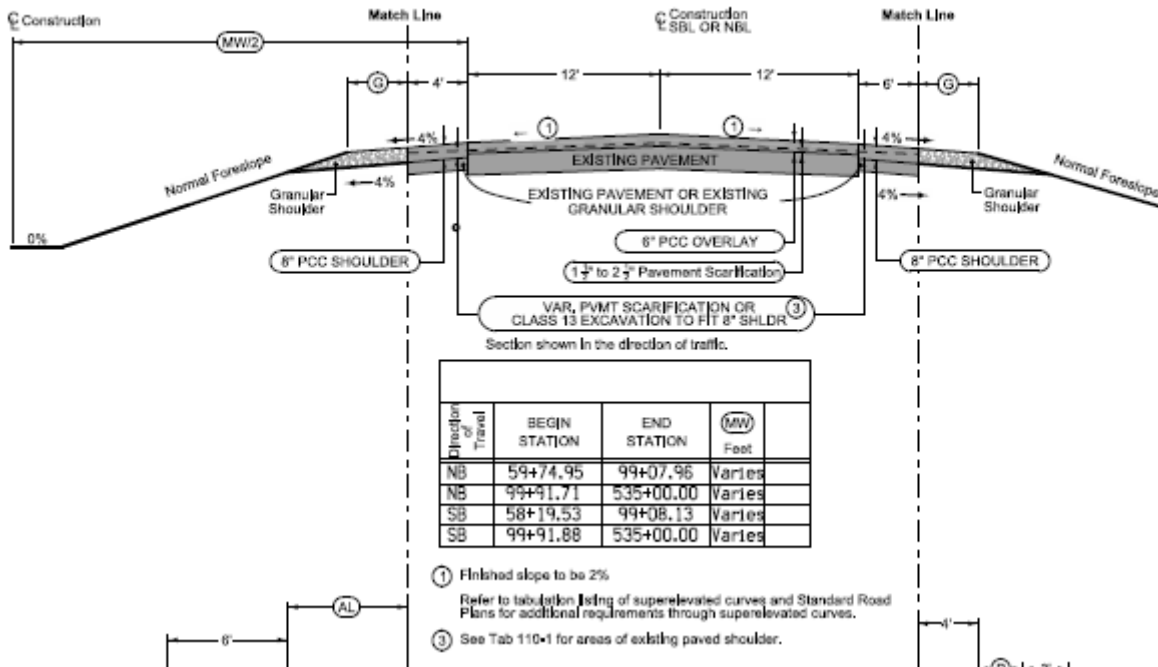




2023

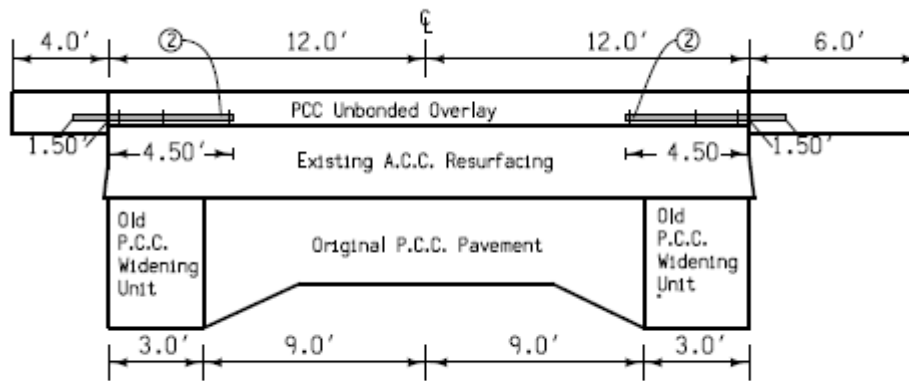
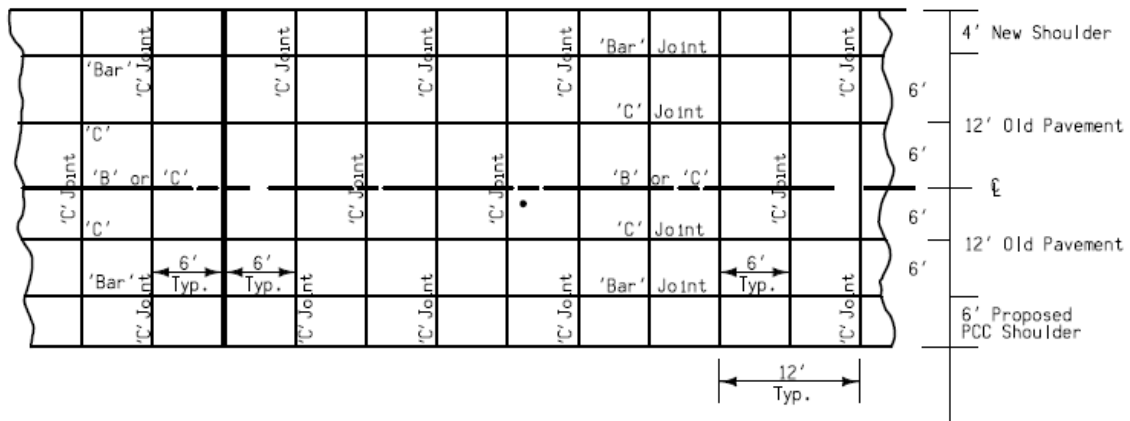
A patching project was let in 2023 with 10,221.09 SY of full depth patching by area and 1680 SY of full depth patches by count. The vast majority of patches were only the 4.5-inch overlay, with a few areas of 10 inch and 17-inch full depth.

|                 |                           |                     |   |
|-----------------|---------------------------|---------------------|---|
| <b>Year</b>     | 2012                      | <b>Overlay Type</b> | WT & UBOL   |
| <b>County</b>   | Clay                      | <b>Design</b>       | 6" x 24' (6' outside, 4' inside 8" PCC Shoulders) |
| <b>Route</b>    | US 71 SB                  | <b>Milling</b>      | 1 1/2 to 2 1/2" Milling                           |
| <b>Project</b>  | NHSX-071-8(55)--3H-21     | <b>Interlayer</b>   | Existing HMA                                      |
| <b>Location</b> | US 18 N to SCL of Milford | <b>Tie Bars</b>     | #5 x 6' @30" CTR - UBOL<br>#5 x 3' @30" CTR - WT  |

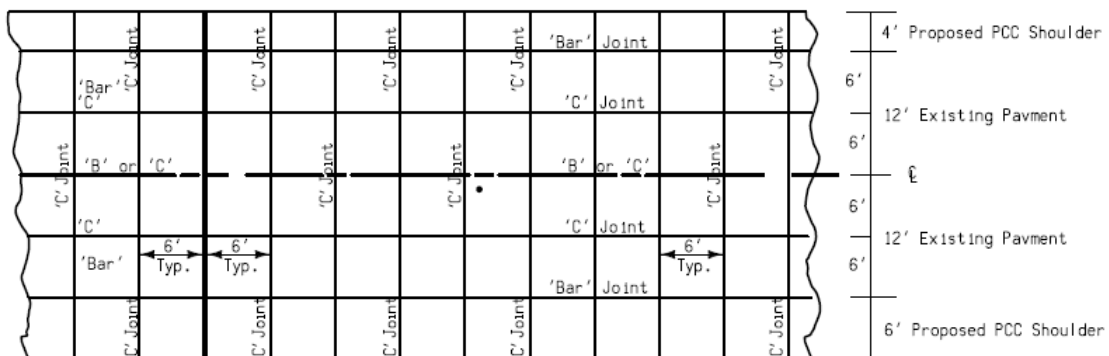


| Milepost      | Direction | Existing Pavement Type |
|---------------|-----------|------------------------|
| 207.92-212.88 | NB        | Composite              |
| 212.88-217.37 | NB        | HMA                    |
| 207.92-212.88 | SB        | HMA                    |
| 212.88-214.55 | SB        | Composite              |
| 214.55-215.33 | SB        | HMA                    |
| 215.33-216.08 | SB        | Composite              |
| 216.08-217.37 | SB        | HMA                    |

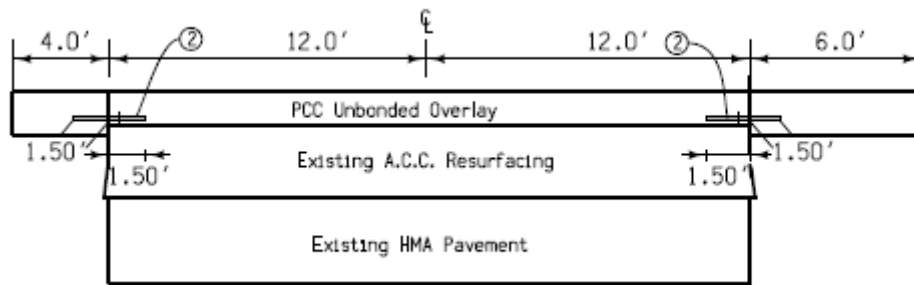
Over existing composite pavement



Over existing HMA pavement







Construction



2021 Review

UBOL sections - Longitudinal cracking off end of reinforcing in the outside wheel path. Shoulder heaving. Whitetopping overlay sections in very good condition.





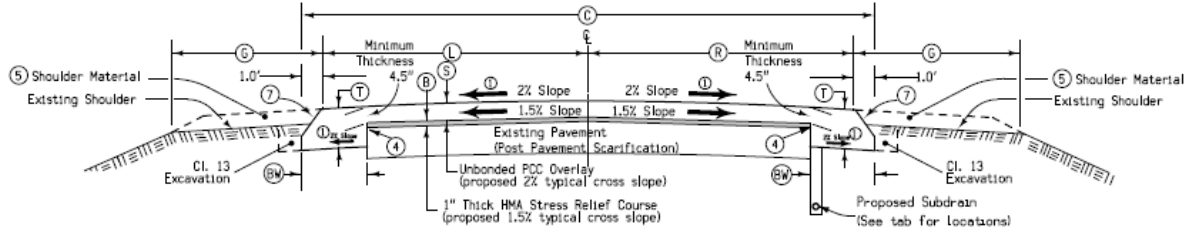
Shoulder cross slope 3.3%, Design 4%.



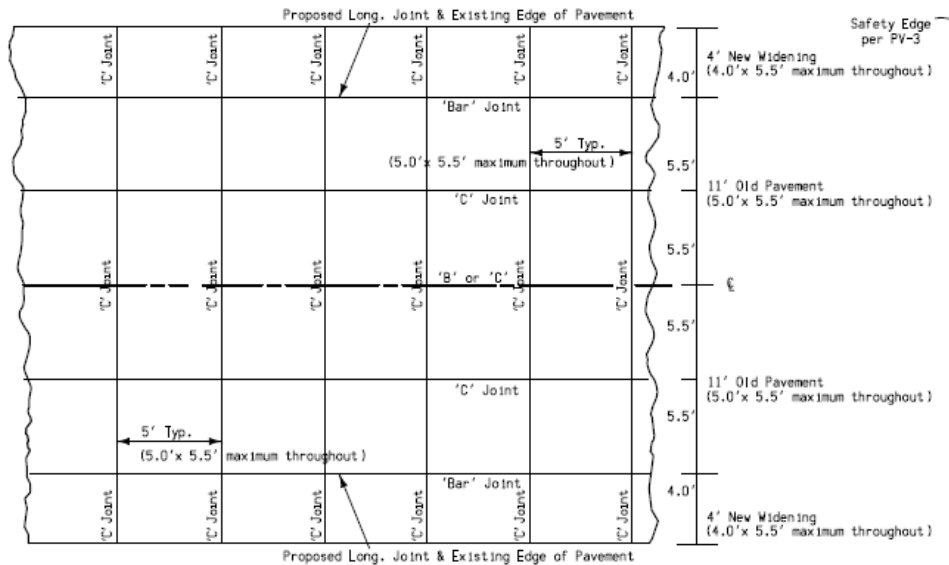


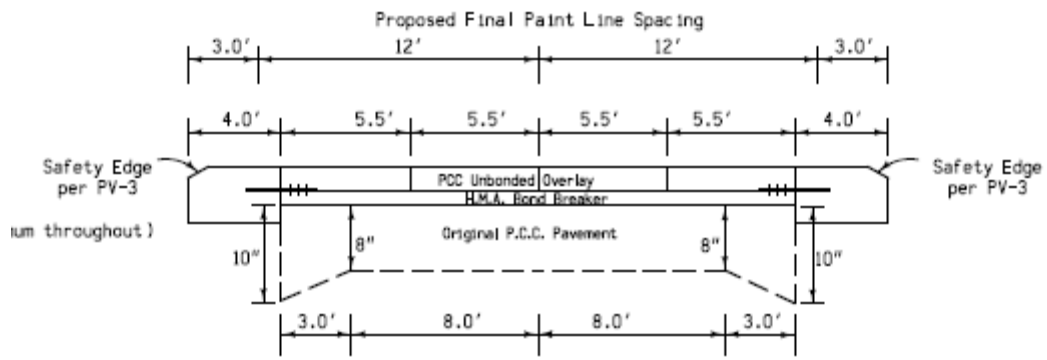
Whitetopping section

|                 |                                      |                     |  |
|-----------------|--------------------------------------|---------------------|--|
| <b>Year</b>     | 2013                                 | <b>Overlay Type</b> | UBOL   |
| <b>County</b>   | Grundy                               | <b>Design</b>       | 4.5" x 30' with safety edge; 5.5' x 5.5'- x 4' long joints |
| <b>Route</b>    | IA 14                                | <b>Milling</b>      | 1" HMA   |
| <b>Project</b>  | STP-014-6(31)--2C-38                 | <b>Interlayer</b>   | Existing & New HMA   |
| <b>Location</b> | From 0.5 miles S of US 20 N to IA 57 | <b>Tie Bars</b>     | #5 bars 3' @ 30" CTR                                       |



| Location |                    | Overlay Quantities (Per Location) |        |      |       |       |                   |       |               |             |             |        | Remarks |      |                               |
|----------|--------------------|-----------------------------------|--------|------|-------|-------|-------------------|-------|---------------|-------------|-------------|--------|---------|------|-------------------------------|
| Road     | Station To Station | B                                 | S      | C    | L     | R     | Tack Coat         |       | Stress Relief | PCC Overlay | PCC Overlay | T      |         | BW   | C                             |
|          |                    | Inches                            | Inches | Feet | Feet  | Feet  | Class 13 Cu. Yds. | Gal.  | Sq. Yds.      | Cu. Yds.    | Sq. Yds.    | Inches |         | Feet | Feet                          |
| IA 14    | 382+75             | 384+00                            |        |      |       |       |                   |       |               |             |             |        |         |      | See Typical HMA1 on sheet B.2 |
| IA 14    | 384+00             | 386+30                            | 1      | 4.5  | 48    | Vari. | 24                | 51    | 1,022         | 178.0       | 1,228.7     | 4.5    | 4       | 5    |                               |
| IA 14    | 386+30             | 392+00                            | 1      | 4.5  | 48-34 | Vari. | 60                | 101   | 2,027         | 377.8       | 2,533.3     | 4.5    | 4       | 5    |                               |
| IA 14    | 392+00             | 450+00                            | 1      | 4.5  | 30    | 14    | 609               | 709   | 14,178        | 3,038.8     | 19,333.3    | 4.5    | 4       | 5    |                               |
| IA 14    | 450+00             | 500+00                            | 1      | 4.5  | 30    | 14    | 325               | 611   | 12,222        | 2,619.7     | 16,868.7    | 4.5    | 4       | 5    |                               |
| IA 14    | 500+00             | 578+50                            | 1      | 4.5  | 30    | 14    | 802               | 988   | 19,762        | 4,137.6     | 26,548.9    | 4.5    | 4       | 5    | (6)                           |
| IA 14    | 578+50             | 588+50                            | 1      | 4.5  | 30    | 14    | 11                | 12    | 244           | 52.4        | 333.3       | 4.5    | 4       | 5    |                               |
| IA 14    | 588+50             | 638+00                            | 1      | 4.5  | 30    | 14    | 501               | 630   | 12,591        | 2,614.6     | 16,827.1    | 4.5    | 4       | 5    | (6)                           |
| IA 14    | 638+00             | 639+00                            | 1      | 4.5  | 30    | 14    | 11                | 12    | 244           | 52.4        | 333.3       | 4.5    | 4       | 5    |                               |
| IA 14    | 639+00             | 666+50                            | 1      | 4.5  | 30    | 14    | 289               | 336   | 6,722         | 1,440.8     | 9,168.7     | 4.5    | 4       | 5    |                               |
| IA 14    | 666+50             | 696+00                            | 1      | 4.5  | 30    | 14    | 310               | 361   | 7,211         | 1,545.6     | 9,833.3     | 4.5    | 4       | 5    |                               |
| IA 14    | 696+00             | 746+00                            | 1      | 4.5  | 30    | 14    | 525               | 611   | 12,222        | 2,619.7     | 16,868.7    | 4.5    | 4       | 5    |                               |
|          |                    |                                   |        |      |       |       | 3,667             | 4,422 | 88,446        | 18,677.4    | 119,469.3   |        |         |      |                               |
| IA 14    | 746+00             | 747+50                            |        |      |       |       |                   |       |               |             |             |        |         |      | See Typical HMA1 on sheet B.2 |





### Construction

Tie steel was glued down with epoxy.





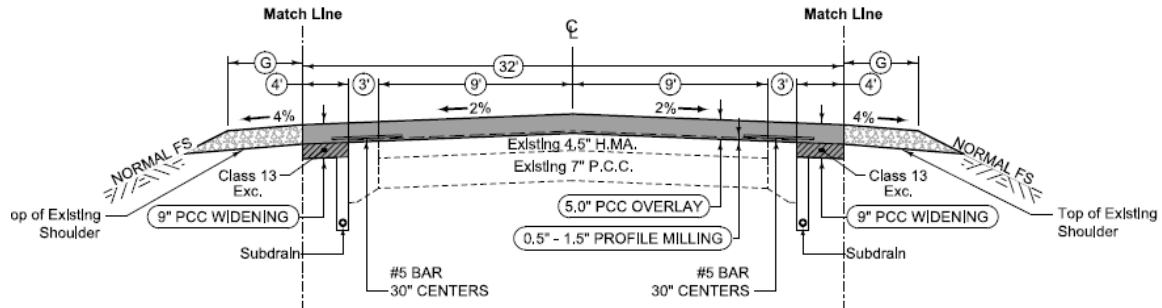


2021 Review

A few broken panels in wheel paths. Some of these areas have been patched.

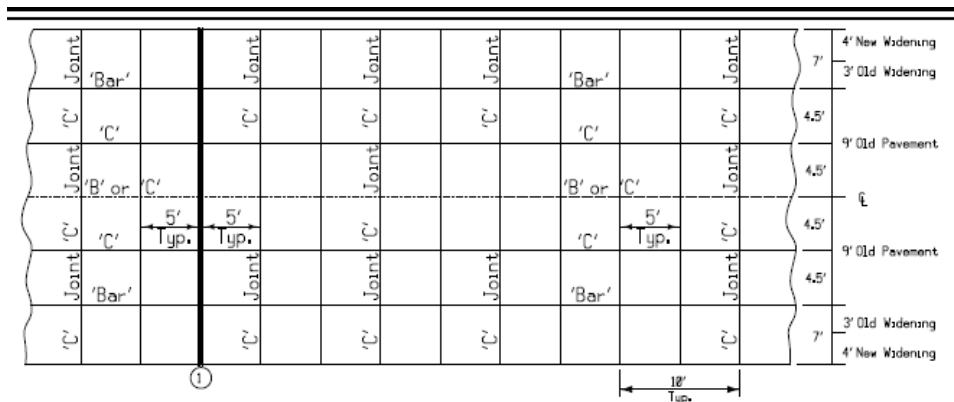


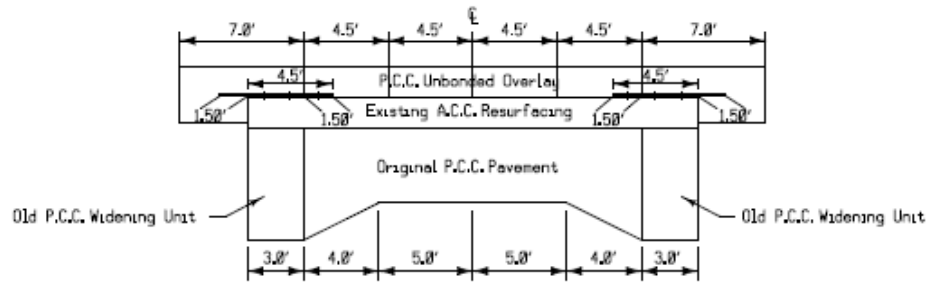
|                 |                               |                     |  |
|-----------------|-------------------------------|---------------------|--|
| <b>Year</b>     | 2013                          | <b>Overlay Type</b> | UBOL   |
| <b>County</b>   | Fayette                       | <b>Design</b>       | 5' x 32' (4.5 x 5' panels 24' wide & 4' x 9.5" widening) |
| <b>Route</b>    | IA 3                          | <b>Milling</b>      | 1 1/2" Milling   |
| <b>Project</b>  | NHSX-003-7 (29)--3H-33        | <b>Interlayer</b>   | Existing HMA   |
| <b>Location</b> | County Line to NCL of Oelwein | <b>Tie Bars</b>     | #5 bars 6' @ 30" CTR                                     |



| 3R_Overlay_<br>MODIFIED |            |
|-------------------------|------------|
| STATION TO STATION      |            |
| 677+22.20               | 785+50.50  |
| 791+45.50               | 1002+44.54 |
| 1007+77.46              | 1124+00.00 |
|                         |            |

Longitudinal joint: See B.6 for Jointing Details  
 Transverse joint: See B.6 for Jointing Details





## Construction

During milling operations, the mill removed HMA on the outside edge of the pavement in areas. Fabric interlayer was used to cover the exposed PCC pavement.





2017 – Cracking at 4 ft from edge. Location of old edge of widened pavement.

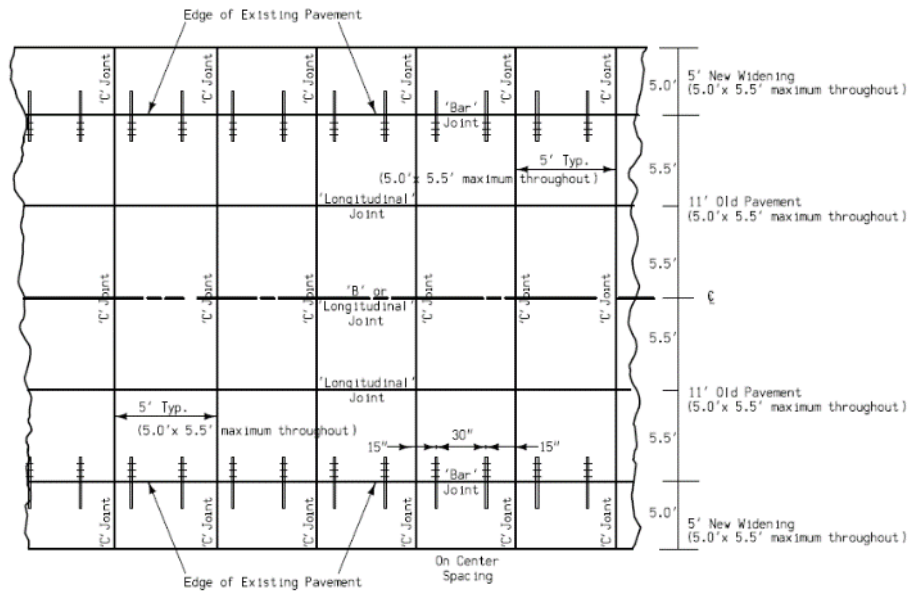
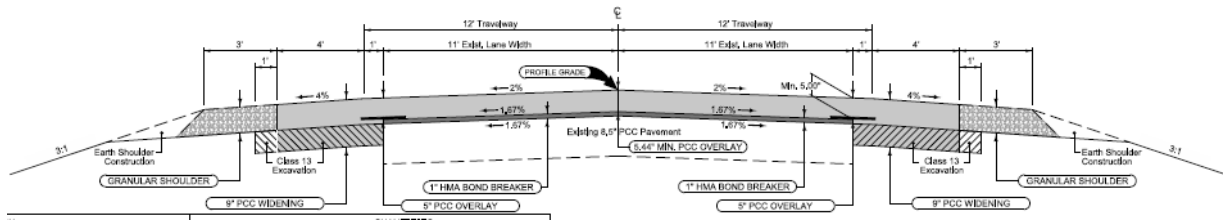


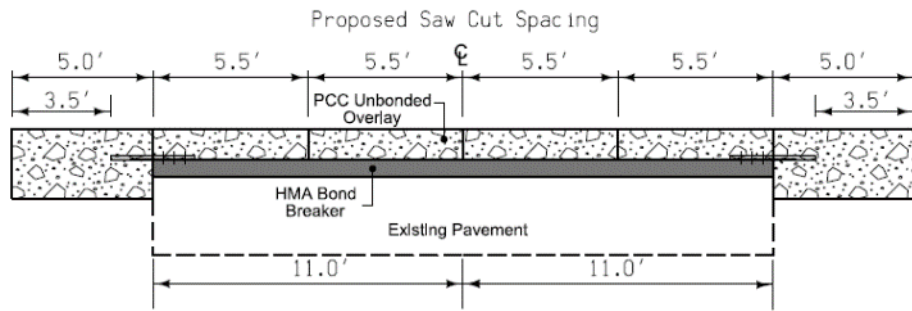
2021 Review

Cracking along paint line. Some patching.



|                 |                            |                     |  |
|-----------------|----------------------------|---------------------|--|
| <b>Year</b>     | 2013                       | <b>Overlay Type</b> | UBOL                                   |
| <b>County</b>   | Lucas                      | <b>Design</b>       | 5" x 32' (5" x 22' & 5" x 9" widening) |
| <b>Route</b>    | US 65                      | <b>Milling</b>      | 1954 8.5" PC8                          |
| <b>Project</b>  | NHSX-065-2(20)--3H-59      | <b>Interlayer</b>   | 1" HMA Bond Breaker                    |
| <b>Location</b> | Wayne Co. Line N. to US 34 | <b>Tie Bars</b>     | #5 bars 36" @ 30" CTR                  |





Construction







## 2023 Review

Several areas with patches. Patches were full lane width, with no midpanel longitudinal joint. Several areas with outside wheel path cracking. Shoulder cross slope was 1.0 to 1.5%. Fairly long areas in good condition as well.

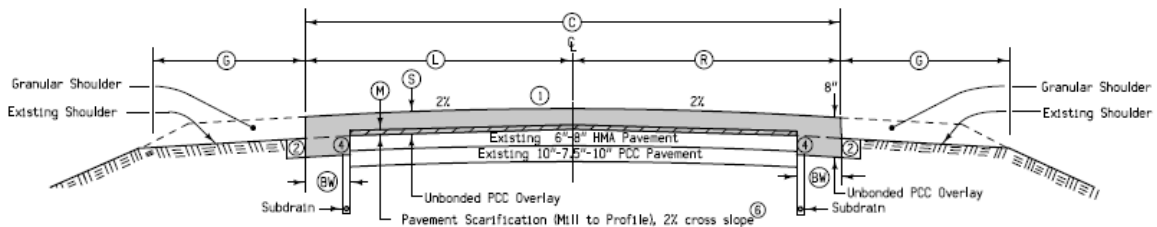




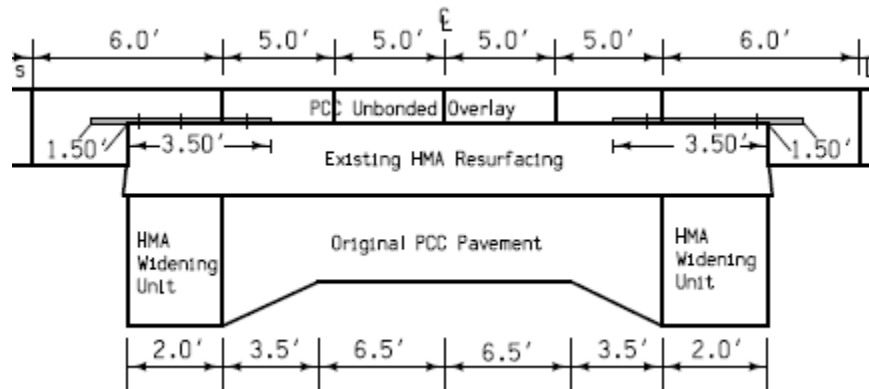
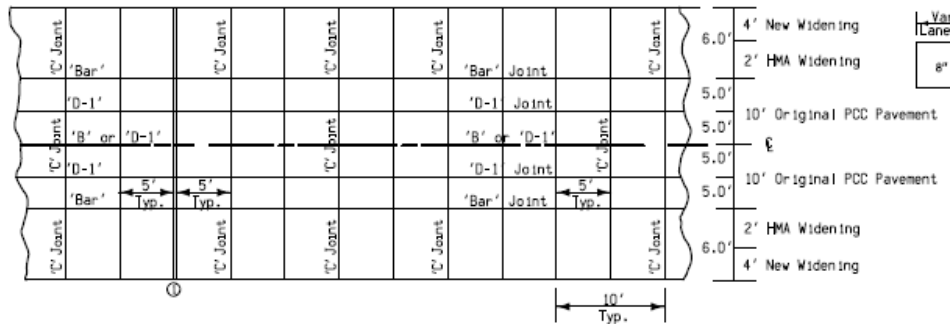


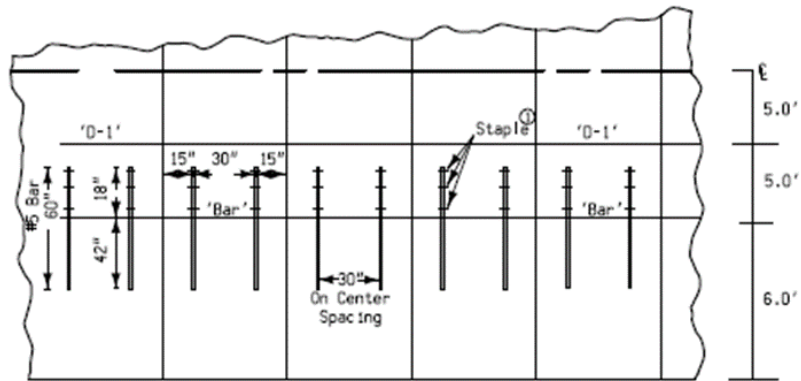


|                 |                                |                     |  |
|-----------------|--------------------------------|---------------------|--|
| <b>Year</b>     | 2014                           | <b>Overlay Type</b> | UBOL                                   |
| <b>County</b>   | Kossuth                        | <b>Design</b>       | 5" x 32' (5" x 24' & 4' x 8" widening) |
| <b>Route</b>    | US 169                         | <b>Milling</b>      | Profile to 2% cross slope, 1"          |
| <b>Project</b>  | NHSX-169-8(59)--3H-55          | <b>Interlayer</b>   | Existing HMA                           |
| <b>Location</b> | IA 9 N to Minnesota State Line | <b>Tie Bars</b>     | #5 bars 5' @ 30" CTR                   |



| Location            |                     | (S)    | (M)    | (C)  | (L)  | (R)  | Overlay Quantities                |                               |                                 | Per Station                    |      | (BW) | (G)                       | Remarks |
|---------------------|---------------------|--------|--------|------|------|------|-----------------------------------|-------------------------------|---------------------------------|--------------------------------|------|------|---------------------------|---------|
| Road Identification | Station To Station  | Inches | Inches | Feet | Feet | Feet | Class 13, (2) Excavation Cu. Yds. | Unbonded PCC Overlay Sq. Yds. | Unbonded PCC Furnished Cu. Yds. | Scarification Overlay Sq. Yds. | Feet | Feet |                           |         |
| US 169              | 4400.0 - 344+65.0   | 5      | VAR.   | 32   | 16   | 16   | 9.3                               | 355.6                         | 56.8                            | 266.7                          | 4    | 2    |                           |         |
| US 169              | 349+90.0 - 410+94.6 | 5      | VAR.   | 32   | 16   | 16   | 9.3                               | 355.6                         | 56.8                            | 266.7                          | 4    | 2    |                           |         |
| US 169              | 410+94.6 - 411+74.6 | 5      | VAR.   | 32   | 16   | 16   | 9.3                               | 355.6                         | 56.8                            | 266.7                          | 4    | 2    | SUPERELEVATION TRANSITION |         |
| US 169              | 411+74.6 - 415+05.0 | 5      | VAR.   | 32   | 16   | 16   | 9.3                               | 355.6                         | 56.8                            | 266.7                          | 4    | 2    | SUPERELEVATED             |         |





Construction











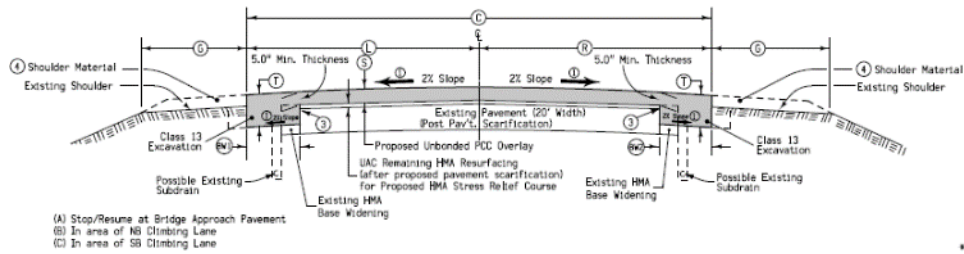
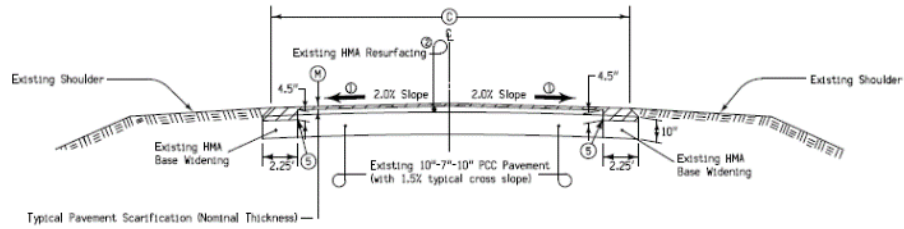
2023 Review

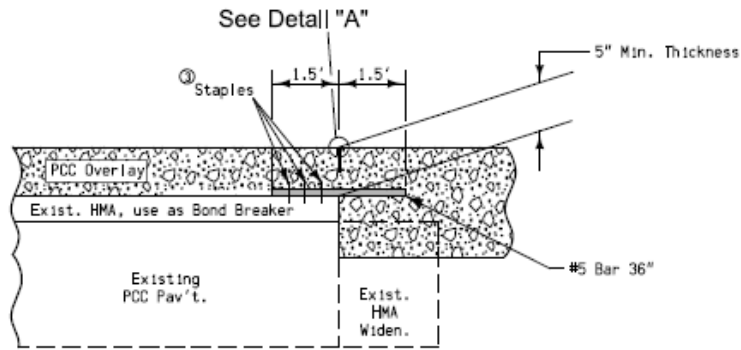
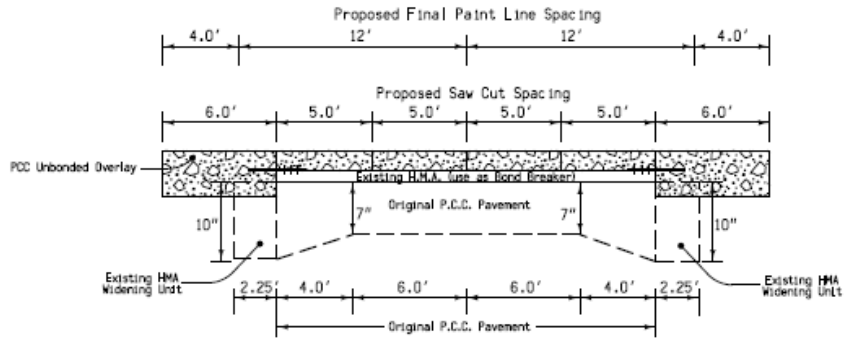
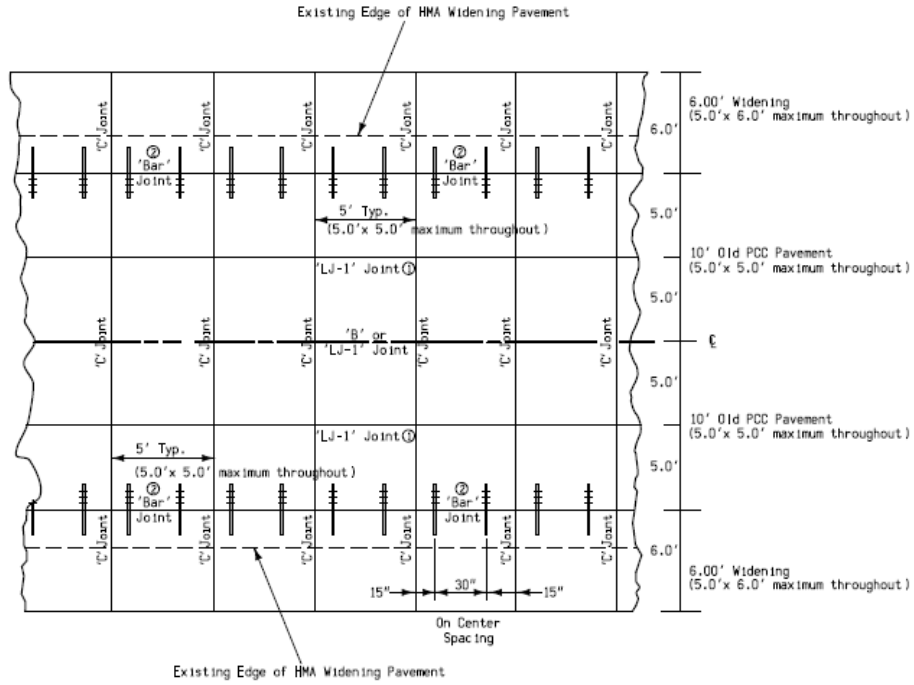
Areas of broken panels with Durapatch.





|                 |                                   |                     |   |
|-----------------|-----------------------------------|---------------------|---|
| <b>Year</b>     | 2014                              | <b>Overlay Type</b> | UBOL  |
| <b>County</b>   | Poweshiek                         | <b>Design</b>       | 5" x 32' (5" x 20' & 6" x 9.5" widening) 5 x 5 x 6' long joints |
| <b>Route</b>    | US 63                             | <b>Milling</b>      | 0.5 to 1.5"   |
| <b>Project</b>  | NHSN-063-4(39)--2R-79             | <b>Interlayer</b>   | Existing HMA  |
| <b>Location</b> | Montezuma N to Just south of I-80 | <b>Tie Bars</b>     | #5 bars 36" @ 30" CTR   |





'BAR' JOINT  
DETAIL "B"

## Construction 2014

HMA was thin in some areas. 1482 tons of HMA added for stress relief layer. Issues with center line rumble strip blowing out joints.











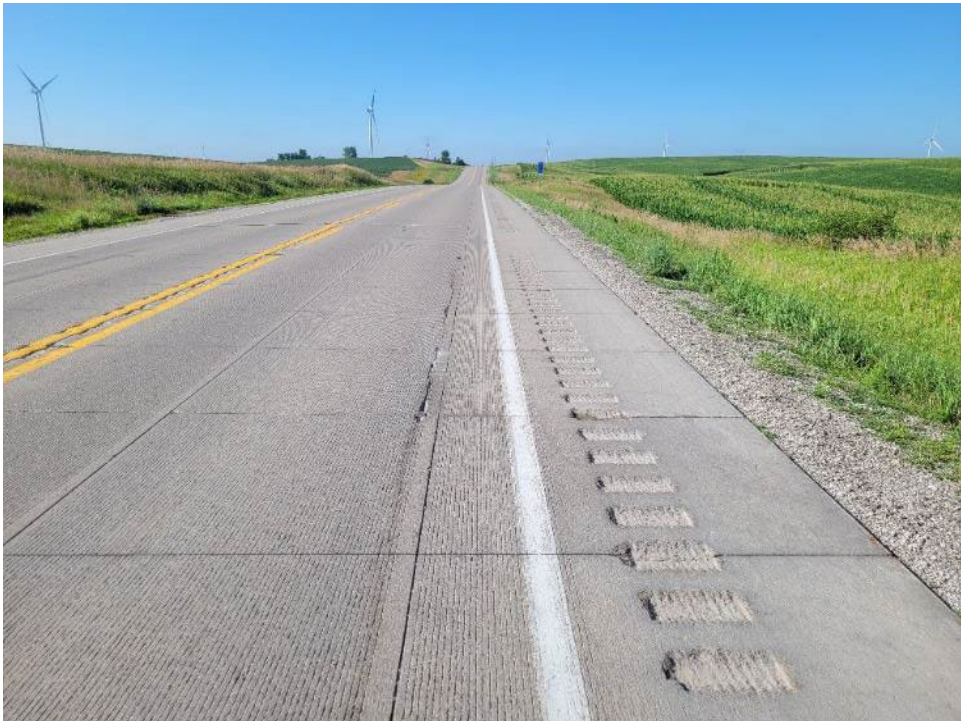






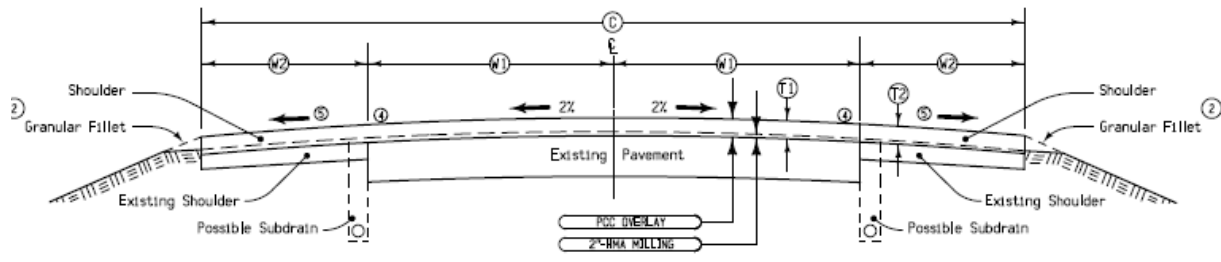
2023 Review

Lots of areas with longitudinal cracking. Some areas with broken panels.





|                 |                         |                     |  |
|-----------------|-------------------------|---------------------|--|
| <b>Year</b>     | 2014                    | <b>Overlay Type</b> | UBOL   |
| <b>County</b>   | Cherokee                | <b>Design</b>       | 6" 12x12 & 6x6 Panels – 10 ft. shoulders. 44 ft. Total |
| <b>Route</b>    | IA 3                    | <b>Milling</b>      | 2" Milling   |
| <b>Project</b>  | NHSX-059-7(46)--3H-18   | <b>Interlayer</b>   | Existing HMA   |
| <b>Location</b> | IDA Co. Line N. to IA 3 | <b>Tie Bars</b>     | #4 bars 6' @ 30" CTR                                   |

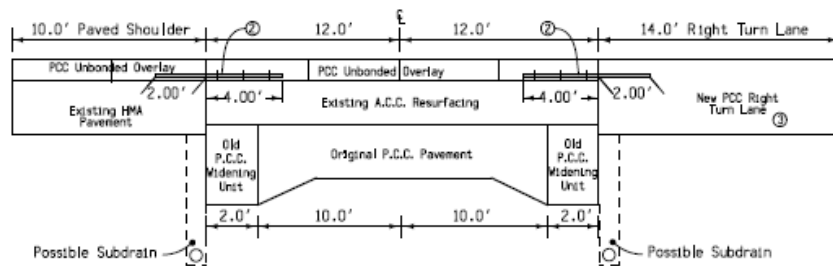
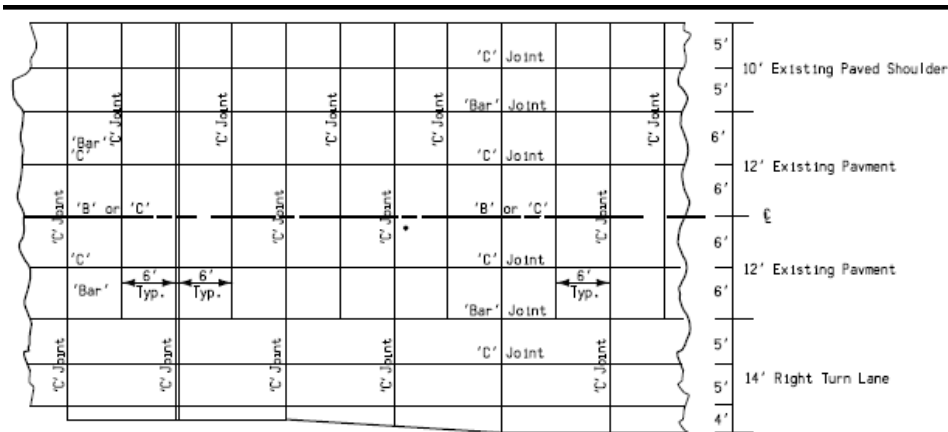


| TABLE OF DESIGN QUANTITIES |            |           |      |        |      |     |     |                         |                         | Per Station |                      | REMARKS |
|----------------------------|------------|-----------|------|--------|------|-----|-----|-------------------------|-------------------------|-------------|----------------------|---------|
| ROAD IDENTIFICATION        | LOCATION   |           | SIDE | W1     | W2   | T1  | T2  | PCC OVERLAY, GPC (FLAC) | PCC OVERLAY, GPC FINISH | MILLING     |                      |         |
|                            | STATION TO | STATION   |      |        |      |     |     |                         |                         |             | Feet                 |         |
| US 59                      | 810+00     | 810+63.40 | Rt.  | 12.0   | 10.0 | 6.0 | 6.0 | 244.44                  | 40.74                   | 26.58       | Ida County Line      |         |
| US 59                      | 0+00       | 266+00.63 | Rt.  | 12.0   | 10.0 | 6.0 | 6.0 | 244.44                  | 40.74                   | 26.58       |                      |         |
| US 59                      | 266+00.63  | 269+72.45 | Rt.  | 12.0   | --   | 6.0 | --  | 133.33                  | 22.22                   | 26.58       | D63                  |         |
| US 59                      | 270+00.60  | 270+88.24 | Rt.  | 12.0   | --   | 6.0 | --  | 133.33                  | 22.22                   | 26.58       | D63                  |         |
| US 59                      | 270+88.24  | 566+37.80 | Rt.  | 12.0   | 10.0 | 6.0 | 6.0 | 244.44                  | 40.74                   | 26.58       | RR Guardrail         |         |
| US 59                      | 566+37.80  | 566+98.83 | Rt.  | 12.0   | --   | 6.0 | --  | 133.33                  | 22.22                   | 26.58       | RR Guardrail         |         |
| US 59                      | 571+15.17  | 571+27.34 | Rt.  | 12.0   | --   | 6.0 | --  | 133.33                  | 22.22                   | 26.58       | RR Guardrail         |         |
| US 59                      | 571+27.34  | 581+89.61 | Rt.  | 12.0   | 10.0 | 6.0 | 6.0 | 244.44                  | 40.74                   | 26.58       | RR Guardrail         |         |
| US 59                      | 581+89.61  | 586+51.50 | Rt.  | 12.0   | --   | 6.0 | --  | 133.33                  | 22.22                   | 26.58       | Washburn St. (S)     |         |
| US 59                      | 586+51.50  | 595+35.61 | Rt.  | 12.0   | 10.0 | 6.0 | 6.0 | 244.44                  | 40.74                   | 26.58       |                      |         |
| US 59                      | 595+35.61  | 597+11.61 | Rt.  | 12.0   | --   | 6.0 | --  | 133.33                  | 22.22                   | 26.58       | Washburn St. (N)     |         |
| US 59                      | 597+11.61  | 635+82.20 | Rt.  | 12.0   | 10.0 | 6.0 | 6.0 | 244.44                  | 40.74                   | 26.58       | Spring Rd HMA Ent.   |         |
| US 59                      | 635+82.20  | 639+47.20 | Rt.  | 12.0   | --   | 6.0 | --  | 133.33                  | 22.22                   | 26.58       | Linden St.           |         |
| US 59                      | 259+24     | 267+53    | Rt-C | 0-24.0 | --   | 6.0 | --  | 107.12                  | 17.85                   | 34.95       | US 59 & IA 31 Inter. |         |
| US 59                      | 267+53     | 269+72.45 | Rt-C | 24.0   | --   | 6.0 | --  | 266.58                  | 44.43                   | 86.97       | US 59 & IA 31 Inter. |         |
| US 59                      | 270+00.60  | 270+88    | Lt-C | 24.0   | --   | 6.0 | --  | 267.73                  | 44.62                   | 87.35       | US 59 & IA 31 Inter. |         |
| US 59                      | 270+88     | 281+37    | Lt-C | 24.0-0 | --   | 6.0 | --  | 133.27                  | 22.21                   | 43.48       | US 59 & IA 31 Inter. |         |
| US 59                      | 810+00     | 810+63.40 | Lt.  | 12.0   | 10.0 | 6.0 | 6.0 | 244.44                  | 40.74                   | 26.58       | Ida County Line      |         |
| US 59                      | 0+00       | 52+00     | Lt.  | 12.0   | 10.0 | 6.0 | 6.0 | 244.44                  | 40.74                   | 26.58       |                      |         |
| US 59                      | 52+00      | 56+47     | Lt.  | 12.0   | --   | 6.0 | --  | 133.33                  | 22.22                   | 26.58       | D66                  |         |
| US 59                      | 56+47      | 268+85.88 | Lt.  | 12.0   | 10.0 | 6.0 | 6.0 | 244.44                  | 40.74                   | 26.58       |                      |         |
| US 59                      | 268+85.88  | 269+72.45 | Lt.  | 12.0   | --   | 6.0 | --  | 133.33                  | 22.22                   | 26.58       | IA 31                |         |
| US 59                      | 270+00.60  | 277+61.73 | Lt.  | 12.0   | --   | 6.0 | --  | 133.33                  | 22.22                   | 26.58       | IA 31                |         |
| US 59                      | 277+61.73  | 426+36.49 | Lt.  | 12.0   | 10.0 | 6.0 | 6.0 | 244.44                  | 40.74                   | 26.58       |                      |         |
| US 59                      | 426+36.49  | 430+92.66 | Lt.  | 12.0   | --   | 6.0 | --  | 133.33                  | 22.22                   | 26.58       | C44                  |         |
| US 59                      | 430+92.66  | 566+86.66 | Lt.  | 12.0   | 10.0 | 6.0 | 6.0 | 244.44                  | 40.74                   | 26.58       | RR Guardrail         |         |
| US 59                      | 566+86.66  | 566+98.83 | Lt.  | 12.0   | --   | 6.0 | --  | 133.33                  | 22.22                   | 26.58       | RR Guardrail         |         |
| US 59                      | 571+15.17  | 571+27.34 | Lt.  | 12.0   | --   | 6.0 | --  | 133.33                  | 22.22                   | 26.58       | RR Guardrail         |         |
| US 59                      | 571+27.34  | 632+87.20 | Lt.  | 12.0   | 10.0 | 6.0 | 6.0 | 244.44                  | 40.74                   | 26.58       | RR Guardrail         |         |
| US 59                      | 632+87.20  | 639+47.20 | Lt.  | 12.0   | --   | 6.0 | --  | 133.33                  | 22.22                   | 26.58       | Linden Street        |         |

Notes:

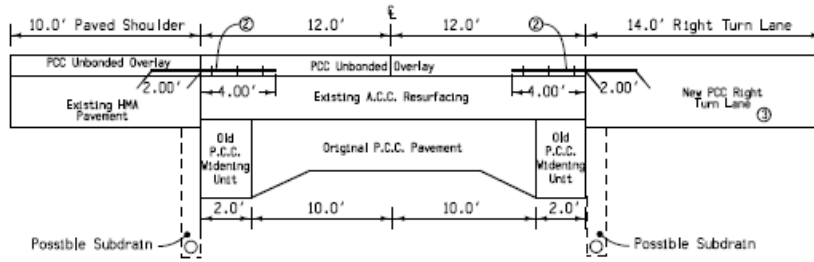
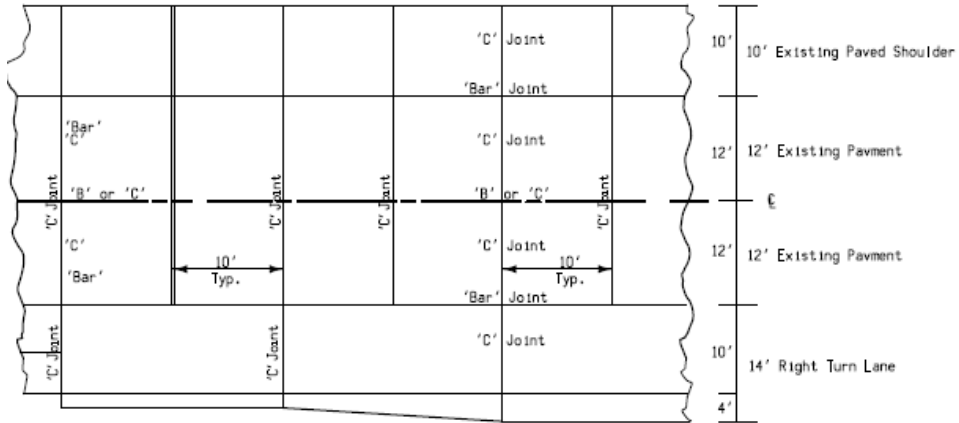
- ⑩ Sta. 810+00 to Sta. 426+36.49  
Longitudinal joints shall be located at centerline, 6.0-ft Lt. and Rt. of centerline, 12.0-ft Lt. and Rt. of centerline, and 17.0-ft Lt. and Rt. of centerline. A modified "L-1" (ML-1) joint shall be located at 12.0-ft Lt. and Rt. of centerline with a 6-ft. long reinforcing bar. Transverse joints shall be located at 6.0-ft. spacings. See "EX-JNT A" on Sheet B.4.
- ⑪ Sta. 426+36.49 to Sta. 639+47.20  
Longitudinal joints shall be located at centerline, 12-ft Lt. and Rt. of centerline, A modified "L-1" (ML-1) joint shall be located at 12.0-ft Lt. and Rt. of centerline with a 6-ft. long reinforcing bar. Transverse joints shall be located at 10.0-ft. spacings. See "EX-JNT B" on Sheet B.4.
- ② Shoulder material as specified elsewhere in these plans; refer to typical 7145 on Sheet B.3.
- ③ Quantity is estimated using a 6-in. thickness over the existing 24-ft. wide pavement and a 10-in. thickness for the integral 2-ft. widening units.
- ④ Refer to "EX-JNT" on B.4 for rebar placement.
- ⑤ Slope shall be 3% on "Turn Lanes" and 4% on shoulders.

Sta. 810+00 to 426+36





Sta. 426+36 to 639+47



Construction

Placed half width.



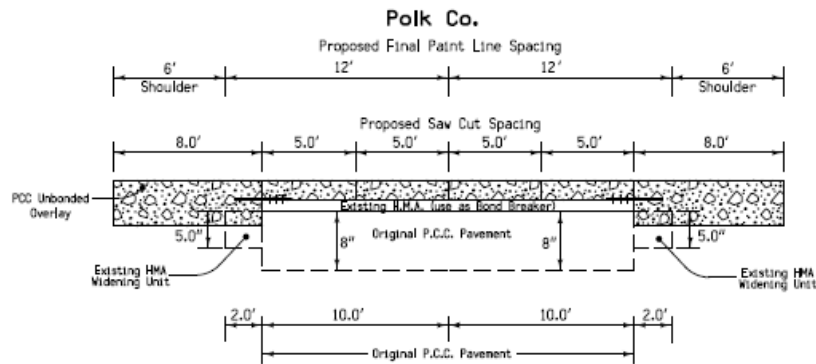
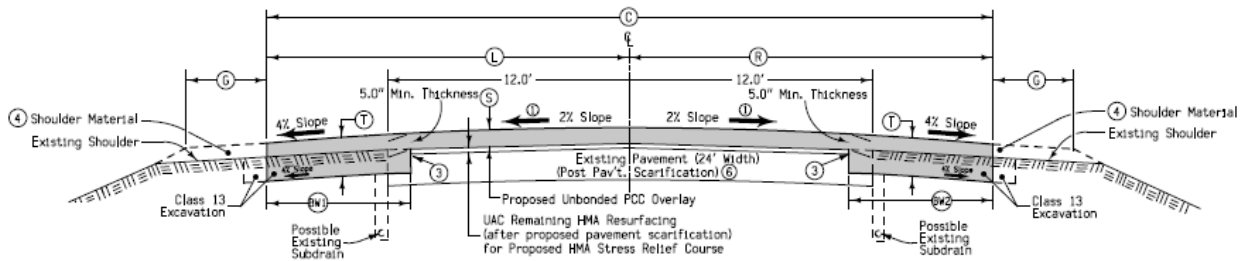


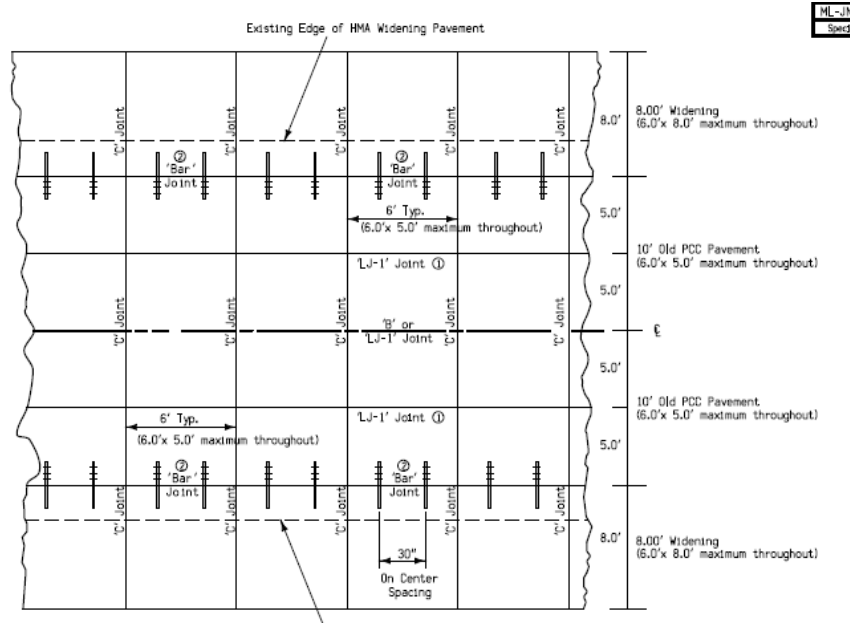
Review 2021

Areas of cracking at quarter point. Some broken panels.



|                 |                                   |                     |  |
|-----------------|-----------------------------------|---------------------|--|
| <b>Year</b>     | 2015                              | <b>Overlay Type</b> | UBOL   |
| <b>County</b>   | Polk                              | <b>Design</b>       | 5" x 36' (5" x 20' & 8' x 9.5" widening)<br>5 x 5 x 6' long joints |
| <b>Route</b>    | US 69                             | <b>Milling</b>      | 0.5" to 2" milling   |
| <b>Project</b>  | STPN-069-4(100)--2J-77            | <b>Interlayer</b>   | Existing HMA   |
| <b>Location</b> | 118th Ave N. to Just S. of IA 210 | <b>Tie Bars</b>     | #5 bars 36" @ 30" CTR  |





Construction

Placed half width. Some random cracking off sawed joints.









Review 2021

Longitudinal cracking in wheel path.

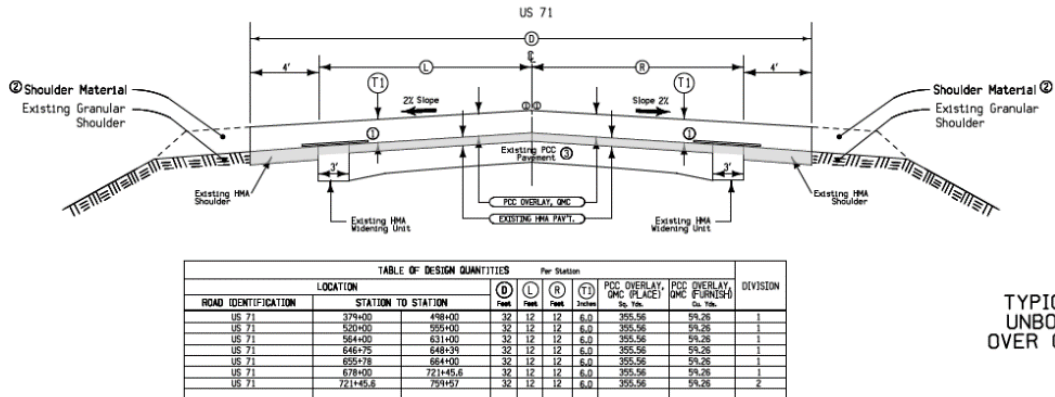




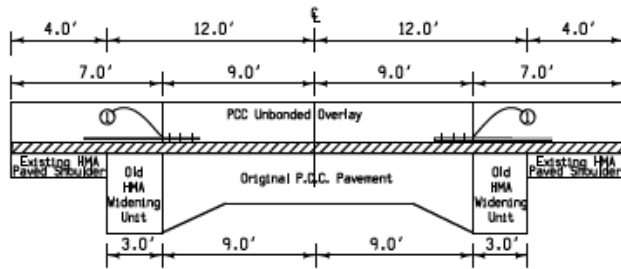
Shoulder cross slope 3.5%, Design 4%

|                 |                             |                     |  |
|-----------------|-----------------------------|---------------------|--|
| <b>Year</b>     | 2015                        | <b>Overlay Type</b> | UBOL & WT  |
| <b>County</b>   | Clay                        | <b>Design</b>       | 6" x 32' (9 x8' panels ML & 7x8' panels shoulders) UBOL<br>6" x 32' (6 x 6' ML and 4 x 6' Shoulder) WT |
| <b>Route</b>    | US 71                       | <b>Milling</b>      | 2" Milling   |
| <b>Project</b>  | NHSX-071-8(59)--3H-21       | <b>Interlayer</b>   | Existing HMA   |
| <b>Location</b> | B53 N to 15th St in Spencer | <b>Tie Bars</b>     | L-1 #4 @30" 6' – UBOL<br>L-1 #4 @30" 3' WT   |

Typical Cross Section – UBOL



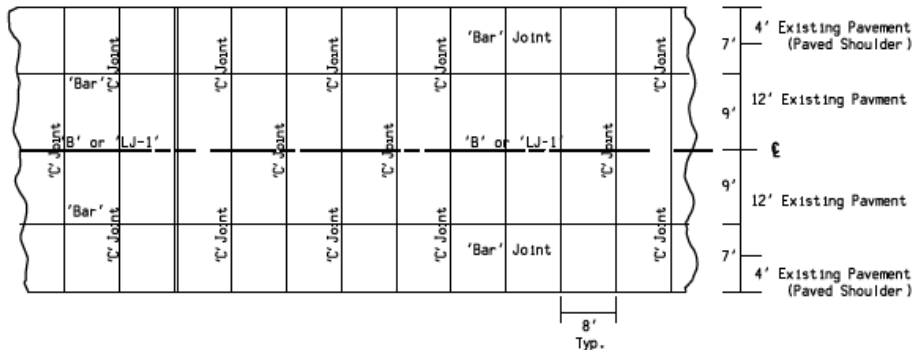
TYPIC  
UNBOI  
OVER C



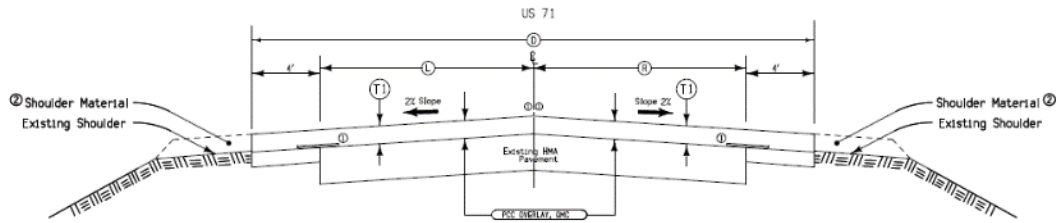
Notes:

Modified 'L-1' (ML-1) joint #4 Bars at 30" on center spacing with a 6-ft long reinforced bar centered over widening unit (10.5' Lt. and Rt. of centerline). Maintain minimum 6-in clearance from transverse joints. Minimum 3 staples per Tiebar. Slapping process subject to Engineer approval prior to Paving operation. Approval is based on no tiebar movement during Paving operation. Mechanical insertion of the tie bar is allowed.

TYP  
AN  
CC

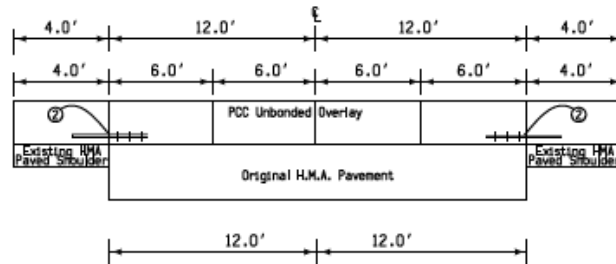
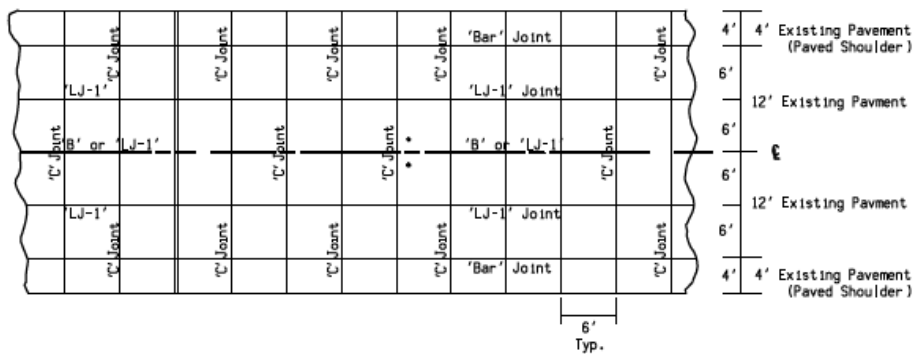


# Typical Cross Section WT



| ROAD IDENTIFICATION | LOCATION           |        | Per Station |     |     |     | PCC OVERLAY, 5% FURFISH (CY) | PCC OVERLAY, 5% FURFISH (CY) |
|---------------------|--------------------|--------|-------------|-----|-----|-----|------------------------------|------------------------------|
|                     | STATION TO STATION |        | (D)         | (L) | (T) | (T) |                              |                              |
| US 71               | 371+48             | 375+00 | 33          | 12  | 12  | 6.0 | 355.56                       | 59.26                        |
| US 71               | 498+00             | 522+00 | 30          | 12  | 12  | 6.0 | 355.56                       | 59.26                        |
| US 71               | 595+00             | 584+00 | 32          | 12  | 12  | 6.0 | 355.56                       | 59.26                        |
| US 71               | 631+00             | 648+75 | 34          | 12  | 12  | 6.0 | 355.56                       | 59.26                        |
| US 71               | 664+00             | 678+00 | 32          | 12  | 12  | 6.0 | 355.56                       | 59.26                        |

TYPIC



Notes:

- 1 Extend existing expansion joints in kind in new pavement.
  - 2 Modified "L-1" (ML-1) Joint HMA Bars at 30" on center spacing with a 3-ft long reinforcing bar centered over joint. Maintain minimum 6-in clearance from transverse joints. Minimum 3 staples per Tiebar. Stapling process subject to Engineer approval prior to Paving operation. Approval is based on no tiebar movement during Paving operation.
- Longitudinal joints shall be located at centerline, 6.0-ft Lt. and Rt. of centerline and 12.0-ft Lt. and Rt. of centerline. A modified "L-1" (ML-1) joint shall be located at 12.0-ft Lt. and Rt. of centerline with a 3-ft. long reinforcing bar. Transverse joints shall be located at 6.0-ft. spacings.
- Mechanical insertion of tie bar is allowed.

TY  
AI  
PC

| Milepost      | Existing Pavement Type |
|---------------|------------------------|
| 188.13-190.29 | Composite              |
| 190.29-192.21 | HMA                    |
| 192.21-193.80 | Composite              |
| 193.80-195.06 | HMA                    |

Construction





2023 Review

Overall, both the UBOL and WT are in very good condition.



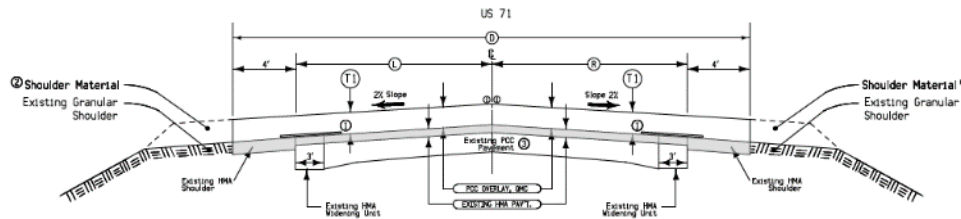
UBOL Overlay section



Whitetopping Overlay section

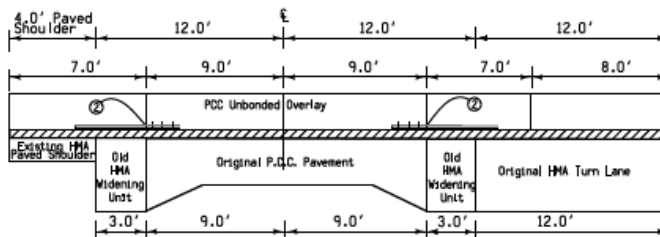
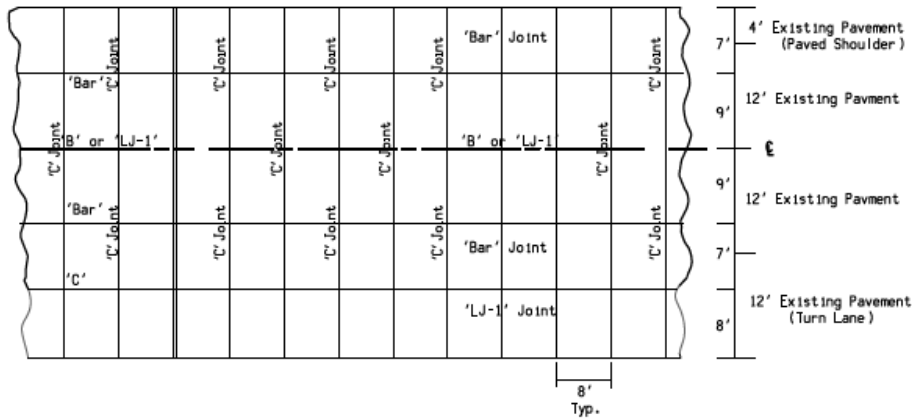
|                 |  |                     |  |
|-----------------|--|---------------------|--|
| <b>Year</b>     | 2016                                   | <b>Overlay Type</b> | UBOL & WT  |
| <b>County</b>   | Clay                                   | <b>Design</b>       | 6" x 32' (9 x8' panels ML & 7x8' panels shoulders) UBOL<br>6" x 32' (6 x 6' ML and 4 x 6' Shoulder) WT |
| <b>Route</b>    | US 71                                  | <b>Milling</b>      | 2" Milling   |
| <b>Project</b>  | NHSX-071-8(58)--3H-21                  | <b>Interlayer</b>   | Existing HMA   |
| <b>Location</b> | Buena Vista Co. Line N. to Co. Rd. B53 | <b>Tie Bars</b>     | L-1 #4 @30" 6' – UBOL<br>L-1 #4 @30" 3' WT   |

Typical Cross Section - UBOL



| ROAD IDENTIFICATION | LOCATION | STATION TO STATION | Per Station |     |     |     | PCC OVERLAY, 6" (PLACE) sq. yds. | PCC OVERLAY, 6" (FINISH) sq. yds. |
|---------------------|----------|--------------------|-------------|-----|-----|-----|----------------------------------|-----------------------------------|
|                     |          |                    | (D)         | (L) | (E) | (T) |                                  |                                   |
| US 71               | 18+45    | 119+00             | 32          | 12  | 12  | 6.0 | 355.56                           | 53.28                             |
| US 71               | 211+00   | 228+56             | 32          | 12  | 12  | 6.0 | 355.56                           | 53.28                             |
| US 71               | 238+05   | 278+00             | 32          | 12  | 12  | 6.0 | 355.56                           | 53.28                             |
| US 71               | 279+00   | 305+00             | 32          | 12  | 12  | 6.0 | 355.56                           | 53.28                             |

TYP  
LINE  
OVER



- Notes:
- ) Extend existing expansion joints in kind in new pavement.
  - ) Modified "L-1" (ML-1) joint #4 Bars at 30" on center spacing with a 6-ft long reinforced bar centered over widening unit (10.5' Lt. and Rt. of centerline). Maintain minimum 6-in clearance from transverse joints. Minimum 3 staples per Tiebar. Stapling process subject to Engineer approval prior to Paving operation. Approval is based on no tiebar movement during Paving operation. Mechanical insertion of tie bar is allowed.
  - ) See ML-2 on Sheet B.2.

TYPICAL CR  
AND JOINT  
PCC UNBOND  
OVER EXISTIN



# Typical Cross Section – WT

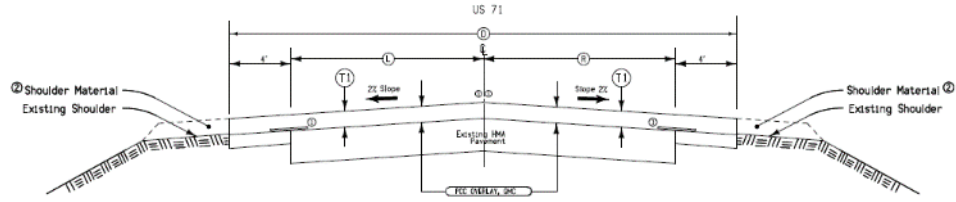
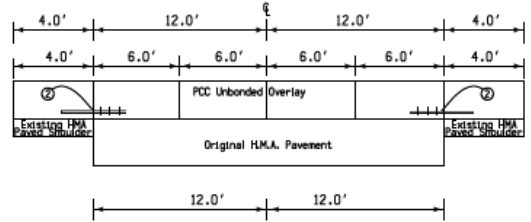
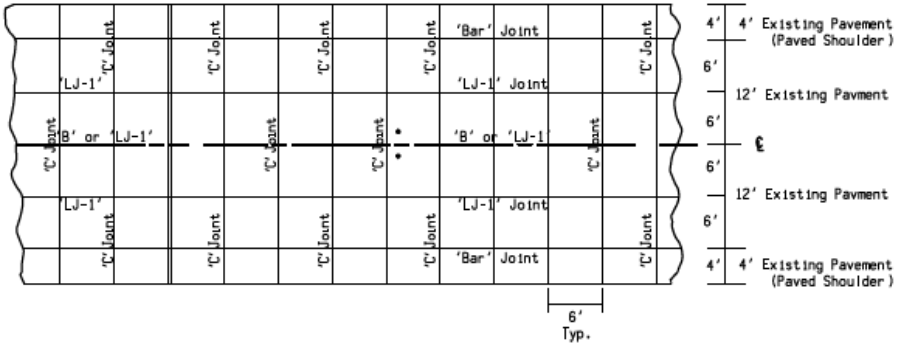


TABLE OF DESIGN QUANTITIES

| ROAD IDENTIFICATION | LOCATION | STATION TO STATION | Per Station |   |   | PCC OVERLAY, 6\"/> |
|---------------------|----------|--------------------|-------------|---|---|--------------------|
|                     |          |                    | ①           | ② | ③ |                    |



- Notes:
- ① Extend existing expansion joints in kind in new pavement.
  - ② Modified 1-1/2" (M-1) joint #4 Bars at 30" on center spacing with a 3-ft long reinforced bar centered over joint. Maintain minimum 5-in clearance from transverse joints. Minimum 3 staples per Tiebar. Stapling process subject to Engineer approval prior to Paving operation. Approval is based on no tiebar movement during Paving operation.
- Longitudinal joints shall be located at centerline, 6.0-ft Lt. and Rt. of centerline and 12.0-ft Lt. and Rt. of centerline.  
 A modified 1-1/2" (M-1) joint shall be located at 12.0-ft Lt. and Rt. of centerline with a 3-ft long reinforcing bar. Transverse joints shall be located at 6.0-ft spacings.  
 Mechanical insertion of the bar is allowed.

**TYPICAL CF AND JOINT PCC UNBON OVER EX1**

Construction



Review 2023

Overall, both the UBOL and WT are in very good condition.

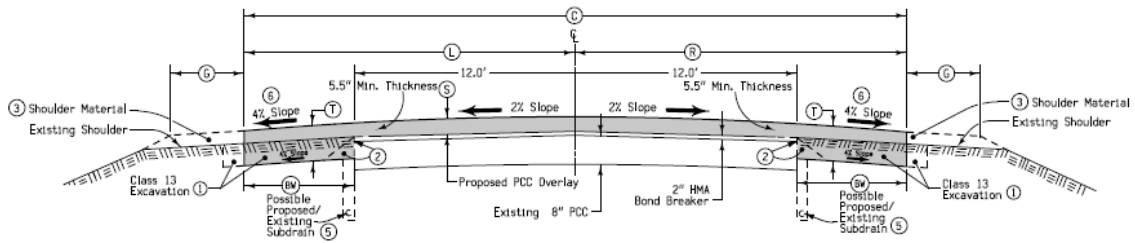


Whitetopping overlay section

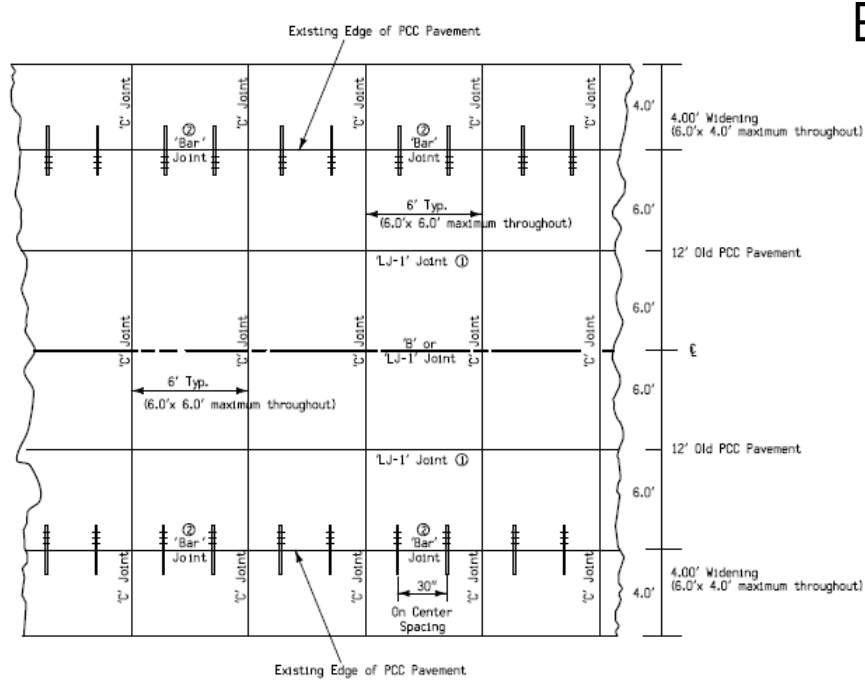


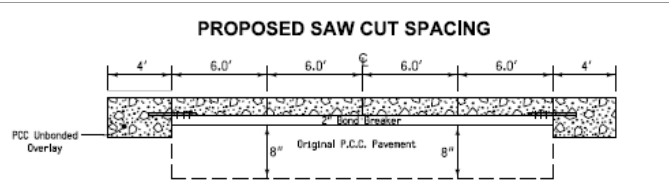
Unbonded overlay section

|                 |                              |                     |  |
|-----------------|------------------------------|---------------------|--|
| <b>Year</b>     | 2016                         | <b>Overlay Type</b> | UBOL                                       |
| <b>County</b>   | Benton                       | <b>Design</b>       | 5.5" x 32' (6 x 6' ML and 4 x 6' Shoulder) |
| <b>Route</b>    | IA 21                        | <b>Milling</b>      | n/a  |
| <b>Project</b>  | STPN-021-4(27)--2J-06        | <b>Interlayer</b>   | New HMA                                    |
| <b>Location</b> | From E66 N. to just S. US 30 | <b>Tie Bars</b>     | #4x36" @30" C-C                            |



| Location |                    | Overlay Quantities (Per Location)     |      |      |      |     |      |     |                           |                      |                      | Remarks |     |      |
|----------|--------------------|---------------------------------------|------|------|------|-----|------|-----|---------------------------|----------------------|----------------------|---------|-----|------|
| Road     | Station To Station | (S)                                   | (C)  | (L)  | (R)  | (T) | (BW) | (G) | Class 13 Overlay Cu. Yds. | PCC Overlay Cu. Yds. | PCC Overlay Sq. Yds. |         | (T) | (BW) |
| IA 21    | 72+65 to 247+25    | 5.5                                   | 32.0 | 16.0 | 16.0 |     |      |     | 1347                      | 10,563               | 62,080               | 8       | 4.0 | 6.0  |
|          |                    | approx. MP 57.82 to MP 61.18          |      |      |      |     |      |     |                           |                      |                      |         |     |      |
|          |                    | 17,460' ± 2x8.167sf/27= 10,563 CY PCC |      |      |      |     |      |     |                           |                      |                      |         |     |      |
|          |                    | 17,460' ± 2x1.042sf/27= 1348 CY CI 13 |      |      |      |     |      |     |                           |                      |                      |         |     |      |





Construction



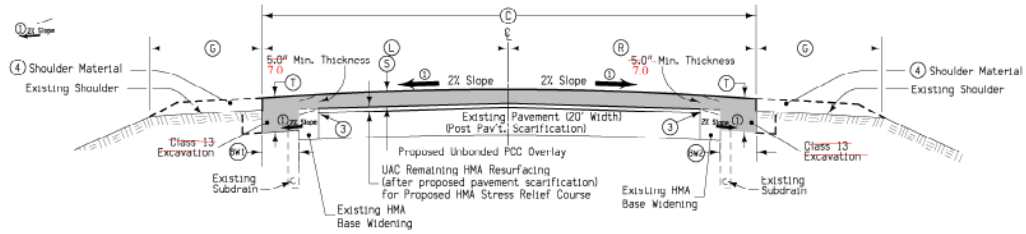


Review 2023

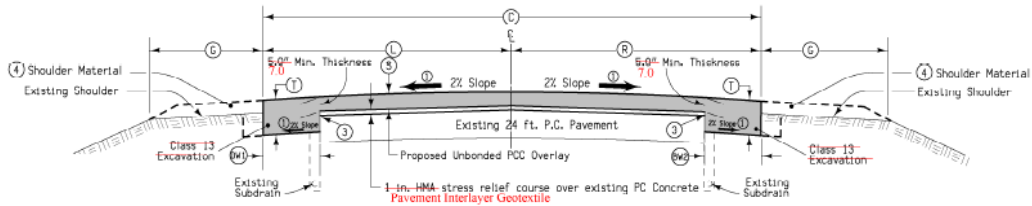
Overall, the overlay is in very good condition.



|                 |                       |                     |   |
|-----------------|-----------------------|---------------------|---|
| <b>Year</b>     | 2018                  | <b>Overlay Type</b> | UBOL  |
| <b>County</b>   | Dallas/Boone          | <b>Design</b>       | 7" x 32' (12 x 12' ML and 4 x 12' Shoulder) |
| <b>Route</b>    | US 169                | <b>Milling</b>      | n/a   |
| <b>Project</b>  | NHSX-169-4(63)--3H-25 | <b>Interlayer</b>   | Fabric Interlayer                           |
| <b>Location</b> | IA 141 N to US 30     | <b>Tie Bars</b>     |   |



| Location |                    | (S)    | (C)  | (L)  | (R)  | (T)    | (BW1) | (BW2) | (G)   |
|----------|--------------------|--------|------|------|------|--------|-------|-------|-------|
| Road     | Station to Station | Inches | Feet | Feet | Feet | Inches | Feet  | Feet  | Feet  |
| US 169   | 26+12.6 - 62+94    | 75.0   | 32.0 | 16.0 | 16.0 | 9.5    | 4.0   | 4.0   | Vari. |
| US 169   | 91+01 - 710+00     | 75.0   | 32.0 | 16.0 | 16.0 | 9.5    | 4.0   | 4.0   | Vari. |



| Location |                    | (S)    | (C)  | (L)  | (R)  | (T)    | (BW1) | (BW2) | (G)   |
|----------|--------------------|--------|------|------|------|--------|-------|-------|-------|
| Road     | Station to Station | Inches | Feet | Feet | Feet | Inches | Feet  | Feet  | Feet  |
| US 169   | 73+61 - 91+01      | 75.0   | 32.0 | 16.0 | 16.0 | 9.5    | 4.0   | 4.0   | Vari. |



Review 2021

Lots of longitudinal cracking.







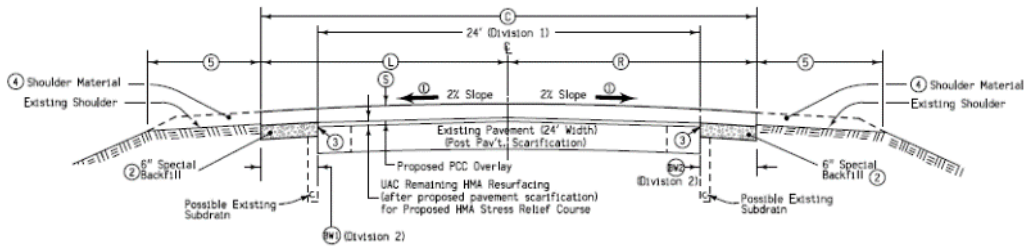
Shoulder cross slope 1.2%, Design 2%.

2023

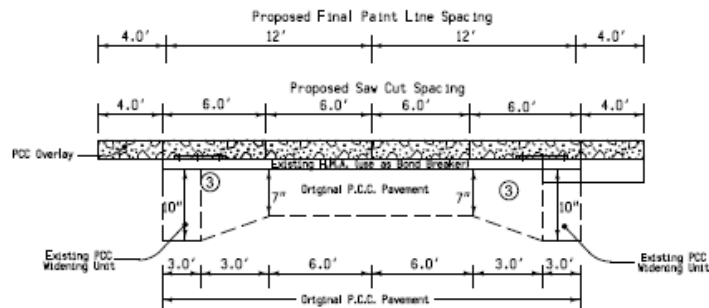
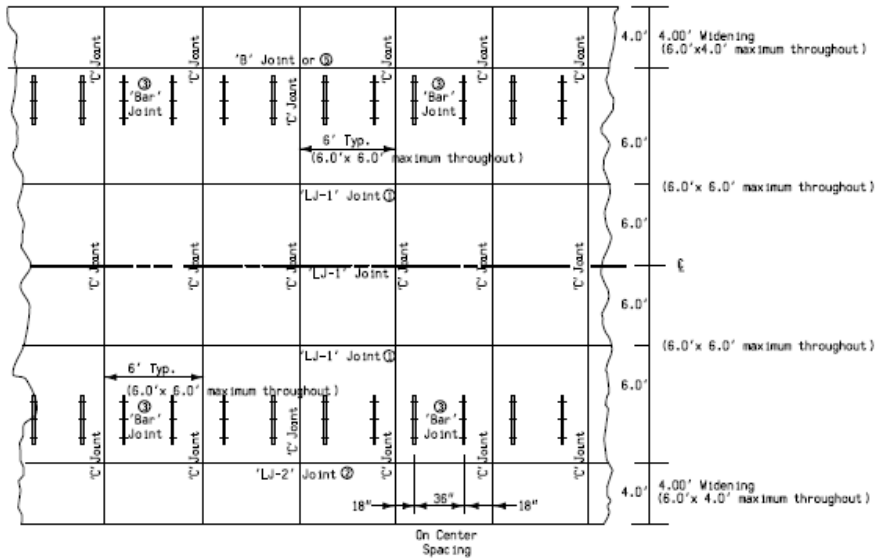
Lots of longitudinal cracking. Most have been sealed.



|                 |                                 |                     |  |
|-----------------|---------------------------------|---------------------|--|
| <b>Year</b>     | 2019                            | <b>Overlay Type</b> | UBOL                                     |
| <b>County</b>   | Marshall/Tama                   | <b>Design</b>       | 6" x 32' (6 x 6' ML and 4 x 6' Shoulder) |
| <b>Route</b>    | IA 14                           | <b>Milling</b>      | 1" Milling                               |
| <b>Project</b>  | HSP1X-014-5(81)--3H-64          | <b>Interlayer</b>   | Existing HMA                             |
| <b>Location</b> | Co. Rd. E18 N. to W. JCT IA 175 | <b>Tie Bars</b>     | Shoulder not tied                        |



| Location | Station To Station | Inches    | C | L  | R  | S  | T | Division 1 Overlay Quantities Per Location |                      |                   | Division 2 Overlay Quantities Per Location |                      |                           | Remarks |                        |
|----------|--------------------|-----------|---|----|----|----|---|--|----------------------|-------------------|--|----------------------|---------------------------|---------|------------------------|
|          |                    |           |   |    |    |    |   | PCC Overlay Cu. Yds.                       | PCC Overlay Sq. Yds. | Class 13 Cu. Yds. | PCC Overlay Cu. Yds.                       | PCC Overlay Sq. Yds. | Special Backfill Cu. Yds. |         |                        |
| IA 14    | 371+50.00          | 447+75.63 | 6 | 32 | 16 | 16 | 4 | 4  | 3165                 | 15012             | 1745                                       | 1056                 | 6337                      | 1745    |                        |
|          | 37+33.40           | 462+1.50  | 6 | 32 | 16 | 16 | 4 | 4  | 1965                 | 11728             | 1077                                       | 662                  | 4079                      | 1077    | St. Turn Lane Layer    |
|          | 467+7.50           | 489+5.50  | 6 | 32 | 16 | 16 | 4 | 4  | 1458                 | 852               | 23   | 18                   | 157                       | 23      | Excludes St. Turn Lane |
|          | 484+5.50           | 52400.00  | 6 | 32 | 16 | 24 |   |  | 235                  | 1292              | 115  | 52                   | 235                       | 119     |                        |
|          | 52400.00           | 56450.00  | 6 | 32 | 16 | 16 | 4 | 4  | 1875                 | 11292             | 1033                                       | 645                  | 3951                      | 1033    |                        |
|          | 152+57.40          | 503+00.00 | 6 | 32 | 16 | 16 | 4 | 4  | 18502                | 113315            | 10279                                      | 6184                 | 37405                     | 10279   |                        |



Construction





Review 2021

In very good condition. Shoulders do appear to be heaving, but no cracking due to no tie steel.



Sta 33+00 Mainline 1.9%





Sta 33+00



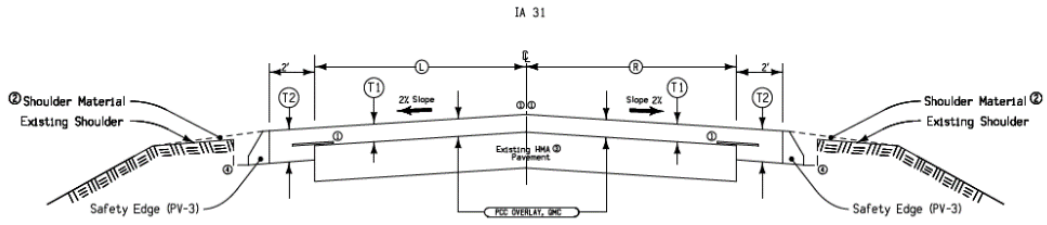
Station 412+00

2023

Still performing very well.

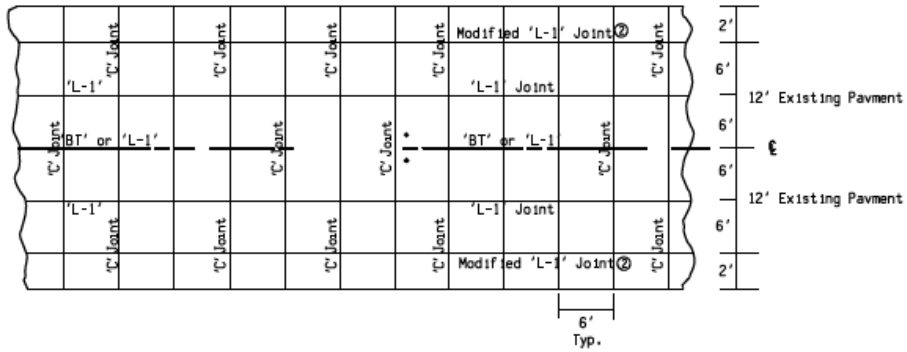


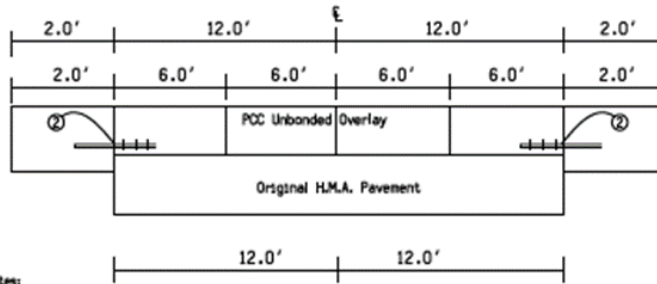
|                 |                                |                     |  |
|-----------------|--------------------------------|---------------------|--|
| <b>Year</b>     | 2020                           | <b>Overlay Type</b> | WT                                       |
| <b>County</b>   | Woodbury                       | <b>Design</b>       | 6" x 32' (6 x 6' ML and 2 x 6' Shoulder) |
| <b>Route</b>    | IA 31                          | <b>Milling</b>      | 3" Milling                               |
| <b>Project</b>  | STP-031-1(43)--2C-97           | <b>Interlayer</b>   | Existing HMA                             |
| <b>Location</b> | E. JCT US 20 N. to Co. Rd. C66 | <b>Tie Bars</b>     | Fiber Test Sections                      |



| LOCATION            |                    | Per Station |    |    |    | PC OVERLAY (3MC) (PLACES) | PC OVERLAY (3MC) (FUNCTION) |
|---------------------|--------------------|-------------|----|----|----|---------------------------|-----------------------------|
| ROAD IDENTIFICATION | STATION TO STATION | L           | R  | T1 | T2 | Sq. Yds.                  | Sq. Yds.                    |
| IA 31               | 43+76 - 277+54     | 12          | 12 | 6  | 8  | 333.3                     | 57.64                       |
| (A 3)               | 278+53 - 318+65.5  | 12          | 12 | 6  | 8  | 333.3                     | 57.64                       |
| (A 3)               | 318+68.5 - 458+50  | 12          | 12 | 6  | 8  | 333.3                     | 57.64                       |

TYPIC  
UNBONDED  
FULL D





**Notes:**

L-1 joint shall use detail D-1 as shown on PY-101. No tie bars to be used except as stated in note 2.

An "L-1" joint shall be located at 12.0-ft. Lt. and Rt. of centerline with a 3-ft. long reinforcing bar.

Reinforced bars shall be #4 Bars at 30" on center spacing with a 3-ft long reinforcing bar centered over joint. Maintain minimum 6-in clearance from transverse joints. Minimum 3 staples per Tiebar. Stapling process subject to Engineer approval prior to Paving operation. Approval is based on no tiebar movement during Paving operation.

Mechanical insertion of tie bar is allowed.

**TYI  
AN  
PC**

### Macro Fiber Test Sections

| Begin Sta. | End Sta. | Length feet | PCC SY | PCC CY | Fiber lbs | Transverse Sawcut Spacing FT | Longitudinal Sawcut Spacing FT | Remarks                          |
|------------|----------|-------------|--------|--------|-----------|------------------------------|--------------------------------|----------------------------------|
| 43+76      | 50+00    | 624         | 2079.8 | 359.7  | 1438.7    | 6                            | 6                              | Use Detail EX-JNT A on sheet B.2 |
| 142+00     | 152+00   | 1000        | 3333.0 | 576.4  | 2305.6    | 15                           | 12                             | Use Detail EX-JNT B on sheet U.1 |
| 152+00     | 162+00   | 1000        | 3333.0 | 576.4  | 2305.6    | 12                           | 12                             | Use Detail EX-JNT B on sheet U.1 |
| 162+00     | 172+00   | 1000        | 3333.0 | 576.4  | 2305.6    | 9                            | 12                             | Use Detail EX-JNT B on sheet U.1 |
| 172+00     | 182+00   | 1000        | 3333.0 | 576.4  | 2305.6    | 9                            | 6                              | Use Detail EX-JNT B on sheet U.1 |
| 182+00     | 192+00   | 1000        | 3333.0 | 576.4  | 2305.6    | 6                            | 6                              | Use Detail EX-JNT B on sheet U.1 |
| 423+00     | 441+00   | 1800        | 5999.4 | 1037.5 | 4150.1    | 6                            | 6                              | Use Detail EX-JNT A on sheet B.2 |

Construction





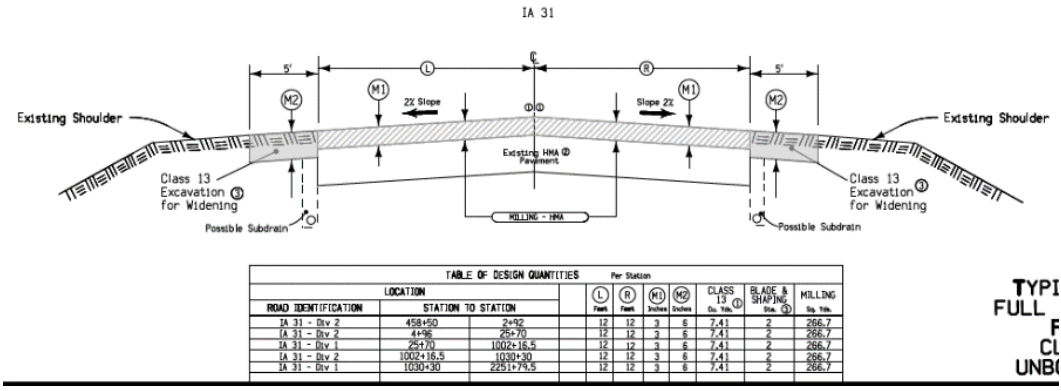
Review 2021

Overall, the overlay is in very good condition.

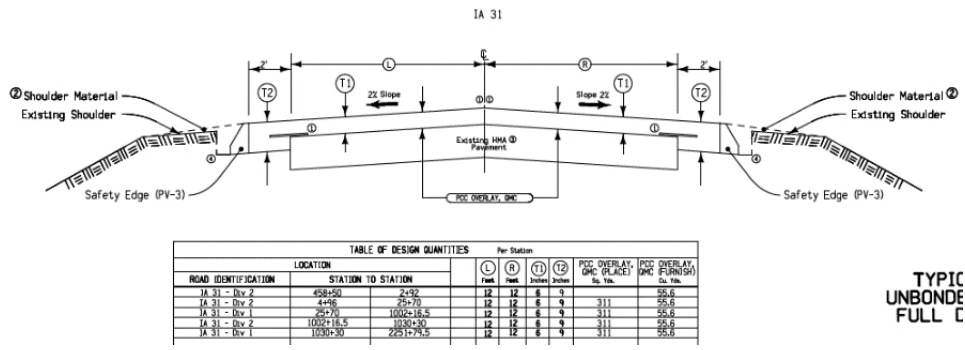




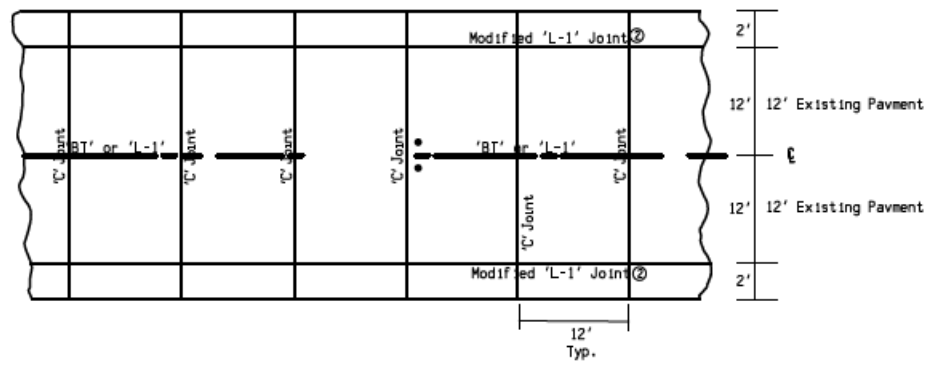
|                 |                      |                     |   |
|-----------------|----------------------|---------------------|---|
| <b>Year</b>     | 2022                 | <b>Overlay Type</b> | UBOL  |
| <b>County</b>   | Cherokee             | <b>Design</b>       | 6" x 28' (12' x12' ML and 2 x 12' Shoulder), Fibers – 4 lb/cy |
| <b>Route</b>    | IA 31                | <b>Milling</b>      | 3" Milling  |
| <b>Project</b>  | STP-031-3(11)--2C-18 | <b>Interlayer</b>   | Existing HMA  |
| <b>Location</b> | Washta to US 59      | <b>Tie Bars</b>     | L-1, 3 ft @ 30" centers                                       |



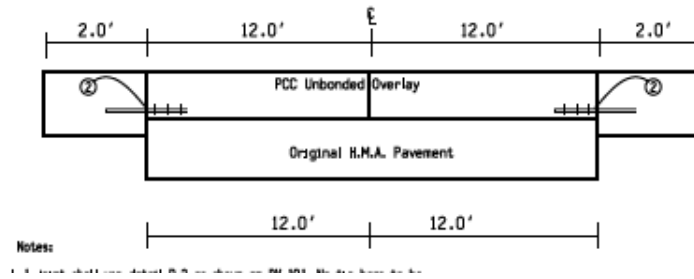
TYPIC  
FULL  
F  
CL  
UNB



TYPIC  
UNBONDE  
FULL C







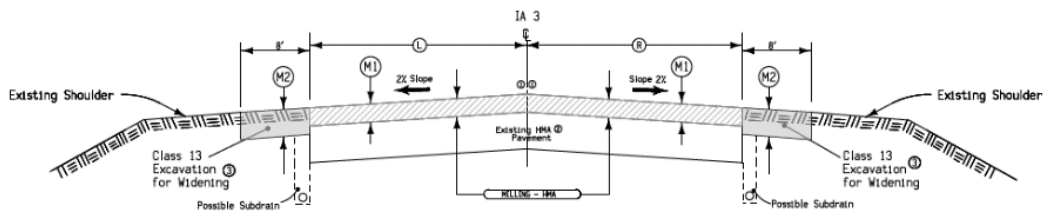
2022 Review

Overall, the overlay is in very good condition. A few areas with random cracking off sawed joints. Issues with center line rumble strip depth and crossing joint.



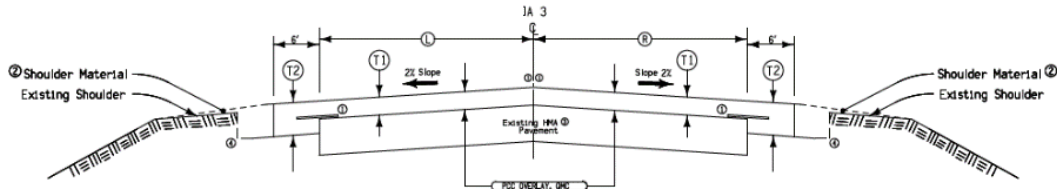


|                 |                        |                     |   |
|-----------------|------------------------|---------------------|---|
| <b>Year</b>     | 2022                   | <b>Overlay Type</b> | WT  |
| <b>County</b>   | Plymouth               | <b>Design</b>       | 6" x 36' (6 x 6' ML and 6 x 6' Shoulder) 12x12 Test Section |
| <b>Route</b>    | IA 3                   | <b>Milling</b>      | 2" Milling  |
| <b>Project</b>  | NHSX-003-1(106)--2R-75 | <b>Interlayer</b>   | Existing HMA  |
| <b>Location</b> | Lemars to Remsen       | <b>Tie Bars</b>     | L-1, 3 ft @ 30" centers                                     |

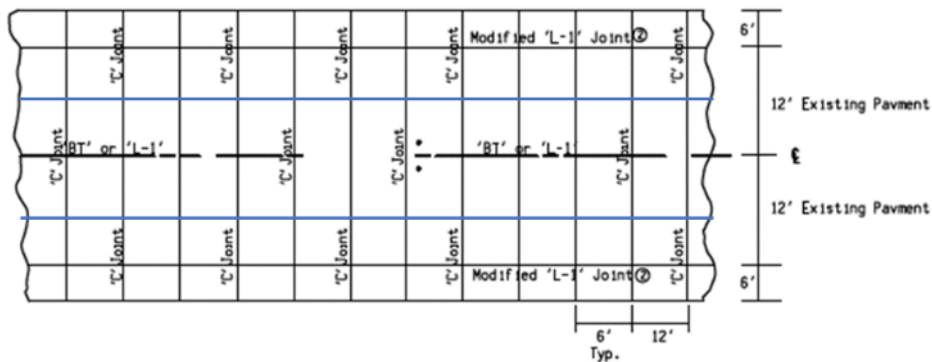


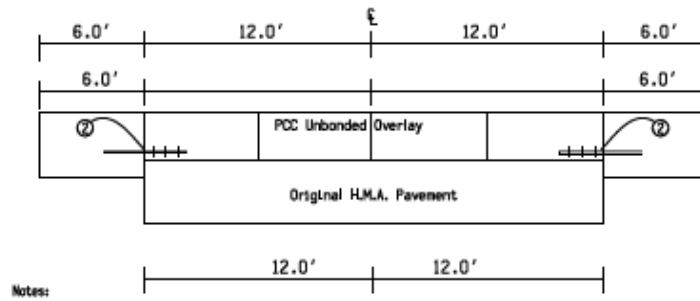
| LOCATION            |                    |            | PER STATION |     |      |      | CLASS 13 Cu. Yds. (1) | BLADE SHARPING Sta. (2) | MILLING Sq. Yds. |
|---------------------|--------------------|------------|-------------|-----|------|------|-----------------------|-------------------------|------------------|
| ROAD IDENTIFICATION | STATION TO STATION |            | (L)         | (R) | (M1) | (M2) |                       |                         |                  |
| IA 3                | 819+62.39          | 851+99.31  | 12          | 12  | 2    | 2    | 14.81                 | 2.50                    | 286.67           |
| IA 3                | 851+61.52          | 1014+12.77 | 12          | 12  | 2    | 2    | 14.81                 | 2.50                    | 286.67           |
| IA 3                | 1014+11.66         | 1244+00    | 12          | 12  | 2    | 2    | 14.81                 | 2.50                    | 286.67           |
| IA 3                | 1244+00            | 1273+00    | 12          | 12  | 2    | 2    | 14.81                 | 2.50                    | 286.67           |

TYPI



| LOCATION            |                    |            | PER STATION |     |      |      | PCC OVERLAY, 6\"/> |       |
|---------------------|--------------------|------------|-------------|-----|------|------|--------------------|-------|
| ROAD IDENTIFICATION | STATION TO STATION |            | (L)         | (R) | (T1) | (T2) |                    |       |
| IA 3                | 819+62.39          | 851+99.31  | 12          | 12  | 6    | 9    | 400                | 77.78 |
| IA 3                | 851+61.52          | 1014+12.77 | 12          | 12  | 6    | 9    | 400                | 77.78 |
| IA 3                | 1014+11.66         | 1244+00    | 12          | 12  | 6    | 9    | 400                | 77.78 |
| IA 3                | 1244+00            | 1273+00    | 12          | 12  | 6    | 9    | 400                | 77.78 |





### Construction

Overlay was placed full width to be able to place shoulders as soon as 325 psi maturity was reached. Goal was to pave ~1 mile per day and fully open each section within 2 days after paving. The test section of 12 x 12 foot panels is located between Otter Ave. and Oyens Ave. (~Sta 1028+00 to 1038+00).



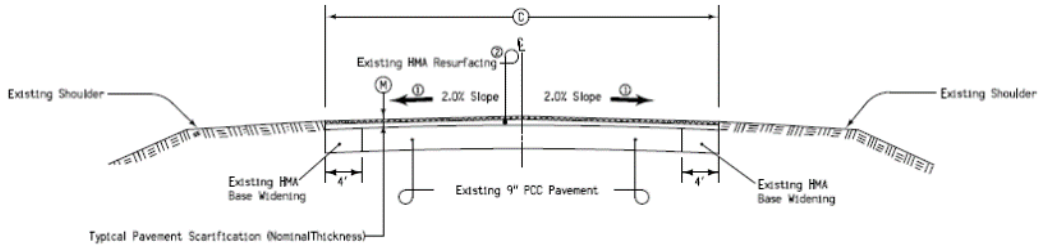


2022 Review

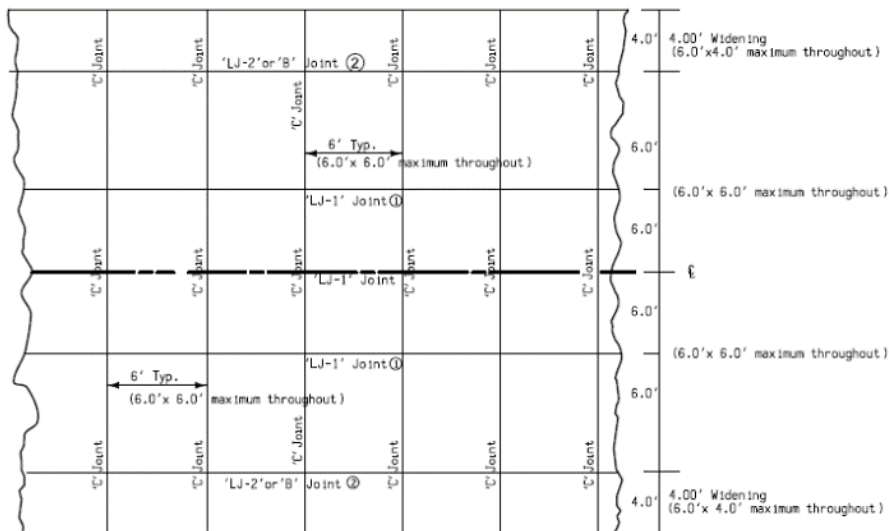
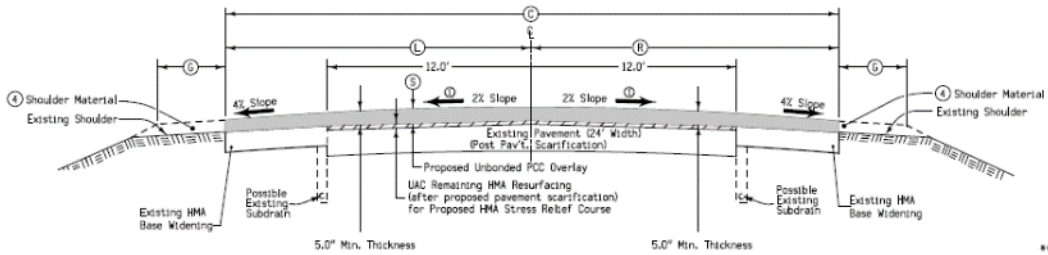
Overall, the overlay is in very good condition.

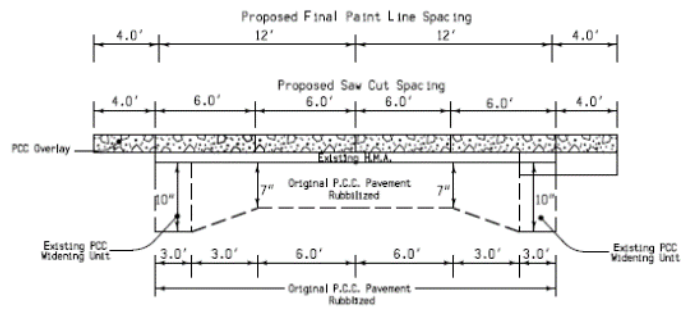


|                 |                            |                     |  |
|-----------------|----------------------------|---------------------|--|
| <b>Year</b>     | 2022                       | <b>Overlay Type</b> | UBOL                                     |
| <b>County</b>   | Tama/Blackhawk             | <b>Design</b>       | 5" x 32' (6 x 6' ML and 4 x 6' Shoulder) |
| <b>Route</b>    | US 63                      | <b>Milling</b>      | 1" Milling                               |
| <b>Project</b>  | NHSX-063-5(72)--3H-86      | <b>Interlayer</b>   | Existing HMA                             |
| <b>Location</b> | Traer to 0.5 mi S of IA 58 | <b>Tie Bars</b>     | Fibers 5 lb/cy – No Tie Steel            |



| Location            |                    | (M)       | (C)  | Remarks |                                     |
|---------------------|--------------------|-----------|------|---------|-------------------------------------|
| Road Identification | Station To Station | Inches    | Feet |         |                                     |
| US 63               | 131+25.40          | 493+88.60 | 1    | 32.0    | EQUATION $493+88.60(SK) = 0+00(AH)$ |
| US 63               | 0+00               | 332+36    | 1    | 32.0    | EQUATION $493+88.60(SK) = 0+00(AH)$ |





Construction





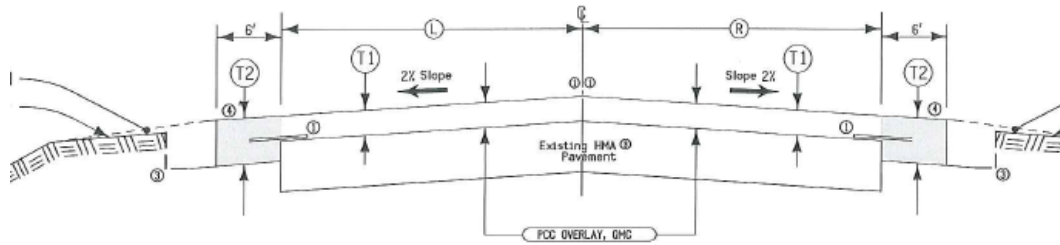


2023 Review

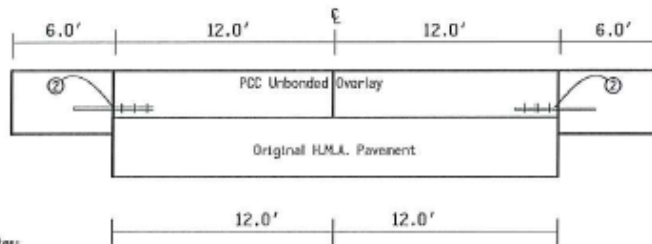
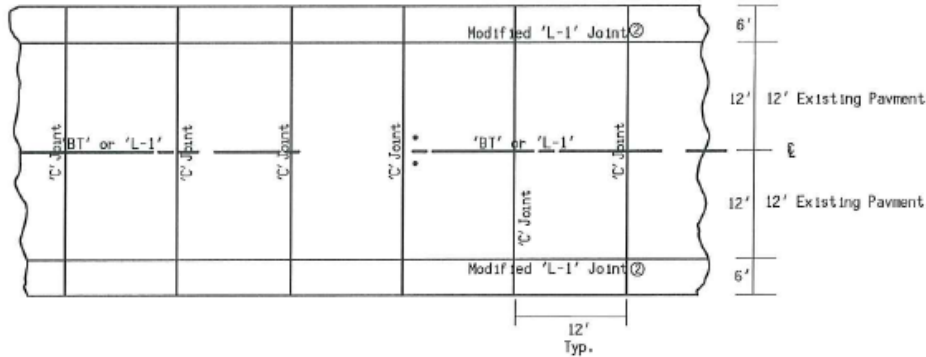
Overall, the overlay is in very good condition.



|                 |                        |                     |  |
|-----------------|------------------------|---------------------|--|
| <b>Year</b>     | 2023                   | <b>Overlay Type</b> | WT   |
| <b>County</b>   | Plymouth               | <b>Design</b>       | 6" x 36" (12 x 12' ML and 6' x 12' Shoulder) |
| <b>Route</b>    | IA 3                   | <b>Milling</b>      | 3" Milling                                   |
| <b>Project</b>  | NHSN-003-1(104)--3H-75 | <b>Interlayer</b>   | Existing HMA                                 |
| <b>Location</b> | Remsen to Co. Line     | <b>Tie Bars</b>     | Fibers 4 lb/cy #4 x 36" at 30" C-C           |



| LOCATION            |                    | Per Station |           | PCC OVERLAY, GMC (PLACE)<br>Sq. Yds. | PCC OVERLAY, GMC (FURNISH)<br>Cu. Yds. |
|---------------------|--------------------|-------------|-----------|--------------------------------------|--|
| ROAD IDENTIFICATION | STATION TO STATION | L<br>Feet   | R<br>Feet |                                      |  |
| IA 3 DIV. 1         | 1315+30 - 1332+78  | 12          | 12        | 266.67                               | 44.44                                  |
| IA 3 DIV. 2         | 1332+78 - 1596+74  | 12          | 12        | 266.67                               | 44.44                                  |



- Notes:
- ① L-1 joint shall use detail D-3 as shown on PP-101. No tie bars to be used except as stated in note ②.
  - ② An 'L-1' joint shall be located at 12.0-ft. Lt. and Rt. of centerline with a 3-ft. long reinforcing bar.
- Reinforcing bars shall be #4 Bars at 30" on center spacing with a 3-ft long reinforcing bar centered over joint. Maintain minimum 6-in clearance from transverse joints. Minimum 3 staples per Tiebar. Stapling process subject to Engineer approval prior to Paving operation. Approval is based on no tiebar movement during Paving operation.
- Mechanical insertion of tie bar is allowed.

T  
A  
PI

Construction



2023 Review



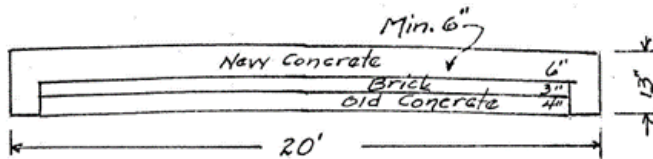
Appendix C – Old Pavement Resurfacing Designs

Design No. R-1  
First used in letting of 5-10-32

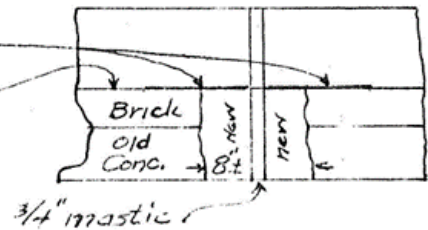
R-1

Dubuque FA 148 D 8.365

Similar to Design No R2 except  
for the details below



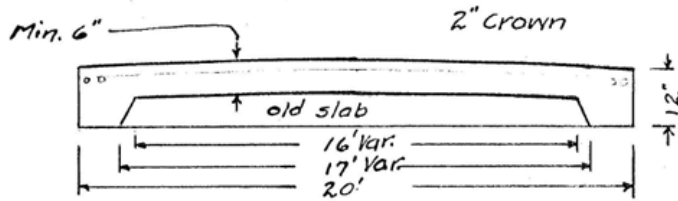
Tin strips 8" x 10' - 30 gauge - oiled  
lapped at  $\frac{3}{4}$ ", bent over edge to subgrade  
Subgrade paper



Design No. R-2  
 First used in letting of 9-12-33

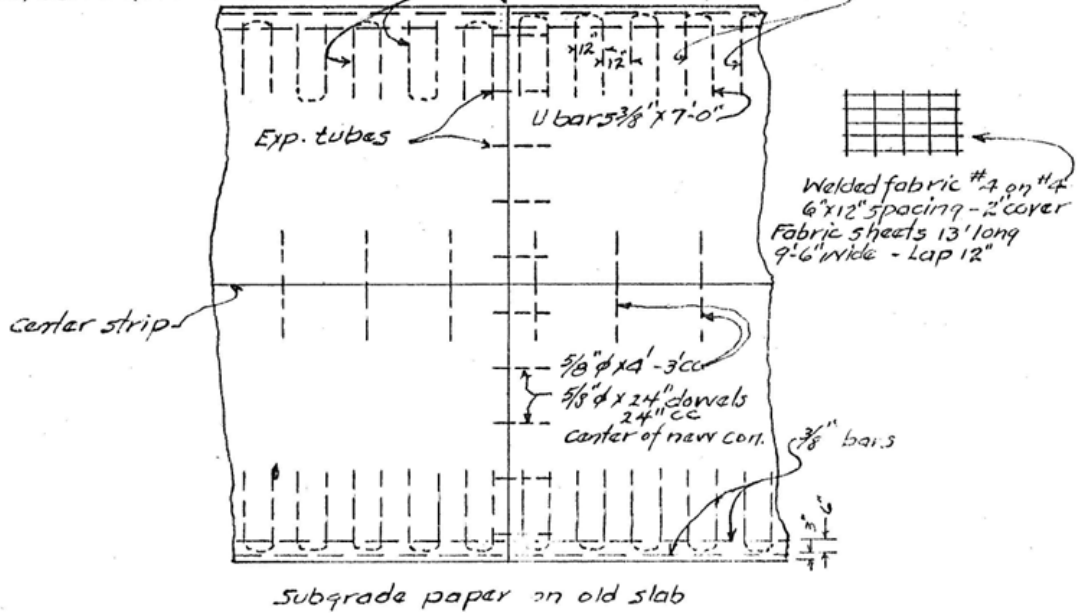
R-2

|             |         |        |
|-------------|---------|--------|
| Cerro Gordo | NRH 1 B | 1.059  |
| Winnebago   | NRM 139 | 0.294  |
| Woodbury    | P 45    | 1.8015 |



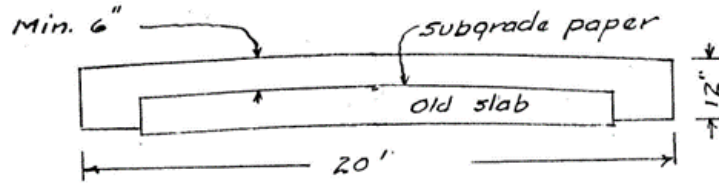
U bars placed thus - alternate bars reversed due to variations in old slab on Cerro Gordo N.R.H. 1 B

3/4" Expansion joints @ 61'-6" U bars designed thus

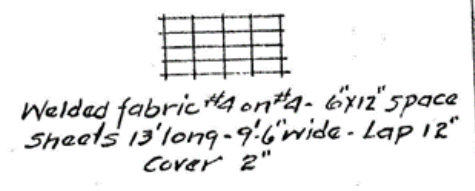
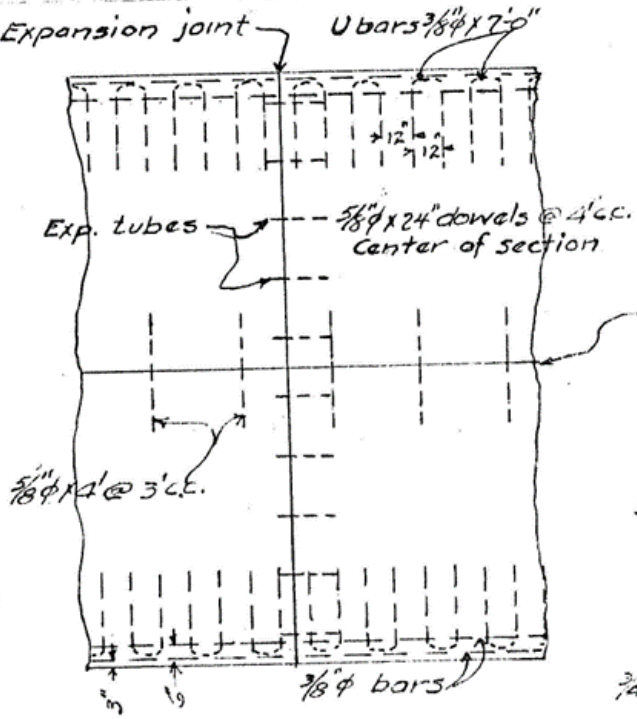




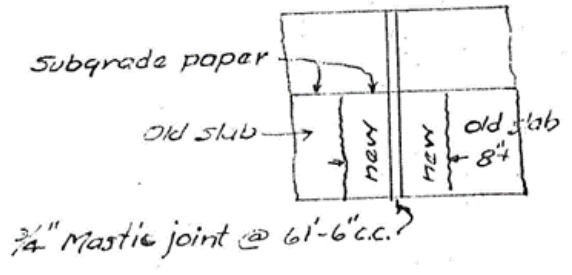
R-3



Expansion joint



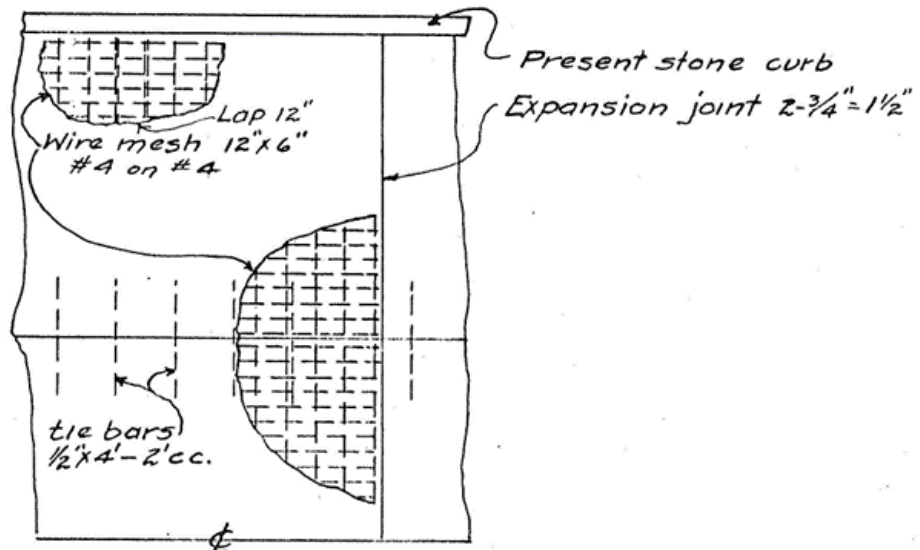
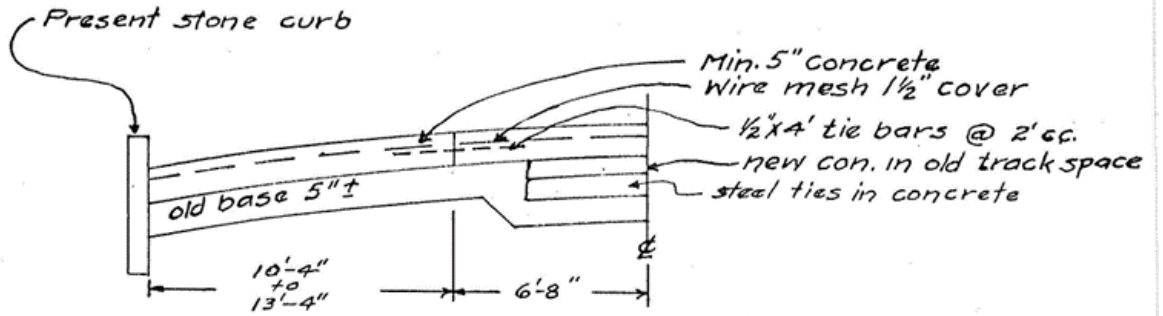
Center joint



Design No. R-4  
First used in letting of 1-29-35

R-4

Dubuque NRM 17 DEF 1.995

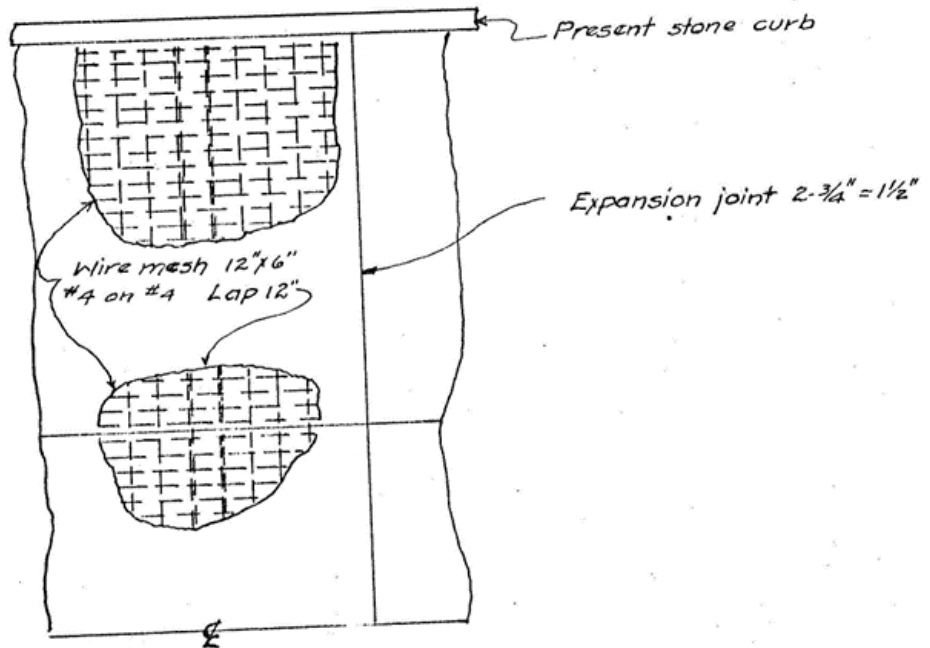
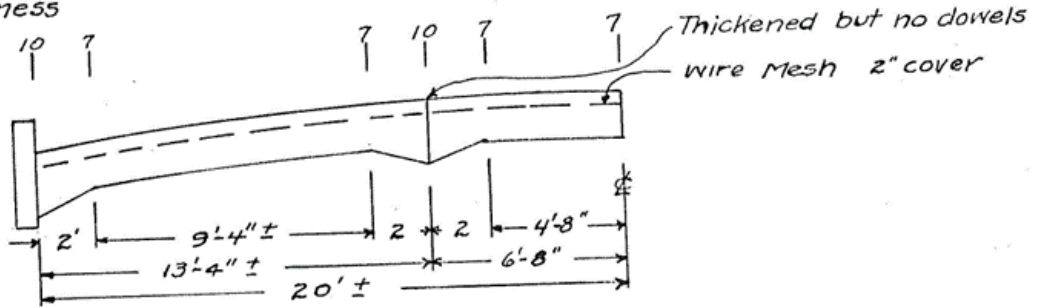


Design No. R-5  
 First used in letting of 1-29-35

R-5

Dubuque NRM 17 DEF 1.995

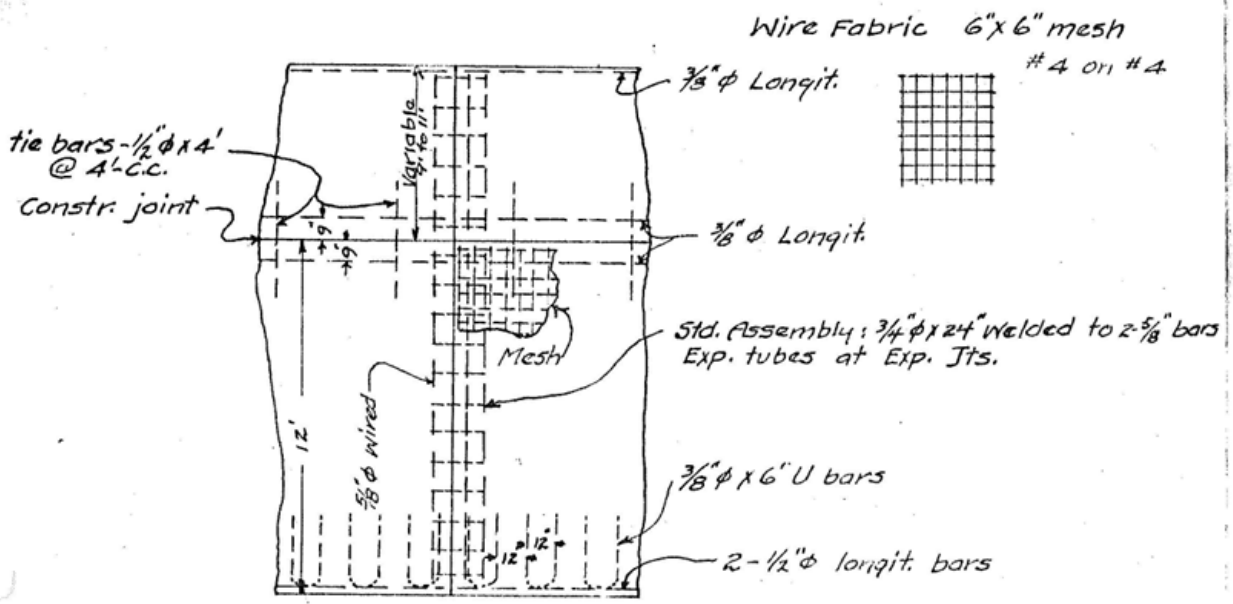
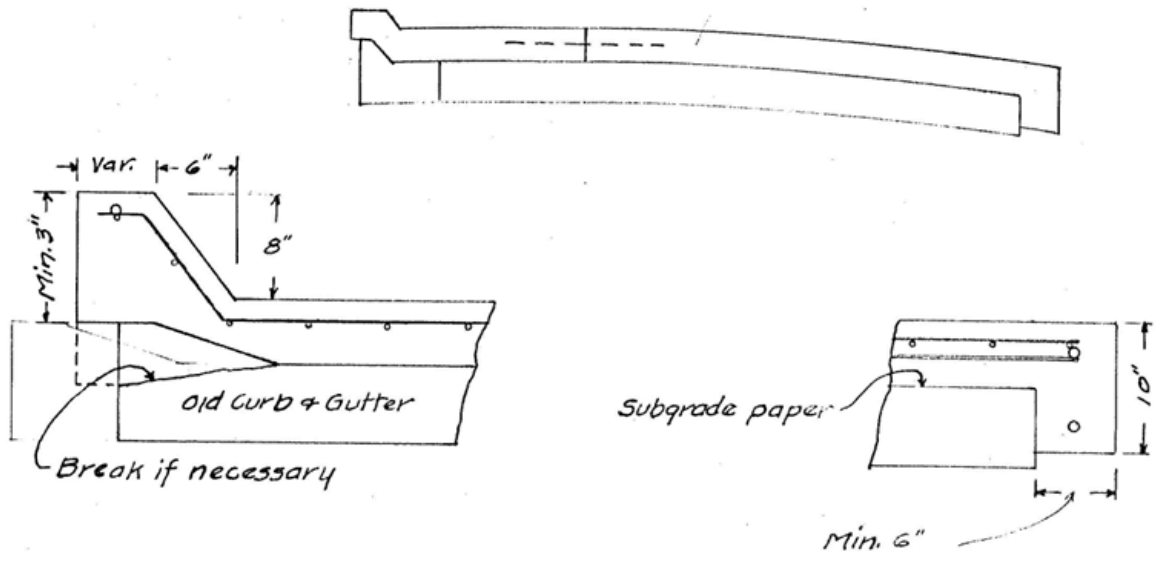
slab thickness  
 inches → 10 7



Design No R-6  
 First used in letting of 6-29-36

R-6

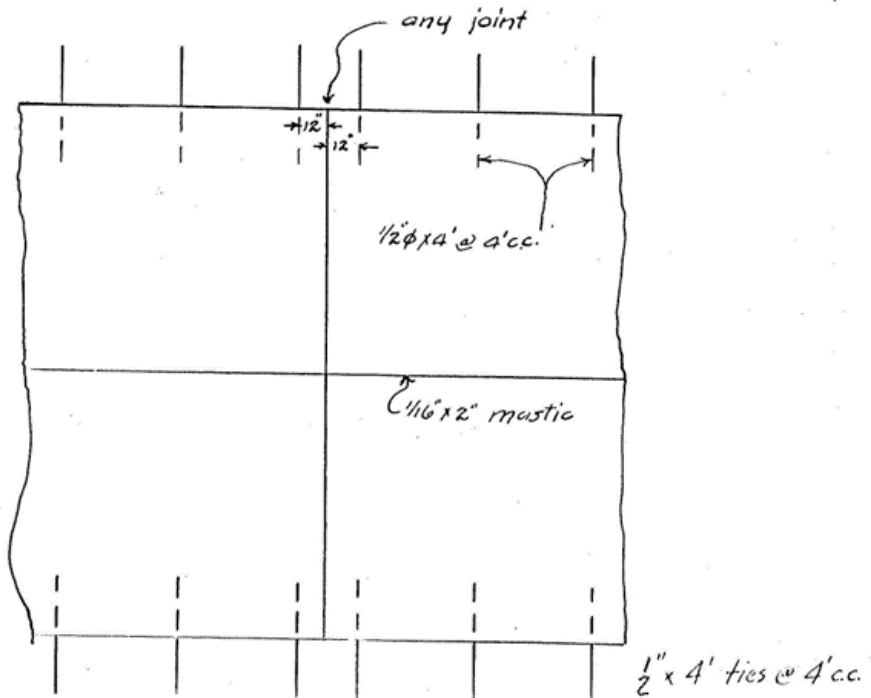
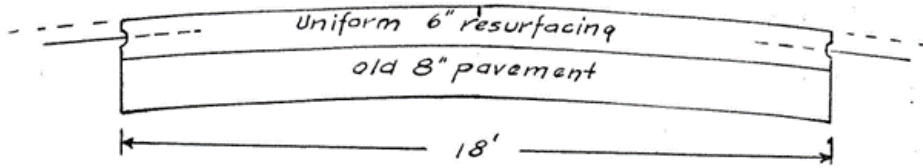
Des Moines WPMH 572B 0.933



Design No. R-7  
First used in letting of 4-21-42

R-7

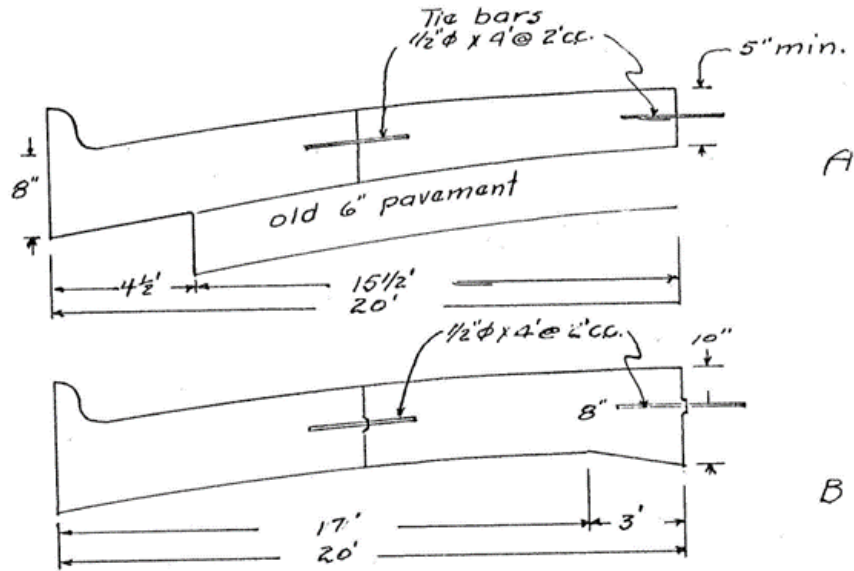
Des Moines DAVI-2 2.045



Design No. R - 8  
 First used in letting of

Plymouth U-38 (b)

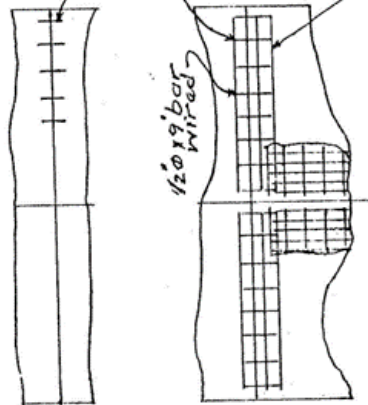
R-8



Construction Joints  
 $8 - \frac{3}{8}'' \phi \times 18''$  dowels

Welded Assemblies -  $8 - \frac{3}{4}'' \phi \times 24''$  dowels  
 to  $2 - \frac{3}{8}'' \phi \times 9'$  bars

Exp. tubes at E.J.



Welded mesh  
 19-#4 wires at 6" cc. long.  
 16 #4 " " 12" cc transv.  
 Mats lapped one transv. wire.

Mesh 2" from jt.  
 Mesh 2" from top.  
 Center of dowels 2 1/2" from top - "A"  
 " " " 4" " " " "B"

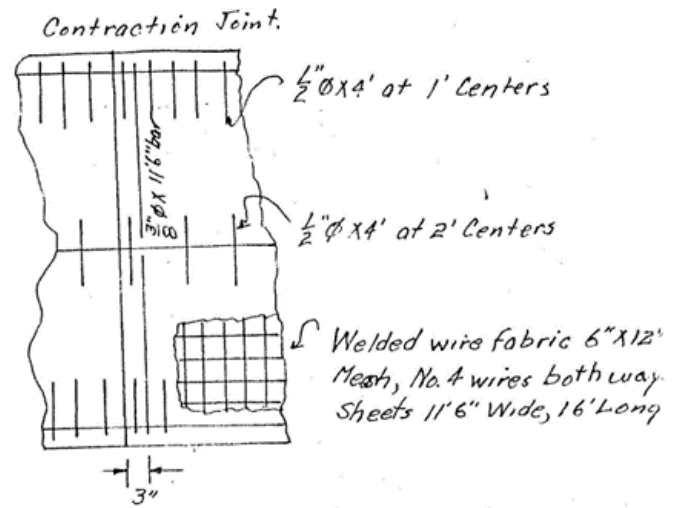
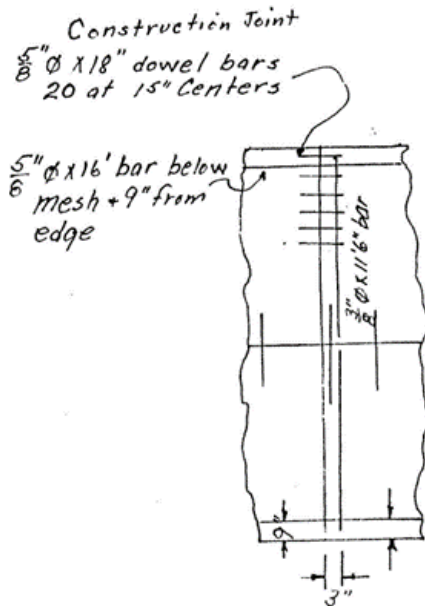
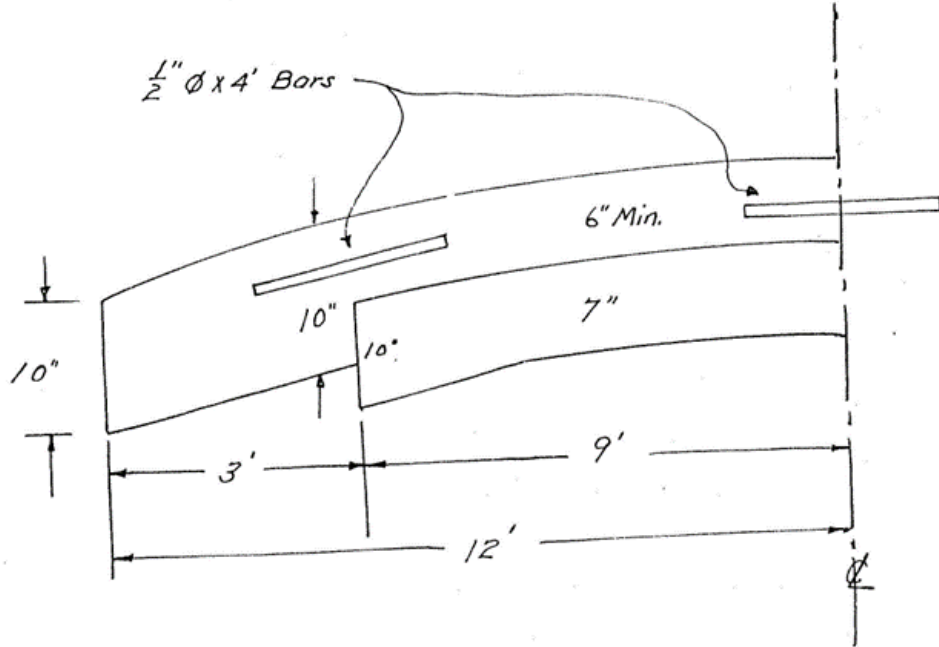
Design No. R-9

First Used in Letting of 7-19-49

Benton  
Benton

F 233(2)  
F 278(2)

R 9



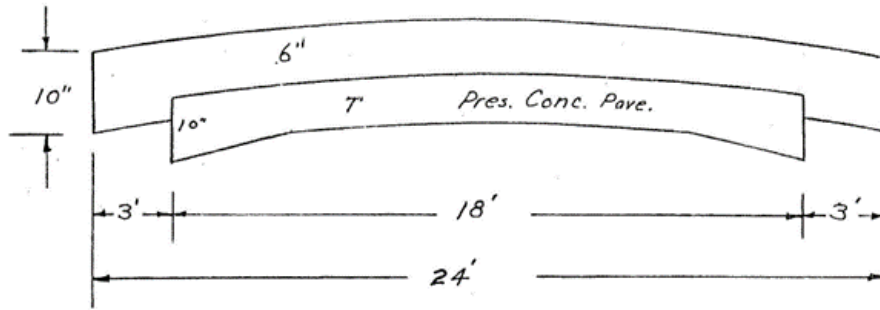
Design No. R-10

First Used in Letting of 8-1-50

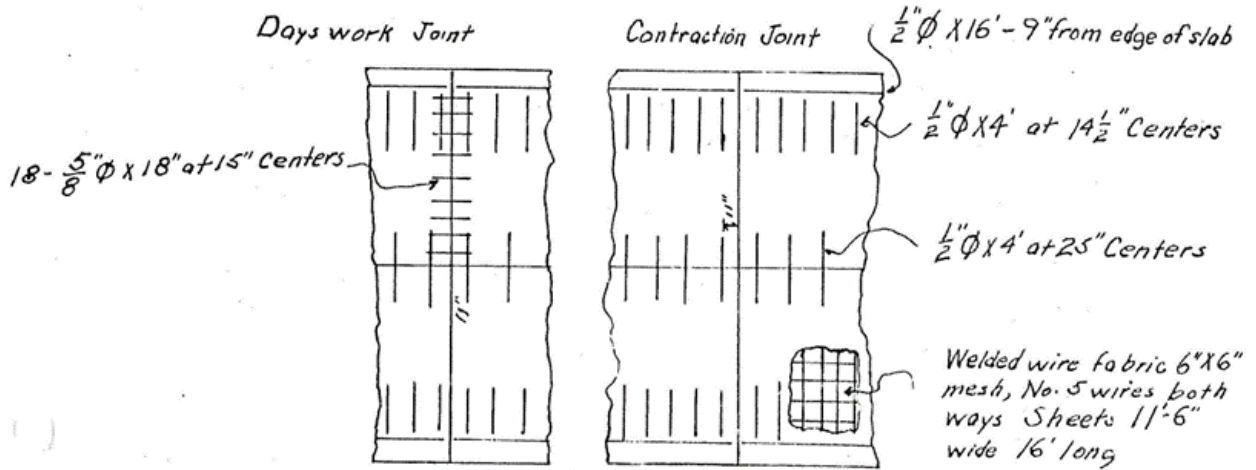
Linn

F-96(11) 4.312 Miles 1950

R10

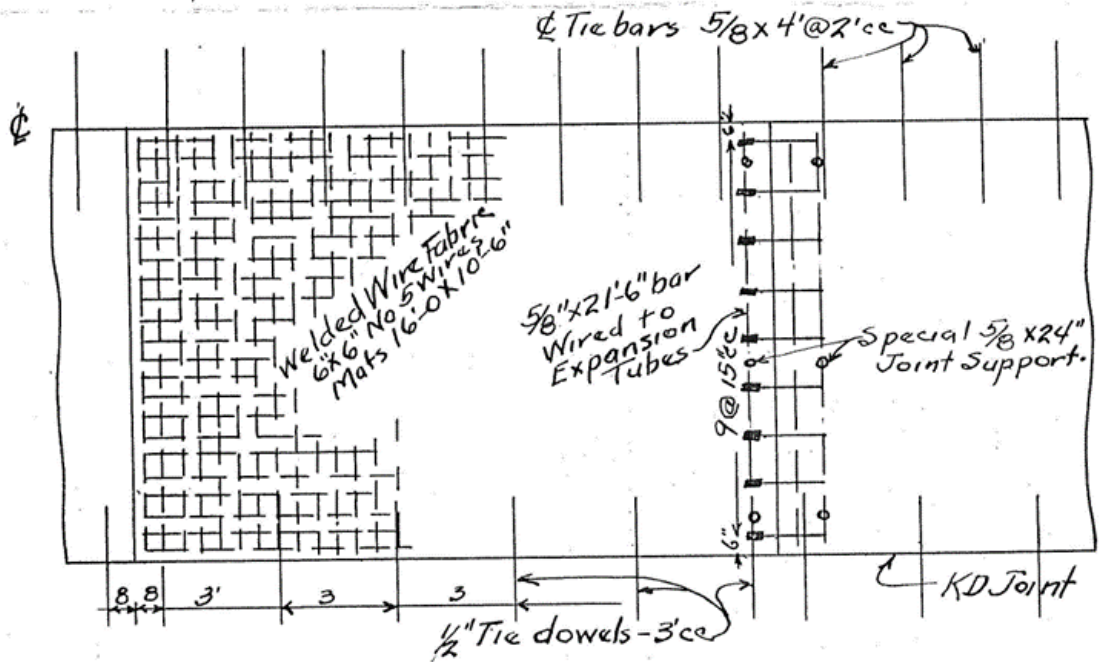
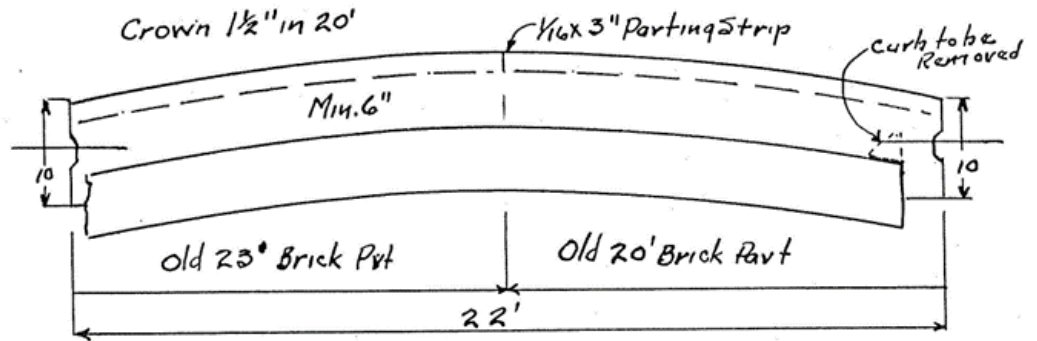


Contraction Joints at 16'-4" intervals





R-11

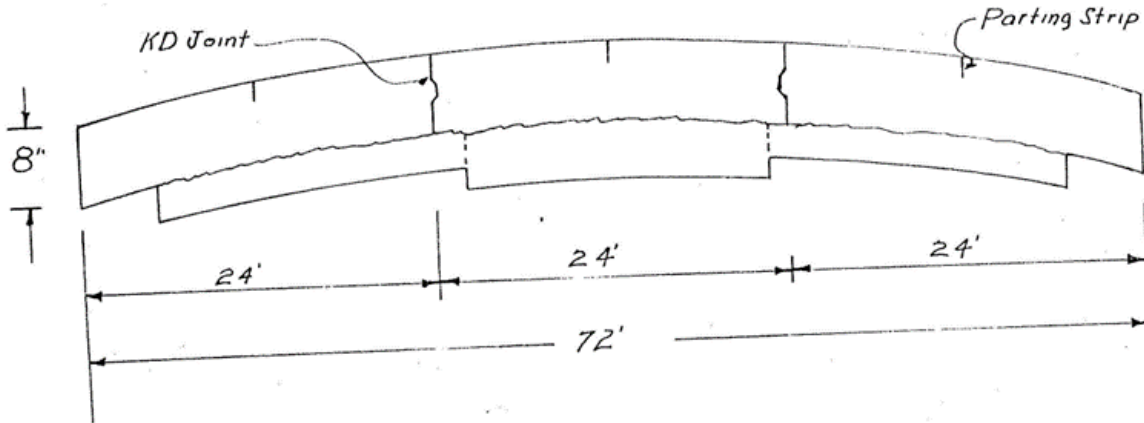


First Used in Letting of 6-6-50

Linn

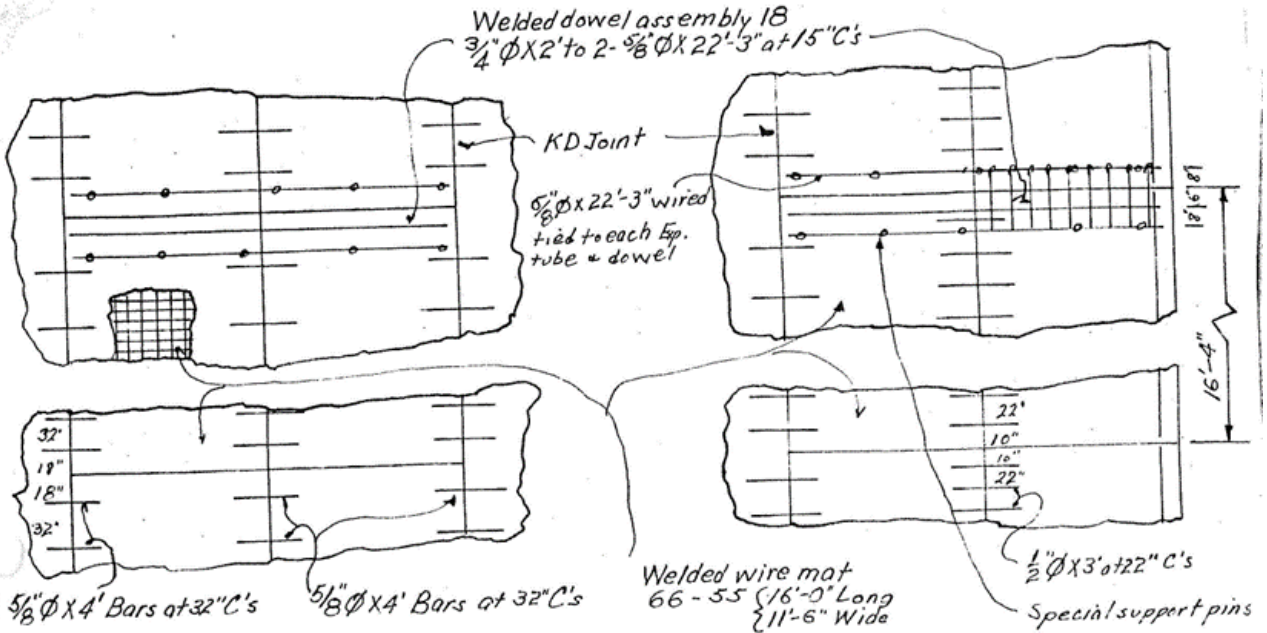
U-22(5)

R-12



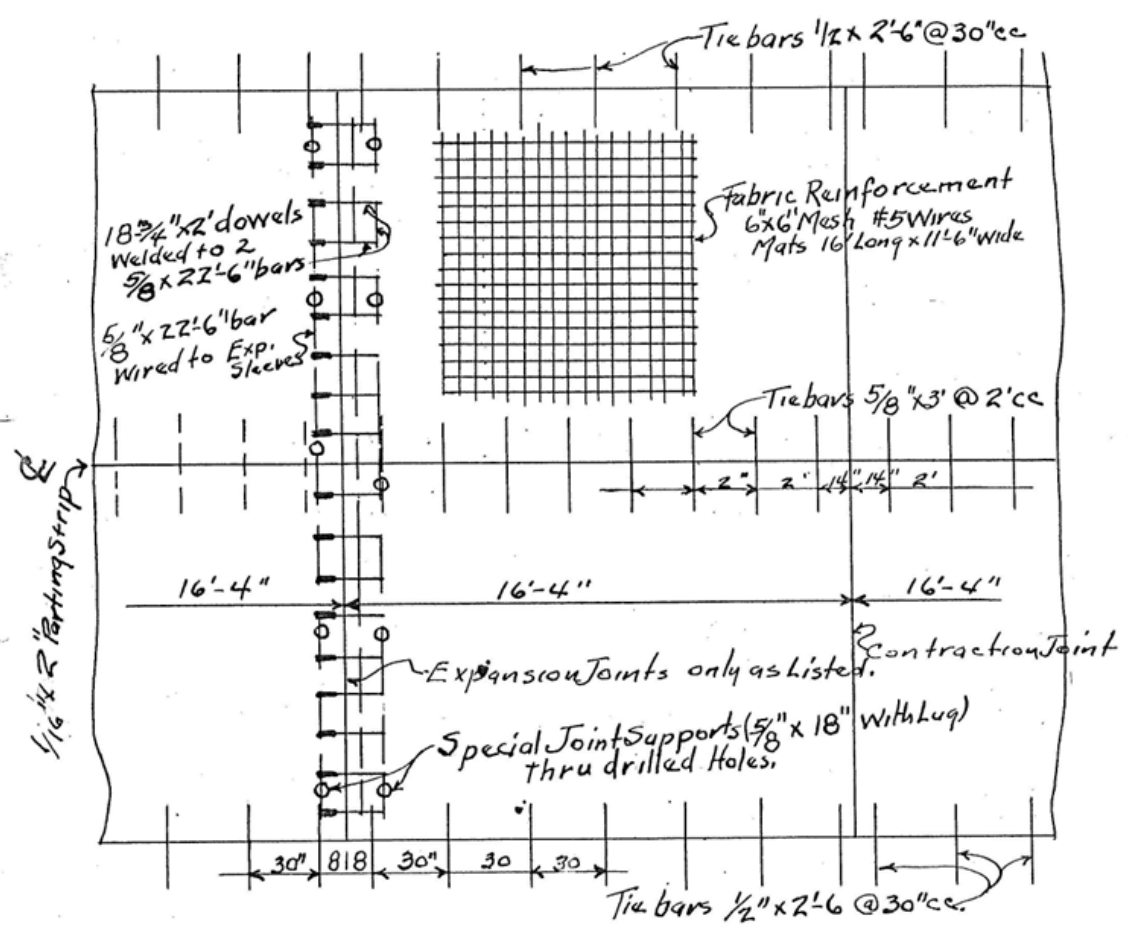
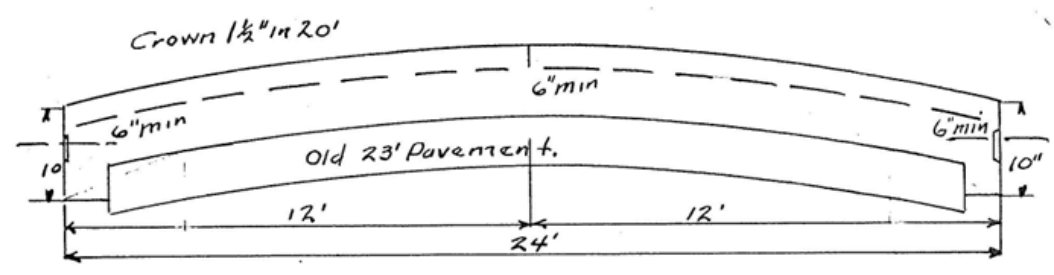
Center 24'

Lt. + Rt. 24' Unit



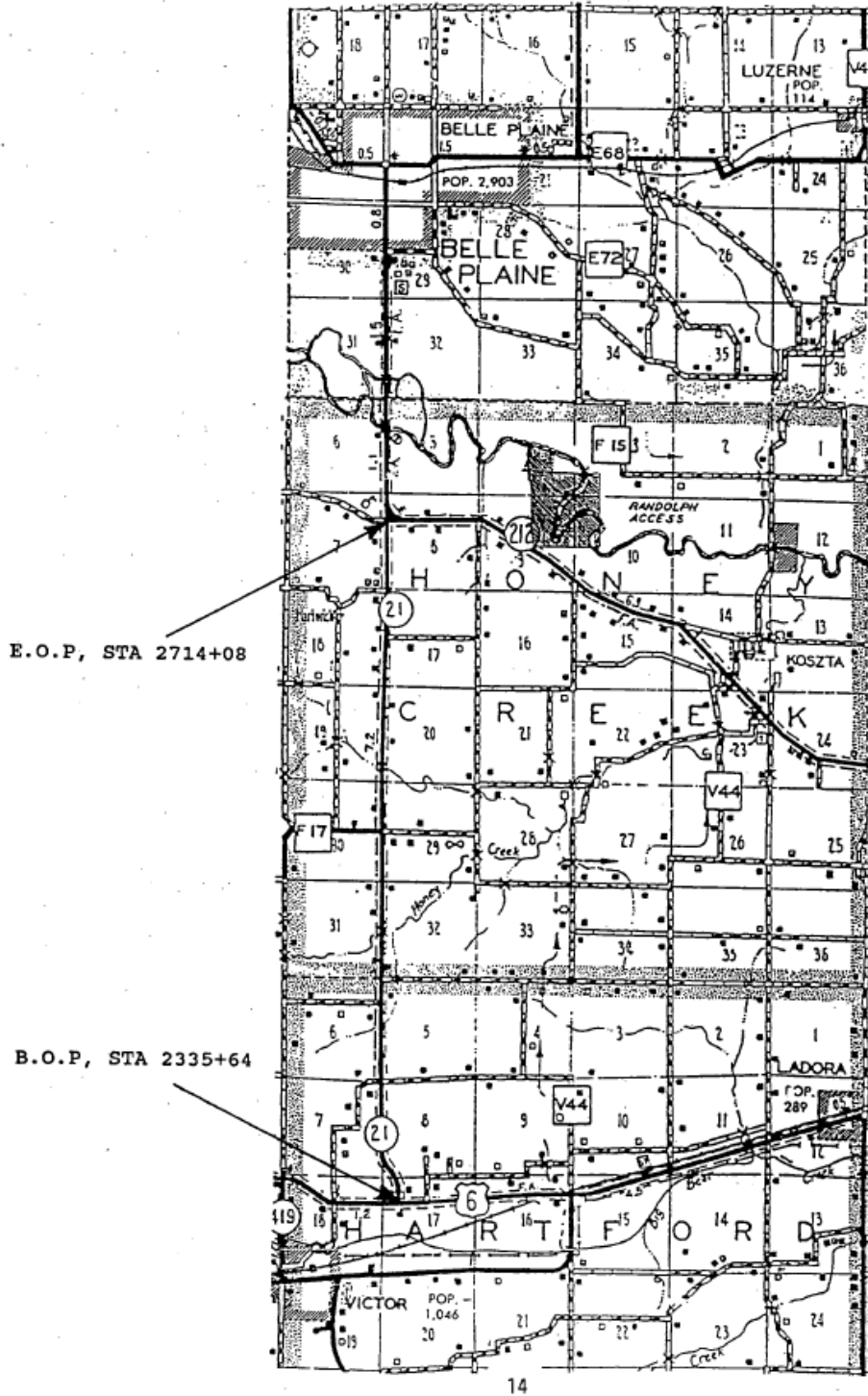
Design R 13 Width 24 Ft Min 6" Edge 10"  
First used in letting of 7-6-50  
Page U 651(4) 0.989 Miles 1950

R-13

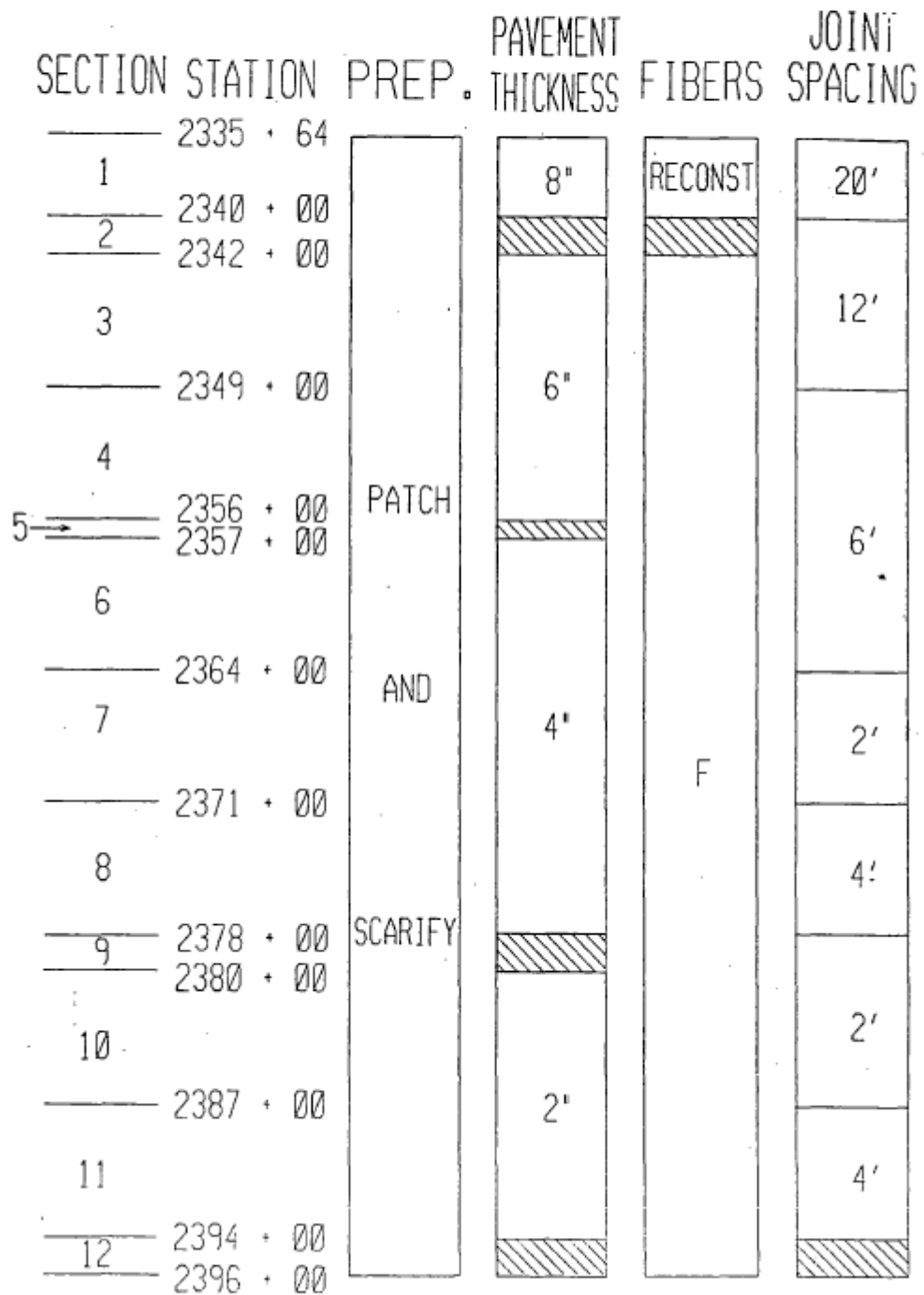


Appendix D – Iowa County IA 21 Whitetopping Overlay Test Sections

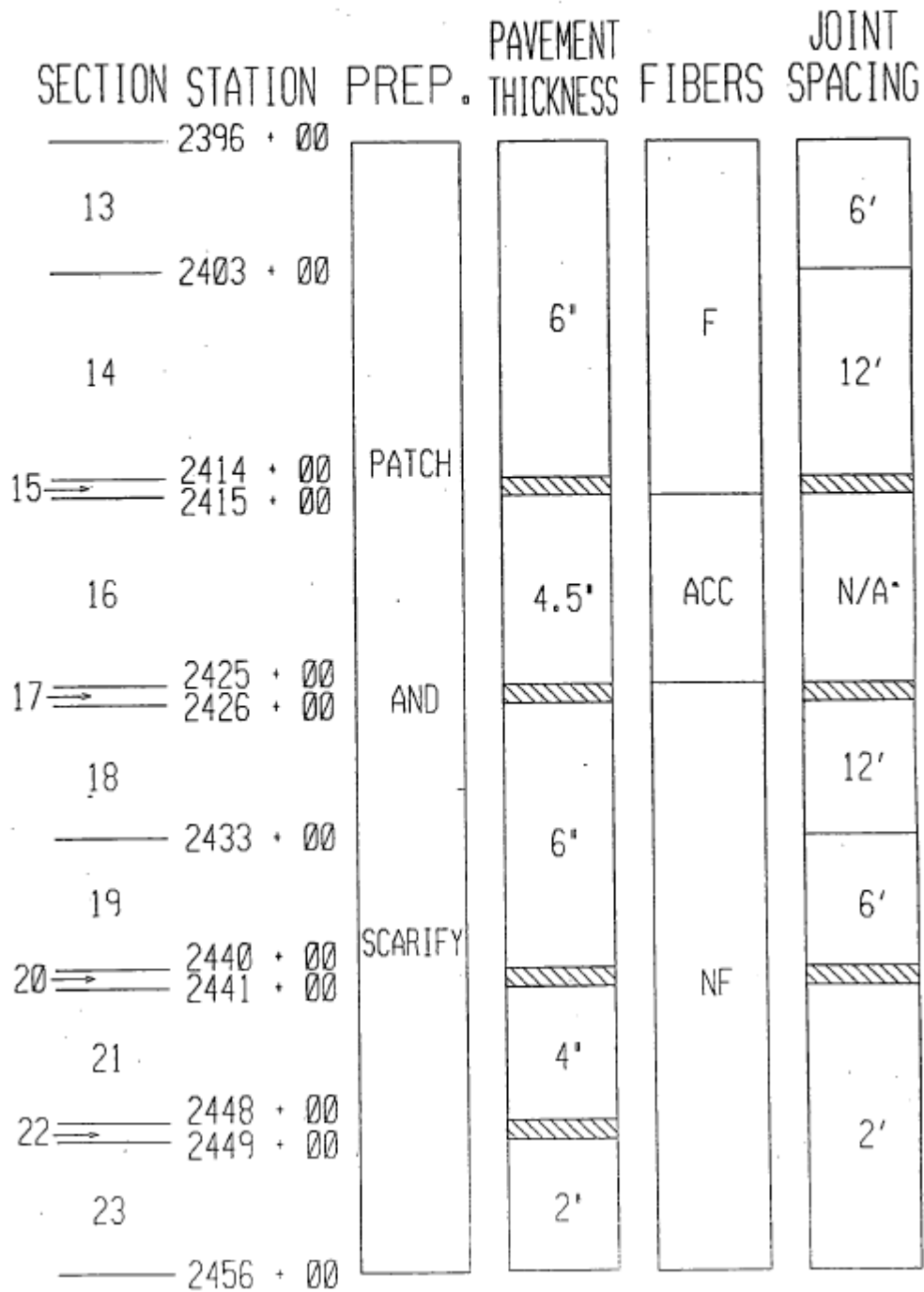
Whitetopping Research Location  
Iowa County IA 21  
STP-21-3(10)—2C-48



WHITETOPPING RESEARCH  
 STP-21-3(10)--2C-48  
 IOWA COUNTY  
 TEST SECTION LAYOUT



WHITETOPPING RESEARCH  
 STP-21-3(10)--2C-48  
 IOWA COUNTY  
 TEST SECTION LAYOUT



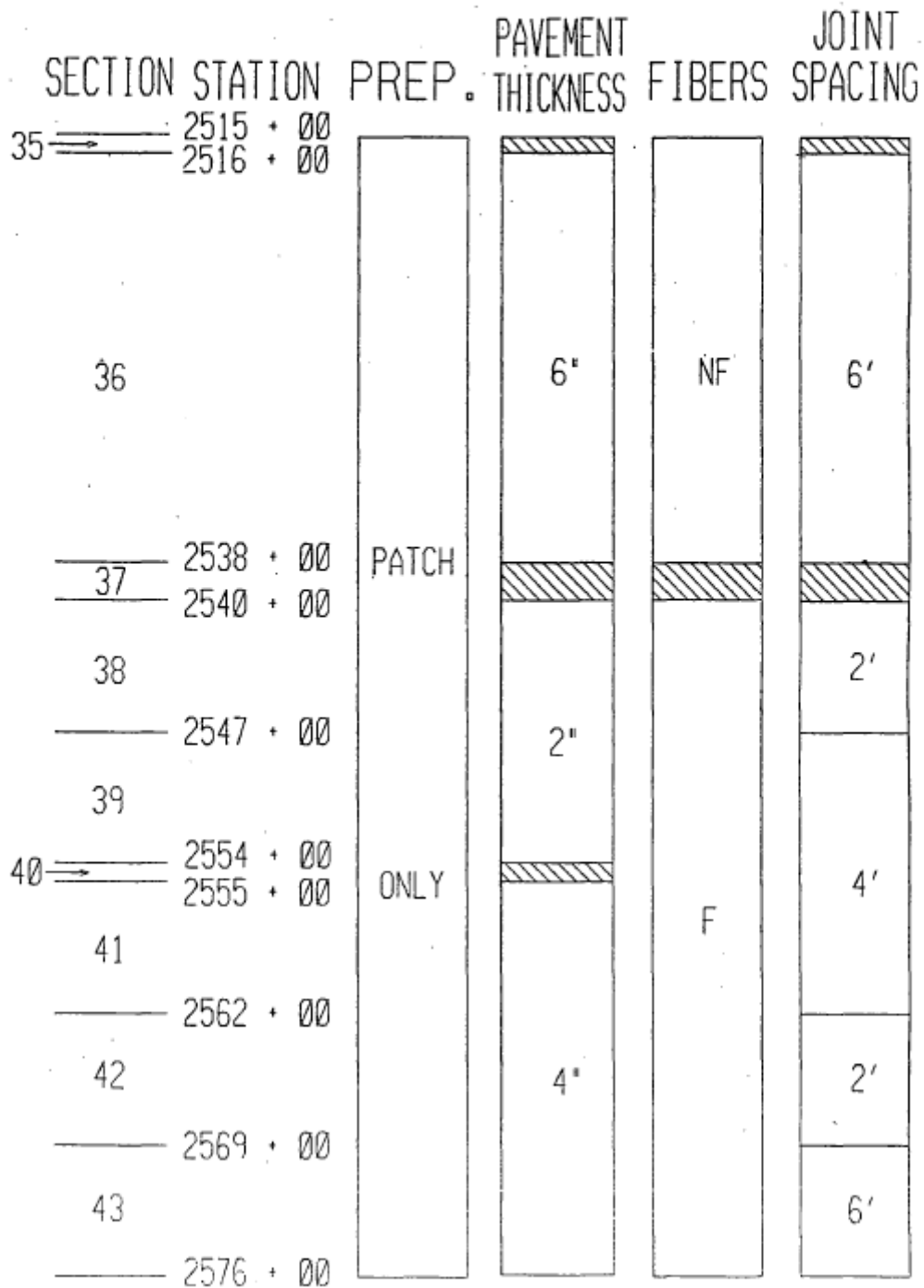
16

WHITETOPPING RESEARCH  
 STP-21-3(10)--2C-48  
 IOWA COUNTY  
 TEST SECTION LAYOUT

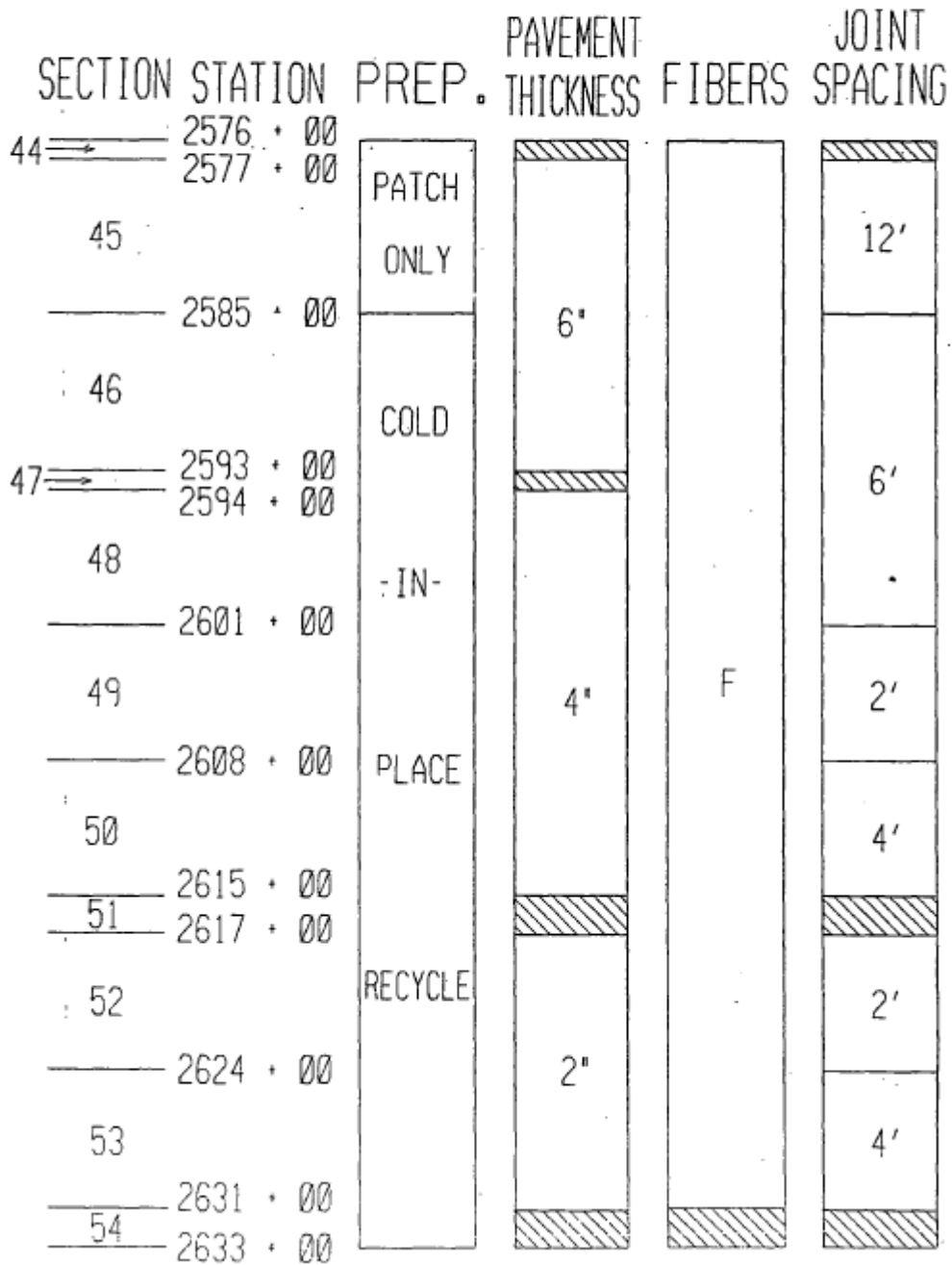
| SECTION | STATION   | PREP.             | PAVEMENT THICKNESS | FIBERS | JOINT SPACING |      |     |     |
|---------|-----------|-------------------|--------------------|--------|---------------|------|-----|-----|
| 24      | 2456 + 00 | PATCH AND SCARIFY | 6"                 | NF     | 6'            |      |     |     |
| 25      | 2458 + 00 |                   |                    |        |               |      |     |     |
| 25      | 2460 + 00 |                   |                    |        |               |      |     |     |
| 26      | 2468 + 00 | PATCH ONLY        | 6"                 | NF     | 12'           |      |     |     |
| 27      | 2479 + 00 |                   |                    |        |               |      |     |     |
| 28      | 2480 + 00 |                   |                    |        |               |      |     |     |
| 29      | 2487 + 00 |                   |                    |        |               |      |     |     |
| 30      | 2489 + 00 |                   |                    |        |               |      |     |     |
| 31      | 2496 + 00 |                   |                    |        |               |      |     |     |
| 32      | 2503 + 00 |                   |                    |        |               |      |     |     |
| 33      | 2505 + 00 |                   |                    |        |               |      |     |     |
| 34      | 2515 + 00 |                   |                    |        |               | 4.5" | ACC | N/A |



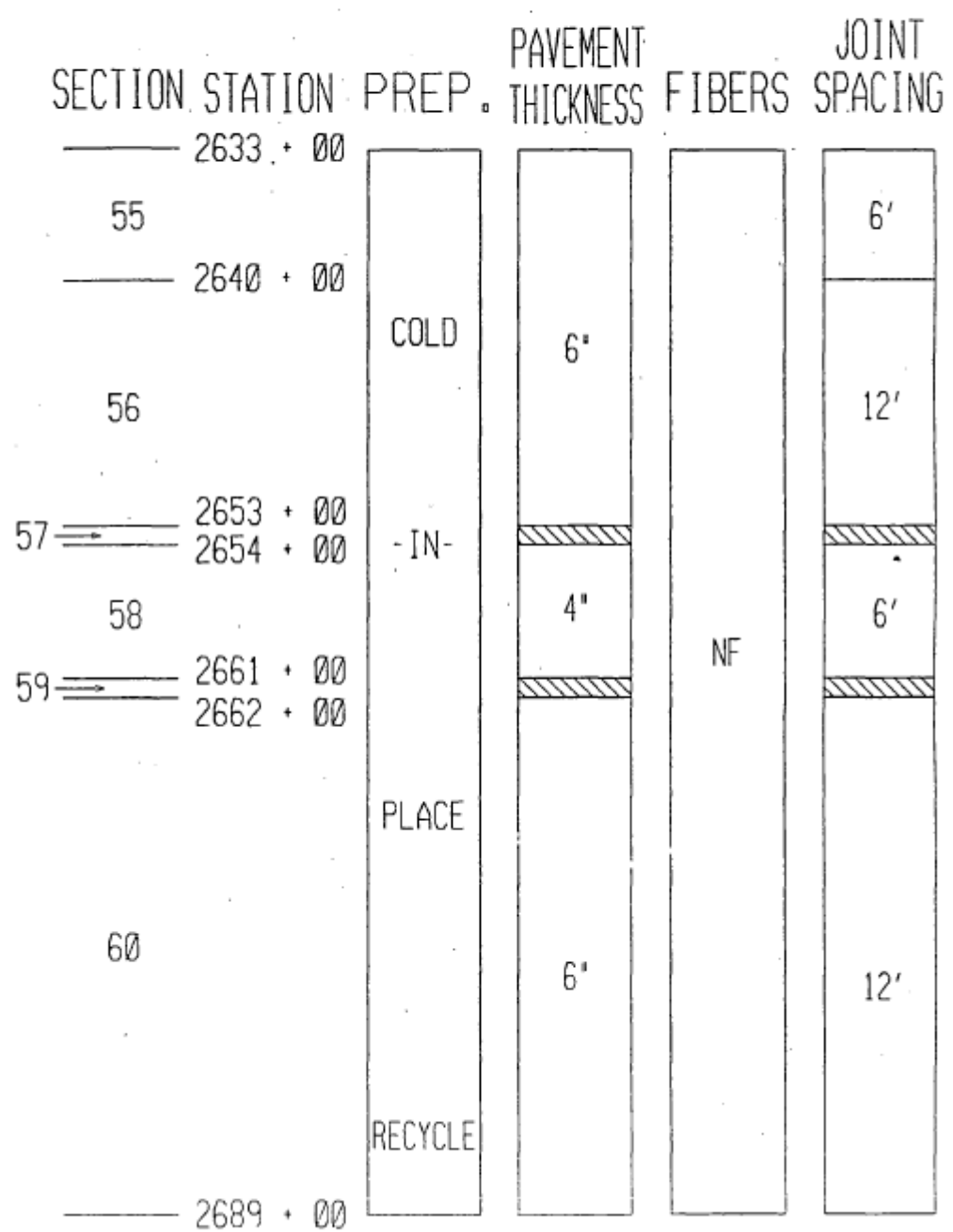
WHITETOPPING RESEARCH  
 STP-21-3(10)--2C-48  
 IOWA COUNTY  
 TEST SECTION LAYOUT



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| SECTION | STATION                | PREP.         | PAVEMENT THICKNESS | FIBERS | JOINT SPACING |
|---------|------------------------|---------------|--------------------|--------|---------------|
| 61      | 2689 + 00<br>2691 + 00 | COLD          | 2"                 | NF     | 4'            |
| 62      |                        |               |                    |        |               |
| 63      | 2698 + 00<br>2700 + 00 | -IN-<br>PLACE | 4.5"               | ACC    | N/A           |
| 64      | 2704 + 00              |               |                    |        |               |
| 65      | 2714 + 00              | RECYCLE       |                    |        |               |