Documentation of the Historic North River Bridge

Bridge No. K0073
Marion County, Route 168
September 2012

MoDOT

U.S. Department of Transportation
Federal Highway Administration

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North River Bridge

Bridge K0073

Marion County, Route 168 over the North River

MoDOT Job Number J3S0781

Historic and Photographic Documentation

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Submitted to:
State Historic Preservation Office
Jefferson City, Missouri

Prepared for:
The Federal Highway Administration
In Compliance with
Section 106 of the National Historic Preservation Act

Kevin L. Keith, Director
Missouri Department of Transportation

September 2012

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HISTORIC DOCUMENTATION
BRIDGE K0073
Over the North River, Route 168, Marion County

Location: Highway Bridge carrying Route 168 across North River, Marion County, Missouri

Construction Dates: 1932

Present Owner: Missouri Department of Transportation, Jefferson City, Missouri

Present Use: Highway Bridge to be removed and replaced by new river crossing

Significance: Bridge K0073 is significant as an increasingly rare example of a Missouri State Highway Department designed Pratt through truss. This span is the longest surviving example and the only one with four identical spans.[1]

Historian: Karen L. Daniels, Historic Preservation Section, Design Division, Missouri Department of Transportation, September 2012.

[1] Grantham, Larry, Randall Dawdy and Karen Daniels. "Phase I and II Investigations, North River Bridge, Route 168 Marion County, Missouri." Historic Preservation Section, Missouri Department of Transportation, Jefferson City, Missouri, pp. 7-8.

I. Introduction

The Missouri Department of Transportation (MoDOT) is proposing to replace bridge K0073 over the North River in Marion County with a new bridge. The existing 1932-rigid connected Pratt through truss was determined to be eligible for listing on the National Register of Historic Places (NRHP) for significance in engineering.[2] It was further determined that the replacement would have an adverse effect on the historic bridge.[3]

II. History of Bridge K0073

On June 9, 1931 a delegation from Marion and Shelby Counties appeared before the Missouri Highway Commission to request early improvement of Route 56. The delegation included representatives of the Marion and Shelby County Courts and the Hannibal Chamber of Commerce and Palmyra Sociability Club. The Highway Commissioners were informed that Route 56 was "one of the old and important roads in Marion and Shelby Counties, serving a prosperous and densely population agricultural section and is a connecting road between the county seats of these two counties."[4] The delegates further requested that improving the road be a priority in 1932.[5]

In November 1931 employees of the State Highway Department conducted a field check in Marion County to determine the best possible route for the highway and for crossing the North River.[6] The existing road had a number of "right angle turns and sharp curves."[7] Based on their field inspection and the topography of the county, it was decided to relocate part of the route, remove the sharp corners and construct a new bridge over the river.

Plans were soon developed for the proposed improvements. On February 9, 1932 the State Highway Commission approved the plans for the Highway 56 relocation. The project was described as "grading, constructing culverts, a bridge, and a gravel surface,

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[2] Ibid.

[3]The Phase I and II investigations report does not explicitly state that the bridge replacement project will have an adverse effect on the bride, it is implied since the purpose of the project is to replace the bridge.

[4] Missouri State Highway Commission. "Minutes of the Meeting of the State Highway Commission, held in Jefferson City, Missouri, June 9, 1931." As held by the Secretary of the Commission, Missouri Department of Transportation, Jefferson City, Missouri, p. 5.

[5] Ibid.

[6] Correspondence file. Microfiche, Bridge Division, Missouri Department of Transportation, Jefferson City, Missouri.

[7] "Will Soon Let Contract for New Highway." *The Palmyra Spectator*. May 4, 1932, p. 1.

together with any incidental work on the state road from Philadelphia to Palmyra…the total length of the improvement being 13.501 miles."[8]
One news article described the relocation in detail:

> The new road will begin at the corner of Main and Ross streets in Palmyra, run west on Ross street and pass under the Burlington underpass and will continue west on the Warren gravel road for about a mile. At this point the Warren road makes a turn to the south, but the new highway will continue west gradually curving to the north until it strikes the North River about a half mile south of the present Philadelphia road bridge. The highway will follow new location across the bottom and up hills west of the river striking the old road near the Bloomer farm about five miles west of Palmyra. The new road will then continue west over the present highway until about four miles east of Philadelphia where it will angle a mile north over new location and strike a road passing by the Prairie school and again meet the old road at the Swisher corner to run in to Philadelphia.[9]

In February 1932 the State Highway Department presented Marion County with the road location.[10] The Palmyra Business Men's Sociability Club protested the proposed location of the highway since it was located south of the business district. They recommended that the State Highway Department change the highway route to bring it through the business district since it was of "vital importance to business interests."[11]

Property owners along the route were asked to donate the right of way for the road since the state was authorized to spend money only for the construction and maintenance of the road, not for the purchase of the land on which to build it. Marion County proceeded with condemnation for those property owners who did not donate the necessary land, and appointed commissioners to determine fair market value. There were thirty-seven property owners involved and 71.76 acres of land necessary for the road. The commissioners determined that the total damages to property totaled $4,636.75.[12]

In June 1932 the State Highway Commission put out four notices to contractors for work on the new highway and the bridge across the North River. The project was broken into four sections and contractors were informed that they could bid on any combination of

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[8] Missouri State Highway Commission. "Minutes of the Meeting of the State Highway Commission, held in Jefferson City, Missouri, February 9, 1932." As held by the Secretary of the Commission, Missouri Department of Transportation, Jefferson City, Missouri, p. 86.
[9] Ibid.

[10] "Securing Right-of-way for Highway 56." *The Palmyra Spectator*. February 17, 1932, p. 1.

[11] "Club Protests Road Location." *The Palmyra Spectator*. February 17, 1932, p. 1.

[12] "Commissioners Make Report on New Road Damage." *The Palmyra Spectator*. May 18, 1932, p. 1.

sections. Sections 6, 7 and 8 were for highway work and section 9 was the bridge job. Bids were due no later than 10 a.m. on June 7, 1932.[13]

On June 14, the State Highway Commission approved the low bids submitted for the projects. Sections 6, 7 and 8 were awarded to Joseph Kesl and Sons of Edwardsville, Illinois for $66,942.27. Section 9, the project for the North River Bridge, was awarded to the Vincennes Bridge Company of Vincennes, Indiana for $35,801.90.[14]

The Kesl and Sons contract included all culvert work, grading and graveling. They were expected to begin moving equipment to the project area at once and start work soon. The Vincennes Bridge contract included a 530 foot long 4-span bridge. It was anticipated that the road would be completed by November 1 and the bridge by November 15.[15]

In early July the *Palmyra Spectator*, the local weekly newspaper, reported that the contractor (Kesl and Sons) had been moving in materials for the culverts. It also noted that "a considerable amount of heavy grading will be necessary on the road, especially through the North River bottom."[16]

The paper regularly reported on the progress of the road construction throughout the fall and winter, including comments on the progress of the bridge construction as well. In late July the paper noted that the culverts were nearing completion and that the grading on the road and construction on the North River Bridge would begin soon.[17]

Heavy rains in late July, followed by the "extremely high stages of the Fabius and North rivers" interfered with state highway construction in the county. All road construction was discontinued until conditions improved. The *Spectator* reported that there had been some damage and loss of equipment due to flooding, although it did not report if it was due to construction on Highway 56 or other construction in the county. Despite the weather setback it was reported that a large number of the culverts on Highway 56 had been completed—seven were of poured concrete and the remainder were of tile. It was further reported that the Vincennes Bridge Company had been moving equipment to the job site, and expected to start work soon, depending on the conditions of the river.[18]

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[13] "State Road Work Notice to Contractors." *The Palmyra Spectator*. June 1, 1932, p. 8.

[14]Missouri State Highway Commission. "Minutes of the Meeting of the State Highway Commission Held in Jefferson City, Missouri on June 14, 1932." As held by the Secretary of the Commission, Missouri Department of Transportation, Jefferson City, Missouri.

[15] "Contracts let on Highway 56." *The Palmyra Spectator*, June 15, 1932, p. 1.

[16] "To Start Work on Highway 56." *The Palmyra Spectator*, July 6, 1932, p. 1.

[17] "Work on Highway 56 Started." *The Palmyra Spectator*, July 27, 1932, p. 1.

[18] "Rain interferes with road work." *The Palmyra Spectator*, August 3, 1932, p. 1.

A week later work was continuing. Chester Fatrell, the foreman for Joseph Kesl and Sons, reported that the culverts on the western end of the road were completed and the crews would be moving to the eastern end of the project. The Vincennes Bridge Company continued to move equipment into the project site to begin work on the North River Bridge.[19]

Heavy rains continued in August, slowing road work and stopping construction in mid-August. Streams were reported flooded and work on bridges had been suspended due to high water levels.[20]

By the end of August the ground had dried sufficiently for work to continue and work on highway 56 was "speeding along in good shape."[21] Two grading crews were at work—one near the North River and the other near Philadelphia. The culverts were reported to be about two-thirds of the way completed. Work on the North River bridge had begun, one of the five piers was about half finished and false work was being run across the river to get material to the mid-stream locations for the other piers.[22]

In early September the United States Weather Bureau reported that the past August had been the wettest on record, for the Marion County area, in 41 years.[23]

Throughout September work on the highway continued. By late September the *Spectator* reported that "practically all" the culvert work was completed as was the rough grading work on the western section of the highway. In addition, a considerable amount of dirt had been moved for the relocation of the North River channel. The bridge was progressing rapidly, with one abutment completed and the other abutment and center pier nearing completion.[24]

Although work was progressing on the highway, it was not expected to be completed by the November 1 date in the contract due to the weather delays during the summer. In early October it was expected that graveling the road should begin soon. It was also reported that "much progress" was being made on the North River Bridge.[25] In mid-October an extra heavy grading crew had been brought to the Palmyra end of the project and was working between there and the North River to complete the grading quickly so that the graveling could be completed and the project completed. All but one of the

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[19] "Work on Highway 56 is Progressing." *The Palmyra Spectator*, August 10, 1932, p. 1.

[20] "All Road Work at Standstill." *The Palmyra Spectator*, August 17, 1932, p. 1.

[21] "Speeding Work on Highway 56." *The Palmyra Spectator*, August 31, 1932, p. 1.

[22] Ibid.

[23] "August Wettest in 41 Years." *The Palmyra Spectator*, September 7, 1932, p. 1.

[24] "Work Progressing on Highway 56." *The Palmyra Spectator*, September 21, 1932, p. 1.

[25] "Road Grading to Begin Within Several Days." *The Palmyra Spectator*, October 5, 1932, p. 1.

bridge piers had been completed and it was reported that the erection of the steel would be started the week of October 12.[26]

By the end of October gravel was being spread on the west end of the road project. All the heavy grading had been completed, except for the fills at the North River. It was announced that the North River Bridge would be completed by November 15.[27]

Coverage of the Roosevelt-Hoover Presidential election kept road progress reports out of the newspaper for a few weeks. In late November Marion County experienced a severe change in winter that hampered road and bridge construction. Temperatures plummeted from highs in the 60s and 70s to highs of 24 and 31.[28] The bridge was complete except for some sections of the concrete deck, which still needed to be poured. These temperatures caused problems with the process of curing the concrete—it needed to be warmed during the curing process in order to keep the project from having to be stopped until weather improved. The *Spectator* described the construction site during the process with steam boilers on each side of the bridge and pipes were laid over the floor of the bridge to keep the top of the concrete warm as it was poured. In addition, "canvas curtains were spread on either side of the bridge to the bed of the river and open heaters, called salamanders, are used in this enclosure to heat the floor of the bridge from underneath."[29]

The cold weather concrete pours were successful, and the bridge was completed on December 12, 1932. The bridge was inspected on that date and it was recommended that it be accepted by the State Highway Department.[30] On December 15, 1932 the State Highway Department formally accepted the bridge as completed by the Vincennes Bridge Company.[31]

III. Construction Contractor: Vincennes Bridge Company

The Vincennes Bridge Company was formed in 1898 by brothers John and Frank Oliphant and Jacob Riddle. They began with a small capital stock of $20,000 and expanded the business in 1902 to $50,000 capital stock. Neither of the Oliphant brothers nor Riddle was trained in engineering, so they hired professional expertise. By 1920

[26] "Work on Highway Progressing." *The Palmyra Spectator*, October 12, 1932, p. 1.

[27] "Work on Road Progressing Rapidly." *The Palmyra Spectator*, October 26, 1932, p. 1.

[28] "Concrete pour report." Microfiche, Bridge Division, Missouri Department of Transportation, Jefferson City, Missouri, various dates.

[29] "Building Roads Under Difficulties in Winter." *The Palmyra Spectator*, November 23, 1932, p. 1.

[30] "Final Inspection Report." Microfiche, Bridge Division, Missouri Department of Transportation, Jefferson City, Missouri, December 3, 1932.

[31]Letter from T. H. Cutler to George L. Clark, Microfiche, Bridge Division, Missouri Department of Transportation, Jefferson City, Missouri, December 15, 1932.

annual production was over $1 million a year and Vincennes Bridge Company bridges could be found in at least eight states before 1920.[32]

The Vincennes Bridge Company not only manufactured trusses, they were a full-service bridge building company. The Company retained crews to build concrete substructures and erect the steel spans it manufactured. This allowed the company to compete directly against other bridge building companies. In the 1920s the company began to pursue contracts with state highway departments as those departments constructed federal and state highway systems.[33]

A search of Bridgehunter.com reveals that the Vincennes Bridge Company constructed many small truss spans across Missouri in the first two decades of the twentieth century for county road departments.[34]

A search of the Missouri State Highway Commission minutes reveals that the Vincennes Bridge Company had many contracts with the State Highway Commission beginning in the early 1920s. Among the bridges they built in the 1920s are the bridges over the Castor River in Madison County, Joachim Creek in Jefferson County, the Meramec River in St. Louis County, the North Fork of the Salt River in Shelby County, and the Current River in Ripley County.[35]

In June 1932 the Vincennes Bridge Company was awarded the contract for a bridge on the new alignment of Route 56 in Marion County over the North River.[36]

IV. Physical Description of Bridge K0073

The North River Bridge (K0073) is a steel, four span, seven-panel, rigid connected Pratt through truss structure with steel reinforced concrete piers and abutments. The bridge has

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[32] Cooper, James L. *Iron Monuments to Distant Posterity Indiana's Metal Bridges, 1870-1930*. Indianapolis, IN: DePauw University, et. al., 1987, p. 28.

[33] Ibid.

[34] Baughn, James. Bridgehunter.com. Search results for Vincennes Bridge Company builder. Search conducted January 12, 2011 at http://bridgehunter.com/category/builder/vincennes-bridge-co/.

[35] Missouri Highway and Transportation Commission. Search results for Vincennes Bridge Company. Search conducted January 12, 2011 at http ://lnapp1/cs/minutes.nsf/422794b6dd0ae0a986256c0f004d5ce0?SearchView. This is an imperfect search engine since not all meeting minutes were made searchable when they were scanned into a .pdf format; therefore these results should not be considered comprehensive. This is offered as a sample of work the Vincennes Bridge Company did in Missouri in the 1920s.

[36] Missouri State Highway Commission. "Minutes of the Meeting of the State Highway Commission, Held in Jefferson City, Missouri, on June 14, 1932." As held by the Secretary of the Commission, Jefferson City, Missouri, p.40. Henceforth this collection is referred to as "Commission."

a total length of 530 feet with each span measuring130 feet. The roadway is 22 feet wide curb to curb.[37]

Bent 1 is the abutment on the north end of the bridge. The footings of bent 1 are set into rock at an elevation of 472' 6" above mean sea level, and are 5' wide, 11' 3" long and 2' 6" thick. Rising from the footings are two columns that are 23' 4-3/4" high and which taper from 9' 3" deep at the footing to 3' 5" deep at the top of the shaft. Joining the shafts to the bent cap are shoulders which taper 18" wider than the shafts on each side and which are 18" tall. Atop the shaft is a bent cap with the bridge seat and attached wing walls. The bent cap is 2' 6" below the bridge seat and has a 4' 2" high backwall. It is 44' 9" wide from the outer (lower) edges of the wing walls to 13' 6" wide at the top of the wing walls. The bridge seat is 2' 5" deep and the back wall is 12" deep. The height varies from 18" at the outer edge of the wing walls to 7' 5" at the top of the wing walls. The total height of bent 1, from the bottom of the footings to the top of the backwall, is 32' 6-3/4". A stone revetment is located between the bent and the river. There is one 12" X 2' expansion plate centered above each shaft.

Pier 2 has two footings, laid to rock at an elevation of 473' 6" above mean sea level, that are 8' 3" wide and long and 5' thick. Atop each footing is a column which tapers as it rises. The columns taper from 6' 1" at the bottom to 4' 4" at the top. The center points of the columns were located 24' 4" apart. A web wall connects the two columns and begins 6' 6" above the top of the footings and rises to the top of the columns. The bent cap is 18" thick and cantilevers 6" over the columns and the web wall. The total height of the pier is 31' 10". There are two 12" X 2' fixed bearing plates on each column.

Pier 3 has two footings, laid to rock at an elevation of 473' above mean sea level, that are 8' 3" wide and long and 5' thick. Atop each footing is a column which tapers as it rises. The columns taper from 6' 2" at the bottom to 4' 4" at the top. The center points of the columns were located 24' 4" apart. A web wall connects the two columns and begins 7' 1" above the top of the footings and rises to the top of the columns. The bent cap is 18" thick and cantilevers 6" over the columns and the web wall. The total height of the pier is 32' 5". There are two 12" X 2' expansion plates on each column.

Pier 4 has two footings, laid to rock at an elevation of 473' above mean sea level, that are 8' 3" wide and long and 5' thick. Atop each footing is a column which tapers as it rises. The columns taper from 6' 2" at the bottom to 4' 4" at the top. The center points of the columns were located 24' 4" apart. A web wall connects the two columns and begins 6' 11-3/4" above the top of the footings and rises to the top of the columns. The bent cap is 18" thick and cantilevers 6" over the columns and the web wall. The total height of the pier is 32' 3-3/4". There are two 12" X 2' fixed bearing plates on each column.

Bent 5 is the abutment on the south end of the bridge. The footings of bent 5 are set into rock at an elevation of 491' above mean sea level, and are 5' wide, 6' 8" long and 2' 6"

[37] Fraser, Clayton B. North River Bridge. Bridge Inventory Form. Historic Preservation Section, Missouri Department of Transportation, Jefferson City, Missouri.

thick. Rising from the footings are two columns that are 4’ 10-1/2” high and which taper from 4’ 7-1/2” deep at the footing to 3’ 5” deep at the top of the shaft. Joining the shafts to the bent cap are shoulders which taper 18” wider than the shafts on each side and which are 18” tall. Atop the shaft is a bent cap with the bridge seat and attached wing walls. The bent cap is 2’ 6” below the bridge seat and has a 4’ 2” high backwall. It is 44’ 9” wide from the outer (lower) edges of the wing walls to 13’ 6” wide at the top of the wing walls. The bridge seat is 2’ 5” deep and the back wall is 12” deep. The height varies from 18” at the outer edge of the wing walls to 7’ 5” at the top of the wing walls. The total height of bent 5, from the bottom of the footings to the top of the backwall, is 14’ 0-1/2”. There is one 12” X 2’ expansion plate centered above each shaft.

The bridge superstructure is comprised of four identical rigid-connected Pratt through trusses. Spans 1 and 4 are 133’ 3-1/2” long, span 2 and 3 are 131’ 8” long. Each span has a roadway width of 22’, concrete gutters and a metal guardrail.

The bottom chord of the bridge is composed of back to back channels with plates on top and bottom. The bottom lateral bracing is formed by two angles which cross between each floor beam. Each truss has two end floor beams and six intermediate floor beams. The floor beams are composed of 24” high I-beams. There are four stringers which run between the floor beams on each truss. The stringers are 21” high I-beams that are joined to the floor beams with riveted angles.

Each truss is has seven panels. The inclined end posts are formed by back to back channels with continuous plates on top and short bar lacing on bottom. The verticals are formed by four back to back angles with short bar lacing. The diagonals are formed by angles joined by plates.

The top chord is composed of back to back channels joined with continuous plates on top and short bar lacing on the bottom. The portal and top struts are I-beams. The top lateral bracing is formed by crossed angles between each of the top struts. There is no sway bracing in the bridge.

The guardrail is formed by I-beams which are attached to the bottom chord; the rails are formed by two parallel channels riveted to angles. The channels are curved at the ends of the bridge around the inclined end posts.

Modifications

It appears that the portal bracing and sway bracing was removed from the bridge. According to the bridge plans the portal bracing was to be located between the portal strut and an intermediate strut located 6’ 2” below. The portal bracing was formed by angles in a vee pattern. The bridge plans show sway bracing between the top strut and an intermediate strut located 5’ 8” below. The sway bracing was formed by angles in a vee pattern. There appear to be patches on the inclined end posts—where the intermediate strut was replaced by a plate.

V. Photographic Methods and Processing

The archival photographs accompanying this documentation were taken and processed according to the standards for photographs accompanying National Register of Historic Places (NRHP) documentation.[38] Randall Dawdy took photographs on March 1, 2011 using a Canon G10 digital camera. Images were captured in a raw (nef) format, which was manipulated for light contrast before being converted to a tagged image file format (.tiff) and printed. Images were numbered according to the NRHP Photographic Imaging Policy[39] and burned onto a Delkin Archival Gold compact disc, which was provided to the SHPO along with this report.

Prints were made on Epson Premium Glossy Photo Paper and used Epson Matte Black Ultra Chrome K3 Ink, both identified as "best" practices by the NRHP photo policy, and which Epson identifies as having 85-year permanence under glass.[40] Kept in archival conditions the materials will exceed the 75 year permanence standard for the NRHP, which is the standard being used for this project.

A copy of the photographs and .tiff images on an archival compact disc will also be maintained by the MoDOT Historic Preservation Section.

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[38] National Park Service. "Proposed Updated Photographic Policy National Register of Historic Places." Downloaded 8 June 2008 from: www.nps.gov/history/nr/policyexpansion.html.

[39] Ibid.

[40] Ibid. Draft of a Proposed New National Register Photographic Imaging Policy." Downloaded 26 March 2009 from: www.nps.gov/history/nr/policyexpansion.html. Epson. "Permanence ratings from Wilhelm Imaging Research." Downloaded 30 April 2009 from www.epson.com/pdf/LightfastCPD_15334R2.pdf.

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The Palmyra Spectator (weekly). Microfilm. Available at the State Historical Society of Missouri, Columbia, Missouri.

North River Bridge (Bridge No. K0073)
Route 168, Marion County, Missouri

Photographer: Randall Dawdy, Missouri Department of Transportation
Date: March 1, 2011
Location of Digital Images: Missouri State Historic Preservation Office

Photo Index:

#1 of 40. Bridge K0073. Southeast nameplate. View to north.

#2 of 40. Bridge K0073. Southwest guardrail. View to northwest.

#3 of 40. Bridge K0073. South approach. View to north.

#4 of 40. Bridge K0073. South portal, Span 4. View to north.

#5 of 40. Bridge K0073. Span 4. View to north.

#6 of 40. Bridge K0073. South portal, Span 3. View to north.

#7 of 40. Bridge K0073. Span 3. View to north.

#8 of 40. Bridge K0073. South portal, Span 2. View to north.

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#13 of 40. Bridge K0073. North portal, Span 1. View to south.

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#16 of 40. Bridge K0073. Bent 1 abutment. View to northwest.

#17 of 40. Bridge K0073. Rocker bearing at Bent 1. View to northwest.

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#26 of 40. Bridge K0073. Span 3 subdeck. View to south.

#27 of 40. Bridge K0073. South end. View to southwest.

#28 of 40. Bridge K0073. Span 4. View to southwest.

#29 of 40. Bridge K0073. Pier 4. View to southwest.

#30 of 40. Bridge K0073. Span 3. View to west.

#31 of 40. Bridge K0073. Spans 3 and 4. View to southwest.

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#33 of 40. Bridge K0073. Spans 1 and 2. View to northeast.

#34 of 40. Bridge K0073. West side. View to northeast.

#35 of 40. Bridge K0073. Span 1, 2 and 3. View to northeast.

#36 of 40. Bridge K0073. Span 1, 2 and 3. View to northeast.

#37 of 40. Bridge K0073. Pier 4. View to northeast.

#38 of 40. Bridge K0073. Span 4 detail. View to northeast.

#39 of 40. Bridge K0073. Span 4 truss detail. View to northeast.

#40 of 40. Bridge K0073. Span 4 truss detail. View to northeast.

Lightfast Ratings From Wilhelm Imaging Research*

EPSON

Permanence rating for Epson prints framed under glass

MEDIA	6-Color Photo Dye Inks: Epson Stylus Photo 825/925/960/1280	6-Color Photo Dye Inks: Epson Stylus Photo R200/R300/R320/RX500/RX600	DURABrite® Ink: Epson Stylus C64/C66/C84/C86/CX4600/CX6400/CX6600	PictureMate™ Ink: PictureMate Personal Photo Lab	UltraChrome™ Ink: Epson Stylus Photo 2200	UltraChrome Hi-Gloss™ Inks: Epson Stylus Photo R1800/R800
EPSON PREMIUM PHOTO PAPERS						
Premium Glossy Photo Paper		23 years			85 years	104 years
Premium Luster Photo Paper – Cut Sheet		22 years			71 years	64 years
Premium Semigloss Photo Paper		22 years			77 years	In progress
EPSON MATTE PAPERS						
Double-Sided Matte Paper	15 years					
Enhanced Matte Paper			71 years		76 years	110 years
Matte Paper Heavyweight	18 years	30 years	105 years			Over 150 years
Photo Quality Ink Jet Paper		8 years				In progress
PremierArt™ Matte Scrapbook Photo Paper for Epson			94 years		108 years	In progress
Premium Bright White Paper		5 years	74 years			In progress
EPSON FINE ART PAPERS						
UltraSmooth Fine Art Paper					108 years	
Epson Velvet Fine Art Paper					61 years	
Watercolor Paper Radiant White					92 years	
PremierArt Water-Resistant Canvas for Epson					75 years	
EPSON GLOSSY PAPERS						
ColorLife™ Photo Paper	27 years	36 years				
DURABrite Ink Glossy Photo Paper			55 years			
PictureMate Photo Paper				104 years		
Semigloss Scrapbook Photo Paper	27 years	36 years				

* Lightfastness ratings are based on accelerated testing of prints on specialty media displayed indoors, under glass. Actual print stability will vary according to media, printed image, display conditions, light intensity and atmospheric conditions. Lightfastness ratings do not measure paper deterioration, such as yellowing. Epson does not guarantee the longevity of prints. For maximum print life display all prints under glass or lamination or properly store them. Ratings based on testing conducted by Epson and Wilhelm Imaging Research www.wilhelm-research.com

**Testing currently in progress. Projected time estimated on current progress of test.

As with traditional photos, proper care will maximize display life. For indoor display, Epson recommends that prints be framed under glass or in a protective plastic sleeve to protect the prints from atmospheric contaminants like humidity, cigarette smoke, and high levels of ozone. And, as with all photographs, the prints should be kept out of direct sunlight. For proper storage, Epson recommends that your prints be stored in a photo album (or plastic photo storage box or museum storage box) in acid free, archival sleeves commonly available from most camera shops and other retailers. By taking these steps to protect prints from direct sunlight and contaminants, you can preserve your photos for many years.

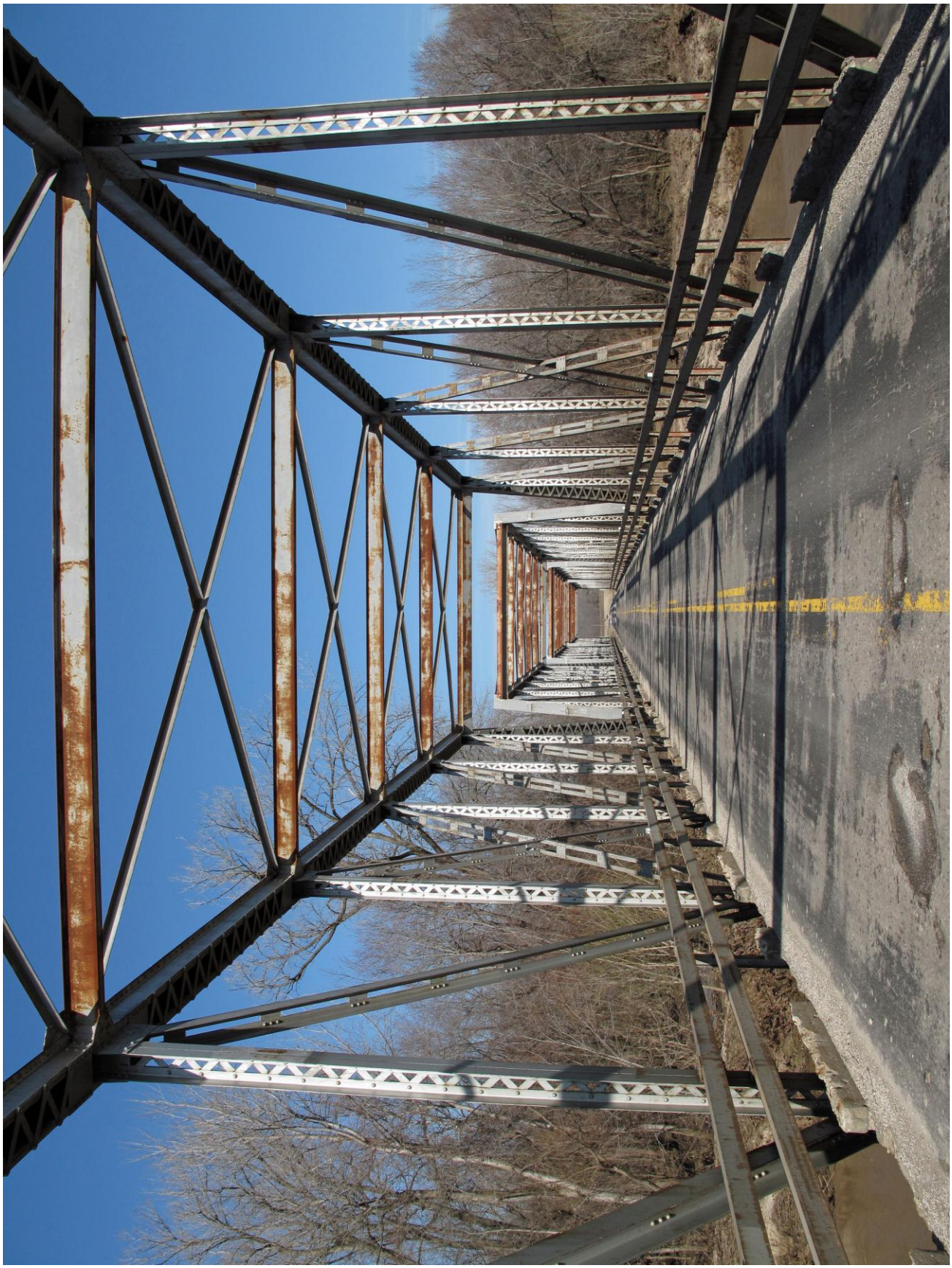
CPD-15334R2 PDF 2/05

#1 of 40. Bridge K0073. Southeast nameplate. View to north.

#2 of 40. Bridge K0073. Southwest guardrail. View to northwest.

#3 of 40. Bridge K0073. South approach. View to north.

#4 of 40. Bridge K0073. South portal, Span 4. View to north.



#5 of 40. Bridge K0073. Span 4. View to north.

#6 of 40. Bridge K0073. South portal, Span 3. View to north.

#7 of 40. Bridge K0073. Span 3. View to north.

#8 of 40. Bridge K0073. South portal, Span 2. View to north.

#9 of 40. Bridge K0073. North portal, Span 2. View to north.

#10 of 40. Bridge K0073. South portal, Span 1. View to north.

#11 of 40. Bridge K0073. East side. View to southwest.

#12 of 40. Bridge K0073. Northwest guardrail. View to southwest.

#13 of 40. Bridge K0073. North portal, Span 1. View to south.

#14 of 40. Bridge K0073. North approach. View to south.

#15 of 40. Bridge K0073. West side. View to southeast.

#16 of 40. Bridge K0073. Bent 1 abutment. View to northwest.

#17 of 40. Bridge K0073. Rocker bearing at Bent 1. View to northwest.

#18 of 40. Bridge K0073. North end. View to northwest.

#19 of 40. Bridge K0073. Span 1. View to northwest.

#20 of 40. Bridge K0073. Pier 2. View to west.

#21 of 40. Bridge K0073. Pier 2 detail. View to west.

#22 of 40. Bridge K0073. Span 2. View to northwest.

#23 of 40. Bridge K0073. Spans 1 and 2. View to northwest.

#24 of 40. Bridge K0073. Pier 3 detail. View to west.

#25 of 40. Bridge K0073. Span 2 detail. View to west.

#26 of 40. Bridge K0073. Span 3 subdeck. View to south.

#27 of 40. Bridge K0073. South end. View to southwest.

#28 of 40. Bridge K0073. Span 4. View to southwest.

#29 of 40. Bridge K0073. Pier 4. View to southwest.

#30 of 40. Bridge K0073. Span 3. View to west.

#31 of 40. Bridge K0073. Spans 3 and 4. View to southwest.

#32 of 40. Bridge K0073. Span 1. View to northeast.

#33 of 40. Bridge K0073. Spans 1 and 2. View to northeast.

#34 of 40. Bridge K0073. West side. View to northeast.

#35 of 40. Bridge K0073. Span 1, 2 and 3. View to northeast.

#36 of 40. Bridge K0073. Span 1, 2 and 3. View to northeast.

#37 of 40. Bridge K0073. Pier 4. View to northeast.

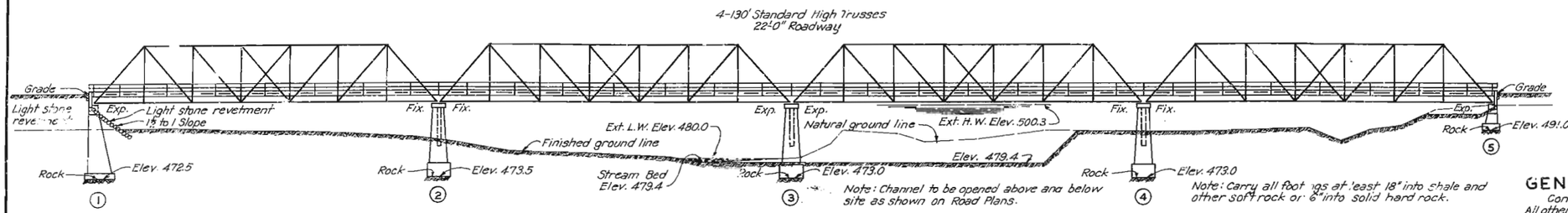
#38 of 40. Bridge K0073. Span 4 detail. View to northeast.

#39 of 40. Bridge K0073. Span 4 truss detail. View to northeast.

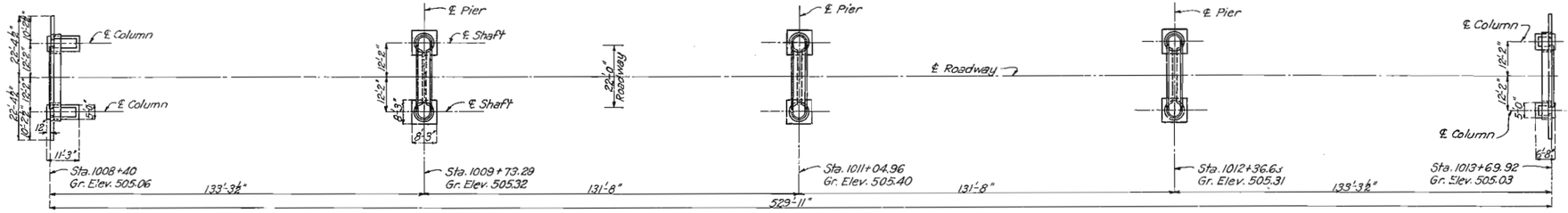
#40 of 40. Bridge K0073. Span 4 truss detail. View to northeast.

MISSOURI STATE HIGHWAY DEPARTMENT

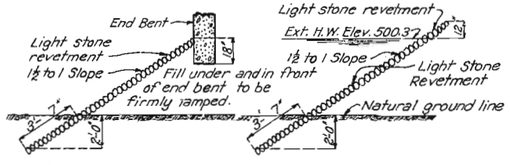
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
3	MO.	R56-S9	19		



GENERAL ELEVATION



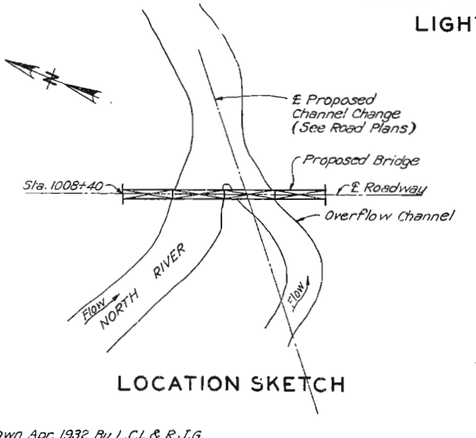
PLAN



FRONT OF END BENT NO. 1 SIDE SLOPES OF FILL

Light stone revetment shall be placed on fills at North end of bridge as shown in sketches. Approximately 240 sq. yds. of light stone revetment work included in road contract.

LIGHT STONE REVETMENT



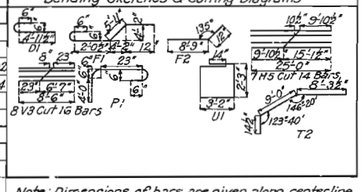
LOCATION SKETCH

COMPLETE BILL OF REINFORCING STEEL

No.	Size	Length	Mark	Location
Substructure - Bents No. 1 & 5				
24	¾ sq.	6'-3"	D1	Footings
16	¾ sq.	10'-3"	F1	Haunches
16	¾ sq.	9'-9"	F2	"
10	⅞ sq.	30'-0"	H1	Beam
10	¾ sq.	30'-0"	H2	"
6	¾ sq.	19'-3"	H3	Brn. & Backwall
12	¾ sq.	15'-9"	H4	Wings
14	¾ sq.	25'-0"	H5	"
4	¾ sq.	21'-3"	T1	Backwall
8	¾ sq.	17'-6"	T2	Wings
60	½ sq.	12'-0"	U1	Beam
84	½ sq.	6'-3"	V1	Backwall
12	½ sq.	7'-0"	V2	Wings
16	½ sq.	8'-6"	V3	"
12	¾ sq.	25'-9"	V4	Cols. Bt. No. 1
12	¾ sq.	7'-0"	V5	" Bt. No. 5
Piers No. 2, 3 & 4				
48	1" sq.	5'-0"	D2	Footings
12	1" sq.	24'-6"	H6	Cap
9	1" sq.	27'-3"	H7	Web
42	½ sq.	26'-0"	H8	"

No.	Size	Length	Mark	Location
Piers No. 2, 3 & 4 Cont'd.				
144	¾ sq.	8'-0"	P1	Cap
66	¾ sq.	15'-9"	V6	Shafts & Web
16	1" sq.	22'-3"	V7	Shafts Pier No. 2
32	1" sq.	22'-9"	V8	Shafts Piers 3 & 4
Superstructure				
2532	⅞ sq.	22'-9"	A	Truss Slab
120	⅞ sq.	22'-6"	B	" "
288	⅞ sq.	24'-6"	C	" "
192	¾ sq.	20'-9"	D	Slab & Curbs
480	¾ sq.	21'-0"	E	Truss Slab
584	⅝ sq.	12'	F	Curbs

Bending Sketches & Cutting Diagrams



Note: Dimensions of bars are given along centerline and are for computed lengths. Reinforcing bars ¾" or over in diameter, which are bent to an angle greater than 90°, shall be of structural grade.

Note: This drawing is not to scale. Follow dimensions.

GENERAL NOTES:

Concrete in slabs and curbs to be 1:2:3½ mix, class "X". All other concrete to be 1:2:4 mix, class "A".

Exposed edges to be beveled ¾" where no other bevel is noted.

Shop drawings for the 130'-1" truss spans shall be submitted to the Missouri State Highway Department in duplicate and shall be approved before steel is fabricated.

Rivets ¾" ϕ, except in handrail. Rivets in handrail ⅝" ϕ. Holes for ¾" ϕ rivets 13/16" ϕ. Holes for ⅝" ϕ rivets and bolts ¹¹/₁₆" ϕ. Field connections riveted, except as noted.

Where bituminous felt is used in expansion or partition joints in concrete, stitch felt in vertical joint securely to one face of concrete with copper wire.

Make details of expansion device at end bents similar to Std. S-911. For expansion device over piers, see Std. S-912. Make fixed joints over piers similar to Std. S-914.

Two name plates, type "B" as shown on Std. S-918 to be furnished and placed by contractor. Cost of name plates to be included in price bid for other items.

Paint:- Shop; none.

Field; Surfaces inaccessible after erection, four coats of red lead. No other paint to be applied by contractor. All paint required will be furnished by the Missouri State Highway Department.

Bridge excavation to be in accordance with Section I of Standard Specifications issued April 1, 1930, except that quantities paid for will be computed from extreme low water Elev. 480.0 where existing ground line is below this elevation.

For details of shoes and rockers for truss spans see Std. S-808.

ESTIMATED QUANTITIES

ITEM		SUBSTR.	SUPERSTR.	TOTAL
Excavation Class I	Cu. Yds.	330		330
Excavation Class II	Cu. Yds.	320		320
Concrete 1:2:3½ mix "X"	Cu. Yds.	..	279.8	279.8
Concrete 1:2:4 mix "B"	Cu. Yds.	330.6		330.6
Reinforcing Steel	Lbs.	13070	85530	98600
Fabricated Structural Steel	Lbs.		580000	580000
Cast Steel	Lbs.		3880	3880

Bridge excavation above Elev. 482.0 will be paid for as Class I Bridge Excavation.
Bridge Excavation below Elev. 482.0 will be paid for as Class II Bridge Excavation.

B.M. Elev. 493.57 Spike in trunk of 10" Cottonwood 4 ft. Left. Sta. 1008+33.0.

BRIDGE OVER NORTH RIVER

STATE ROAD FROM PHILADELPHIA TO PALMYRA
ABOUT 3 MILES NW OF PALMYRA
PROJECT NO. R56-S9 RT. 56 STA. 1008 + 40
MARION COUNTY

SUBMITTED BY M R Sack BRIDGE ENGINEER DATE 5/13/32
APPROVED BY T M Cutler CHIEF ENGINEER DATE 5/13/32

STD. S-911
STD. S-918
K-73

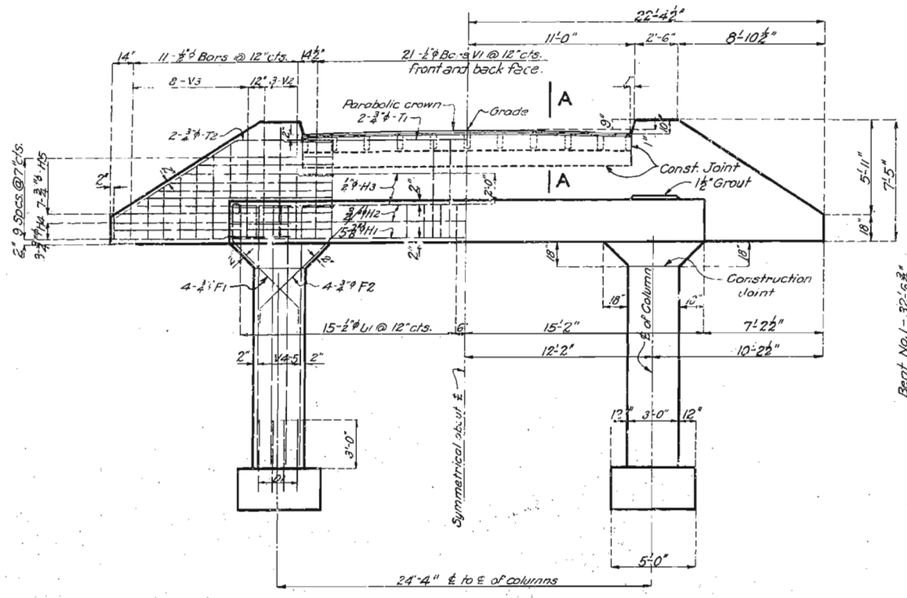
Drawn Apr. 1932 By L.C.L. & R.J.G.
Traced Apr. 1932 By R.J.G.
Checked May 1932 By F.A.B.

Sheet No. 1 of 3.

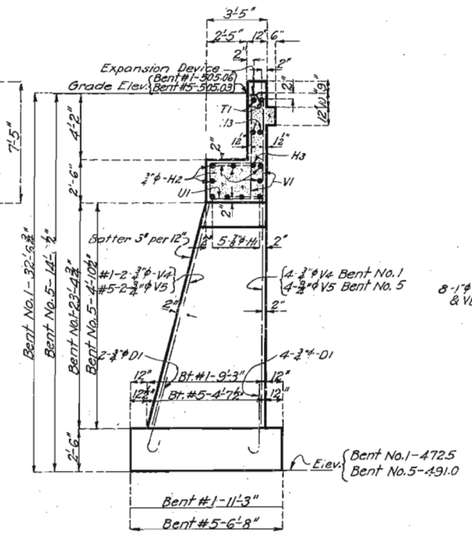
584

MISSOURI STATE HIGHWAY DEPARTMENT

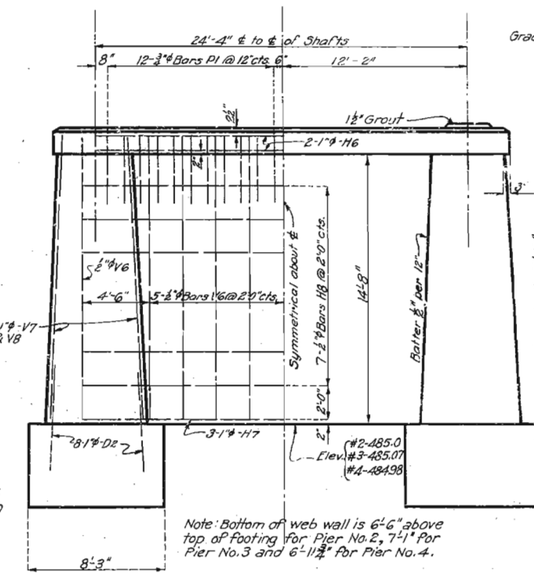
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	MO.	R56-59	39		



ELEVATION

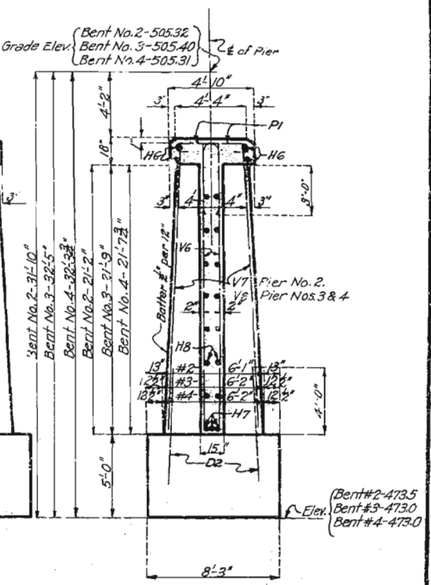


SECTION AT ℄

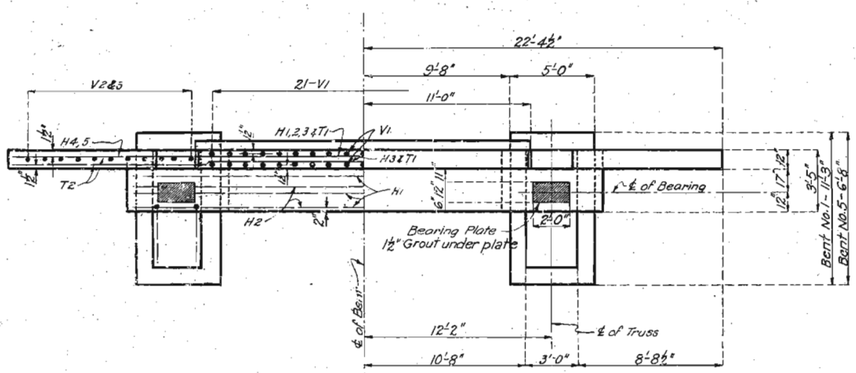


ELEVATION

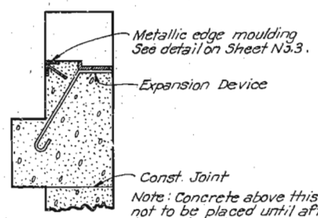
Note: Bottom of web wall is 6'-6" above top of Footing for Pier No.2, 7'-1" for Pier No.3 and 6'-11⅜" for Pier No.4.



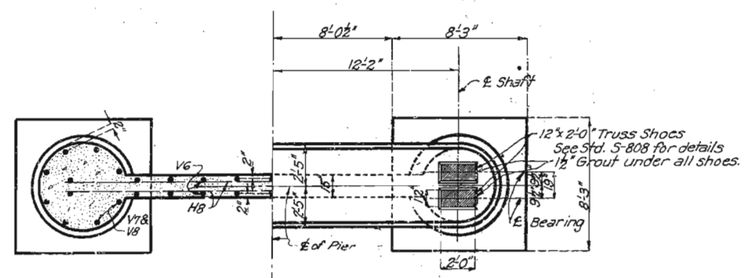
SECTION AT ℄



PLAN



PART SECTION A-A



HALF HORIZONTAL SEC. HALF PLAN

DETAILS OF PIERS NOS. 2 3 & 4

DETAILS OF BENTS NOS. 1 & 5

NOTE: This drawing is not to scale. Follow dimensions.

BRIDGE OVER NORTH RIVER

STATE ROAD FROM PHILADELPHIA TO PALMYRA

ABOUT 3 MILES NW OF PALMYRA

PROJECT NO. R 56-59 STA. 1008 + 40

MARION COUNTY

FINISHED

FINISHED

SUBMITTED BY M R Fay BRIDGE ENGINEER DATE 5/13/32

APPROVED BY M H Cutler CHIEF ENGINEER DATE 5/13/32

STD. S-911
STD. S-918
K-73

Assembled Apr. 1932 By L.C.L. - R.J.G.
Checked May 1932 By R.W.B.
Drawn Dec. 1926 By F.C.L.
Checked Dec. 1926 By C.B.

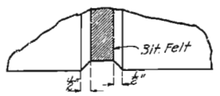
Sheet No. 2 of 3

Steel Spans - End Bents and Piers S803.2

0154

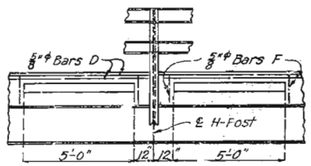
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	MO.	R56-S9	193		

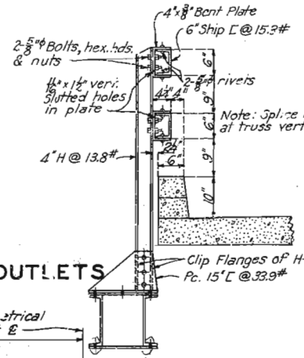
491

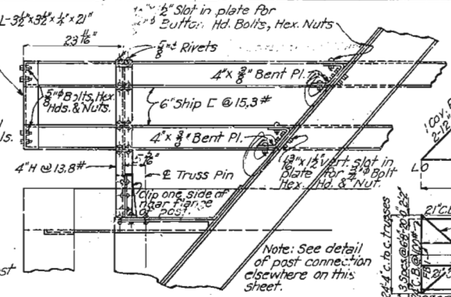


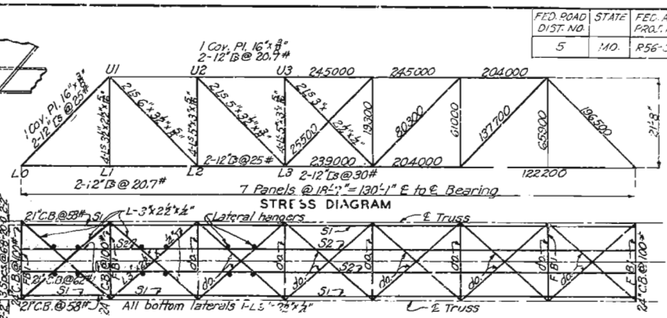
Note: Use bevel as shown for all joints consisting of bituminous felt except at top surface of roadway slab. Use metallic edge moulding at top surface of roadway each side of felt joint.

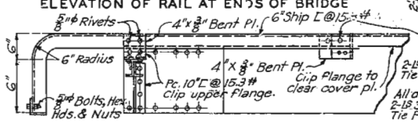
DETAIL OF BEVEL FOR BIT. FELT JOINTS

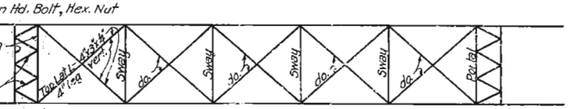


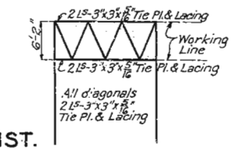


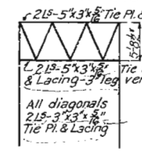


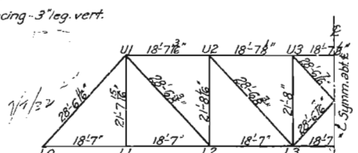




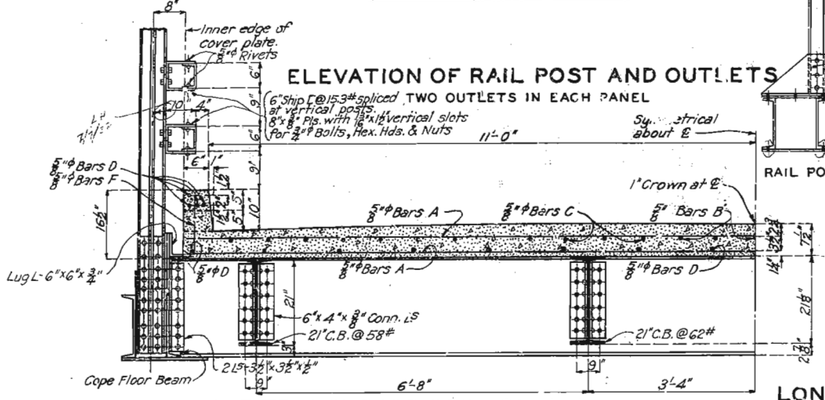








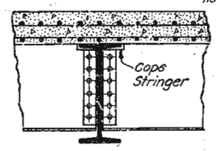
Dimensions given are for cambered lengths.



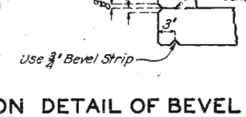
ELEVATION OF RAIL POST AND OUTLETS

TWO OUTLETS IN EACH PANEL

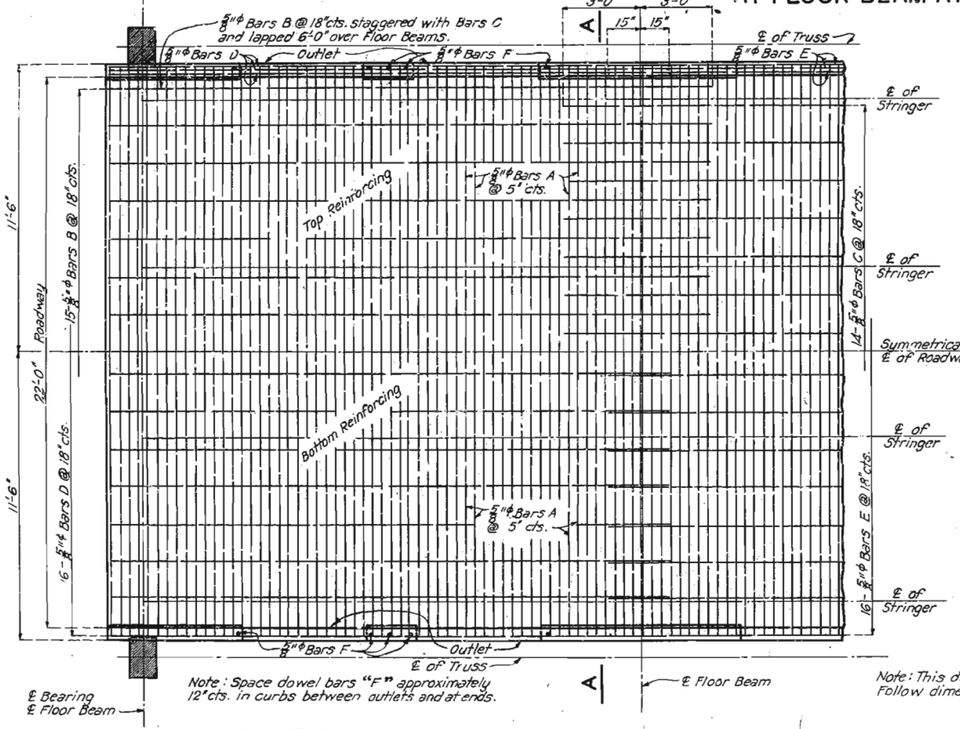
RAIL POST AT CENTER OF PANEL



HALF TRANSVERSE SECTION A-A



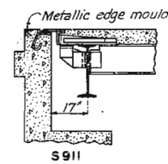
LONGITUDINAL SECTION DETAIL OF BEVEL FOR CONST. JOINT AT CURB AT FLOOR BEAM AT ℄ ROAD



Note: Space dowel bars "F" approximately 12" cts. in curbs between outlets and at ends.

Note: This drawing is not to scale. Follow dimensions.

PART PLAN SHOWING REINFORCING

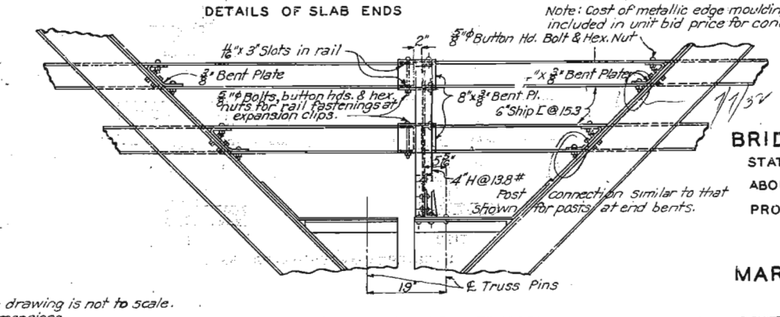


STEEL SPAN - ABUTMENT

Note: See Standards numbered above.

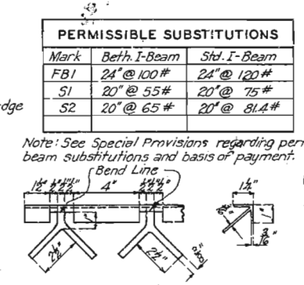
EXPANSION ENDS FIXED ENDS

DETAILS OF SLAB ENDS



DETAIL OF RAIL BETWEEN TRUSSES

DETAILS OF SLAB ENDS

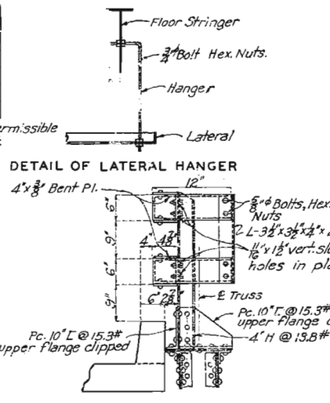


PERMISSIBLE SUBSTITUTIONS		
Mark	Beth. I-Beam	Std. I-Beam
FB1	24" @ 100#	24" @ 120#
S1	20" @ 55#	20" @ 75#
S2	20" @ 65#	20" @ 81.4#

Note: See Special Provisions regarding permissible beam substitutions and basis of payment.

METALLIC EDGE MOULDING

Note: Cost of metallic edge moulding to be included in unit bid price for concrete.



BRIDGE OVER NORTH RIVER

STATE ROAD FROM PHILADELPHIA TO PALMYRA

ABOUT 3 MILES NW OF PALMYRA

PROJECT NO. R56-S9 STA. 1008+40

FINISHED

MARION COUNTY

SUBMITTED BY M R Sachs BRIDGE ENGINEER DATE 5/13/32

APPROVED BY T H Cutler CHIEF ENGINEER DATE 5/13/32

FINISHED

DETAILS OF SLAB ENDS

STD. S-911
STD. S-918
K-73

Sheet No. 3 of 3.

Apr. 1932 - By: E.C.L. - R.J.G.
May 1932 - By: E.C.L.