
Documentation of the Historic Meramec River Bridge

Bridge No. H-117R
Crawford County, Route 19



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HISTORIC AMERICAN ENGINEERING RECORD

MERAMEC RIVER BRIDGE

I. INTRODUCTION

Location: Spanning Meramec River at Missouri State Route 19, Steelville vicinity, Crawford County, Missouri.

USGS Quadrangle: Steelville, Missouri, 7.5 Series, 1978.

Construction Date: 1925-26.

Substructure: Designed by Bureau of Bridges, Missouri State Highway Department. Constructed by Federal Bridge Company, Des Moines, Iowa.

Superstructure: Designed by Bureau of Bridges, Missouri State Highway Department. Constructed by Federal Bridge Company, Des Moines, Iowa.

Present Owner: Missouri Department of Transportation.

Present Use: Vehicular bridge, scheduled for demolition in 2000.

Significance: The Meramec River Bridge is a five-span, reinforced concrete, filled spandrel arch bridge, and is significant as a large-scale representative of this rare structural type.

Historian: David C. Austin, Preliminary Studies Division, Missouri Department of Transportation, Jefferson City, Missouri.

Date: January 1999.

II. HISTORY OF THE MERAMEC RIVER BRIDGE

The Meramec River Bridge (Bridge No. H-117R) spans the Meramec River at Missouri State Route 19 in central Crawford County, Missouri, approximately one mile northwest of Steelville, the county seat. Designed by the Missouri State Highway Department and constructed by the Federal Bridge Company in 1925-26, the Meramec River Bridge is a five-span, reinforced concrete, filled spandrel arch structure supported by reinforced concrete abutments and piers. Distinguished as one of Missouri's longest filled spandrel arch bridges, it is significant for its technological achievement in large-scale construction of this bridge type during the formative years of the Missouri State Highway Department.¹

Under the auspices of the Missouri State Highway Commission, the Missouri State Highway Department began improvements to Route 19 in the 1920s as part of an extensive statewide highway construction program. Route 19 would meander south from U.S. Route 66 at Cuba, Crawford County, pass through Steelville and several other county seats in the eastern Ozarks, and end at U.S. Route 63 near the Arkansas state line. The Meramec was one of the largest rivers along the route, with a drainage area upstream from Steelville encompassing over 780 square miles. The Meramec River would require a substantial crossing over its braided, often-volatile stream and broad floodplain.²

In early 1925, the highway department's Division No. 6 headquartered in St. Louis County forwarded their survey report on the proposed Meramec River bridge site to the department's Bureau of Bridges in Jefferson City. The new highway would thread its way between two high bluffs facing opposite banks of the Meramec to cross at a relatively level portion of the valley. The survey report considered the conditions at the river channel, including high water elevations, stream velocities, bank profiles, and the surrounding topography, and recommended a bridge approximately 600 feet in length. Armed with this information, Assistant Bridge Engineer Vaughn W. Enslow worked up preliminary layouts which would meet the site requirements. After lengthening the planned crossing to include the river's second terrace, Enslow suggested a structure comprised of a 140' steel channel span with six 80' steel approach

¹ Clayton B. Fraser, "HAER Inventory Data Sheet, Meramec River Bridge, (No. H-117R)," Missouri Historic Bridge Inventory, 5 Vols., Missouri Department of Transportation, Project No. NBIH (6) (Loveland, Colorado: Fraserdesign, Inc., 1996).

² Route 19 was later extended north from Cuba, crossing the Missouri River at Hermann, and continuing to Hannibal, Missouri. Missouri State Highway Commission, "Plan and Profile of Proposed State Road, Crawford County," Route 19, Section 3, 1925, Plans and Records Office, Design Division, Missouri Department of Transportation, Jefferson City; Missouri State Highway Commission, *Fifth Biennial Report of the State Highway Commission of Missouri for the Period Ending December First, 1926*, (Jefferson City: Hugh Stephens Press, 1926), map; Missouri State Highway Commission, "Map of Missouri Showing State Road System, Route Numbers, Road Conditions and Points of Interest," (Jefferson City: Botz-Hugh Stephens Press, 1930).

spans on the west end, a 35' concrete deck girder on the east end, and a substructure of piers and column bents. He indicated that the west approach could substitute 40' concrete girder spans for the steel spans. Another alternative was a concrete arch structure of five 130' spans which would also fit the location and probably compare favorably in cost.³

To help pinpoint the location and determine the type of structure, Enslow visited the site on April 13, 1925, in company with the highway design engineer and a member of the river sounding party. Upon viewing the site, Enslow remarked it impossible "to locate a point where the stream could be crossed at a better advantage than the one chosen," given the lengthy, near-vertical bluffs both up and down stream. At the chosen site, the highway could enter and leave the valley along more moderate slopes at grades of 7 percent or less. The river here had a fairly straight channel, with an abundance of sand and gravel to supply concrete aggregate, and shallow bedrock in the stream bed and on both banks to carry the substructure. Enslow foresaw potential problems with accumulating driftwood from the heavily forested bottoms, necessitating span lengths of at least 60', but believed this could be offset by clearing the timber for short distances both up and down stream. The channel overflow could also be improved by excavating the second bottoms for roadway fill material. Given the natural supply of sand and gravel for fill and concrete materials, the shallow surface bedrock for substructure support, and the favorable stream conditions, Enslow proposed using five 110', reinforced concrete filled spandrel arches with end abutments. This would provide a crossing close to the recommended 600' in length, and provide an outlet for overflow underneath the bridge approximately 550' wide.⁴

Having confirmed that the difference in cost between a concrete structure and a steel structure amounted to less than 10 percent, Enslow forwarded his proposal for the spandrel arch bridge to S. M. Rudder, the Division Engineer of Division No. 6, who concurred with the general design. The department's bridge bureau drew up detailed plans and material estimates for the proposed structure during May and June. On July 8, 1925, the Missouri State Highway Commission awarded the construction contract for the Meramec River Bridge to the Federal Bridge Company of Des Moines, Iowa, which had submitted the low bid of \$53,725.70.⁵ Designated as Route 19, Section 5, the job also involved short sections of roadway to total--with the bridge--0.31 mile in length. At the same time, the commission let a separate contract to the

³ B. H. Piepmeier to S. M. Rudder, February 26, 1925; V. W. Enslow, "Preliminary Layouts, Route 19, Crawford County," April 10, 1925, Bridge No. H-117R Correspondence File, Bridge Division, Missouri Department of Transportation, Jefferson City. Hereafter cited as Bridge File.

⁴ V. W. Enslow, "Inspection Report, Route 19, Crawford County," April 21, 1925, Bridge File.

⁵ Little information regarding the Federal Bridge Company was located. According to their stationary letterhead, they were "Builders of Concrete and Steel Bridges," with offices in the Bankers Trust Building in Des Moines. Known principals of the company were its president E. S. Carpenter, and the construction engineer George D. Dobson. The Meramec River Bridge is the only bridge in Missouri known to have been built by the Federal Bridge Company. Correspondence from Federal Bridge Company in Bridge File; Fraser, Missouri Historic Bridge Inventory, passim.

M.E. Gillioz Company for Route 19, Section 3, which entailed over four miles of connecting roadway both north and south of the river.⁶

The Federal Bridge Company began construction in early August 1925, when several men and a few teams started clearing the river bottom of its timber. D. C. Wolfe, a Bridge Construction Engineer in the Bureau of Bridges, arrived to oversee the construction for the highway department, while George D. Dobson would supervise the project for the Federal Bridge Company. In Des Moines, Federal Bridge Company engineers drew up designs for the centering, or the temporary wood falsework which would support the arch rings during construction. Enslow made only minor modifications to these designs, such as substituting 1"-diameter bolts for 1/2" ones for the centering braces. He insisted, however, that drawings of the lagging, or "fish-bellies," on the tops of the centering stringers be included, as the curvature of the arch rings' extradoses would depend on these forms. On August 22, Dobson met personally with the head of the Bureau of Bridges, Bridge Engineer Leif J. Sverdrup, and worked out the final centering design to the satisfaction of both parties; they would use 2" x 12" lumber for the stringer components although Enslow had advised 3" x 12" pieces, and the department's bridge office would prepare the sketches of the lagging for Federal Bridge.⁷

By early September, the footing excavations for Abutment No. 1 on the east bank had been completed and the forms built for the first concrete pouring. The Federal Bridge Company proceeded without a full complement of workers, due to an unusual flurry of other construction work in and around Steelville which had led to a local labor shortage. The M.E. Gillioz Company had shipped in around sixty teams and drivers for their road work, but they also remained shorthanded. In mid-October, Federal Bridge began removing fill from the river bottoms for the east approach off of Abutment No. 1 (implying that the abutment was finished), using a new Caterpillar tractor, an elevating grader, and several horse teams; the roadway fill there would be up to 7' feet high. While hampered by the shortage of men (Dobson said he could use up to sixty laborers), Federal Bridge generally enjoyed ideal autumn weather and low water which expedited the pier excavations. In early November, however, Wolfe advised Sverdrup that the bedrock beneath Abutment No. 6 on the west bank was about 3' deeper than expected. They therefore had to lower that footing and widen the base for the arch seat.⁸

⁶ Ibid., B. H. Piepmeier to S. M. Rudder, April 21, 1925; S. M. Rudder to B. H. Piepmeier, April 23, 1925; Missouri State Highway Department, "Bridge Over Meramec River," [bridge plans, five sheets], July 1925, Bridge Division, Missouri Department of Transportation, Jefferson City; Missouri State Highway Department, "Tabulation of Bids Received," Crawford County, Route 19, Sections 3 and 5, 1925, Plans and Records Office, Design Division, Missouri Department of Transportation, Jefferson City; *Crawford Mirror* (Steelville), July 16, 1925.

⁷ B. H. Piepmeier to Federal Bridge Company, August 18, 1925; B. H. Piepmeier to Federal Bridge Company, August 22, 1925; B. H. Piepmeier to Federal Bridge Company, September 3, 1925, Bridge File.

⁸ Ibid., D. C. Wolfe to L. J. Sverdrup, November 6, 1925; V. W. Enslow to D. C. Wolfe, November 17, 1925; *Crawford Mirror*, September 3, September 10, October 15, 1925.

Work continued through the winter months despite the difficulties inherent with concrete construction during cold weather, which necessitated that the wet concrete be protected from freezing. After the piers were completed, the centering was erected, the lagging and forms built, and the reinforcing steel laid in place. Each span's arch ring was then poured in specified stages: first, two blocks from the springing line at the tops of the piers outward 13'-0"; next, a 24'-0" section of the arch crown, poured along with the short sections of the spandrel walls, cross beams and brackets; then, two 25'-0" blocks left and right of the crown; and finally, the 2'-6"-wide key sections at the ends of the latter blocks to close the arch ring. According to construction plan notes, the keys were to be poured after the adjacent sections had been in place for at least twenty-four hours. Once the arch ring was finished, the main sections of the spandrel walls, the reinforcing pilasters at the piers, and the tie beams were poured, ending with the curbs, balustrades and posts. Above the keys, the abutting ends of the spandrel wall and curb sections were to be connected by expansion joints made of 14"-wide, 16-gauge zinc plates, but these proved unsuitable when they cracked and split. About January 1, 1926, Dobson received Sverdrup's permission to substitute more expensive lead plates in the expansion joints. Layers of bituminous felt or tar paper covered the remaining, abutting sections. The interiors of the spandrel walls and the intradoses of the arch rings were waterproofed with coatings of pitch; the outer surfaces were rubbed smooth. The centering remained in place for at least three weeks after the arches were poured. At the end of January 1926, three of the concrete arch spans were complete and "ready for the floor."⁹

One problem arose in early January as the workers leveled the floodplain along the length of the bridge to an even elevation of 694', or 1'-0" below the springing line, roughly even with the tops of the piers. While this work was done to improve the channel overflow, Wolfe had also expected to use the excavated material for the spandrel fill until he discovered much of it was too full of earth and roots to be useful; the spandrels required a cleaner mix of sand and gravel. Federal Bridge was obligated to carry out additional excavations in and outside of the right of way to locate enough clean fill amounting to some 3,285 cubic yards. E. S. Carpenter, the president of Federal Bridge Company, visited the site in early February and came away "well pleased" with the progress made so far.¹⁰

On March 19, with the five arch spans completed and allowed to cure for at least a month, Wolfe reported he was ready to begin placing the spandrel fill. Enslow advised him to avoid over-stressing the arch rings by layering the fill uniformly along the entire length of the bridge, with the first layer from the springing line up to the arch crowns, followed by a second

⁹ Missouri State Highway Department, "Bridge Over Meramec River," sheets 1-2; Federal Bridge Company to L. J. Sverdrup, January 2, 1926; B. H. Piepmeier to S. M. Rudder, January 5, 1926, Bridge File; *Crawford Mirror*, January 28, 1926.

¹⁰D. C. Wolfe to L. J. Sverdrup, January 7, 1926; L. J. Sverdrup to D. C. Wolfe, January 11, 1926; E. S. Carpenter to L. J. Sverdrup, March 28, 1927, Bridge File; *Crawford Mirror*, February 18, 1926.

layer up to the crown of the roadway. This work continued at least through the end of April when Steelville's *Crawford Mirror* reported the new bridge was "nearing completion." A month later, near the end of May, the newspaper stated, ". . . the large fill at the new bridge will likely be completed by July 1." The paper may have been referring either to continuing work on the spandrel fill, or to the west approach where the roadway was built up to as much as 15' above the original ground surface for a distance of about 175'. The Meramec River Bridge opened sometime in the summer 1926, without local fanfare. (The project had received scant attention from the local press, as the *Crawford Mirror* had given the bridge project only minimal coverage, while the *Steelville Ledger* and the *Cuba Review* had both ignored it completely). In its subsequent biennial report, the highway commission listed the official project completion date as August 18, 1926, and its total cost, including the engineering, as \$82,157.83.¹¹

III. DESCRIPTION OF THE MERAMEC RIVER BRIDGE

(See HAER Photographs MO-109-1 through MO-109-5 for original construction drawings).

The Meramec River Bridge (Bridge No. H-117R) spanning the Meramec River at Missouri State Route 19 consists of five 110'-0", reinforced concrete, filled spandrel arches carried on reinforced concrete piers, and two 35'-0" end abutments. (The five spans were labeled A through E, from east to west). The overall bridge length is 640'-0". The original roadway width was 20'-0", with modifications in 1984 widening it to 22'-4" (see Photographs MO-109-6 through MO-109-9).

The two end abutments are similar in design, both having closed spandrel walls, fluted corbels, and curved wing walls. The U-shaped footings, with wide portions in front to support the arch seats, are 2'-0" thick and carried at least 6" into bedrock. The main footing for Abutment No. 1 on the east bank measures 9'-6" x 23'-10", with narrow, rear extensions 16'-6" long x 3'-0" wide. The design of the main footing for Abutment No. 6 is wider at 15'-0" x 23'-10", and has rear extensions similar to Abutment No. 1, but these dimensions were altered during construction with the lower-than-expected depth of bedrock. The footings support two spandrel walls 1'-3" thick and 25'-11- ¼" high, spaced 19'-7" apart. The spandrel walls are braced with four spandrel tie beams 1'-6" x 2'-6", which are themselves supported by four 1'-0"-square concrete piers in the interior of the abutments. Fluted corbels 4'-0" wide x 3'-7-1/2" deep reinforce the spandrel walls in front of the abutments while also supporting the cantilevered roadway deck and curbs. Retaining walls at the rear of the abutments, originally topped with curbs, balustrades and end posts, curve outward in a 10'-9" radius to announce the bridge entrance with a shoulder width of 34'-0" (see Photograph MO-109-10).

¹¹ D. C. Wolfe to V. W. Enslow, March 19, 1926; V. W. Enslow to D. C. Wolfe, March 23, 1926, Bridge File; *Crawford Mirror*, April 29, May 27, 1926; Missouri State Highway Commission, *Sixth Biennial Report of the State Highway Commission of Missouri for the Period Ending December First, 1928*, (Jefferson City: Hugh Stephens Press, 1928), 223.

Each of the four piers are similarly constructed solid piers, although their dimensions grow slightly larger from east to west. All are built up to an even elevation of 695'. The footing for Pier No. 2 measures 9'-9" x 22'-3" x 2'-0"; Pier No. 3's footing measures 10'-0" x 22'-6" x 3'-0"; and the footings for Pier Nos. 4 and 5 measure 10'-6" x 23'-0" x 3'-0". The footings support short stems--battered 3" per 1' on each side--which rise 3'-6" on Pier No. 2, 4'-0" on Pier No. 3, and 5'-0" on both Pier No. 4 and Pier No. 5. The stems are crowned with overlapping, beveled caps 2'-0" thick.

The elliptical arch rings have a vertical thickness at the piers of 4'-2-1/2", and narrow gradually to a thickness of 1'-6" at the crown. The rise measures 20'-0" from the springing line to the crown extrados. The arch rings remain well defined in elevation, being offset from the spandrel walls by 3" (see Photographs MO-109-11 through MO-109-13). The spandrel walls are 1'-0" thick, and are embellished at the piers by 5'-0"-wide fluted pilasters with flared crowns which also serve to support the cantilevered deck and curbs (see Photographs MO-109-14 and Mo-109-15). The spandrel walls are strengthened by spandrel tie beams 1'-3" x 2'-3", placed at regular intervals of 10'-11". These extend 3'-3" beyond the walls to form cantilevered knee braces which support the curbs and outer sections of the road deck (see Photograph MO-109-16). Originally, reinforced concrete curbs built 1'-3" high were topped with balustrades 2'-6" high, consisting of 4" x 4" balusters centered 8" apart, capped by 10"-wide beveled coping, and interrupted at the piers by 5'-0"-wide beveled posts. The spandrel fill served as the roadway surface for approximately five years until 1931 when it first received an oil mat surface, and has since been recovered with asphalt.

Modifications completed in 1984 widened the roadway from 20'-0" to 22'-4" by removing the curbs and balustrades and installing thrie-beam metal posts and guardrails along the outer edges of the deck. Other alterations have included the installation of tie rods underneath the deck, and repairs to several of the deteriorated knee braces.¹²

While these alterations have somewhat diminished its physical integrity, the Meramec River Bridge remains significant as one of a few multiple-span, filled spandrel arch structures dating from the early years of the Missouri State Highway Department. Since its inception in 1918, the department's Bureau of Bridges had designed several concrete filled spandrel arches that featured elliptical profiles and resembled the patented designs of Daniel Luten, a pioneer in reinforced concrete bridge construction. However, these filled spandrel arches were generally single spans of 60' or less. Among the earliest surviving examples are a group of three single-span structures, each 40' long, constructed along Route 21 in Iron County in 1922. Later that year, the department's bridge engineers designed a filled spandrel arch bridge of five 80' spans. Crossing Roubidoux Creek at Route 17 in Pulaski County, this bridge was extensively modified in 1939 by widening the arch rings and replacing the original guardrails. At the same time in late 1922, the department completed designs for another filled spandrel arch bridge of

¹² Missouri Department of Transportation, "Report on the Feasibility of Rehabilitating the Bridge over Meramec River on Route 19 About Two Miles Northwest of Steelville," 1998, Bridge Division, Missouri Department of Transportation, Jefferson City, 1-3.

three spans. Located over Salt Fork Creek at Route 20 in Saline County, this bridge features a central span of 90', flanked by two 60' spans.¹³

Only a few other multiple-span, filled spandrel arch structures followed these first examples. In late 1923, the bridge bureau designed the largest of the type so far, one comprised of three 130' spans and two 60' end spans, for a total length of 602'-0". This bridge crosses the Current River--one of the largest streams in the central Ozarks--at Route 19 in Shannon County. The 130' span length exceeds Missouri's other filled spandrel arch structures. The design for the Meramec River Bridge, also on Route 19, came less than one year after the completion of the Current River Bridge. With its five 110' spans, the Meramec River Bridge surpasses all others in total length, at 640'-0". In June 1925, when the plans for the Meramec River Bridge were being finalized, construction began on another filled spandrel arch bridge. Located in Ozark County on Route 5, this bridge features three 80' spans. Soon after the completion of these last bridges, the use of filled spandrel arch structures fell out of favor, particularly those with multiple spans. The latest, single surviving example dates to 1934, and is comparatively shorter with three 37' spans. After about 1925, Missouri's multiple-span concrete arch bridges employed ribbed open spandrel arch designs. Many of these are concentrated in southern Missouri's Ozark region.¹⁴

The Meramec River Bridge is thus distinguished as a technological achievement in the construction of large-scale, reinforced concrete, filled spandrel arch structures. Aside from its remarkable size, it is further notable for its balanced, symmetrical appearance achieved by the use of spans and abutments of equal lengths. Its overall configuration lends itself well to the river valley's natural surroundings. Since the removal of the original balustrades, its remaining stylistic details include the distinct lines defining the intradoses of the arch rings, the fluted, flared pilasters, and the more massive fluted corbels at the abutments. Although these features are obscured from general view, they further enhance the aesthetic qualities of the bridge and attest to the era's values in design and workmanship.

¹³ Fraser, Missouri Historic Bridge Inventory, 1: 24-28, 136-138.

¹⁴ Ibid., 138-140.

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REFERENCES CITED

A. PRIMARY SOURCES

Missouri Department of Transportation. "Report on the Feasibility of Rehabilitating the Bridge over Meramec River on Route 19 About Two Miles Northwest of Steelville." Jefferson City: Bridge Division, Missouri Department of Transportation, 1998.

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_____. "Plan and Profile of Proposed State Road, Crawford County." Route 19, Section 3, 1925. Jefferson City: Plans and Records Office, Design Division, Missouri Department of Transportation.

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B. NEWSPAPERS

Crawford Mirror (Steelville). January 1, 1925-December 31, 1926.

C. SECONDARY SOURCES

Fraser, Clayton B., comp. Missouri Historic Bridge Inventory. 5 Vols. Missouri Department of Transportation, Project No. NBIH (6). Loveland, Colorado: Fraserdesign, Inc., 1996.

HISTORIC AMERICAN ENGINEERING RECORD

INDEX TO PHOTOGRAPHS

Meramec River Bridge
Spanning the Meramec River at
Missouri State Route 19
Steelville vicinity
Crawford County
Missouri

HAER No. MO-109

Documentation : 5 photos of original construction drawings (1925)
 11 exterior photographs (1998)
 10 data pages (1999)

Shaun W. Schmits, Photographer, December 1998

- MO-109-1 Photographic copy of the original construction drawing, 1925, by Missouri State Highway Department.
 GENERAL ELEVATION AND DIMENSIONS OF ARCH RING

- MO-109-2 Photographic copy of the original construction drawing, 1925, by Missouri State Highway Department.
 DETAILS OF SPANDREL ARCH

- MO-109-3 Photographic copy of the original construction drawing, 1925, by Missouri State Highway Department.
 DETAILS OF PIERS NOS. 2, 3, 4 AND 5

- MO-109-4 Photographic copy of the original construction drawing, 1925, by Missouri State Highway Department.
 DETAILS OF ABUTMENT NO. 1

- MO-109-5 Photographic copy of the original construction drawing, 1925, by Missouri State Highway Department.
 DETAILS OF ABUTMENT NO. 6

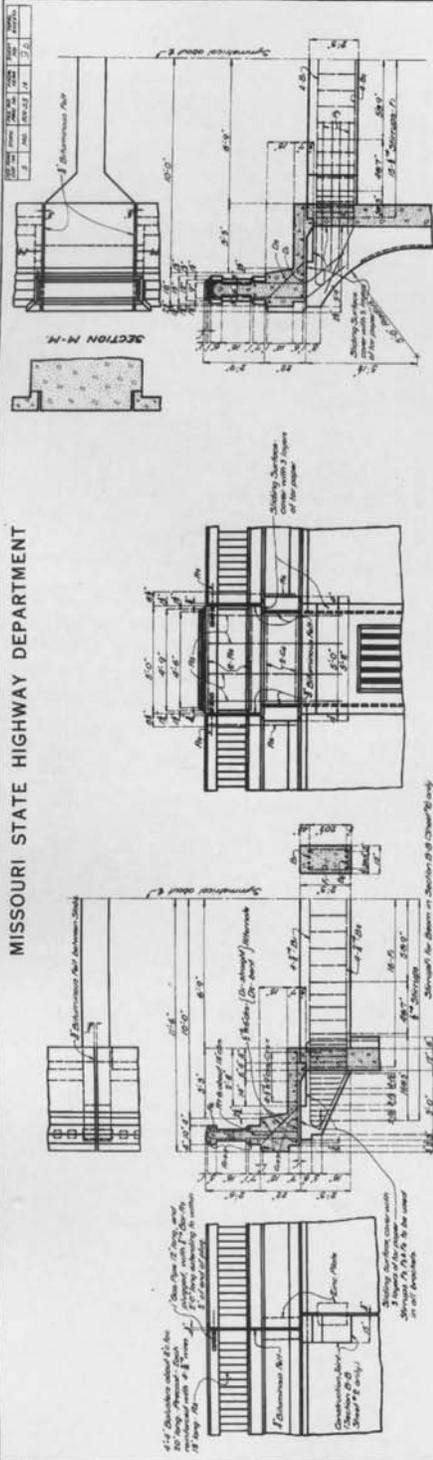
- MO-109-6 MERAMEC RIVER BRIDGE, VIEW TO THE SOUTHEAST

- MO-109-7 MERAMEC RIVER BRIDGE, VIEW TO THE EAST (DOWNSTREAM)

- MO-109-8 MERAMEC RIVER BRIDGE, VIEW TO THE SOUTHWEST

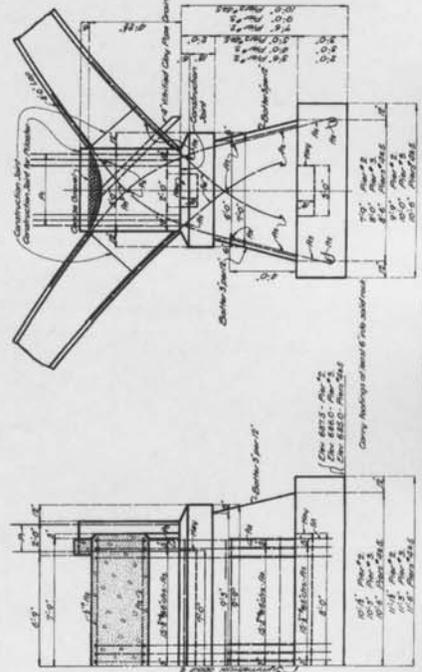
- MO-109-9 MERAMEC RIVER BRIDGE, VIEW TO THE NORTHEAST
- MO-109-10 ABUTMENT NO. 6 AND SPAN E, VIEW TO THE WEST
- MO-109-11 CLOSE-UP VIEW OF ARCH SPRINGING LINE AT TOP OF PIER NO. 3
- MO-109-12 SPANS D AND E AT PIER NO. 5
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- MO-109-14 FLUTED PILASTER AND SPANDREL WALLS AT PIER NO. 3
- MO-109-15 CLOSE-UP VIEW OF TYPICAL FLARED PILASTER CROWN
- MO-109-16 CLOSE-UP VIEW OF TYPICAL CANTILEVERED KNEE BRACE

MISSOURI STATE HIGHWAY DEPARTMENT



DETAILS OF EXPANSION JOINT AT PILASTER.

DETAILS OF EXPANSION JOINT AT BRACKET.



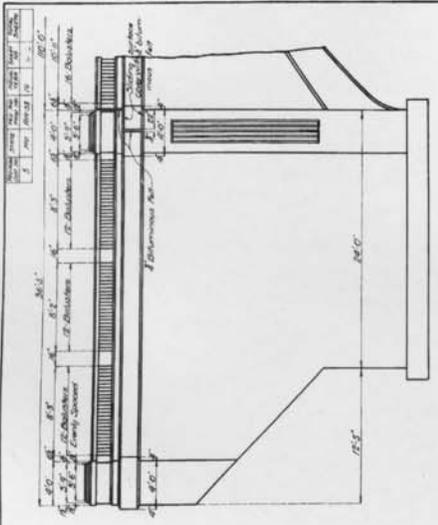
DETAILS OF PIERS NOS. 2, 3, & 5.

BRIDGE OVER MERAMEC RIVER
 STATE ROAD FROM CURA TO STEELVILLE
 ABOUT 2 MILES N.W. OF STEELVILLE
 PROJECT NO. 779-SE STA. 354+50
 CRAWFORD COUNTY

H 117

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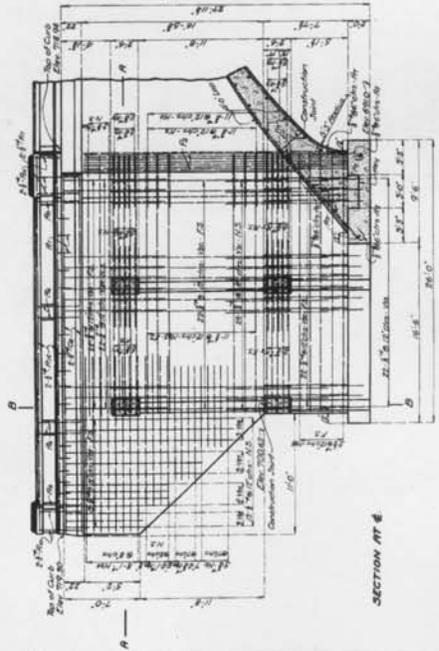
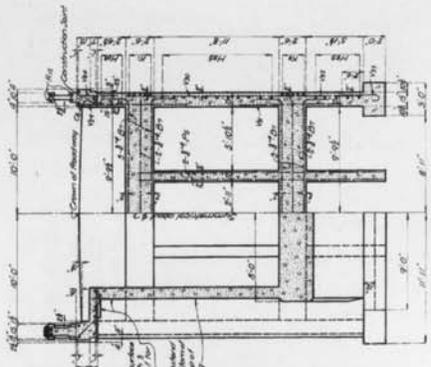
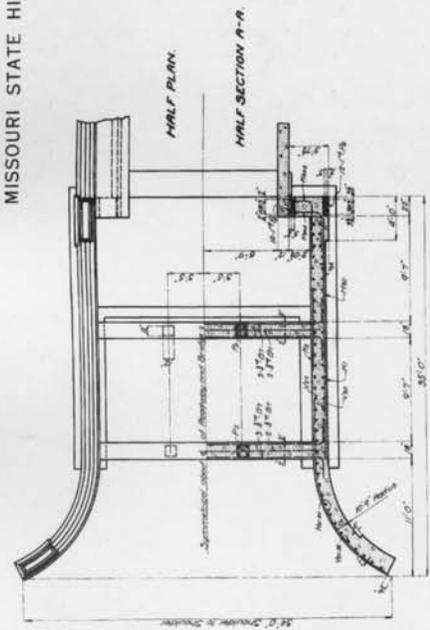
MISSOURI STATE HIGHWAY DEPARTMENT



DETAILS OF ABUTMENT NO. 1.

BRIDGE OVER MERRIMEC RIVER
 STATE ROAD, FROM CURB TO STEELVILLE
 ABOUT 2 MILES N.W. OF STEELVILLE
 PROJECT NO. B.P.S. 5 STA. 5361+50
 CRAWFORD COUNTY

H.117



Drawn May, 1922 by J. J. ...
 Checked by H. P. S. ...

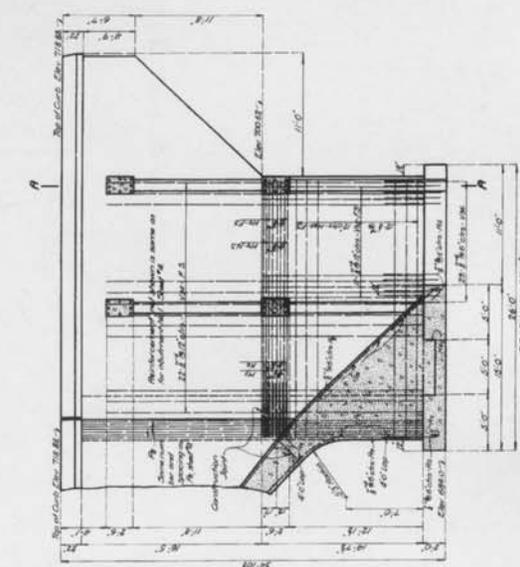
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MISSOURI STATE HIGHWAY DEPARTMENT

NO. OF SHEETS	102	NO. OF SHEETS USED	102
DATE	NOV 13 1935	DATE	NOV 13 1935

BILL OF REINFORCING STEEL

Ab.	Size	Length	Area	Weight	Quantity	Weight	Notes
100	1/2"	100'	0.0007	0.0007	100	0.07	
101	3/8"	100'	0.0011	0.0011	100	0.11	
102	1/2"	100'	0.0007	0.0007	100	0.07	
103	3/8"	100'	0.0011	0.0011	100	0.11	
104	1/2"	100'	0.0007	0.0007	100	0.07	
105	3/8"	100'	0.0011	0.0011	100	0.11	
106	1/2"	100'	0.0007	0.0007	100	0.07	
107	3/8"	100'	0.0011	0.0011	100	0.11	
108	1/2"	100'	0.0007	0.0007	100	0.07	
109	3/8"	100'	0.0011	0.0011	100	0.11	
110	1/2"	100'	0.0007	0.0007	100	0.07	
111	3/8"	100'	0.0011	0.0011	100	0.11	
112	1/2"	100'	0.0007	0.0007	100	0.07	
113	3/8"	100'	0.0011	0.0011	100	0.11	
114	1/2"	100'	0.0007	0.0007	100	0.07	
115	3/8"	100'	0.0011	0.0011	100	0.11	
116	1/2"	100'	0.0007	0.0007	100	0.07	
117	3/8"	100'	0.0011	0.0011	100	0.11	
118	1/2"	100'	0.0007	0.0007	100	0.07	
119	3/8"	100'	0.0011	0.0011	100	0.11	
120	1/2"	100'	0.0007	0.0007	100	0.07	
121	3/8"	100'	0.0011	0.0011	100	0.11	
122	1/2"	100'	0.0007	0.0007	100	0.07	
123	3/8"	100'	0.0011	0.0011	100	0.11	
124	1/2"	100'	0.0007	0.0007	100	0.07	
125	3/8"	100'	0.0011	0.0011	100	0.11	
126	1/2"	100'	0.0007	0.0007	100	0.07	
127	3/8"	100'	0.0011	0.0011	100	0.11	
128	1/2"	100'	0.0007	0.0007	100	0.07	
129	3/8"	100'	0.0011	0.0011	100	0.11	
130	1/2"	100'	0.0007	0.0007	100	0.07	
131	3/8"	100'	0.0011	0.0011	100	0.11	
132	1/2"	100'	0.0007	0.0007	100	0.07	
133	3/8"	100'	0.0011	0.0011	100	0.11	
134	1/2"	100'	0.0007	0.0007	100	0.07	
135	3/8"	100'	0.0011	0.0011	100	0.11	
136	1/2"	100'	0.0007	0.0007	100	0.07	
137	3/8"	100'	0.0011	0.0011	100	0.11	
138	1/2"	100'	0.0007	0.0007	100	0.07	
139	3/8"	100'	0.0011	0.0011	100	0.11	
140	1/2"	100'	0.0007	0.0007	100	0.07	
141	3/8"	100'	0.0011	0.0011	100	0.11	
142	1/2"	100'	0.0007	0.0007	100	0.07	
143	3/8"	100'	0.0011	0.0011	100	0.11	
144	1/2"	100'	0.0007	0.0007	100	0.07	
145	3/8"	100'	0.0011	0.0011	100	0.11	
146	1/2"	100'	0.0007	0.0007	100	0.07	
147	3/8"	100'	0.0011	0.0011	100	0.11	
148	1/2"	100'	0.0007	0.0007	100	0.07	
149	3/8"	100'	0.0011	0.0011	100	0.11	
150	1/2"	100'	0.0007	0.0007	100	0.07	
151	3/8"	100'	0.0011	0.0011	100	0.11	
152	1/2"	100'	0.0007	0.0007	100	0.07	
153	3/8"	100'	0.0011	0.0011	100	0.11	
154	1/2"	100'	0.0007	0.0007	100	0.07	
155	3/8"	100'	0.0011	0.0011	100	0.11	
156	1/2"	100'	0.0007	0.0007	100	0.07	
157	3/8"	100'	0.0011	0.0011	100	0.11	
158	1/2"	100'	0.0007	0.0007	100	0.07	
159	3/8"	100'	0.0011	0.0011	100	0.11	
160	1/2"	100'	0.0007	0.0007	100	0.07	
161	3/8"	100'	0.0011	0.0011	100	0.11	
162	1/2"	100'	0.0007	0.0007	100	0.07	
163	3/8"	100'	0.0011	0.0011	100	0.11	
164	1/2"	100'	0.0007	0.0007	100	0.07	
165	3/8"	100'	0.0011	0.0011	100	0.11	
166	1/2"	100'	0.0007	0.0007	100	0.07	
167	3/8"	100'	0.0011	0.0011	100	0.11	
168	1/2"	100'	0.0007	0.0007	100	0.07	
169	3/8"	100'	0.0011	0.0011	100	0.11	
170	1/2"	100'	0.0007	0.0007	100	0.07	
171	3/8"	100'	0.0011	0.0011	100	0.11	
172	1/2"	100'	0.0007	0.0007	100	0.07	
173	3/8"	100'	0.0011	0.0011	100	0.11	
174	1/2"	100'	0.0007	0.0007	100	0.07	
175	3/8"	100'	0.0011	0.0011	100	0.11	
176	1/2"	100'	0.0007	0.0007	100	0.07	
177	3/8"	100'	0.0011	0.0011	100	0.11	
178	1/2"	100'	0.0007	0.0007	100	0.07	
179	3/8"	100'	0.0011	0.0011	100	0.11	
180	1/2"	100'	0.0007	0.0007	100	0.07	
181	3/8"	100'	0.0011	0.0011	100	0.11	
182	1/2"	100'	0.0007	0.0007	100	0.07	
183	3/8"	100'	0.0011	0.0011	100	0.11	
184	1/2"	100'	0.0007	0.0007	100	0.07	
185	3/8"	100'	0.0011	0.0011	100	0.11	
186	1/2"	100'	0.0007	0.0007	100	0.07	
187	3/8"	100'	0.0011	0.0011	100	0.11	
188	1/2"	100'	0.0007	0.0007	100	0.07	
189	3/8"	100'	0.0011	0.0011	100	0.11	
190	1/2"	100'	0.0007	0.0007	100	0.07	
191	3/8"	100'	0.0011	0.0011	100	0.11	
192	1/2"	100'	0.0007	0.0007	100	0.07	
193	3/8"	100'	0.0011	0.0011	100	0.11	
194	1/2"	100'	0.0007	0.0007	100	0.07	
195	3/8"	100'	0.0011	0.0011	100	0.11	
196	1/2"	100'	0.0007	0.0007	100	0.07	
197	3/8"	100'	0.0011	0.0011	100	0.11	
198	1/2"	100'	0.0007	0.0007	100	0.07	
199	3/8"	100'	0.0011	0.0011	100	0.11	
200	1/2"	100'	0.0007	0.0007	100	0.07	



BRIDGE OVER MERRIMAC RIVER
 STATE ROAD FROM GUBA TO STEELVILLE
 ABOUT 2 MILES N.W. OF STEELVILLE
 PROJECT NO. R19-55 STA. 336-30
 CRAWFORD COUNTY
 DRAWN BY: [Signature]
 CHECKED BY: [Signature]
 DATE: 11/13/35

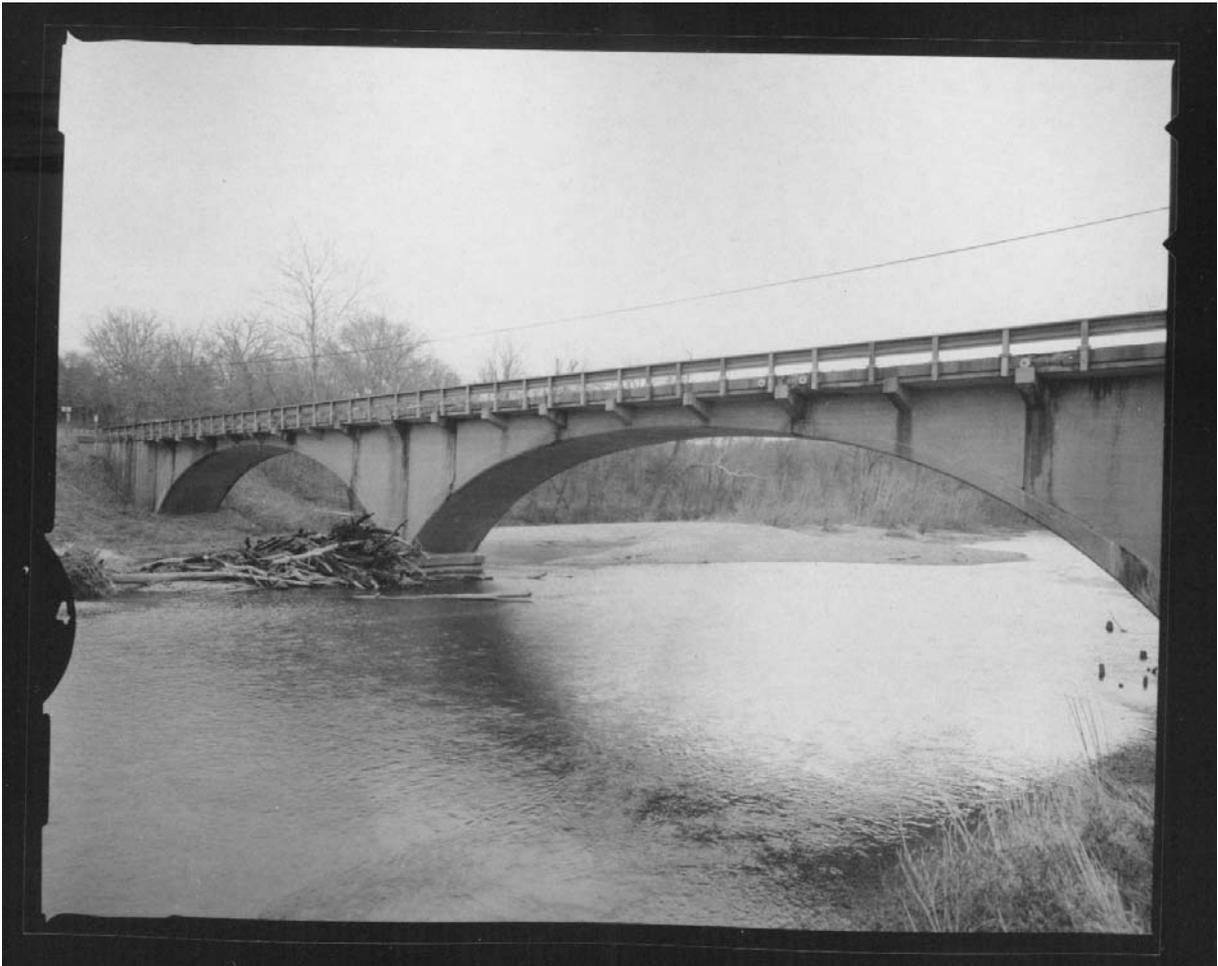
Drawn Nov. 1935 Rev. 11
 Checked Jan. 1936 Rev. 11

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HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION
HAER No. MO-109-6



HISTORIC AMERICAN ENGINEERING RECORD
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HISTORIC AMERICAN ENGINEERING RECORD
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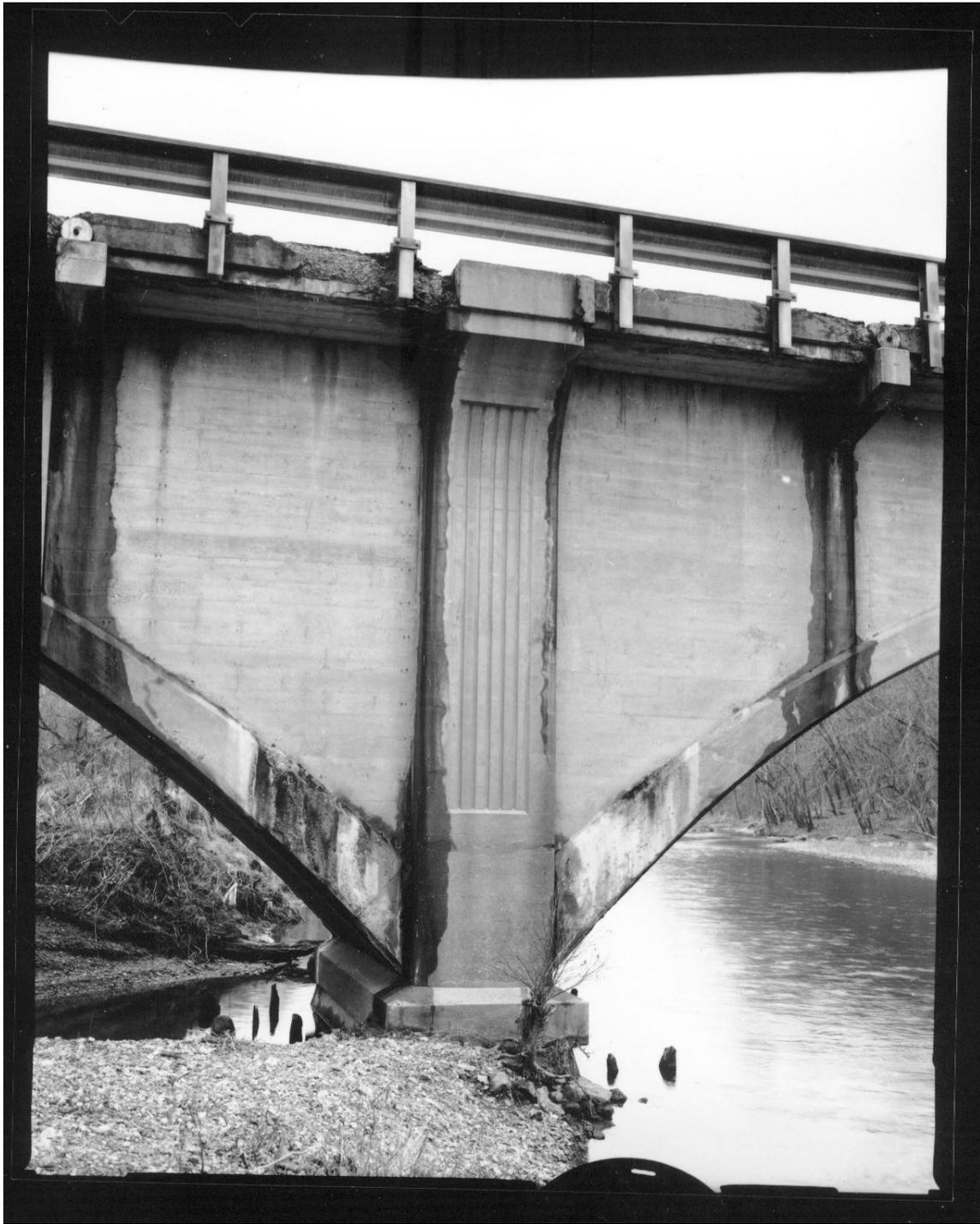
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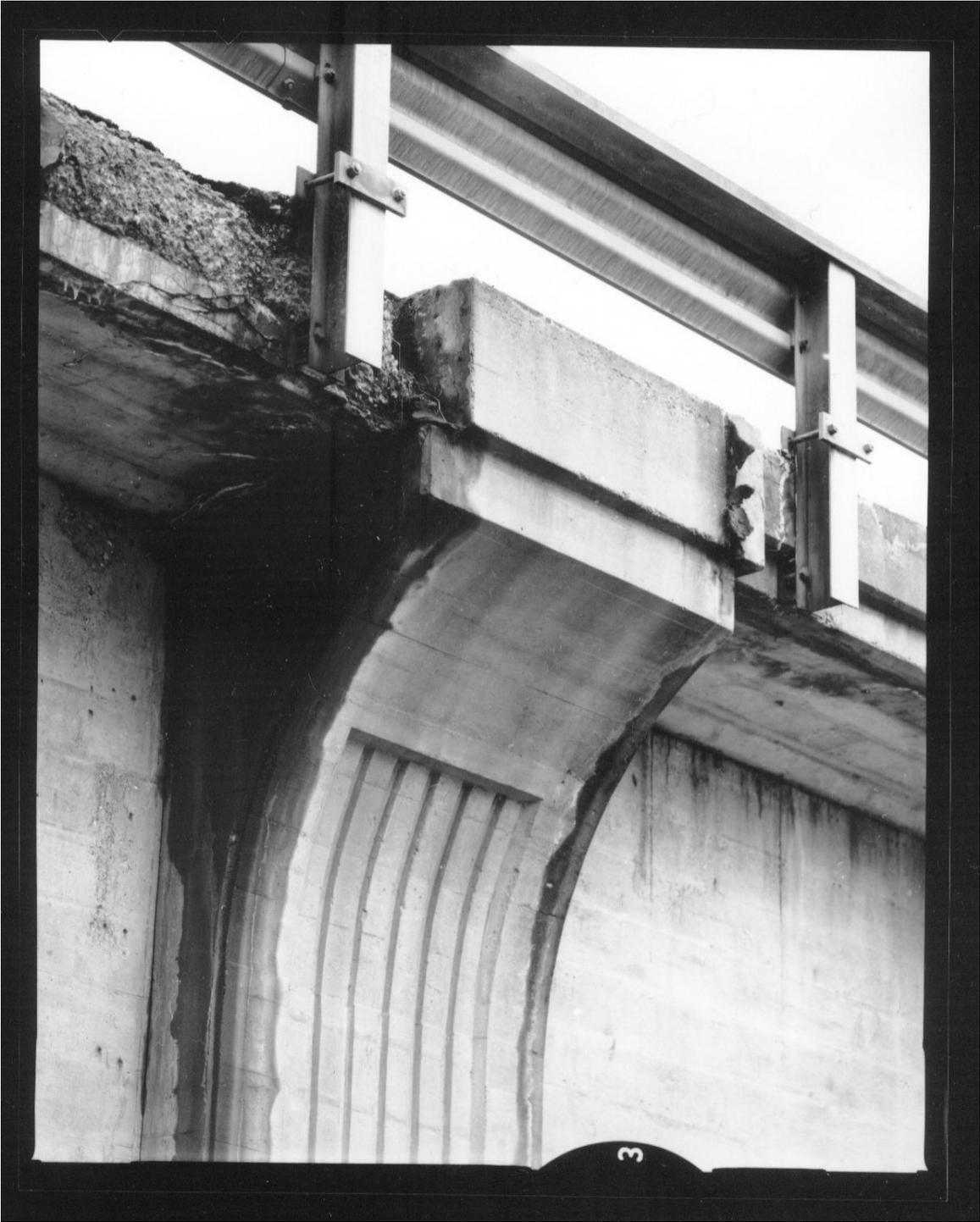
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