
Documentation of the Historic Bridge over Lake of the Ozarks (Hurricane Deck)

Bridge No. K0961
Camden County, Route 5
October 2012



Hurricane Deck Bridge

Bridge K0961

Camden County, Route 5 over the Lake of the Ozarks

MoDOT Job Number J5P2188

Historic and Photographic Documentation

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In Compliance with
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Kevin L. Keith, Director
Missouri Department of Transportation

October 2012

HISTORIC DOCUMENTATION
BRIDGE K0961R
HURRICANE DECK BRIDGE

Location: Camden County, Route 5 over the Osage Arm of the Lake of the Ozarks

Construction Dates: 1935-1936

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

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

Significance: The Hurricane Deck Bridge (K0961) is a dramatic, long-span, cantilever deck truss constructed between 1935 and 1936. It was designed by the Sverdrup & Parcel and constructed by W. A. Ross Construction Company and the Stupp Brothers Bridge and Iron Company. The deck truss was never common in Missouri, and cantilevered deck trusses were a small sub-set of that bridge type. The Hurricane Deck Bridge is significant an outstanding long-span example of an uncommon structural type.¹

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

¹ Fraser, Clayton. "Missouri Historic Bridge Inventory" Hurricane Deck Bridge (K-961R), Historic Inventory Data Sheet. Missouri Highway and Transportation Department, Project No. NBIH (6), Loveland, Co: Fraserdesign, Inc. 1996.

I. Introduction

The Hurricane Deck Bridge is located on Missouri Highway 5 over the Osage Branch of the Lake of the Ozarks. The Hurricane Deck Bridge is one of three rigid-connected, Warren Cantilever deck truss bridges designed by Sverdrup and Parcel for Missouri highways in the Lake of the Ozarks region in the 1930s.²

The bridge was constructed in 1935-1936 by Camden County using a combination of bonds and Public Works Administration (PWA) grant funds. Tolls were to pay off the cost of constructing the bridge. In 1953 the Missouri Highway Commission took over the bridge and it became a free bridge.³

In 2007, following the collapse of the I-35 bridge in Minnesota, the Hurricane Deck Bridge was inspected since it has an identical design. It was noted at the August 8, 2007 Missouri Highway and Transportation Commission meeting that Missouri has 10,200 bridges on the state highway system and 1,024 are considered structurally deficient. The Safe and Sound Bridge Improvement Program would address 800 of those bridges, but the other 200 would need another source of funding before they could be addressed.⁴

In 2010 the Missouri Department of Transportation applied for a Transportation Investment Generating Economic Recovery grant to replace the Hurricane Deck Bridge.⁵ Rehabilitation of the bridge had been considered. It was estimated that rehabilitation would cost \$7 million; while replacement would cost \$30 million it would also allow the bridge deck to be widened to between 32-38 feet—providing two traffic lanes with shoulders, which rehabilitation would not allow.⁶

Since the Hurricane Deck Bridge is eligible for listing on the National Register of Historic Places for significance in engineering, as an uncommon example of a cantilever deck truss bridge in Missouri, replacement of the bridge would have an adverse effect on the historic bridge. This document provides historical documentation about the history and construction of the Hurricane Deck Bridge to partially fulfill the mitigation stipulated in the Memorandum of Agreement developed for the project.

² Ibid. p. 116.

³ Missouri State Highway Commission. “Minutes of the Special Commission Meeting Held in Jefferson City, Missouri on Thursday, February 5, 1953 and Friday, February 6, 1953.” As held by the Secretary of the Commission, Jefferson City, Missouri, pp. 4-5. Henceforth this record group is referred to as the Missouri State Highway Commission.

⁴ Missouri State Highway Commission. “Minutes of the Regularly Scheduled Highway and Transportation Commission Meeting held in Springfield, Missouri on Wednesday, August 8, 2007,” p. 6.

⁵ Missouri State Highway Commission. “Minutes of the Regularly Scheduled Highway and Transportation Commission meeting held in Springfield, Missouri, Wednesday, August 4, 2010,” p. 7.

⁶ Wilson, Amy. “MoDOT looking for funds to replace Hurricane Deck Bridge.” Lake News Online. Downloaded November 8, 2010 from www.lakenewsonline.com/communities/x2115309355/MoDOT-looking-for-funds-to-replace-Hurricane-Deck-Bridge.

II. History of Bridge K0961

The Osage River dominated the northern portion of Camden County. Historically it provided a transportation corridor serving farms and the community of Linn Creek. Steamboats regularly stopped in Linn Creek in the years before the Civil War leaving industrial goods and picking up locally produced goods for shipment to other Missouri communities. After the Civil War railroads replaced steamboats as the major provider of transportation. Camden County was bypassed by the railroads, but the timber rich county became a major producer of wood railroad ties.⁷

In the early twentieth century the Osage River attracted the attention of power companies for its potential to power a hydro-electric plant. The Missouri Hydro-Electric Power Company of Kansas City considered building a dam across the river as early as 1911, and even began to purchase land in Camden County for the reservoir, but did little study of the feasibility of a plant. By the 1920s the Union Electric Light and Power Company of St. Louis was also interested in building a hydro-electric dam across the Osage River and purchased the land that the Kansas City company had already acquired. In 1924 they announced their plans to build a dam, and construction started in August 1929.⁸

The dam was completed in February 1931 and the reservoir began to fill.⁹ As the reservoir filled, Highway 5 was flooded as it crossed over the Osage River. Highway 5 was the main route between Versailles, the county seat of Morgan County and Camdenton, the newly created county seat of Camden County. When the highway connection was severed a ferry was purchased by Dale Francis and Lloyd Green to provide service across the Lake. They named the ferry the *Governor McClurg* after a nineteenth century Missouri Governor (1869-1871) who had been a resident of Linn Creek. The ferry ran approximately the same location as highway 5 had been before the inundation.¹⁰

Writing many years later, a writer for *The Reveille*, provided a description of getting across the Lake before the Hurricane Deck bridge was constructed “you drove your car down a long stretch of dusty gravel road and piloted your car down a steep hill to a ferry and then you waited until the proper time for the ferry to take off for the other shore. This might mean a few minutes wait and again it could mean quite some time.”¹¹

⁷ Gubbels, Thomas J. “Camden County, Route 5 Bridge No. K-510A over Niangua River Branch, Lake of the Ozarks, MoDOT Job No. J5P0589.” 1999. Historic Preservation Section, Missouri Department of Transportation, Jefferson City, Missouri, p. 1.

⁸ Sone, Stacy and David Austin. “Grand Glaize Bridge.” Historic American Engineering Record Documentation, 1993. Historic Preservation Section, Missouri Department of Transportation, Jefferson City, Missouri, p. 2; Gubbels, p. 2.

⁹ Gubbels, p. 2.

¹⁰ Ibid.

¹¹ “Hurricane Deck Toll Bridge Freed Wednesday Noon.” *The Reveille*. March 20, 1953, p. 1. This was written on the occasion of freeing the bridge from tolls.

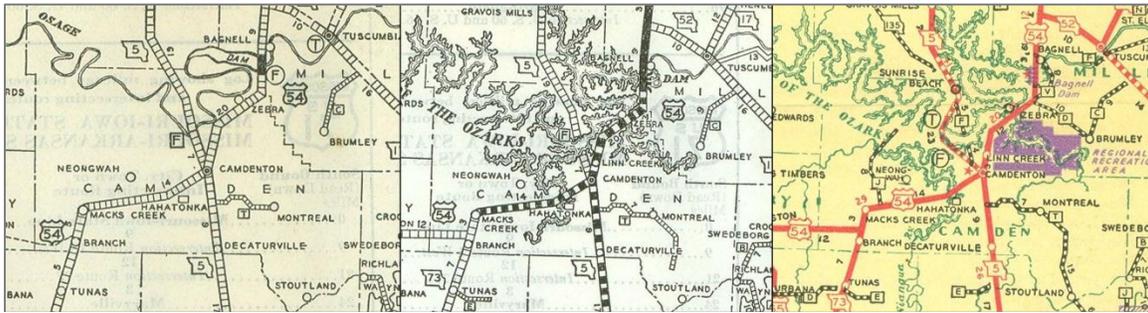


Figure 1: State Highway Maps from left to right: 1932, 1933 and 1939.¹²

Figure 1 above shows the impact of the construction of the dam on the road system, and the appearance of the river, between 1932, 1933 and 1939.

In March 1933 a delegation from Morgan County appeared before the Camden County Court to discuss promoting the construction of a bridge across the Lake of the Ozarks at the crossing point of Highway 5. The delegation included representatives of the Morgan County Court and several prominent citizens. The Camden County Court agreed to the proposal and the Lake of the Ozarks Bridge Association was formed to promote the construction of a bridge.¹³

In May 1933 representatives of the Lake of the Ozarks Bridge Association (J. V. Foster, President), Norman R. Sack, Bridge Engineer with the State Highway Department, and L. J. “Jack” Sverdrup, Consulting Engineer, appeared before the Camden County Court. They discussed the desirability of a bridge on Highway 5 over the Lake of the Ozarks and means of funding construction of the bridge through a loan from the Reconstruction Finance Corporation, as authorized under Senate Bill 283.¹⁴

The County Court passed orders granting the Presiding Judge authority to sign contracts relating to a bridge over the Lake of the Ozarks, agreed to apply for funding from the Reconstruction Finance Corporation for a loan for the bridge, and agreed to enter into a contract with Sverdrup & Parcel Consulting Engineers for engineering for the bridge, for which the company would receive payment of 7-1/2 percent of the total construction cost of the bridge for services.¹⁵

¹² Missouri State Highway Commission, “Map of Missouri Showing State Road System.” Jefferson City, MO: self, 1932; Missouri State Highway Commission, “Map of Missouri Showing State Road System.” Jefferson City, MO: self, 1933; Missouri State Highway Commission, “Missouri (Official) Highway Map.” Jefferson City, MO: self, 1939.

¹³ Camden County Court. “County Court Record.” Book 8, p. 186, March 27, 1933. Camden County Clerk, Camdenton, Missouri.

¹⁴ Ibid, “County Court Record.” Book 8, p. 194, May 3, 1933.

¹⁵ Ibid, pp. 194-195.

Sverdrup & Parcel agreed to survey the site and determine the proper and most economical location for the bridge, make necessary soundings, assist in procuring financing for the project, prepare necessary drawing and applications for War Department approval of the bridge, prepare complete plans for the bridge and its approaches, a toll house and all other appurtenances, prepare data necessary for the Reconstruction Finance Corporation application, confer with the State Highway Department about necessary road connections, send out invitations for bids and assist in letting the contracts, supervise construction of the entire project, prepare monthly estimates of work, prepare any reports required by the Reconstruction Finance Corporation, and prepare final estimates for the project.¹⁶

For their work, Sverdrup & Parcel would receive four percent of their commission when the project was awarded, and would receive the remaining 3-1/2 percent paid monthly during construction, based on the progress of the contractor.¹⁷

The realignment of Highway 5 due to the inundation of the Lake of the Ozarks was considered by the State Highway Commission in 1933. Three alternates were considered, with the middle alternate being selected as the most direct route. This route would require construction of bridges over the Osage Arm of the Lake south the Hurricane Deck and over the Niangua Branch of the Lake.¹⁸

Camden County had agreed to seek funding from the Public Works Administration (PWA) to construct the main bridge over the lake, funding the grant and loan repayment by collecting tolls until the bridge debt was paid. The State Highway Commission would construct the Niangua Branch Bridge and the relocated highway 5.¹⁹

Camden County applied to the PWA for funding in 1933 and made at least one trip to the district offices of the PWA in St. Louis to promote the project. In December 1933 the State Relief Committee had considered the application and had forwarded it to Washington, D. C. for consideration there.²⁰

By early 1934 there was a sense of discouragement in Camden County about the prospects of getting the bridges constructed. The State Highway Department was firm that there was no money for the Hurricane Deck Bridge in their 1934 plan. In a letter to Joe V. Foster, president of the Lake of the Ozarks Bridge Association, L. J. Sverdrup,

¹⁶ Ibid, p. 195.

¹⁷ Ibid, p. 196.

¹⁸ Missouri State Highway Commission. "Minutes of the State Highway Commission held in Jefferson City, Tuesday, November 14, 1933," p. 10a.

¹⁹ Ibid.

²⁰ "Bridge Prospects Bright." *The Reveille*. December 29, 1933, p.1. Microfilm, State Historical Society of Missouri, Columbia, Missouri.

described the situation as “far from bright, and I [Sverdrup] am, as a matter of fact, quite disturbed about it. The application for a grant and loan is progressing satisfactorily though not very fast. It is, however, impossible to rush an application of this type through Washington at the present time.”²¹

By July the funding issues had been resolved and the State Highway Commission and Camden County entered into a formal agreement that Camden County would construct the Main Lake (Osage River) bridge and the Highway Commission would construct the Niangua Branch Bridge and highways to connect the new bridges.²² The new bridges and the connecting highways would constitute State Route 5.²³ The Commission also agreed that the Highway Department would assume permanent maintenance of the bridge as soon as construction was complete.²⁴

In July 1934 the specifications for the bridge were filed with the War Department, since any crossing of a navigable river required approval, and the Osage was considered a navigable river.²⁵ In July the Camden County Court authorized the State Highway Department to proceed with condemnation for right of way for highway 5 where necessary, and set up a special fund for bridge toll revenue, which would be used to pay off the loan.²⁶

The County Court met in special session in September to prepare specifications for the Hurricane Deck Bridge letting. Sealed bids would be received from contractors interested in bidding on the project. Notice to bidders was to be published in the *St. Louis Post Dispatch*, *The [Camdenton] Reveille*, and the *Central Missouri Reader*.²⁷ It was noted that several hundred local men should be able to find work on the project, which the local newspaper, *The Reveille*, speculated would begin probably by November 15.²⁸

²¹ “Discouragement in Bridge Plans.” *The Reveille*. February 2, 1934, p. 1. Microfilm, State Historical Society of Missouri, Columbia, Missouri.

²² Missouri State Highway Commission. “Minutes of the Meeting of the State Highway Commission, Held in Jefferson City, Missouri, Tuesday, July 10, 1934,” p. 15.

²³ *Ibid.* p. 16.

²⁴ *Ibid.* “Minutes of the Meeting of the State Highway Commission Held in Jefferson city, Missouri, Tuesday, October 9, 1934,” pp. 25-26.

²⁵ “Specifications for Bridges Filed with War Department.” *The Reveille*, July 20, 1934, p.1.

²⁶ “Special Meeting of County Court.” *The Reveille*, July 20, 1934, p.1.

²⁷ Camden County Court. “County Court Record.” Book 8, p. 388, September 26, 1934. Camden County Clerk, Camdenton, Missouri.

²⁸ “Work on Bridge Probably by Nov. 15.” *The Reveille*, September 28, 1934, p.1.

Before the bids were opened the County Court requested that bidders be aware that the county expected that the people of Camden County would be:

“...benefitted to the maximum by the labor and construction of the bridge across the Osage Arm of the Lake of the Ozarks (PWA Project 171). It’s our [the County Court’s] intention that the merchants, dealers, and residents of Camden County be given all the business which it is possible to give them and that they be allowed an opportunity to furnish anything or any service which may be required locally as long as their prices are near or equal to the prices of others, and their services competent accordingly.”²⁹

The County Court went on to enumerate examples of when local labor and businesses should be given priority. Those examples included all labor, all construction materials, sand and gravel, lumber and building materials, fuel oil, gasoline, commissary supplies, and insurance. They also expressed a preference for shipping end points if water transportation was not used to bring materials to the building site—that steel be shipped to Bagnell or Lebanon and that cement be shipped to Versailles or Lebanon.³⁰

On October 19, 1934 the County Court opened the bids received for the project. Bidders had the option of bidding for the entire project, just the substructure or just the superstructure. The county would then choose the option that was most cost effective.

There were seven bidders who submitted bids to build the entire structure:³¹

W. A. Ross Construction Company	\$544,094.50
Wisconsin Bridge & Iron Company	\$565,071.50
Massman Construction Company	\$595,300.00
Union Bridge & Iron Company	\$599,145.00
Kansas City Bridge Company	\$629,517.50
Missouri Valley Bridge & Iron Company	\$660,571.50
Pittsburg-Des Moines Steel Company	\$722,672.50

Five bidders submitted bids for the substructure of the bridge:³²

W. A. Ross Construction Company	\$211,187.00
Union Bridge & Construction Company	\$248,365.00

²⁹ Camden County Court. “County Court Record.” Book 8, p. 391, October 16, 1934. Camden County Clerk, Camdenton, Missouri.

³⁰ Ibid.

³¹ Camden County Court. “County Court Record.” Book 8, pp. 392-393, October 19, 1934. Camden County Clerk, Camdenton.

³² Ibid.

Missouri Valley Bridge & Iron Company	\$260,300.00
Massman Construction Company	\$263,615.00
Kansas City Bridge Company	\$277,080.00

Seven bidders submitted bids for the superstructure of the bridge:³³

Stupp Brothers Bridge & Iron Company	\$329,930.00
McClintic Marshall Corp.	\$333,761.00
Mississippi Valley Structural Steel	\$343,986.40
Nashville Bridge Company	\$351,910.00
Mt. Vernon Bridge Company	\$369,594.00
R. C. Mahon Company	\$370,193.23
Missouri Valley Bridge & Iron Company	\$423,840.00

Based on the bids received the County Court awarded the substructure to W. A. Ross Construction Company for \$211,187 and the superstructure to Stupp Brothers Bridge and Iron Company for \$329,930.³⁴

In the first week of December 1934 L. C. Beattie, Superintendent of Construction for the W. A. Ross Company, arrived in Camden to set up the local project office. *The Reveille* noted that the camp office was under construction at the bridge site, and that equipment and machinery were being moved to the location and work on the substructure would soon start. The camp office was set up on the north side of the lake. Barges were transporting materials from Warsaw.³⁵

In late January 1935 dredging for the piers started. In February bench excavations were begun on shore for piers on the north side of the lake. It was reported by *The Reveille* that the pay role for the week of February 1, 1935 included about 40 men, thirty of whom were Camden County men.³⁶

In March it was reported that two telephone lines were being strung, along the new location for Highway 5, to the bridge site. One line was exclusively for the bridge project, the other line was for local residents.³⁷

In April 1935 construction on the new Highway 5 location was begun. This route would connect the Hurricane Deck Bridge, the bridge being constructed over the Niangua

³³ Ibid.

³⁴ Ibid, p. 394.

³⁵ "Preparation Underway for Bridge Construction." *The Reveille*, December 7, 1934, p.1.

³⁶ "Dredging Started for Bridge Piers." *The Reveille*, February 1, 1935, p.1.

³⁷ "Telephone Lines to Bridge Site under Construction." *The Reveille*, March 8, 1935, p.1.

Branch of the Lake, and provide a direct route between Versailles and Camdenton that was currently being served by a ferry boat.³⁸

By late April 1935 it was reported that several additional local men would be put to work on the new bridge. Accurate reports as to the number of men working were not available, but it was estimated that 40 to 50 new men went to work the last week of April 1935. Unauthorized reports numbered the work crew at about 100 men. *The Reveille* reported that “the bridge work is on the boom with day and night shifts operating throughout the twenty-four hours of the day.”³⁹

In July 1935 the materials for the superstructure were being moved to the bridge site so it would be ready when the substructure was completed. In the July 26 edition of *The Reveille* it was estimated that 20% of the material had arrived at the site and two more carloads of materials would soon arrive from Warsaw.⁴⁰

In late July reportedly 113 men were working on the bridge site. Veterans made up 46% of the work crew. It was also reported that there were about 30 sand hogs working, and that they were mostly African-American.⁴¹

In October 1935 the substructure was reported complete and steel for the superstructure had begun to arrive at the project site. It was estimated that work would progress quickly from that point on.⁴² Also in October 1935 work on the Niangua Branch Bridge was begun.⁴³ Before Highway 5 could be relocated and opened to traffic it was necessary that both the Hurricane Deck Bridge and the Niangua Branch Bridge be completed. They would replace the ferry crossing that had been temporarily carrying Highway 5 traffic since the inundation of the Lake of the Ozarks flooded the highway location.

On December 4, 1935 the County Court accepted and approved the substructure of the bridge as constructed by the W. A. Ross Company.⁴⁴ Once the substructure was approved, the Stupp Brothers Bridge and Iron Company could begin work on the superstructure of the bridge.

³⁸ Work on Highway 5 to Bridge Site to Start Soon.” *The Reveille*, April 12, 1935, p. 1.

³⁹ “More Men Put to Work on Bridge.” *The Reveille*, April 26, 1935, p. 1.

⁴⁰ “Super structure Material Moved to Bridge Site.” *The Reveille*, July 26, 1935, p.1.

⁴¹ Ibid.

⁴² “Frame Work of Bridge Starts.” *The Reveille*, October 18, 1935, p. 1.

⁴³ “Bridge Work Continues Through Winter.” *The Reveille*, December 27, 1935, p.1.

⁴⁴ Camden County Court. “County Court Record.” Book 8, p. 536, December 4, 1935. Camden County Clerk, Camdenton, Missouri.

Construction on the bridge superstructure began in December 1935. Steel had been shipped to the construction site from Warsaw beginning in October, but freezing weather during the winter stalled construction. The Lake of the Ozarks was frozen between January 24, 1936 and March 2, 1936 stopping the arrival of additional shipments of steel to the construction site.⁴⁵

Once spring arrived work on the steel superstructure progressed quickly, and by mid-May 1936 the Hurricane Deck bridge ironwork was almost complete. The last of the steel work was completed the week of May 15 and it was estimated that laying the concrete slab for the bridge deck would be completed soon.⁴⁶

Quick completion of the bridges would soon take on a new urgency. On May 13, 1936 the ferry which had been carrying Highway 5 traffic, the *Governor McClurg*, sank. Nunley Contracting of Kansas City contracted to try to raise the ferry.⁴⁷ In June it was reported that the ferry had been down for 30 days, and that no work had been done in raising it.⁴⁸ During the busy tourist season, it was estimated that hundreds of cars had used the ferry, so it was important that it be raised quickly.⁴⁹

Pouring the concrete deck in the summer of 1936 progressed slower than originally scheduled. Unseasonably hot weather “very materially delayed” work on the deck.⁵⁰ During hot weather concrete could not be poured because it would cure too rapidly causing damage to the concrete which could cause shrinking, cracking and would reduce the life of the concrete.⁵¹

The *Governor McClurg* was finally raised in September 1936, after the tourist season. It was estimated that the boat would take about three weeks to repair, and would be in service again in early October.⁵²

In November, *The Reveille*, reported that the Osage Arm Bridge (the Hurricane Deck Bridge) had been completed for many weeks but the Niangua Bridge, which was nearing

⁴⁵ Ibid. “County Court Record.” Book 9, p. 11, December 23, 1936.

⁴⁶ “One bridge near finish across Lake.” *The Reveille*, May 15, 1936, p. 1.

⁴⁷ “Kansas City Contractors Take Job of Raising Ferry.” *The Reveille*, May 29, 1936, p. 1.

⁴⁸ “Ferry Down for Thirty Days.” *The Reveille*, June 12, 1936, p.1.

⁴⁹ “Kansas City Contractors Take Job of Raising Ferry.” *The Reveille*, May 29, 1936, p. 1.

⁵⁰ Camden County Court. “County Court Record.” Book 9, p. 11, December 23, 1936. Camden County Clerk, Camdenton, Missouri.

⁵¹ Gurley, Evan. “How to keep on pouring when the temperature’s soaring.” *Precast, Inc. Magazine*. May-June 2008. Downloaded December 16, 2010 from www.rollcov-r.com/hot_weather_curing.html.

⁵² “Ferry Raised Wednesday to be Repaired.” *The Reveille*, September 11, 1936, p. 1.

completion, and the construction of Highway 5 had to be completed before the new bridge could be used.⁵³

In December 1936 the deck was laid on the Niangua Bridge. The bridge would be completed as soon as curbs and sidewalks were complete. It was estimated that traffic would be allowed on the bridge by Christmas, or January 1 at the latest.⁵⁴

On Sunday, December 20, 1936 it was planned to open the new bridges to traffic, provided toll collectors could be placed on duty on Sunday. If toll collectors were not in place, the Hurricane Deck Bridge would not open that day, although Highway 5 and the Niangua Branch Bridge would be opened. The two new bridges and highway had cost over \$1 million to construct.⁵⁵

On December 23, 1936 the Camden County Court granted the Stupp Brothers Bridge and Iron Company an extension on their contract for the superstructure of the bridge. The bridge was substantially completed, but painting needed to be completed, and a cash register provided for the toll house. The painting could not be completed until warmer weather.⁵⁶

In considering the request for the extension the County Court noted that Sverdrup & Parcel had recommended that the bridge be accepted with the exception of the painting and providing a cash register. They also noted that the bridge across the Niangua Arm was not completed until about December 24, 1936 and that Highway 5 connecting the two bridges had not been completed until about December 20, 1936.⁵⁷

The Hurricane Deck Bridge was officially opened to traffic on Monday, December 28, 1936, by order of the Camden County Court.⁵⁸ Signs on the gable of the toll house and on the approach span prominently displayed the toll charges for using the bridge:

Car and driver	40 cents
Bus and driver	50 cents
Car, trailer, and driver	60 cents
Trucks:	
One ton	60 cents
Two tons	70 cents

⁵³ "May Complete Niangua Bridge January 1." *The Reveille*, November 13, 1936, p. 1.

⁵⁴ "Traffic Can Cross Lake on Bridges Soon." *The Reveille*, December 4, 1936, p. 1.

⁵⁵ "New Bridges to be Open to Traffic Sunday." *The Reveille*, December 18, 1936, p. 1.

⁵⁶ Camden County Court. "County Court Record." Book 9, p. 11, December 23, 1936, Camden County Clerk, Camdenton, Missouri.

⁵⁷ *Ibid.*

⁵⁸ "Toll Bridge Officially Opened." *The Reveille*, January 1, 1937, p. 1.

Over two tons	90 cents
Each passenger	5 cents ⁵⁹

The Hurricane Deck Bridge was immediately recognized by the engineering and construction communities as a beautiful bridge. In 1936 it won first prize as the most beautiful medium-span bridge by the American Institute of Steel Construction.⁶⁰

The official dedication of the bridge was held on Sunday, October 3, 1937. Once the plans had been finalized The Reveille printed a banner headline: HURRICANE DECK BRIDGE DEDICATION TO BE HELD SUNDAY AFTERNOON, OCTOBER 3RD.⁶¹ The announced program included band music by the Springfield Shrine Band and a number of speakers: John Caskie Collett, a federal judge; Guy B. Park, a former Missouri Governor; J. C. Mc Nerney, State Engineer of the P. W. A.; L. J. Sverdrup, listed as architect; Carl Brown, State Highway Department; Harry S. Truman, United States Senator; Lloyd C. Stark, Governor of Missouri; and Dr. F. A. Middlebush, President of the Missouri University. Presiding Judge of the Camden County Court, M. M. Prussing would be the Master of Ceremonies for the program.⁶²

An estimated 2000 people attended the dedication of the Hurricane Deck Bridge. Governor Stark declared that the completion of the bridge was “a long step forward in the development of Missouri’s great recreational area.” Charles Dodd, representing the American Institute of Steel Construction, presented Judge Prussing a plaque “designating the bridge as the most beautiful built in 1936.”⁶³ Governor Stark declared the bridge open, and L. J. Sverdrup, Junior cut a ribbon officially opening the bridge at 4:00. Most of the announced program went as scheduled, but the audience “was disappointed” in not getting to hear Senator Truman speak or the playing of Springfield Shrine Band.⁶⁴

In 1951 a delegation, headed by Congressman Morgan M. Moulder and State Representative Jim Banner of Camdenton, appeared before the State Highway Commission requesting that the Highway Commission take over the Hurricane Deck Bridge and free it from tolls. The bond issue on the bridge, \$524,000 and the Public Works Administration grant of \$172,000 made the total cost of constructing the bridge

⁵⁹ Photograph 13-07. Missouri Department of Transportation Collection, Missouri State Archives, no date.

⁶⁰ Fraser; American Institute of Steel Construction. “Prize Winners: 1930s List.” Downloaded December 15, 2010 from: <http://www.aisc.org/contentNSBA.aspx?id=21362>.

⁶¹ *The Reveille*. September 24, 1937, p. 1.

⁶² “Ceremonies to the Held at 3 O’clock.” *The Reveille*. September 24, 1937, p. 1.

⁶³ “Large Crowd at Bridge Dedication.” *The Reveille*. October 8, 1937, p. 1.

⁶⁴ *Ibid*.

\$696,000, and this full amount was still outstanding. The income from the tolls had not been sufficient to pay off the debt.⁶⁵

Congressman Moulder presented resolutions from several civil, political and commercial organizations in Camden, Miller, Morgan, Moniteau, Cooper, Howard, Chariton, Linn, Sullivan, Laclede and Wright Counties supporting the request. In addition the delegation presented evidence that the tolls were detrimental to the Camdenton Reorganized School District, which was located on both sides of the Lake.⁶⁶

The Highway Commission stated that they were unable to comply with the request at the time. The Commission did ask that a complete statement, covering the financial and other operations of the bridge, be submitted for study.⁶⁷ The local delegation considered their request very well received and estimated that it would take 12-18 months of preparation for all the steps necessary to remove the tolls.⁶⁸

The local newspaper noted that although people had been complaining about the tolls for some time, this was the first time any group had taken action toward the removal of them.⁶⁹

On February 5, 1953 another delegation appeared before the State Highway Commission, this time led by State Senators W. H. Robinett and C. R. Hawkins and Representative J. H. Banner. They informed the Highway Commission that, under an agreement between the Reconstruction Finance Corporation, the Corporation had acquired the 512 outstanding bonds from the construction of the Hurricane Deck Bridge, and was agreeable to selling the bonds for \$465,920 plus 2% of the face value of the bonds within a 90-day period ending February 6, 1953. The delegation informed the Commission that the toll charged on the bridge diverted traffic away from the area and that the elimination of the toll would be an "important contribution" to Camden County and the surrounding area.⁷⁰

After lengthy discussion the Highway Commission approved the purchase of the outstanding bonds, provided the payment would acquire title to the entire structure and right of way for use by the State Highway Commission. The Chief Counsel's Office was

⁶⁵ Missouri State Highway Commission. "Minutes of the Special and Regular Meetings of the State Highway Commission, held in Jefferson City, Missouri, on Monday, July 9, 1951 and Tuesday, July 10, 1951," p. 67.

⁶⁶ Ibid, p. 68.

⁶⁷ Ibid.

⁶⁸ "Large Delegation Attend Hearing Before Commission." *The Reveille*. July 13, 1951, p. 1.

⁶⁹ Ibid.

⁷⁰ Missouri State Highway Commission. "Minutes of the Special Commission Meeting Held in Jefferson City, Missouri, on Thursday, February 5, 1953 and Friday, February 6, 1953," pp. 4-5.

charged with drafting the necessary agreements after being satisfied that complete title to the bridge would rest with the Commission.⁷¹

In March 1953 the Chief Counsel reported that all necessary agreements for the conveyance of the Hurricane Deck Bridge had been completed and recorded. The Chief Counsel recommended that the 512 outstanding bonds be cancelled and returned to Camden County for a dedication ceremony planned by the County Court.⁷² The Hurricane Deck Bridge was declared a toll free bridge as of 12:00 noon on March 18, 1953.⁷³ Camden County paid the State Highway Commission \$38,754.62 money on hand from the toll bridge account and transferred all insurance policies for the bridge.⁷⁴

The Reveille commended all those who had worked toward the removal of tolls from the bridge. It was noted that there were many individuals involved in the effort, but several people and groups deserved special recognition: the Camden County Court, the Camdenton Chamber of Commerce, State Representative Jim Banner and Congressman Morgan M. Moulder. The paper also noted “the members of the State Highway Commission should not be forgotten for the fine attitude they took toward the problem and their final decision in the matter that made the work of all others a success.”⁷⁵

People who had outstanding coupons for bridge tolls were given thirty days to present those coupons to the County Clerk for a refund.⁷⁶

At noon on Wednesday, March 18, 1953 a crowd gathered at the toll booth on the north⁷⁷ end of the bridge and the official proclamation announcing the lifting of tolls was read by Hugh Phillips, the Prosecuting Attorney for Camden County. The toll keeper, Lester Bookout was officially notified to stop taking tolls for crossing the bridge.⁷⁸

⁷¹ Ibid, p. 5.

⁷² Missouri State Highway Commission. “Minutes of the Special Commission Meeting Held in Jefferson City, Missouri on Saturday, March 21, 1953,” pp. 17-18.

⁷³ Camden County Court. “County Court Record.” Book 12, p. 101, March 18, 1953. Camden County Clerk, Camdenton, Missouri.

⁷⁴ Camden County Court. “County Court Record.” Book 12, p. 100, March 18, 1952. Camden County Clerk, Camdenton, Missouri.

⁷⁵ “Bridge Expected to Be Freed Before Long.” *The Reveille*, March 13, 1953, p. 1.

⁷⁶ Camden County Court. “County Court Record.” Book 12, p. 100, March 18, 1952. Camden County Clerk, Camdenton, Missouri.

⁷⁷ It was described in the newspaper as the north end of the bridge, because it was the north shore of the lake. On highway 5 it is considered the west end of the bridge.

⁷⁸ “Hurricane Deck Toll Bridge Freed Wednesday Noon.” *The Reveille*, March 20, 1953, p. 1.

Ceremonies to dedicate the Hurricane Deck Bridge as a free bridge were planned and announced for Saturday, April 4, 1953. The festivities would include a parade, speeches and a banquet. Festivities would begin at 2:15 with the parade and end with the banquet at the Lake Plaza Hotel which would begin at 6:30. At 3:00 the Harwood Hotel would host a reception for official visitors, who would then be transported to the bridge, where “appropriate ceremonies” would occur.⁷⁹

The main address at the dedication was given by John C. Harlin of Gainesville, Missouri. Honored guests included members of the State Highway Commission represented by J. G. Morgan and J. C. Harlan and the State Highway Department led by Chief Engineer Rex Whitton, Assistant Chief Engineer P. H. Daniels, Chief Counsel R. L. Hyder, and John Acuff, Secretary of the Commission.⁸⁰



Figure 2: The Camdenton High School Band provides a musical setting for the freeing the bridge ceremonies.⁸¹

⁷⁹ “Toll Bridge Freeing Celebration to be held Saturday, April 4.” *The Reveille*, April 3, 1953, p.1.

⁸⁰ “Celebration of Toll Bridge Freeing Well Attended Sat.” *The Reveille*, April 10, 1953, p. 1.

⁸¹ Negative 689_015, Missouri Department of Transportation Collection, Missouri State Archives, April 1953.

After the ceremony it was noted that “citizens of our county can now travel anywhere within the county without paying toll and we hope our many visitors to this area will appreciate their travel around the lake without being stopped by a toll bridge.”⁸²



Figure 3: John Acuff, Secretary to the State Highway Commission, prepares to cut the ribbon officially dedicating the Hurricane Deck Bridge as a free bridge.⁸³

In 1983 inspections found major deterioration of the bridge deck and recommended removing and replacing the slab, curb and handrail for all spans of the bridge; removing the concrete deck girders to the intermediate bent and replacing them; cleaning and repainting, or replacing (as required), all members within the top chord of the deck trusses; rehabilitate piers 4, 5, 6 and 7 and the substructure of the abutments on both ends of the bridge.⁸⁴

⁸² “Celebration of Toll Bridge Freeing Well Attended Sat.” *The Reveille*, April 10, 1953, p. 1.

⁸³ Negative 689_001, Missouri Department of Transportation Collection, Missouri State Archives, April 1953.

⁸⁴ Rhodes, Arthur J. “Memorandum to File.” August 23, 1983. Bridge Division, Missouri Department of Transportation, Jefferson City, Missouri.

The rehabilitation had to be accomplished while maintaining traffic on the bridge since there were not suitable other routes between Versailles and Camdenton for residents to use. The projects also included removing the sidewalks from the bridge. This had been discussed with the local community, and the impression had been that the removal would not be met with opposition.⁸⁵

The rehabilitation was awarded to the St. Louis Bridge Construction Company in June 1985. They were the low bidders for the project with a bid of \$3,377,925.62.⁸⁶ They began construction on October 15, 1986 and had the rehabilitation completed slightly less than one year later, on October 1, 1987.⁸⁷

III. Builder and Fabricator

Designer--Sverdrup & Parcel Company

The Hurricane Deck Bridge was designed by Sverdrup & Parcel. The Sverdrup & Parcel Company was formally founded on April 1, 1928 by Leif J. “Jack” Sverdrup and John Parcel.⁸⁸ Sverdrup, a Norwegian immigrant who had trained at Augsburg College and the University of Minnesota in Civil Engineering, had founded the company following several years with the Missouri Highway Department, including several years as the Bridge Engineer. John Ira Parcel, Sverdrup’s mentor from Minnesota, was invited to join him in the partnership in designing and supervising construction of a bridge in Hermann, Missouri. With the commission for the Hermann Bridge, Sverdrup resigned his position as Assistant to the Chief Engineer and moved to St. Louis.⁸⁹

The company was successful through 1930, with commissions including the Grand Glaize Bridge on U. S. Route 54 in Camden County, relocated because of the construction of Bagnell Dam.⁹⁰ The next two years brought little work, until the election of Franklin Roosevelt and the creation of the Public Works Administration during the first hundred days of his presidency. Loans and grants were made to state and local governments for building projects and Sverdrup & Parcel were recipients of many contracts during this period.⁹¹

⁸⁵ Muri, Wayne. Correspondence to W. D. Charney, February 3, 1984. Bridge Division, Missouri Department of Transportation, Jefferson City, Missouri.

⁸⁶ “Minutes of the Regularly Scheduled Highway and Transportation Commission Meeting held in Jefferson City, Missouri, on Friday, July 12, 1985,” p. 55.

⁸⁷ “Final Inspection Report.” January 29, 1988. Bridge Division, Missouri Department of Transportation, Jefferson City, Missouri.

⁸⁸ Franzwa, Gregory M. *Legacy: The Sverdrup Story*. St. Louis, Mo.: Sverdrup Corporation, 1978, p. 9.

⁸⁹ Gubbels, p. 3.

⁹⁰ Franzwa, p. 16.

⁹¹ *Ibid*, pp. 16-22.

Two important commissions Sverdrup & Parcel had in Camden County related to the relocation of State Highway 5, due to the inundation of the Lake of the Ozarks following the completion of the Bagnell Dam. In 1933 they received the commission for the Hurricane Deck Bridge over the Osage River branch of the Lake, for which they received \$43,000.⁹² In 1935, their plans for the bridge over the Niangua River branch of the lake were approved.⁹³

In 1977 Sverdrup & Parcel reorganized as the Sverdrup Corporation. The Corporation had five principal subsidiaries including Sverdrup & Parcel and Associates, which continued design work that the company had been founded on.⁹⁴ In 1999 the company merged with Jacobs Engineering Group.⁹⁵

Fabricator—Illinois Steel Company

The Illinois Steel Company was a subsidiary of the Federal Steel Company, which was in turn a subsidiary of the US Steel Company.⁹⁶ The Illinois Steel Company was formed May 1, 1889 by the consolidation of the North Chicago Rolling Mill company, the Joliet Steel company and the Union Steel Company.⁹⁷ In 1901 the company was merged with the U S Steel Corporation.⁹⁸

The North Works, located in Northern Chicago, Illinois, produced cement, pig-iron, structural steel shapes and bridges. The North Works was the oldest plant associated with the Illinois Steel Company, having begun in 1857. Originally it produced wrought iron. The fitting shop was “prepared to turn out a complete bridge or steel structure, direct from the ore, as there are facilities on the premises for all the intermediate operations. The fitting shops are equipped with all modern appliances for punching, assembling and riveting steel structures.”⁹⁹

⁹² Ibid, p. 24.

⁹³ Gubbels, p. 4.

⁹⁴ Sverdrup Corporation. “Company History.” Downloaded November 8, 2010 from: <http://www.fundinguniverse.com/company-histories/Sverdrup-Corporation-Company-History.html>.

⁹⁵ Manning, Margie. “Jacobs Shakes Up Sverdrup.” *St. Louis Business Journal*, March 21, 1999. Downloaded February 3, 2011 from: <http://www.bizjournals.com/stlouis/stories/1999/03/22/story2.html>.

⁹⁶ American Iron and Steel Association. *The Iron and Steel Works of the United States 1901*. Philadelphia, PA: Allen, Lane & Scott, 1902.

⁹⁷ “The Illinois Steel Company.” *Twenty-fifth volume The Railway Age and Northwestern Railroader, January 1 to July 1, 1898*, April 8, 1898 edition, p. 244.

⁹⁸ U S Steel Company. “History of U S Steel.” Downloaded December 15, 2010 from: <http://www.uss.com/corp/company/profile/history.asp>

⁹⁹ “The Illinois Steel Company,” pp. 244-245.

Contractor—W. A. Ross Construction Company

The W. A. Ross Construction Company was formed in December 1927 with three principals: T. J. Pendergast, 500 shares, William A. Ross, 499 shares, and Edward L. Schneider 1 share. The company formed to carry on and conduct a general contracting business specializing in public works projects including “buildings, roads, highways, sewers, streets, pavement of every description, manufacturing plants, sewerage disposal plants, bridges, piers, culverts, docks, mines, shafts, water works, railroads, railroad structures, and all iron, steel and masonry constructions.”¹⁰⁰

The W. A. Ross Construction Company was active in the late 1920s and 1930s receiving several state contracts for bridge construction throughout the state. Other contracts for the State Highway Department included the Niangua Branch Bridge on Highway 5.¹⁰¹

The W. A. Ross Construction Company was controlled by Thomas J. “Boss” Pendergast, a leading political figure in Kansas City. William A. Ross was the son of Michael Ross, responsible for keeping the North wards of the city in line with the Pendergast machine. William Ross died in 1928, and his share of the company passed to Michael Ross’ control.¹⁰² The Company dissolved in April 1941.¹⁰³

Sub-Contractor—Stupp Brothers Bridge and Iron Company

The Stupp Brothers Bridge and Iron Company was formed in December 1890 by George, Peter and Julius Stupp. These three brothers were the sons of John Stupp, who, in 1856, had formed the South St. Louis Iron Works. Stupp manufactured steel and ornamental iron products, fences, gates and building fronts. During the 1880s, George, Peter and Julius Stupp joined the family business, which began to design, fabricate and construct bridges.¹⁰⁴

The Stupp Brothers Bridge and Iron Company formed with the purpose of “building, constructing and repairing iron and steel bridges, and manufacturing, constructing and repairing all kinds of iron and steel structural work.”¹⁰⁵ The three brothers were equal partners in the company which was based in St. Louis and was incorporated for a term of

¹⁰⁰ “Article of Association.” W. A. Ross Company. Downloaded December 14, 2010 from: <https://www.sos.mo.gov/BusinessEntity/soskb/Corp.asp?46718>.

¹⁰¹ Gubbels, p. 6.

¹⁰² Ibid.

¹⁰³ “Affidavit of Dissolution.” W. A. Ross Company. Downloaded December 14, 2010 from: <https://www.sos.mo.gov/BusinessEntity/soskb/Corp.asp?46718>.

¹⁰⁴ “History Overview—Stupp Bros., Inc.” Stupp Brothers, Inc. Downloaded November 8, 2010 from www.stupp.com/history.html.

¹⁰⁵ “Articles of Agreement of the Stupp Bros. Bridge & Iron Co.” Stupp Bros. Bridge & Iron Company. Downloaded November 8, 2010 from: <https://www.sos.mo.gov/BusinessEntity/soskb/Filings.asp?5305>.

fifty years.¹⁰⁶ In 1939 the company amended their articles of incorporation to have a perpetual existence.¹⁰⁷

Stupp Brothers Bridge and Iron Company has built many bridges for the State Highway Department including several in the Lake of the Ozarks region: Grand Glaize Bridge on Route 54 and the Niangua Branch Bridge on Highway 5.¹⁰⁸ They constructed the 1953-1955 Missouri River Bridges at Jefferson City.¹⁰⁹ Other major river crossings include the Washington Bridge across the Missouri River and the Tesson Ferry Road Bridge across the Meramec River.¹¹⁰

Stupp Brothers Bridge and Iron continues in business as the Stupp Bridge Company division of Stupp Bros., Incorporated.¹¹¹

IV. Physical Description of Bridge K0961

The description below is based on the final as built plans for the bridge and the physical appearance of the bridge as of 2011. The as built plans accompany this report. The plans for the various rehabilitations to the bridge are included as a .pdf file on the compact disc which accompanies this report.

The Hurricane Deck Bridge is a 5-span, steel, rigid-connected, Warren cantilever deck truss with 2-span reinforced concrete deck girder approach spans on each end, concrete abutments, wing walls, and piers. The bridge has a total length of 2281 feet and in 2010 it had a roadway width of 28 feet.¹¹² The approach spans appear to have originally been 2-span concrete rigid-frame construction.¹¹³

¹⁰⁶ Ibid.

¹⁰⁷ "Certificate of Amendment of Articles of Association of Stupp Bros. Bridge & Iron Co." Stupp Bros. Bridge & Iron Co. Downloaded November 8, 2010 from: <https://www.sos.mo.gov/BusinessEntity/soskb/Filings.asp?5305>.

¹⁰⁸ Sone, p. 10. Gubbels, p. 7.

¹⁰⁹ Missouri State Highway Commission. "Minutes of the Meeting of the State Highway Commission, Held in Jefferson City, Missouri, Tuesday, April 14, 1953," p. 45.

¹¹⁰ Bridgehunter.com. Search results for Stupp Bros. Iron Company, December 15, 2010.

¹¹¹ Stupp Bros., Inc. "History Overview." Downloaded from: <http://www.stupp.com/history.html>, November 8, 2010.

¹¹² Fraser, Clayton. "Missouri Historic Bridge Inventory" Hurricane Deck Bridge (K-961R), Historic Inventory Data Sheet.

¹¹³ Sverdrup & Parcel. "Highway Bridge Over Lake of the Ozarks, Osage Arm, Route No. 5, Camden County, Missouri, PWA Docket No. 4553, PWA Project No 171." Bridge Division, Missouri Department of Transportation, Jefferson City, Missouri.

The following description of the bridge and modifications to it are based on the plans for the Highway Bridge over Lake of the Ozarks Osage Arm prepared by Sverdrup & Parcel, consulting engineers, and as modified by the Missouri Department of Transportation during rehabilitation.¹¹⁴

The east approach structures are 68' 6" long. Each is formed of two concrete T-beam spans each 32' long with a concrete abutment and wing wall (labeled bent 1 or the east approach span on the plans), an intermediate bent (bent 2) and bent 3 which has the bridge seat for the metal truss bridge. The superstructure of the approach structure was replaced from the intermediate construction joint up during bridge rehabilitation in 1985-1986. The west approach spans are identical. Pier 8 has the bridge seat for the truss bridge, and bents 9 and 10 carry the T-beam spans.

Substructure

Piers 3 and 8 are pile piers, and are illustrated on sheet 3 of the accompanying plans. Each pier has four concrete piles which are tied together at the footings, at the intermediate construction joint and at the pier cap. The footings are irregularly shaped, but generally two squares, each supporting two of the piles. Pier 3 is 47 feet 1-3/4 inches total height and Pier 8 is 41 feet 1-3/4 inches total height. The bridge seat is 6 feet above the footings, and is 5 feet deep with a concrete backwall.

Piers 4, 5 and 7 are column piers with web walls with large shaft footings, and are illustrated on sheet 5 of the accompanying plans. The shafts range in height between 42 feet high (pier 4) to 64 feet high (piers 5 and 7). They are 36 feet wide and 18 feet deep. The columns are inset 2 feet 6 inches from the stream flow edges of the footing shaft. The columns are battered slightly as they rise in height. Piers 4 and 7 have columns 31 feet 9-7/8 inches high, the columns of pier 5 are 39 feet 6-1/2 feet high. The web walls are 2 feet 6 inches thick. The pier caps are two part capitals encompassing both columns and the web wall. The pier cap is 3 feet 6 inches deep in total, and overhangs the columns slightly.

Pier 6 is similar to piers 4, 5 and 7, only differing in the dimensions. It is also shown on sheet 5 of the accompanying plans. The shaft footing for Pier 6 is 67 feet high, 36 feet wide and 18 feet deep. The columns are set 2 feet from the stream flow edges of the footing and 4 feet from the sides of the footing. The columns are 38 feet 7-1/2 inches high.

The truss is symmetrical around the center point of the truss (identified as U and L 37 on plan sheet 7), with spans 1, 3 and 5 of the truss being cantilever spans and spans 2 and 4 having suspended spans (the six panels between U-L 18 and U-L 24). The truss plans begin on page 6 of the accompanying plan sheets.

The bottom chord of the truss spans is composed of built up members. The sides of the members are plates with angles riveted to the top and bottom edges. On the tops and bottoms of the member are small bar lacing, which is riveted to the angles. There are gaps

¹¹⁴ Ibid.

in the lacing under the vertical members that are not in compression. There are riveted plate diaphragms on the bottom of the chord, underneath the vertical members that are in compression.

The end beam is an I-beam with diaphragms of pairs of riveted angles. The bottom struts are composed of two pairs of back to back angles with small bar lacing in between. The bottom laterals in the first 9 panels of the cantilevered spans from both ends of the bridge are composed of two pairs of back to back angles with evenly spaced small plates. The remaining bottom laterals in the bridge are composed of two pairs of back to back angles with small bar lacing. There is a gap in the laterals between the cantilever spans and the suspended spans to allow for the movement of the wind transfer devices.

Cantilever Spans

There are three types of verticals in the cantilever spans. The vertical posts that rest on the piers are composed of built up members composed of back to back channels connected by crisscrossed small bar lacing on both sides, and plates where the bracing connects to the vertical. The even numbered verticals are composed of two pairs of back to back angles connected by small plates. The odd numbered verticals are composed of built up members composed of two channels connected by small bar lacing.

The diagonals are formed by built up members consisting of paired angles connected by plates, which are then connected by crisscrossed small bar lacing.

The sway bracing in the cantilever spans consists of a pair of back to back angles extends diagonally from the top chord on the south side of the bridge to the bottom chord on the north side of the bridge. This vertical is intersected by two pairs of back to back angles, extending from the opposite corners, which are joined to it at a gusset plate. The bracing forms an "X" pattern. The sway bracing is different in the portals connecting Upper 12 to Lower 13, Lower 13 to Upper 14, Upper 28 to Lower 29 and Lower 29 to Upper 30, and in the sway frames of panels 13 and 29. In these areas the bracing consists of three panels formed by horizontal back to back angles. Within each panel a paired back to back angle extends diagonally from one corner to the opposite corner, two paired back to back angles extend from the other corners to meet the diagonal and are joined to it at a gusset plate.

The upper chord is composed of built up members consisting of paired angles connected by plates on the sides, which are connected to each other by a plate on the top and small plates on the bottom.

The upper sway bracing is formed by a bar and back to back angles crossed diagonally between vertical and diagonal members.

Suspended Spans

The suspended spans have a bottom chord comprised of a built up member consisting of back to back channels connected by small bars. The bottom chord of the suspended span connects to the bottom chord of the cantilever span through a diaphragm of pins,

channels and gusset plates. The bottom lateral bracing and the bottom struts are formed by two pairs of back to back angles connected by small bar lacing.

The inclined end posts of the suspended spans are built up members formed by two back to back channels connected by intermittent plates on the top and bottom. The bracing in the panel is two panels of diagonal cross bracing formed by back to back angles joined by a gusset plate in the middle. Hangers run from struts to the gusset plates. The hangers are back to back angles. The struts are located at the bottom and middle of the panel and are formed by back to back angles.

The top chords of the suspended spans are built up members formed by back to back channels connected by plates on the top and small bars on the bottom. The top lateral bracing is formed by a bar and a pair of back to back angles which cross diagonally between each vertical member forming an "X" pattern.

The verticals are formed by two pairs of back to back angles connected by small plates. There are two types of diagonals. One is formed by two pairs of back to back angles joined by small bar lacing; the other is formed by back to back channels joined by small bar lacing. The sway bracing is formed by a pair of back to back angles running diagonally in each panel which are met in the middle by two pairs of back to back angles.

Floor System

The floor system of the bridge consists of four I-beam stringers crossed by floor beams which consist of I-beams. A metal deck subfloor is laid on top of the floor beams and a concrete deck is laid.

Modifications

The approach spans were significantly altered in 1986-1987 during the rehabilitation, when everything above the intermediate construction joint was removed and replaced.

Originally there were two slightly arched concrete deck truss spans with integrated, cantilevered sidewalks. The reinforced-concrete deck girders protruded 6" from the surrounding concrete diaphragms. The girders were centered over the columns. The girder spans arch gently between the abutment and the bents, rising 18" from the low point at the column connection.

Historically cantilevering 6' 3" over each side of the bridge was the part of the structure that carried the sidewalks. The cantilever had a reverse curve providing a decorative element to the feature. The deck of the approach spans included sidewalks and the roadway. The roadway width varied from 35' over the abutment to 20 feet as it approached the main Lake spans, and it had a deck depth of 3-1/2". The sidewalk width also varied from 4' over the abutment to 10' near the main span and back to 4' as it connected to the sidewalk of the Lake span; the sidewalk was 11-1/2" above the road deck. Centered in the roadway at the north end of the bridge was the toll house, which collected tolls from the time the bridge opened in 1936 until tolls were eliminated in 1953.



Figure 4: Hurricane Deck Bridge with the original approach spans in 1935.

The original approach span had a concrete balustrade with decorative posts. The posts were centered at the apex of each arch of the span. The balusters were square concrete posts with concrete rails and handrails, the posts had varying degrees of decoration, based on the location. A lamp post with finial globe was located on the posts at the entrance to the approach spans and the entrance to the main deck. These details can be seen in Figure 4 above.



Figure 5: The Hurricane Deck Bridge Toll House

A toll house was located on the north end of the bridge (see Figure 5 above). The 11' X 19' building was in the Colonial Revival style, with concrete posts and balustrade along

the east façade; the posts were topped with Doric columns. The building had a concrete foundation, weatherboard siding, front gable asphalt shingle roof, and rectangular plan. The east façade of the toll house had two one-over-one double hung sash windows, west façade had one one-over-one double hung sash windows; each window was covered by a pair of shutters with a diamond shaped hole near the top of each shutter. The north and south elevations had central doors with one one-over-one double hung sash window on each side. A brick chimney was located off center on the east end of the roof. The interior of the toll house had three oak tables with locking drawers, and a stove. Two chairs were to be included in the toll house. Hanging on the columns that a driver would approach first was a sign reading “STOP Pay Toll.” Toll charges were displayed on a board on the gable of the toll house.

Historically the bridge had a 20’ two-lane roadway with four foot sidewalks on each side. In 1983 this was resurfaced with asphalt. The handrail on the bridge was originally two rectangular interlocking channels with vertical bars between them (see Figure 6 below). The handrail was supported by vertical I-beams bolted to the superstructure of the bridge. The bridge deck, sidewalks and handrail were removed during the rehabilitation of the bridge. A new, wider, deck and guardrails were installed.



Figure 6: Detail of the handrail, ca. 1936.

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.¹¹⁵ Randall Dawdy took photographs on March 2, 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

¹¹⁵ National Park Service, “Proposed Updated Photographic Policy National Register of Historic Places.” Downloaded 8 June 2008 from: www.nps.gov/history/nr/policyexpansion.html.

(.tiff) and printed. Images were numbered according to the NRHP Photographic Imaging Policy¹¹⁶ and burned onto a Delkin Archival Gold compact disc, which was provided to the State Historic Preservation Office 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.¹¹⁷ 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.

¹¹⁶ Ibid.

¹¹⁷ 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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Appendix A

Photo Index and Photo Plates

**Hurricane Deck Bridge (Bridge No. K0961R)
Route 5, Camden County, Missouri**

Photographer: Randall Dawdy, Missouri Department of Transportation

Date: March 2, 2011

Location of Digital Images: Missouri State Historic Preservation Office

Photo Index:

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- #2 of 48. Bridge K0961R. South side. View to northwest.
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- #6 of 48. Bridge K0961R. Pier 4. View to northwest.
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- #8 of 48. Bridge K0961R. Details at Pier 4. View to northwest.
- #9 of 48. Bridge K0961R. Lower chords at Span 3. View to northwest.
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#20 of 48. Bridge K0961R. Struts and lateral bracing. View to northwest.

#21 of 48. Bridge K0961R. South side. View to north.

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#23 of 48. Bridge K0961R. Span 5. View to north.

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#25 of 48. Bridge K0961R. Span 6. View to north.

#26 of 48. Bridge K0961R. Span 6. View to northeast.

#27 of 48. Bridge K0961R. Span 7. View to north.

#28 of 48. Bridge K0961R. West end. View to north.

#29 of 48. Bridge K0961R. Bents 8, 9 and 10. View to north.

#30 of 48. Bridge K0961R. Pier 7. View to northeast.

#31 of 48. Bridge K0961R. Pier 6. View to northeast.

#32 of 48. Bridge K0961R. Spans 3, 4 and 5. View to northeast.

#33 of 48. Bridge K0961R. Span 3. View to north.

#34 of 48. Bridge K0961R. Pier 7. View to east.

#35 of 48. Bridge K0961R. Span 7. View to east.

#36 of 48. Bridge K0961R. Span 7. View to east.

#37 of 48. Bridge K0961R. Struts and lateral bracing. View to east.

#38 of 48. Bridge K0961R. Span 7 sub-deck. View to east.

#39 of 48. Bridge K0961R. Span 8 sub-deck. View to east.

#40 of 48. Bridge K0961R. West end. View to northeast.

#41 of 48. Bridge K0961R. West approach. View to east.

#42 of 48. Bridge K0961R. Northwest end-post. View to north.

#43 of 48. Bridge K0961R. Northeast end-post. View to north.

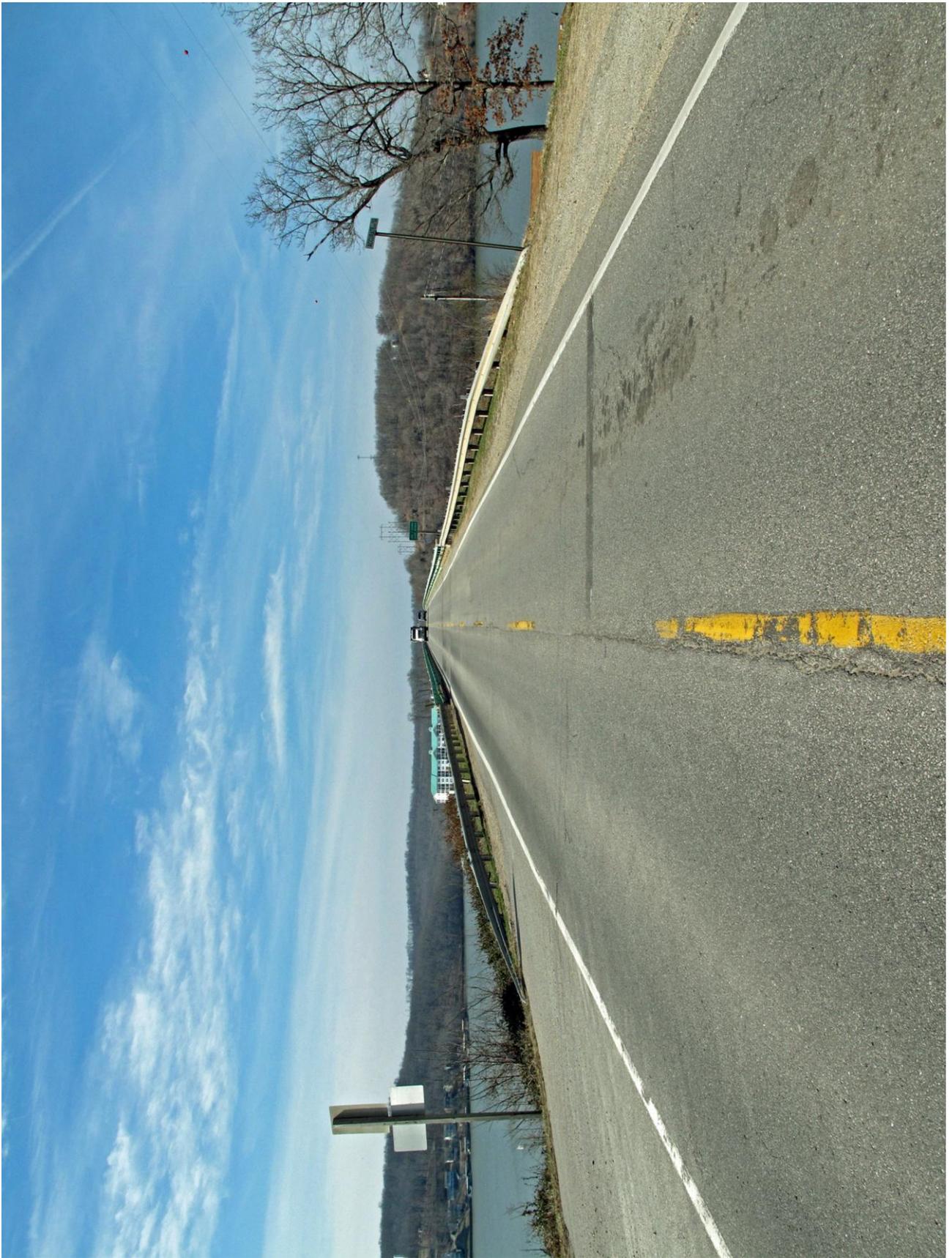
#44 of 48. Bridge K0961R. Northeast nameplate. View to north.

#45 of 48. Bridge K0961R. Northeast nameplate. View to north.

#46 of 48. Bridge K0961R. Southeast end-post. View to south.

#47 of 48. Bridge K0961R. Southeast nameplate. View to south.

#48 of 48. Bridge K0961R. Southeast nameplate. View to south.



#1 of 48. Bridge K0961R. East approach. View to west.



#2 of 48. Bridge K0961R. South side. View to northwest.



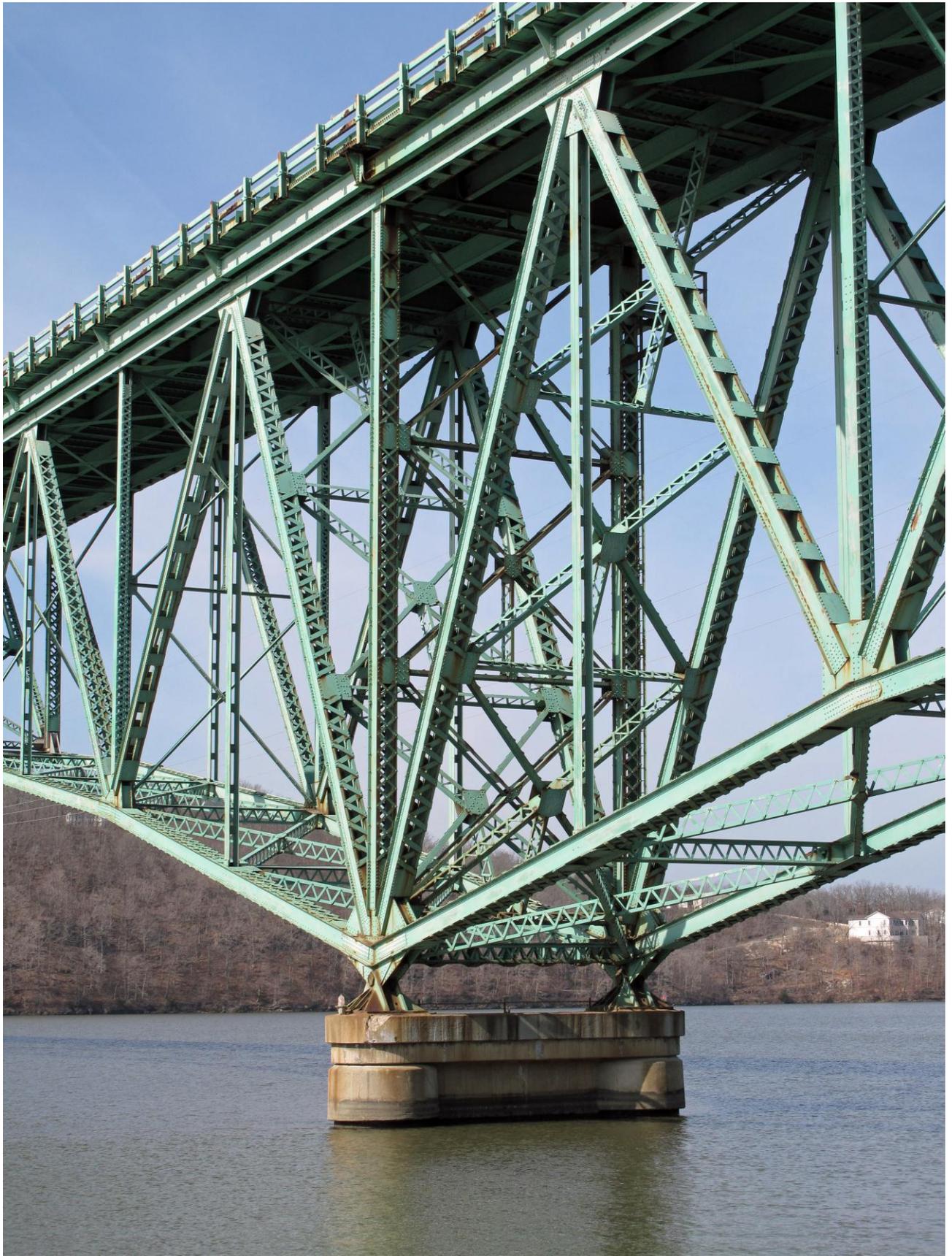
#3 of 48. Bridge K0961R. South side. View to northwest.



#4 of 48. Bridge K0961R. South side. View to northwest.



#5 of 48. Bridge K0961R. North side. View to southwest.



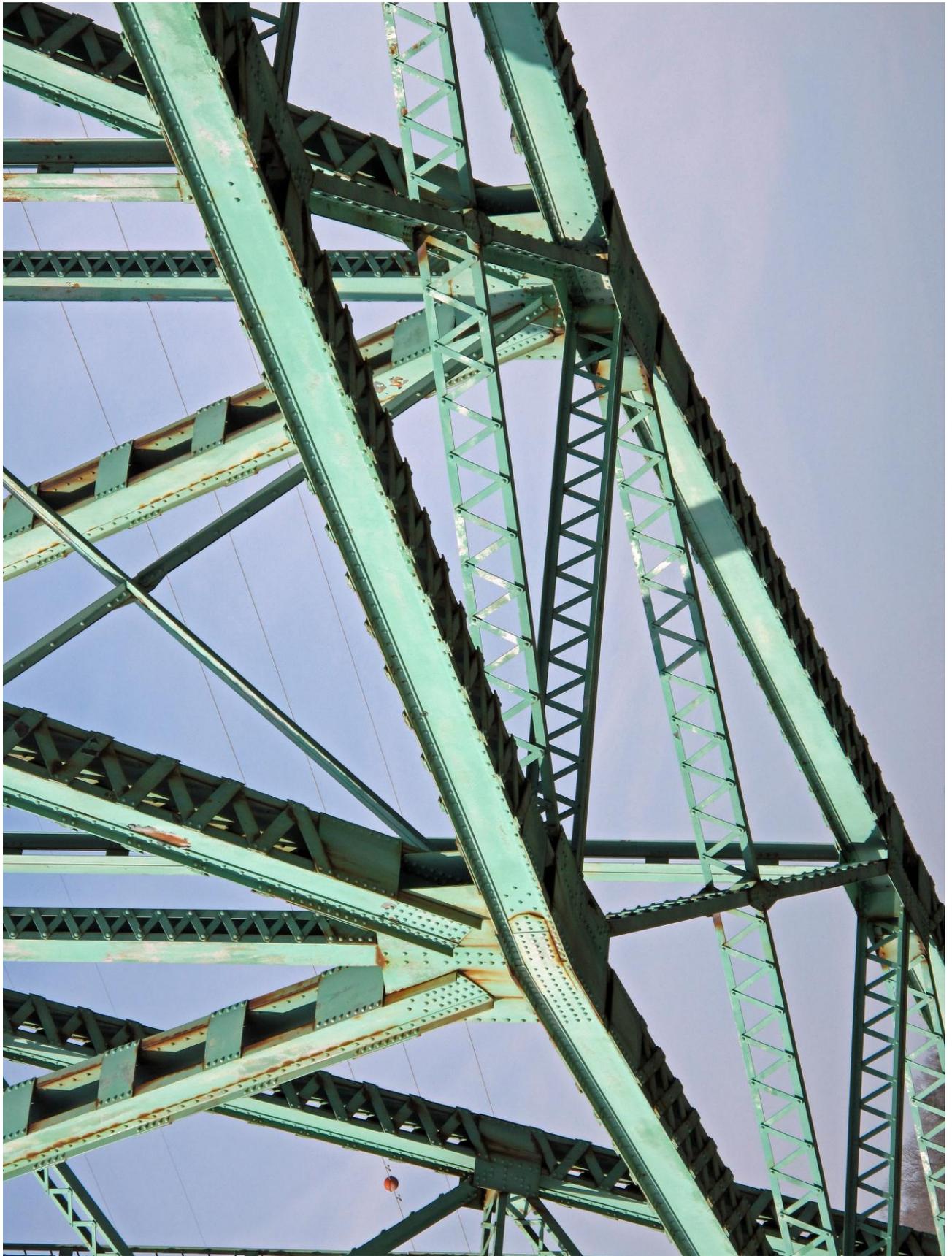
#6 of 48. Bridge K0961R. Pier 4. View to northwest.



#7 of 48. Bridge K0961R. Pier 4. View to southwest.



#8 of 48. Bridge K0961R. Details at Pier 4. View to northwest.



#9 of 48. Bridge K0961R. Lower chords at Span 3. View to northwest.



#10 of 48. Bridge K0961R. Span 3. View to northwest.



#11 of 48. Bridge K0961R. Span 3 details. View to north.



#12 of 48. Bridge K0961R. East end. View to northeast.



#13 of 48. Bridge K0961R. Bents 1, 2 and 3. View to northeast.



#14 of 48. Bridge K0961R. Rocker bearing at Bent 3. View to north.



#15 of 48. Bridge K0961R. Span 3 details at Bent 3. View to northeast.



#16 of 48. Bridge K0961R. East end of Span 3. View to east.



#17 of 48. Bridge K0961R. Span 3 sub-deck. View to west..



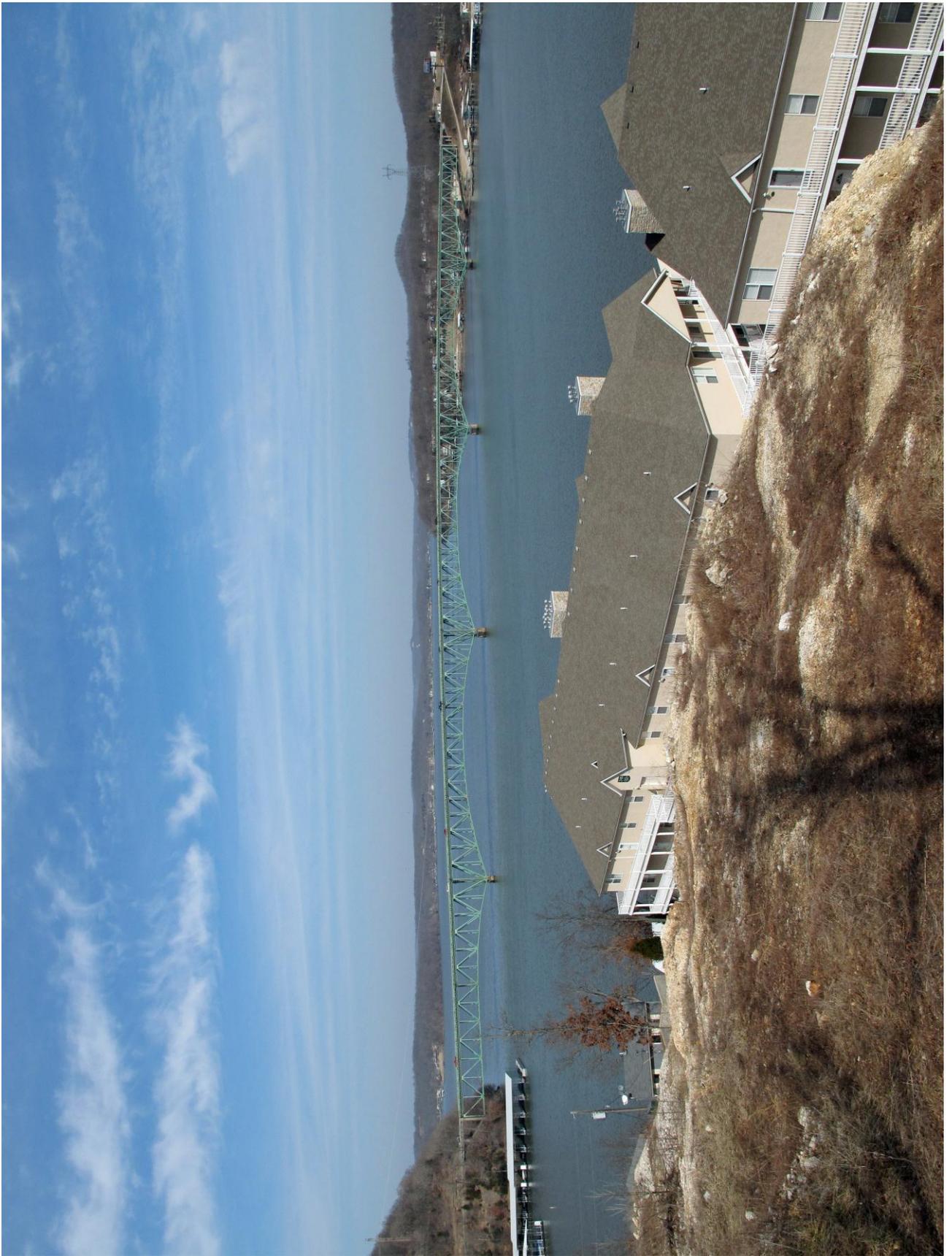
#18 of 48. Bridge K0961R. Span 3 sub-deck. View to west.



#19 of 48. Bridge K0961R. Span 3. View to west.



#20 of 48. Bridge K0961R. Struts and lateral bracing. View to northwest.



#21 of 48. Bridge K0961R. South side. View to north.



#22 of 48. Bridge K0961R. Span 4. View to north.



#23 of 48. Bridge K0961R. Span 5. View to north.



#24 of 48. Bridge K0961R. Span 5. View to northeast.



#25 of 48. Bridge K0961R. Span 6. View to north.



#26 of 48. Bridge K0961R. Span 6. View to northeast.



#27 of 48. Bridge K0961R. Span 7. View to north.



#28 of 48. Bridge K0961R. West end. View to north.



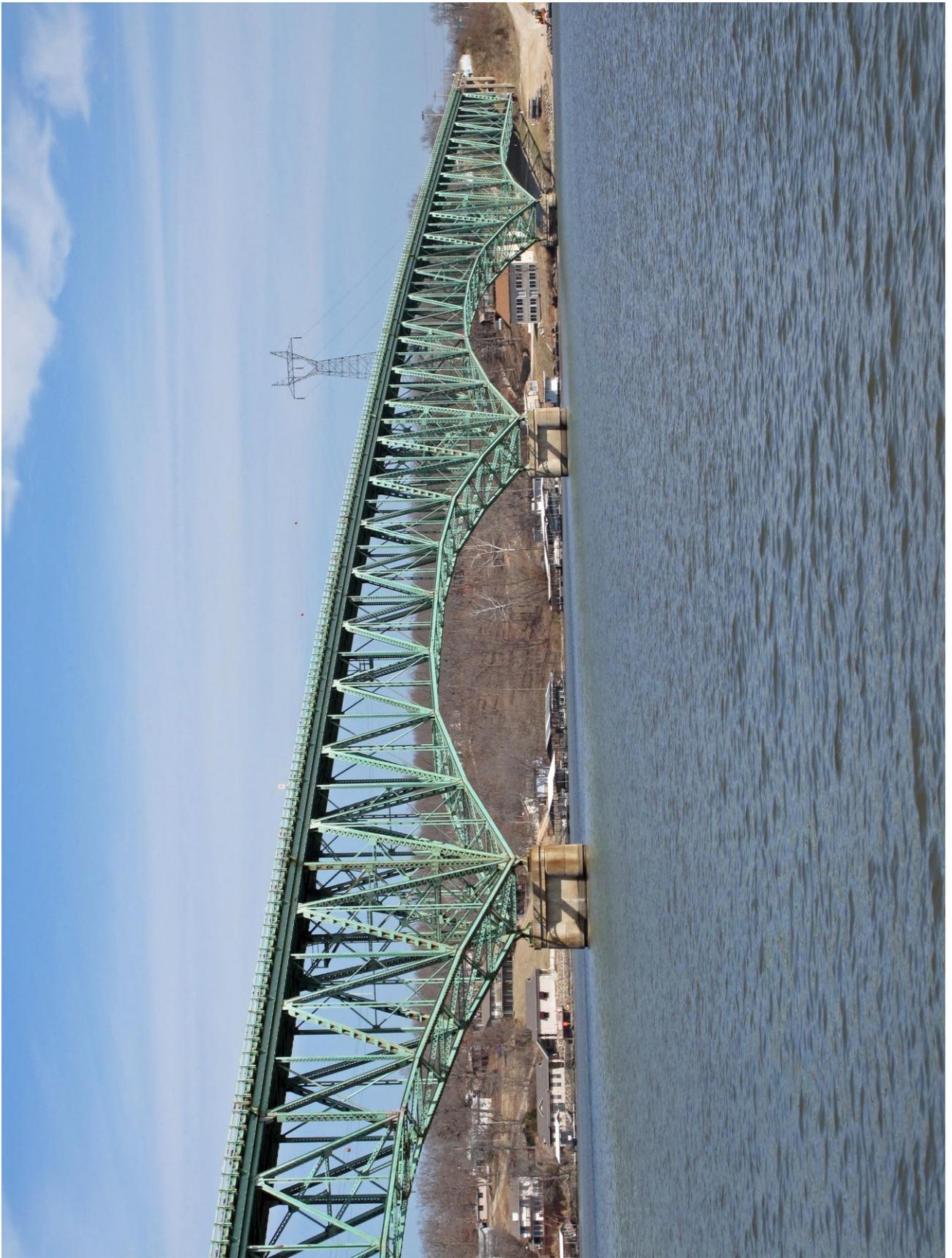
#29 of 48. Bridge K0961R. Bents 8, 9 and 10. View to north.



#30 of 48. Bridge K0961R. Pier 7. View to northeast.



#31 of 48. Bridge K0961R. Pier 6. View to northeast.



#32 of 48. Bridge K0961R. Spans 3, 4 and 5. View to northeast.



#33 of 48. Bridge K0961R. Span 3. View to north.



#34 of 48. Bridge K0961R. Pier 7. View to east.



#35 of 48. Bridge K0961R. Span 7. View to east.



#36 of 48. Bridge K0961R. Span 7. View to east.



#37 of 48. Bridge K0961R. Struts and lateral bracing. View to east.



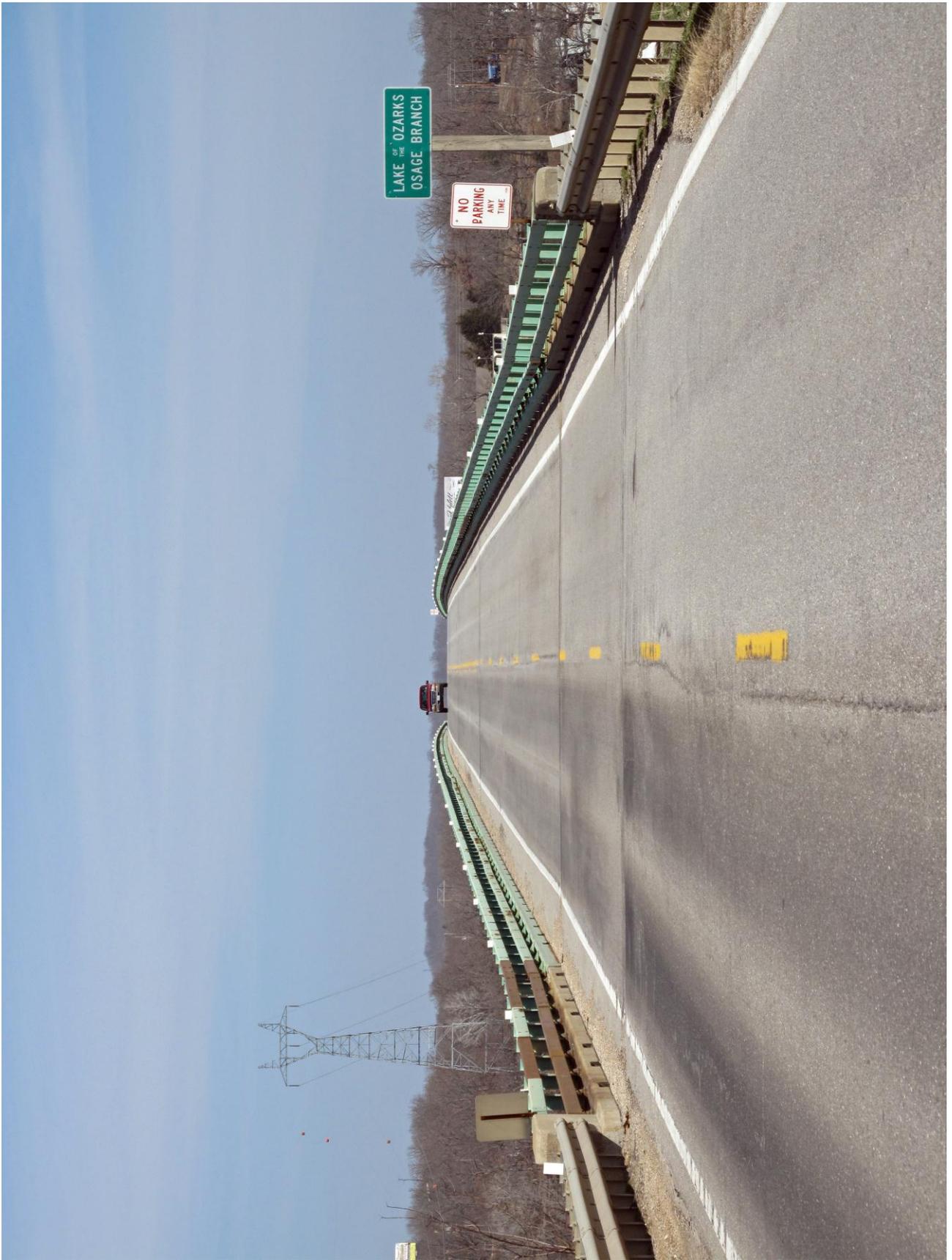
#38 of 48. Bridge K0961R. Span 7 sub-deck. View to east.



#39 of 48. Bridge K0961R. Span 8 sub-deck. View to east.



#40 of 48. Bridge K0961R. West end. View to northeast.



#41 of 48. Bridge K0961R. West approach. View to east.



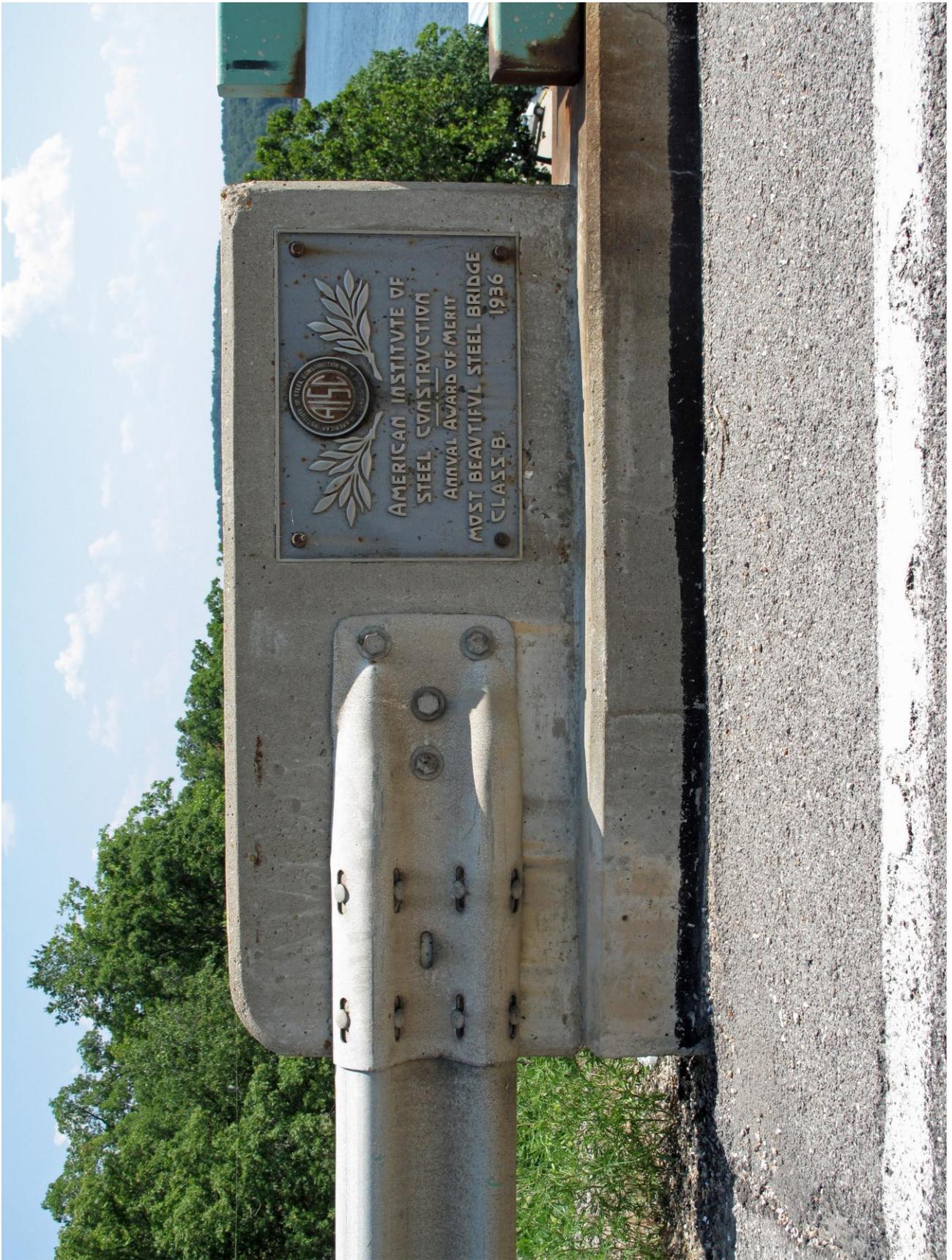
#42 of 48. Bridge K0961R. Northwest end-post. View to north.



#44 of 48. Bridge K0961R. Northeast nameplate. View to north.



#45 of 48. Bridge K0961R. Northeast nameplate. View to north.



#46 of 48. Bridge K0961R. Southeast end-post. View to south.



#47 of 48. Bridge K0961R. Southeast nameplate. View to south.



#48 of 48. Bridge K0961R. Southeast nameplate. View to south.

Appendix B

Original Construction Plans

HIGHWAY BRIDGE
OVER
LAKE OF THE OZARKS
— OSAGE ARM —
ROUTE No. 5 — CAMDEN COUNTY, MISSOURI.

P.W.A. DOCKET NO. 4553
P.W.A. PROJECT NO. 171

LIST OF DRAWINGS

- 1 GENERAL PLAN AND ELEVATION
- 2 APPROACH PROFILE & L.O. OF SOUNDINGS
- 3 DETAILS OF CONCRETE APPROACHES
- 4 DETAILS OF CONCRETE APPROACHES
- 5 DETAILS OF MAIN PIERS 4, 5, 6 AND 7
- 6 MAIN TRUSS STRESS SHEET
- 7 MAIN TRUSS STRESS SHEET
- 8 MAIN TRUSS DETAILS L0-L4
- 9 MAIN TRUSS DETAILS L5-L10
- 10 MAIN TRUSS DETAILS L11-L14
- 11 MAIN TRUSS DETAILS L15-L18
- 12 MAIN TRUSS DETAILS L18-L21
- 13 MAIN TRUSS DETAILS L29-L33
- 14 MAIN TRUSS DETAILS L34-L37
- 15 MAIN SPAN CROSS SECTIONS
- 16 MAIN SPAN SWAYS & EXPANSION DEVICES
- 17 SHOE DETAILS
- 18 TOLL HOUSE AND NAVIGATION LIGHTS

PREPARED BY
SVERDRUP & PARCEL
CONSULTING ENGINEERS
ST. LOUIS, MO.

APPROVED

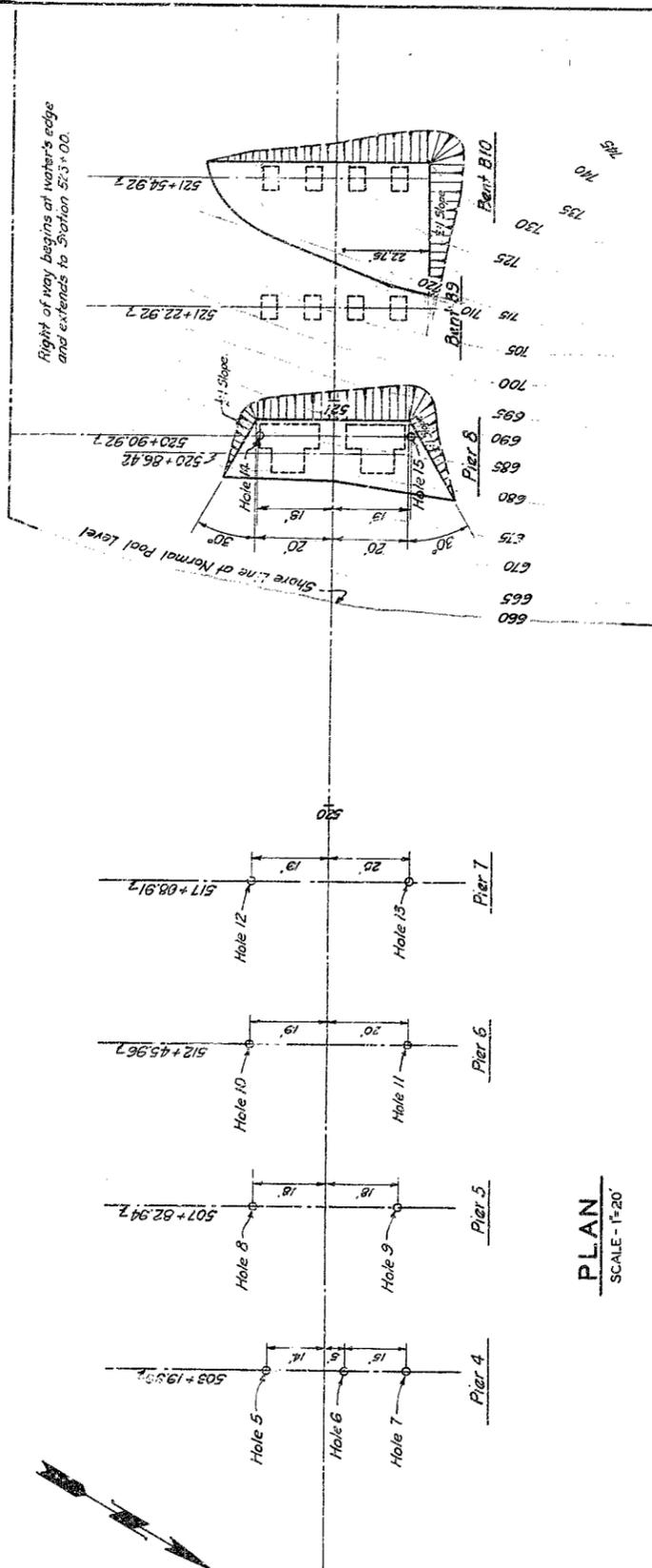
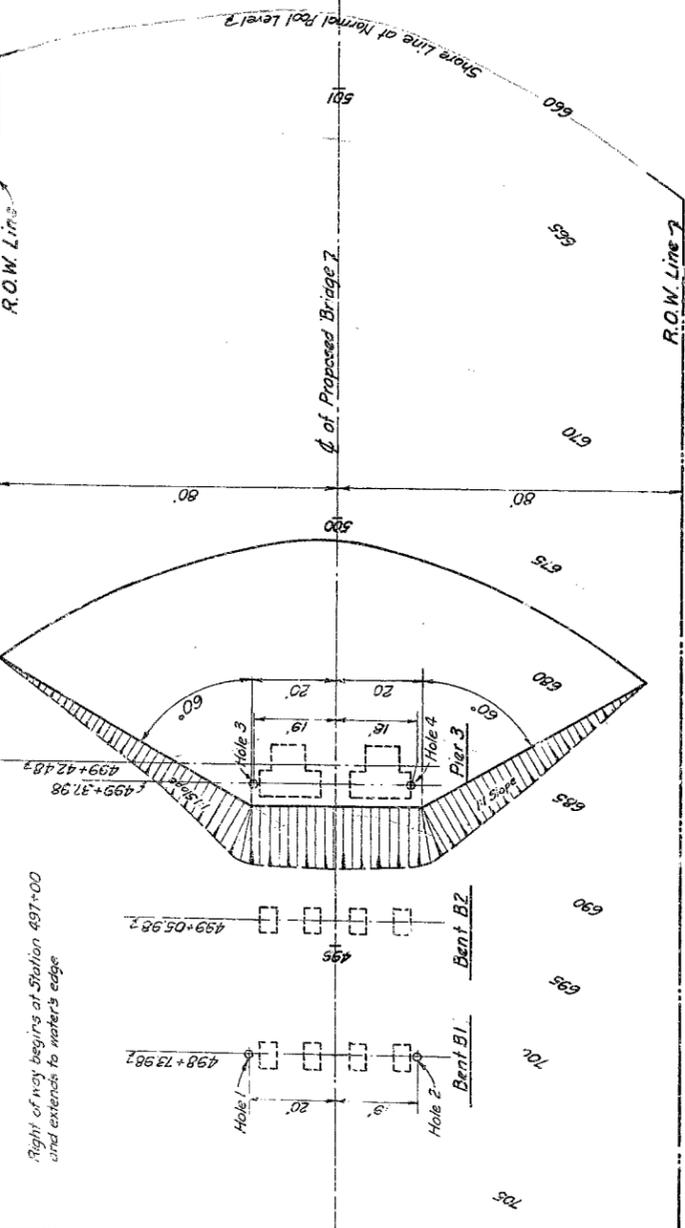
COUNTY COURT OF CAMDEN COUNTY, MISSOURI.

W. B. Burch
PRESIDING JUDGE

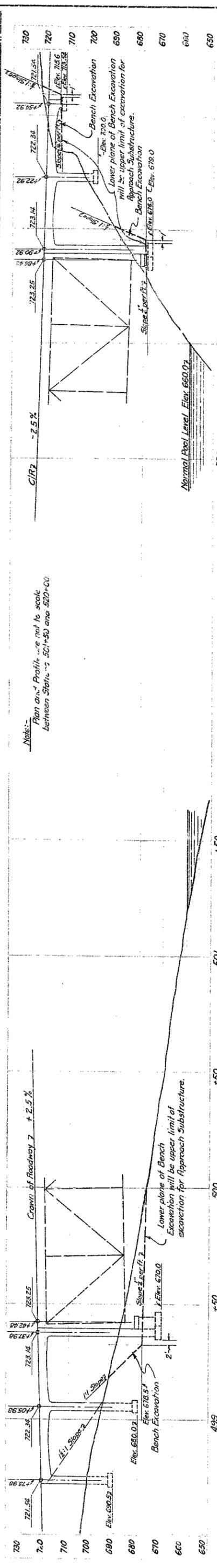
W. B. Burch
MISSOURI STATE HIGHWAY DEPT.
BRIDGE ENGINEER

W. B. Burch
FEDERAL EMERGENCY ADMINISTRATION
OF PUBLIC WORKS.
STATE ENGINEER FOR MISSOURI

602



PLAN
SCALE - 1"=20'



PROFILE

Notes:
Elevations given at tops of Holes No. 5 to No. 13, inclusive, are elevations of base level of hole soundings were made. For all other holes, the elevations given represent the approximate elevation of the natural ground surface. The log of borings shows indicates materials encountered in making soundings and represents materials which may be encountered. No additional compensation will be allowed because of variations in materials from those indicated.

Notes:
Plan and Profile are not to scale between Station 501+50 and 520+00.

Hole No.	Water	Soil	Notes
Hole 1	Water	El. 694.5 Dirt & Loose Rock El. 693.6 Iron Blossom Ledges El. 691.4 Flint El. 694.5	
Hole 2	Water	El. 692.9 Dirt & Loose Rock El. 691.4 Flint El. 692.9	
Hole 3	Water	El. 690.0 Dirt & Loose Rock El. 688.6 Red Clay & Loose Rock El. 687.3 Limestone & Flint El. 687.2	
Hole 4	Water	El. 686.3 Hardpan Clay El. 682.9 Limestone El. 680.2	
Hole 5	Water	El. 604.5 Brown loam with some sand El. 599.7 Limestone El. 592.8	
Hole 6	Water	El. 606.1 Brown loam with some sand El. 599.7 Limestone El. 590.6	
Hole 7	Water	El. 576.9 Course Gravel El. 571.9 Sand & Gravel El. 565.9 Gravel El. 562.8 Porous Limestone El. 558.3 Brown Limestone El. 558.3	
Hole 8	Water	El. 576.1 Course Gravel El. 571.9 Sand & Gravel El. 565.9 Gravel El. 562.8 Porous Limestone El. 558.3 Brown Limestone El. 558.3	
Hole 9	Water	El. 614.5 Clay Loam El. 610.2 Stiff Grayish Red Clay	
Hole 10	Water	El. 614.2 Sandy Clay Loam El. 610.2 Stiff Red Clay	
Hole 11	Water	El. 614.2 Sandy Clay Loam El. 610.2 Stiff Red Clay	
Hole 12	Water	El. 614.2 Sandy Clay Loam El. 610.2 Stiff Red Clay	
Hole 13	Water	El. 614.2 Sandy Clay Loam El. 610.2 Stiff Red Clay	
Hole 14	Water	El. 614.2 Sandy Clay Loam El. 610.2 Stiff Red Clay	
Hole 15	Water	El. 614.2 Sandy Clay Loam El. 610.2 Stiff Red Clay	

LOG OF BORINGS

HIGHWAY BRIDGE OVER LAKE OF THE OZARKS OSAGE ARN
ROUTE 5 - CAMDEN COUNTY, MISSOURI FOR CAMDEN COUNTY, MISSOURI

APPROACH PROFILE & LOG OF SOUNDINGS
SVERDRUP AND PARCEL CONSULTING ENGINEERS
ST. LOUIS, MO.
K. 961
SHEET NO. 2 OF 18

251

254

PIERS 4, 5, 6, 7

All concrete in working chambers of caisson and above top of base to be Class B. Concrete in base to be Class C.

ELEVATION SECTION A-A

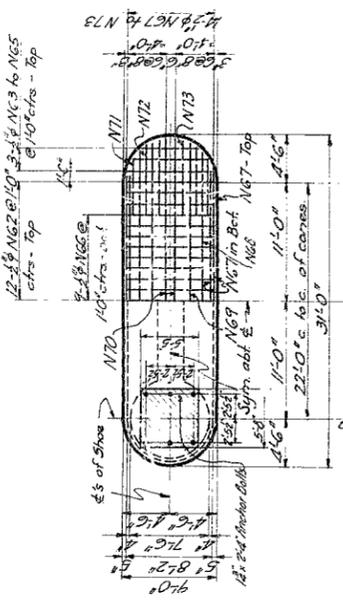
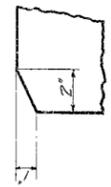
HALF SECTION D-D

ELEVATION SECTION E-E

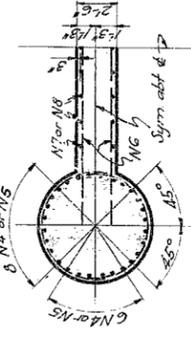
HALF SECTION G-G

HALF SECTION F-F

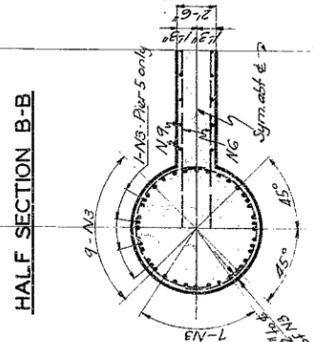
TYPICAL BEVEL ON COPINGS



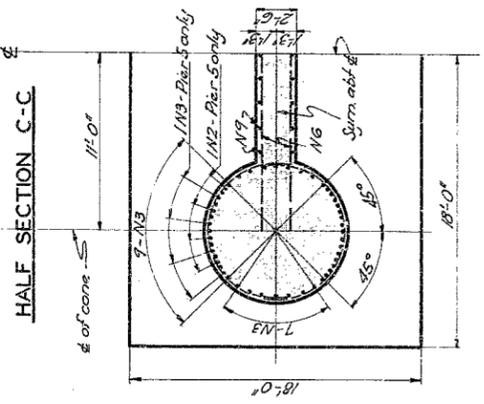
TOP VIEW



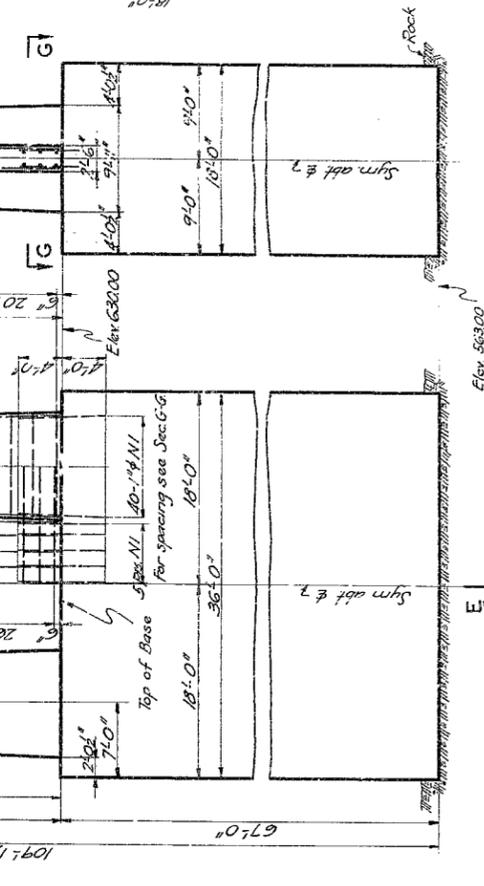
HALF SECTION C-C



HALF SECTION E-E



ELEVATION



TOP VIEW



TOP VIEW



TOP VIEW



TOP VIEW



TOP VIEW



TOP VIEW



TOP VIEW



TOP VIEW



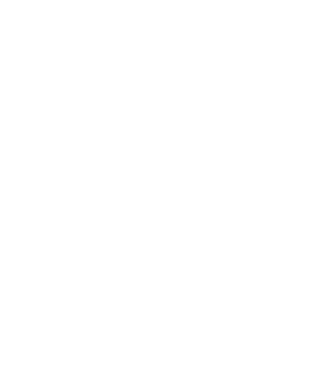
TOP VIEW



TOP VIEW



TOP VIEW



TOP VIEW



TOP VIEW



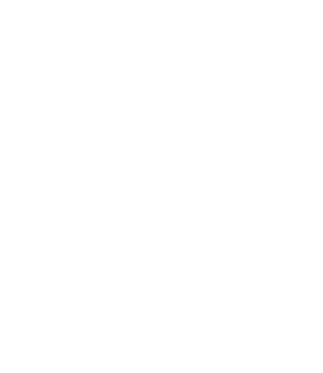
TOP VIEW



TOP VIEW



TOP VIEW



TOP VIEW



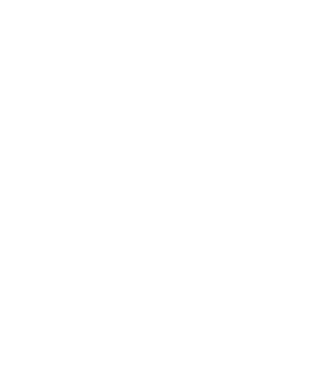
TOP VIEW



TOP VIEW



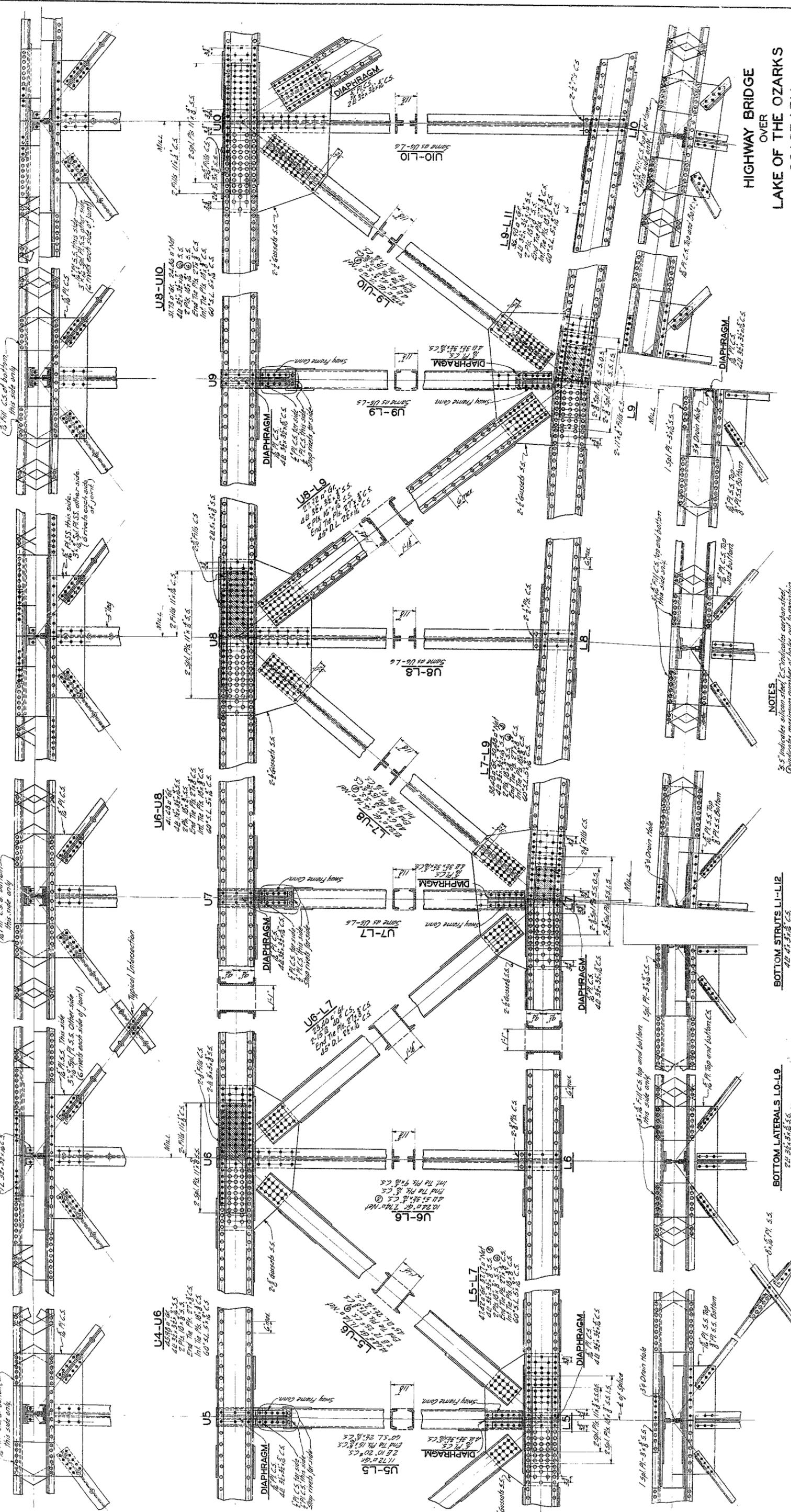
TOP VIEW



TOP STRUTS UJ-UII
 2 1/2" x 3 1/2" x 5/8" S.S.
 1/8" Fill C.S. at bottom
 this side only

TOP LATERALS UO-U12
 2 1/2" x 3 1/2" x 5/8" S.S.
 1/8" Fill C.S. at bottom
 this side only

TOP LATERALS UO-U12
 2 1/2" x 3 1/2" x 5/8" S.S.
 1/8" Fill C.S. at bottom
 this side only



NOTES
 S.S. indicates structural steel, C.S. indicates carbon steel.
 1. All members shall be mill finished.
 2. All members shall be painted with a minimum of two coats of maintenance paint.
 3. All members shall be galvanized.
 4. Clearances between plates on tension members shall not exceed 3/16".
 5. All gusset plates and diaphragms which support floor beams to extend at least 3' above top chord angles and the top ends of these members are to be mill finished and connection angles are riveted on (see sheet 10).
 6. See sheet 15 for typical cross section.
 7. 3/4" x 3/4" x 1/4" gusset to be ground to fit fillet of chord angles.
 8. Diaphragms of web members to be riveted in place for shipment.

BOTTOM STRUTS LI-L12
 2 1/2" x 3 1/2" x 5/8" S.S.
 1/8" Fill C.S. at bottom
 this side only

BOTTOM LATERALS L0-L9
 2 1/2" x 3 1/2" x 5/8" S.S.
 1/8" Fill C.S. at bottom
 this side only

BOTTOM LATERALS L9-L18
 2 1/2" x 3 1/2" x 5/8" S.S.
 1/8" Fill C.S. at bottom
 this side only

**HIGHWAY BRIDGE
 OVER
 LAKE OF THE OZARKS
 OSAGE ARM**
 ROUTE 5 - CAMDEN COUNTY, MISSOURI
 FOR CAMDEN COUNTY, MISSOURI

MAIN TRUSS DETAILS L5-L10

SVERDRUP AND PARCEL
 CONSULTING ENGINEERS
 ST. LOUIS, MO.

K-961
 SHEET NO. 9 OF 18

258

**HIGHWAY BRIDGE
OVER
LAKE OF THE OZARKS
OSAGE ARM**

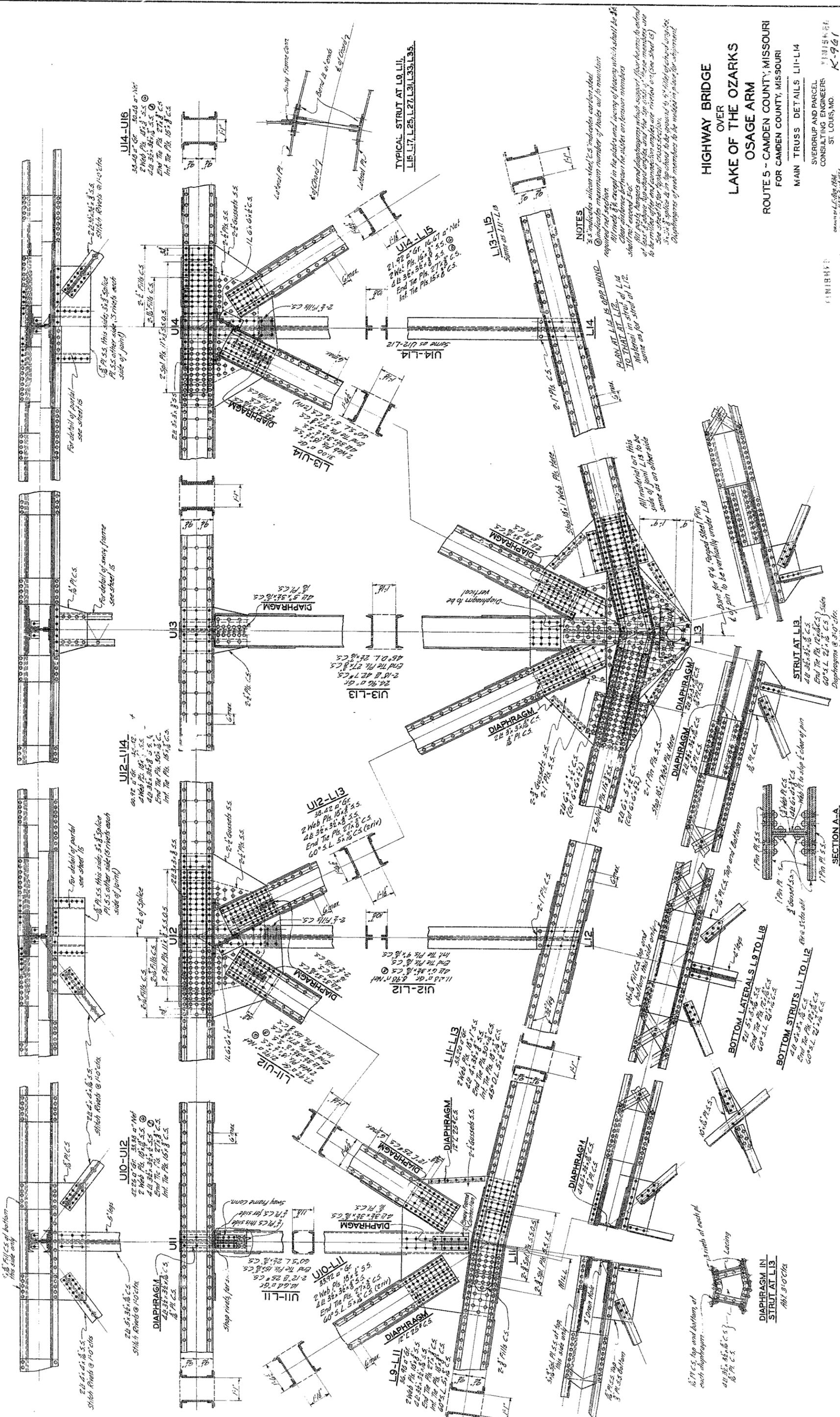
ROUTE 5 - CAMDEN COUNTY, MISSOURI
FOR CAMDEN COUNTY, MISSOURI

MAIN TRUSS DETAILS L1-L14

SVENDRUP AND PARCEL
CONSULTING ENGINEERS
ST. LOUIS, MO.

DESIGNED BY: SVP, 1934
CHECKED BY: SVP, 1934
CREATED BY: SVP, 1934

SHEET NO. 10 OF 15



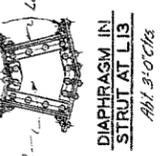
**TYPICAL STRUT AT L9, L11,
L13, L15, L17, L19, L21, L23, L25, L27, L29, L31, L33, L35.**

NOTES

- 3/8" indicates silicon steel, 1/2" indicates carbon steel
- ⊙ indicates maximum number of holes cut to maintain required net section
- All girths to be engaged in the girths and, except where noted, shall be 1/2" thick
- Clearance between the plates on tension members shall not exceed 1/8"
- All girths, hangers and diaphragms which support floor beams to be cut off at least 1/2" above top chord unless the 1/2" girths of these members are to be riveted after and connection angles are riveted on (see sheet 15)
- See sheet 15 for typical cross-sections
- 3/8" girths to be spaced 4" on center
- Diaphragms of web members to be welded in place for shipment

PLAN AT L13 IS OPPOSITE TO THAT AT L12

DIAPHRAGM TO BE VERTICALLY UNDER L13



DIAPHRAGM IN STRUT AT L13
1/2" x 3/8" x 1/2"

SECTION A-A

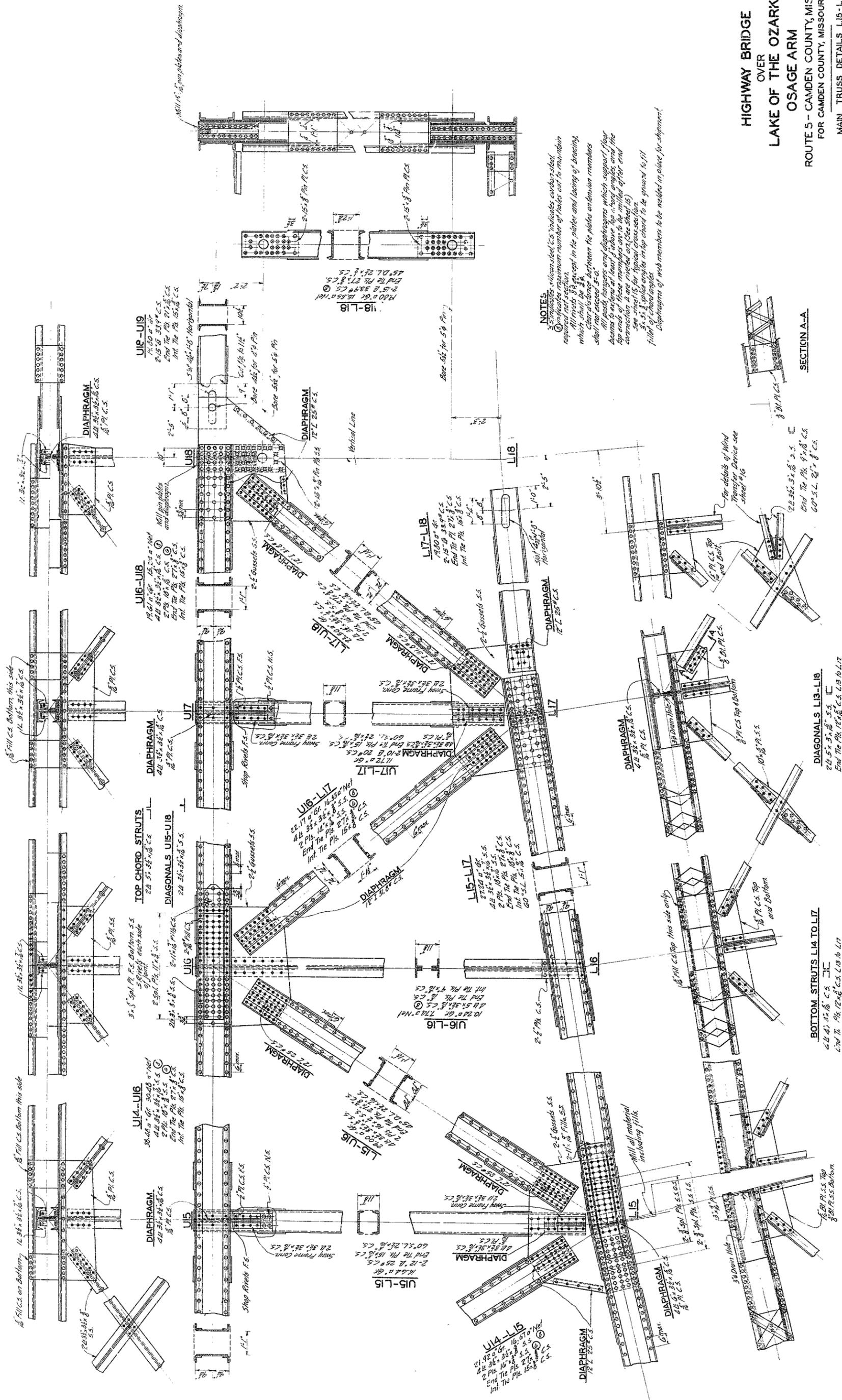
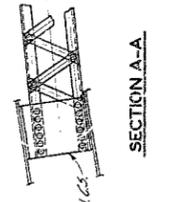
**HIGHWAY BRIDGE
OVER
LAKE OF THE OZARKS
OSAGE ARM**
ROUTE 5 - CAMDEN COUNTY, MISSOURI
FOR CAMDEN COUNTY, MISSOURI

MAIN TRUSS DETAILS L15-L18
SVECDRUP AND PARCEL
CONSULTING ENGINEERS
ST. LOUIS, MO

11115181
K-981
SHEET NO. 11 OF 18

NOTES:
 1. Mill all steel, unless noted, to 1/16" thickness carbon steel.
 2. Diaphragms minimum number of holes cut to maintain required net section.
 3. All rivets 5/8" except in the plates and lacing of bracing which shall be 3/4".
 4. Clear distance between fire plates extension members shall not exceed 5'-0".
 5. All posts, bracing and diaphragms which support floor beams to extend at least 1' above top chord angles and the top ends of these members are to be milled after end connection is riveted on. (See Sheet 15).
 6. See sheet 15 for typical cross section.
 7. 3/4" x 5/8" splice angles on top chord to be ground to fill fillet of chord angles.
 8. Diaphragms of web members to be welded in place for shipment.

SECTION A-A



BOTTOM STRUTS L14 TO L17
 2 L4 3 1/2 x 3 1/2 C.S.
 End Tr. Pls. 12 x 12 C.S. L14 to L17
 End Tr. Pls. 9 1/2 x 9 1/2 C.S. L17 to L18
 60° S.L. 2 1/2 x 1/2 C.S. L14 to L17
 60° S.L. 2 1/2 x 1/2 C.S. L17 to L18

DIAGONALS L13-L18
 2 L4 3 1/2 x 3 1/2 C.S.
 End Tr. Pls. 12 x 12 C.S. L13 to L17
 End Tr. Pls. 9 1/2 x 9 1/2 C.S. L17 to L18
 60° S.L. 2 1/2 x 1/2 C.S. L13 to L17
 60° S.L. 2 1/2 x 1/2 C.S. L17 to L18

DIAGONALS L13-L18
 2 L4 3 1/2 x 3 1/2 C.S.
 End Tr. Pls. 9 1/2 x 9 1/2 C.S.
 60° S.L. 2 1/2 x 1/2 C.S.

SECTION A-A

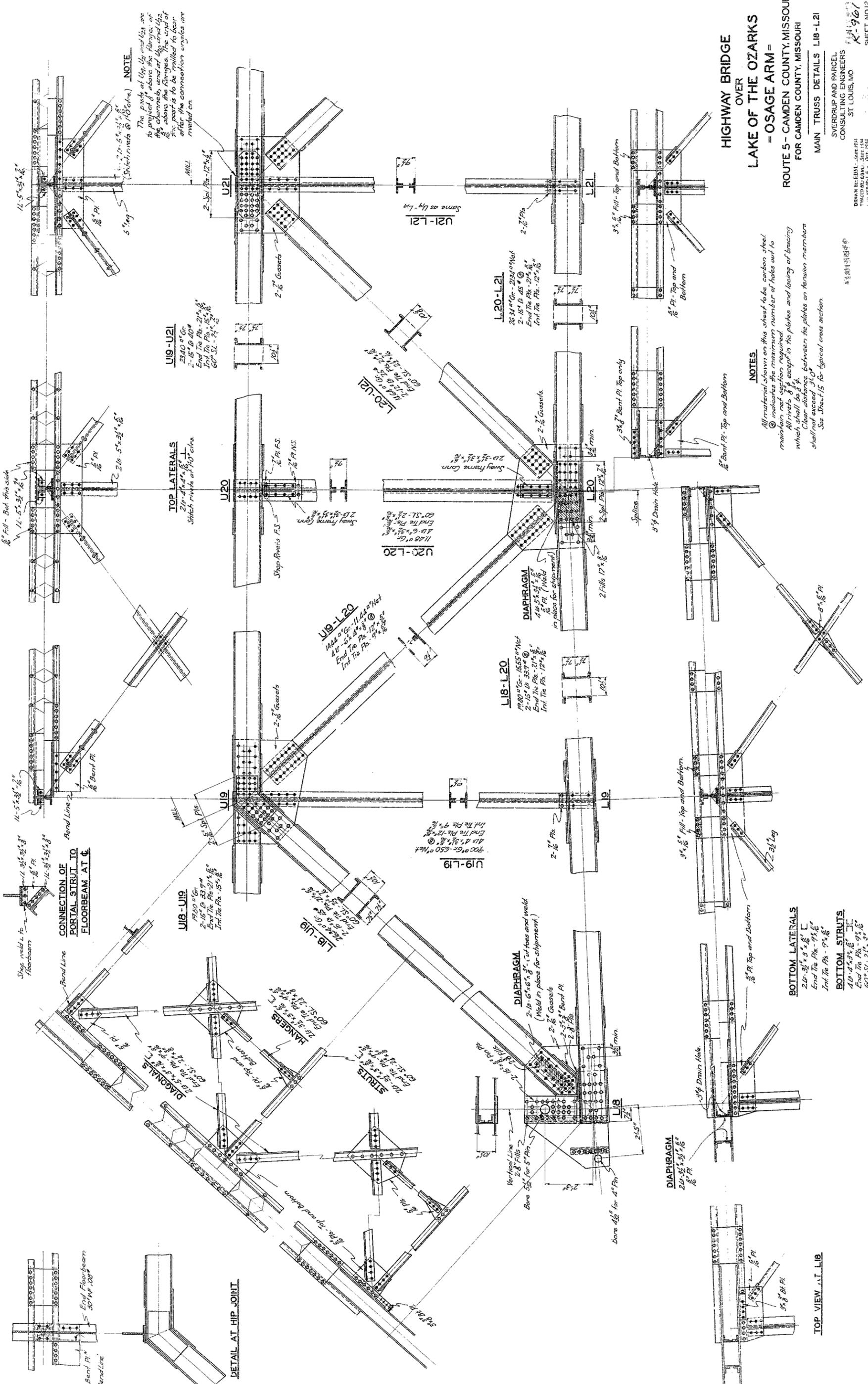
260

HIGHWAY BRIDGE OVER LAKE OF THE OZARKS = OSAGE ARM = ROUTE 5 - CAMDEN COUNTY, MISSOURI FOR CAMDEN COUNTY, MISSOURI

MAIN TRUSS DETAILS L18-L21

SYVERUP AND PARCEL
CONSULTING ENGINEERS
ST. LOUIS, MO.

Drawn by: J. M. ...
Checked by: ...
Date: 12-9-61
SHEET NO. 12 OF 12



NOTES

All material shown on this sheet to be carbon steel.
 (2) indicates the maximum number of holes cut to maintain net section required.
 All rivets 3/4" except in the plates and lacing of bracing which shall be 5/8".
 Clear distance between the plates on tension members shall not exceed 31/2".
 See Sheet 15 for typical cross section.

BOTTOM LATERALS

2L-3 1/2" x 3/8"
 End Tie Pls. - 9' x 1/2"
 Int. Tie Pls. - 5' x 1/2"

BOTTOM STRUTS

4L-4 1/2" x 3/8"
 End Tie Pls. - 9' x 1/2"
 Int. Tie Pls. - 5' x 1/2"

NOTE

The ends of top-chord members are to project 6" above the floorbeam or 6" above the main deck and 1/2" above the floorbeam and 1/2" above the main deck. The ends of bottom-chord members are to be drilled to clear the connection angles after member cut.

DETAIL AT HIP JOINT

CONNECTION OF PORTAL STRUT TO FLOORBEAM AT C

Step weld to floorbeam
 Bend Line
 1/2" Bent Pl.
 11-5 1/2" x 3/8"

LANGERS

2L-3 1/2" x 3/8"
 End Tie Pls. - 9' x 1/2"
 Int. Tie Pls. - 5' x 1/2"

STRUTS

2L-3 1/2" x 3/8"
 End Tie Pls. - 9' x 1/2"
 Int. Tie Pls. - 5' x 1/2"

DIAGONALS

2L-3 1/2" x 3/8"
 End Tie Pls. - 9' x 1/2"
 Int. Tie Pls. - 5' x 1/2"

DIAPHRAGM

2L-3 1/2" x 3/8"
 End Tie Pls. - 9' x 1/2"
 Int. Tie Pls. - 5' x 1/2"

DIAPHRAGM

2L-3 1/2" x 3/8"
 End Tie Pls. - 9' x 1/2"
 Int. Tie Pls. - 5' x 1/2"

TOP VIEW AT L18

5/8" Bent Pl.
 Bend Line
 30" x 1" Floorbeam

263

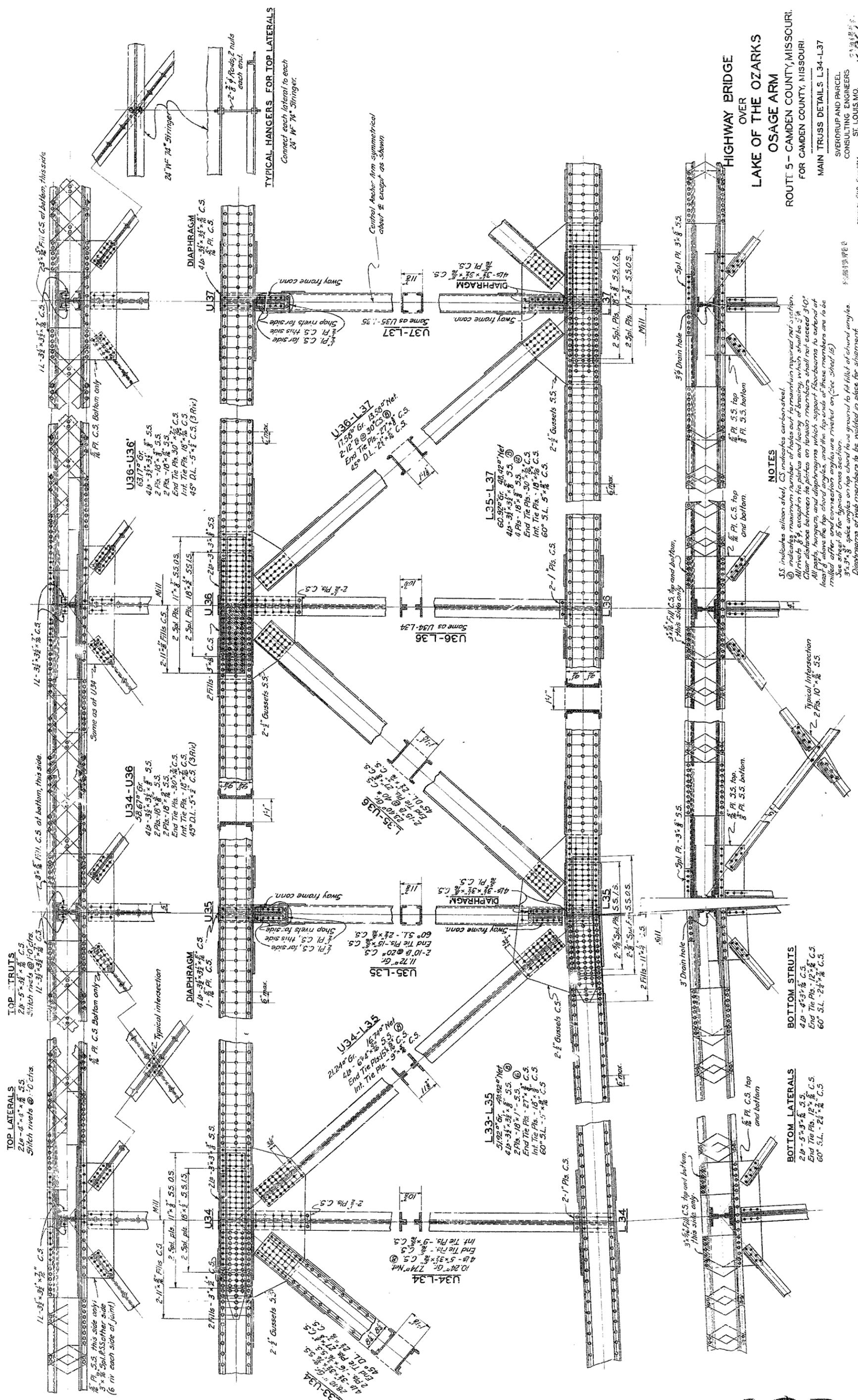
HIGHWAY BRIDGE OVER LAKE OF THE OZARKS OSAGE ARM

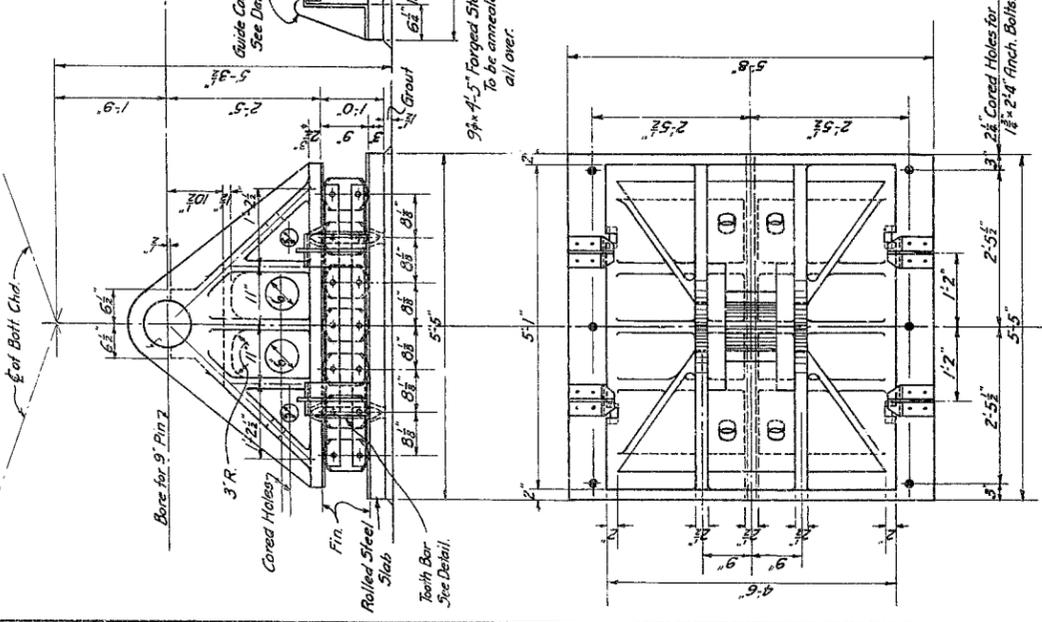
ROUTE 5 - CAMDEN COUNTY, MISSOURI
FOR CAMDEN COUNTY, MISSOURI

MAIN TRUSS DETAILS L34-L37

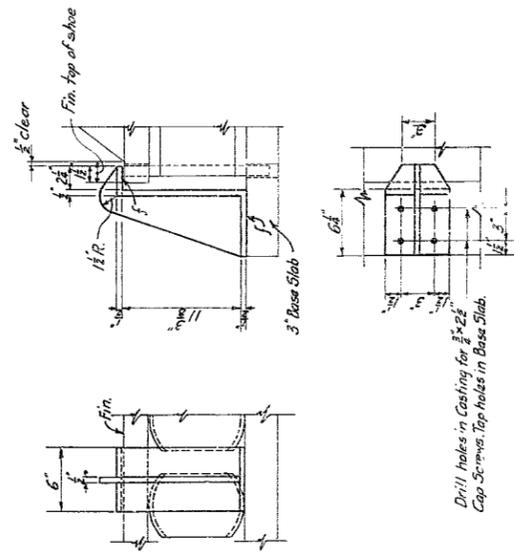
SVERDRUP AND PARCEL
CONSULTING ENGINEERS
ST. LOUIS, MO.

Drawn by: C. H. S. 1/24/34
Checked by: J. H. S. 1/24/34
SHEET NO. 14 OF 18

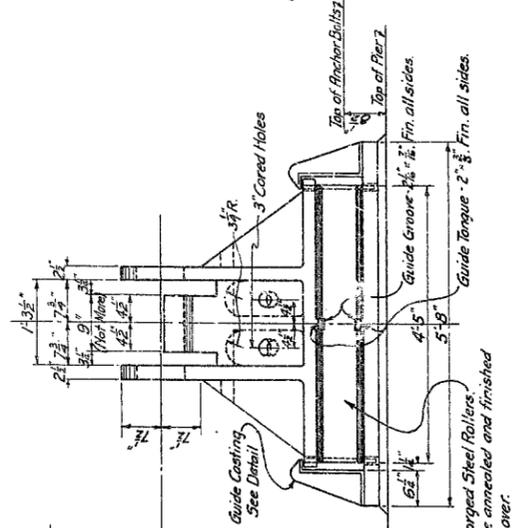




ROLLER SHOE AT L29

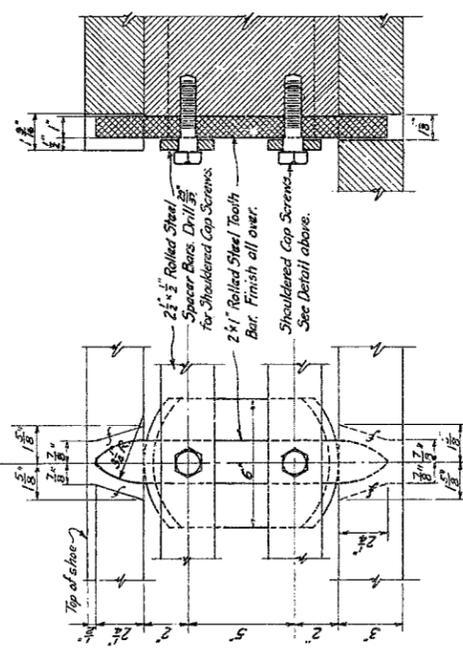
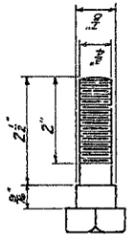


DETAIL OF GUIDE CASTING

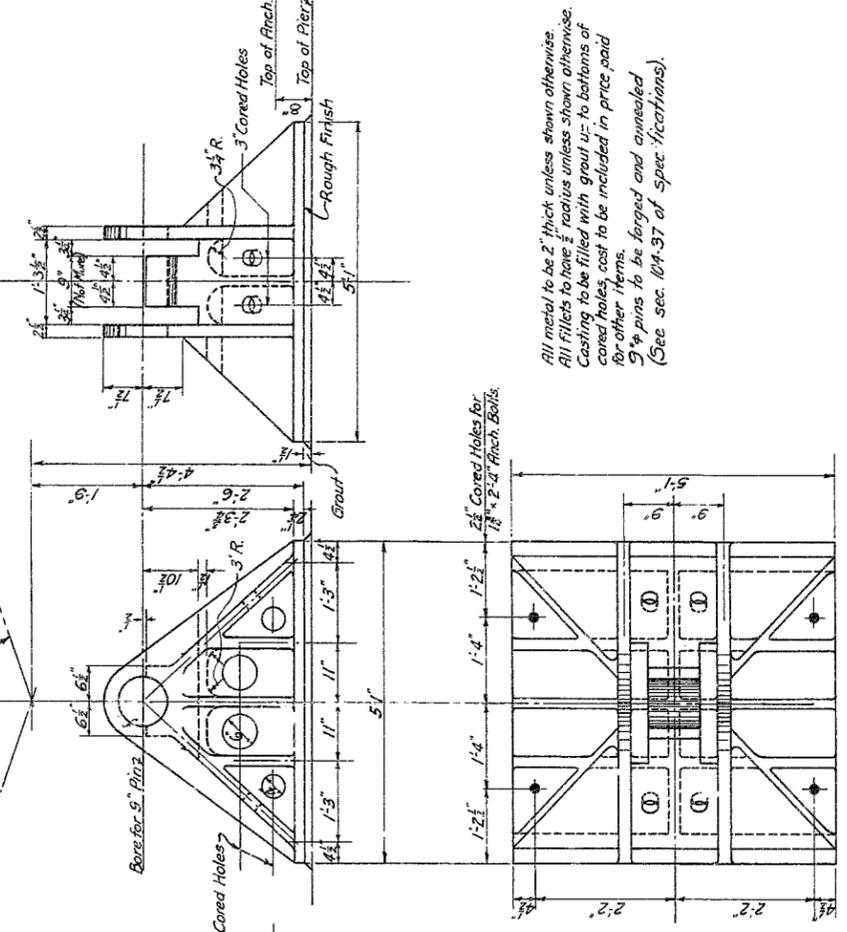


FIXED SHOES AT L29, L28, & L13

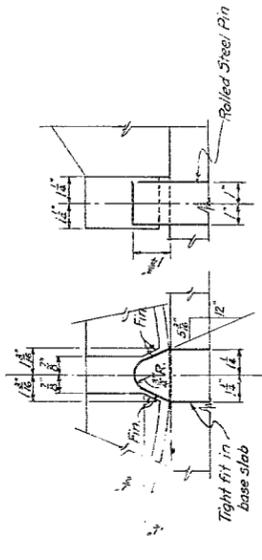
SHOULDERED CAP SCREWS



DETAILS OF TOOTH & SPACER BARS



ROCKER SHOES AT L0 & L0'



DETAIL OF CENTERING PIN

NOTES

Unless noted otherwise, all material is to be cast steel, annealed.
 All pins, nuts, rollers, anchor bolts, and rolled steel parts are to be paid for at the unit contract price for fabricated structural steel.
 All finished surfaces are to be coated with white lead and tallow before leaving shop.
 All anchor bolts are to be furnished with square heads, two square nuts, and 1/2 plate washers.
 All pilot and driving nuts required are to be furnished by the fabricator without extra compensation.

All metal to be 2" thick unless shown otherwise.
 All fillets to have 1/2" radius unless shown otherwise.
 Castings to be filled with grout up to bottoms of cored holes, cost to be included in price paid for other items.
 5/8" pins to be forged and annealed (See sec. 107-37 of specifications).

All fillets to have 1/2" radius unless shown otherwise.
 Pockets in rocker casting to be filled with grout.

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HIGHWAY BRIDGE
 LAKE OF THE OZARKS
 OSAGE ARM
 ROUTE 5 - CAMDEN COUNTY, MISSOURI
 FOR CAMDEN COUNTY, MISSOURI

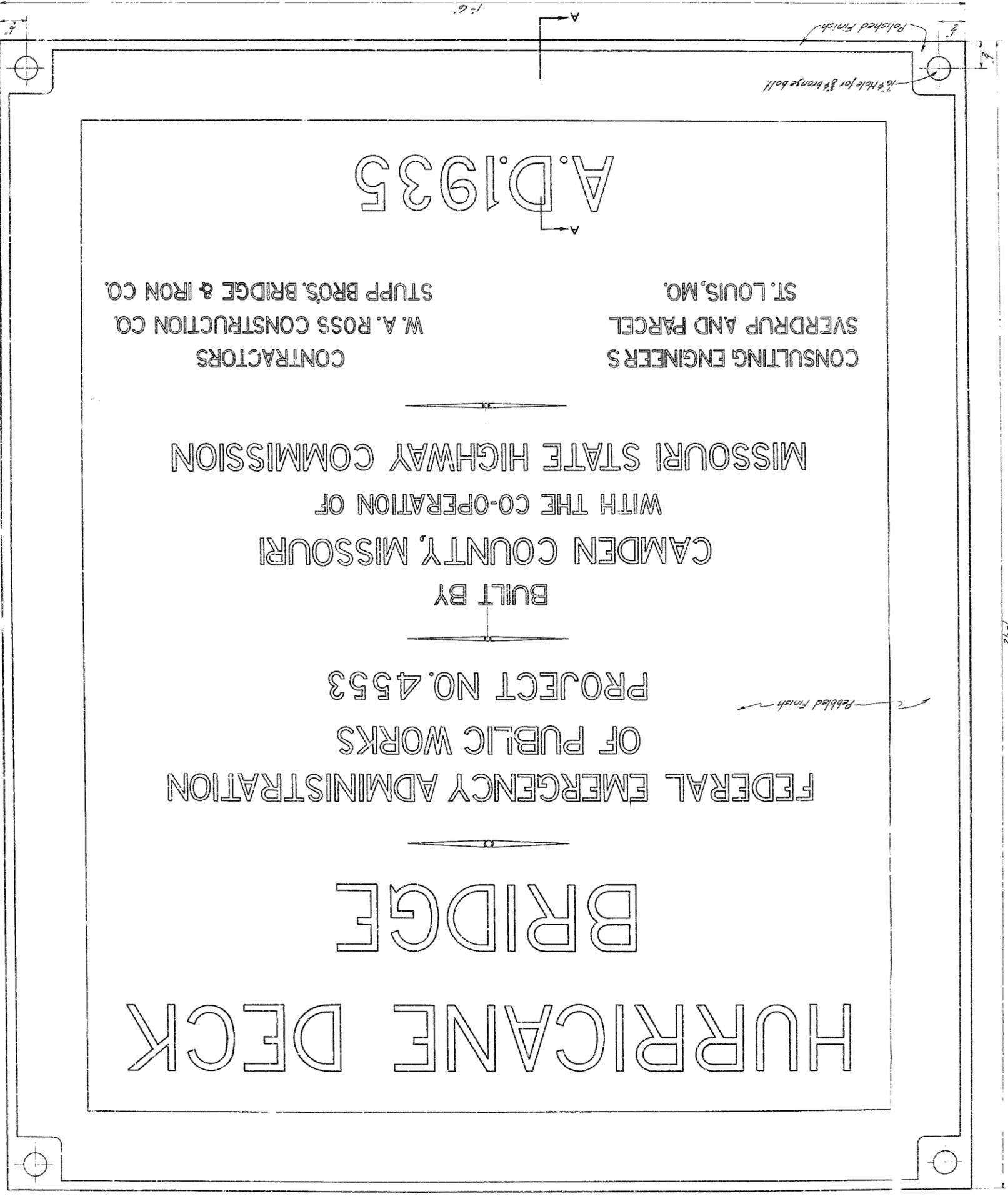
DETAIL OF NAMEPLATES
 SVERDRUP AND PARCEL
 CONSULTING ENGINEERS
 ST. LOUIS, MO. K-961
 SHEET NO. 1 OF 1

SECTION A-A



NOTES:
 Nameplates to be made of cast bronze.
 Face of letters and border of plate to have polished surface.
 Background to have a pebbled finish.
 Holes in nameplates by means of 3/8 bronze bolts.
 Holes in expansion sleeves of a type approved by the Engineers.
 Letters to be 8 high and border 1/2 high.

FULL SIZE ELEVATION
 2 Required



Work by this office
 prepared by the
 Sverdrup and Parcel
 Consulting Engineers
 St. Louis, Mo.

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