Documentation of the Historic Osage River Bridge at Tuscumbia

Bridge No. J-719
Miller County, Route 17

MoDOT

U.S. Department of Transportation
Federal Highway Administration

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HISTORIC DOCUMENTATION
BRIDGE J-719

I. Introduction

Location: Highway Bridge carrying Missouri Route 17 over the Osage River at Tuscumbia, Miller County, Missouri

Construction Dates: 1932-1933

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

Present Use: Highway bridge to be removed and replaced by a new structure; Projected date of removal in 2010

Significance: Bridge J-719 is an excellent example of a small-scale, multi-span truss bridge that has remained unchanged since it opened to traffic in 1933. This structure replaced a privately owned suspension bridge built in 1905 by Joe Dice, a legendary Missouri artisan. Bridge J-719 was a free bridge that carried Missouri State Highway 17 across the Osage River, and it represents a rare Missouri example where a multi-span truss bridge was constructed at a site other than the Missouri or Mississippi Rivers.

Historian: Thomas Gubbels, Historic Preservation Section, Design Division, Missouri Department of Transportation, December 2006.

II. History of Bridge J-719

A. Historic background

The origins of Bridge J-719 lie in the changing nature of transportation in Miller County at the beginning of the twentieth century. Throughout the nineteenth century, the Osage River served as a critical transportation resource for Miller County residents. The Missouri General Assembly organized Miller County in 1837, and the county seat was established at Tuscumbia, a small community located along the north bank of the Osage River in the center of the county. Several steamboats began to use the Osage River as a transportation corridor in the years following the creation of the Miller County, and Tuscumbia became a minor shipping point along the river. Since the Osage River was a wide, shallow waterway, shipping along the river was usually suspended in the winter and summer months, but during the spring and fall, shipments from St. Louis and Southwest Missouri regularly arrived in Tuscumbia and other river communities:

> Tuscumbia soon became a great trading point, people coming here from all sections of this and adjoining counties to the west and southwest. Warehouses sprung up on the north and south banks of the Osage, and flatboats, loaded with merchandise were poled up the river laboriously by white men. Caravans cane here from southwest Missouri and merchandise was shipped by ox team and wagon to Springfield and other southwest points, this being a terminus for water transportation much of the time. This was before the advent of the railroad.[1]

Supplies imported from St. Louis via the Osage River included salt, groceries, and iron, while local commodities such as grain, pork, and timber were sent downstream. The Osage River proved to be the lifeline that allowed Tuscumbia to evolve into a thriving commercial center, but the river soon became an obstacle to transportation and a potential threat to Tuscumbia's economic survival.[2]

Towards the end of the nineteenth century and the beginning of the twentieth century, steamboat usage on the Osage River slowly declined, as railroads became the primary means for Miller County residents to ship their goods to outside markets. Tuscumbia remained an active shipping point, supporting several steamboats and an active wharf well into the twentieth century. However, Miller County farmers began to ship their crops on two railroad lines built into the region. In 1882 a Union Pacific line was constructed to Bagnell, a community in northern Miller County that soon became a

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[1]"Two-Day Celebration Marked Opening of Suspension Bridge in '05." *Miller County Autogram*, 2 November 1933, 2.

[2]Pat Pollock, "Navigating the Osage River in Missouri: 1839-1926," December 1999, downloaded 16 October 2006 from http://write4801.tripod.com/areas/osage_r.html; Gerard Schultz, "Steamboat Navigation on the Osage River Before the Civil War," *Missouri Historical Review* 29 (April 1935), *passim*; William Heckman, *Steamboating: Sixty-Five Years on Missouri Rivers* (Kansas City, Missouri: Burton Publishing Company, 1950), 216-217; and James Goodrich and Lynn Wolf Gentzler, eds., *Marking Missouri History* (Columbia, Missouri: State Historical Society of Missouri, 1998), 162.

major shipping point for wooden railroad ties. In addition, a line operated by the St. Louis, Kansas City, and Colorado Railroad opened to traffic in Miller County in 1903, providing local farmers and merchants an additional transportation option.[3]

Efforts to improve overland roads in Miller County also increased during the late nineteenth and early twentieth century. Several rough roads had been laid out through Miller County in the antebellum era, and the county was crossed by a number of old Indian trails. However, little had been done to improve these roads, and a petition requesting aid for road construction vividly describes the condition of local roadways:

> The roads established by the State, and the County Court, are merely trails, often impassable in the winter and spring thaws, or, during rainy seasons, little improved from the pack roads along the buffalo paths and Indian trails followed by our fathers. We labor under great disadvantages owing to the condition of the roads, being almost useless, going over steep hills, unable to haul heavy loads, for the lack of expenditures on them for over twenty years.[4]

In response to local demands, the county court appointed a full-time road commissioner in 1865 to examine and maintain public roads. Local road commissioners were also appointed in each school district to oversee local work crews. Despite the county's efforts, overland travel remained a rough affair in Miller County. Most roads were little more than dirt or gravel trails that became impassable in bad weather, and good roads linking Miller County to the rest of Missouri would not be built until the 1920s and 1930s.[5]

B. Building a suspension bridge across the Osage River

As Miller County entered the twentieth century, its road system remained underdeveloped. In addition, Miller County residents who lived on the south side of the Osage River lacked access to their county seat. Tuscumbia was served by a number of ferries that worked during good weather, but there was no reliable way for residents of southern Miller County to travel to Tuscumbia.[6] This situation did not sit well with many of Tuscumbia's civic leaders who believed that the community needed a bridge

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[3]Goodrich and Gentzler, *Marking Missouri History*, 162; and Gerard Schulz, *A History of Miller County, Missouri* (Jefferson City, Missouri: Midland Printing Company, 1933), 105-106. For a vivid account of the dangers involved in steamboat travel along the Osage River, see "The Old Ferry Landing Was the Scene of Several Tragedies," *Miller County Autogram*, 2 November 1933, 6.

[4]Clyde Lee Jenkins, *Judge Jenkins' History of Miller County, Missouri Volume II: End of Civil War Through 1900* (Tuscumbia, Missouri: by the author, 1997), 50.

[5]*Ibid*., 50-51; Schultz, *A History of Miller County*, 106-107; and Missouri State Highway Commission, *Roads and Their Builders* (Jefferson City, Missouri: Missouri State Highway Commission, [1970]), *passim*.

[6]For a listing of some of the ferries that served Tuscumbia prior to 1905, see "Two-Day Celebration Marked Opening of Suspension Bridge in '05," *Miller County Autogram*, 2 November 1933, 2.

across the Osage to ensure the town's economic survival. These businessmen gathered in the spring of 1904 to create a new corporation called the "Tuscumbia Bridge Company." The Tuscumbia Bridge Company initially owned $8,000 capital divided into 80 shares. The shares were held by a variety of local merchants, farmers, and investors, as well as by the publisher of the *Miller County Autogram*.[7] According to its corporate charter, the Tuscumbia Bridge Company was created for a very specific reason:

> This corporation is formed for the purpose of building, owning, operating, leasing, buying and selling wire suspension toll bridges, and particularly for the purpose of building and operating a certain toll bridge, the same to be a wire suspension wagon bridge to be built across the Osage River about one-fourth of a mile below the present ferry landing, at the Village of Tuscumbia, Miller County, Missouri.[8]

The Tuscumbia Bridge Company was chartered for a period of fifty years, and following its creation, the company set out to find a contractor who could build a suspension bridge across the Osage River for a reasonable fee.

When the Tuscumbia Bridge Company decided to build a structure across the Osage River, it turned to a well-known local bridge contractor, Joe Dice. Dice was a resident of Warsaw in nearby Benton County, and he had built numerous suspension bridges for local governments and private individuals. Although Dice never received any formal training in engineering or bridge construction, he had a reputation as an efficient bridge builder who could construct a sturdy structure for a low price. Dice had constructed a wire suspension bridge across the Osage River at Warsaw, and after several stockholders visited this bridge, the Tuscumbia Bridge Company voted to hire Dice to build a similar structure in Tuscumbia.[9] On April 5, 1905, a load of wire weighing over 50 tons arrived in Tuscumbia via steamboat, and one week later, Joe Dice and his crew began to build a new suspension bridge. Construction crews began by building two large towers to support the spun cables. The cables for the bridge consisted of 720 wrapped steel wires with each wire having a tensile strength of approximately 1,500 pounds. The

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[7]Tuscumbia Bridge Company, "Articles of Incorporation of the Tuscumbia Bridge Company," 1904, copy on file at Missouri Corporations Office, Missouri Secretary of State, Jefferson City, Missouri; and United States Bureau of the Census, "1900 Population Census: Miller County, Missouri," microfiche copy available from Missouri State Archives, Jefferson City, Missouri. Nine of the investors who formed the Tuscumbia Bridge Company were Miller County residents, while one investor, F.A. Goodrich, was a St. Louis resident.

[8]Tuscumbia Bridge Company, "Articles of Incorporation of the Tuscumbia Bridge Company."

[9]"Two-Day Celebration Marked Opening of Suspension Bridge in '05," *Miller County Autogram*, 2 November 1933, 2; and Robert Hayden, *Bridges over the Osage: An Historical Study of Suspension Bridges Built Over the Osage River and its Tributaries from 1895 through 1937, Harry S. Truman Dam and Reservoir Project, Missouri* (Garrison, North Dakota: Historical and Archeological Surveys, Inc., 1980), 22-23.

wire was strung across the Osage River by means of an improvised pulley system, and eventually a 618' structure emerged with a 12'-wide wood deck.[10]

The suspension bridge owned by the Tuscumbia Bridge Company officially opened to traffic in August 1905. Although the company would charge a toll for wagons, and later automobiles, to cross the bridge, all tolls for using the structure were waived during its first days of operation. A large celebration was held to dedicate the toll bridge on August 4 and 5, 1905. Approximately 1,500 people attended the festivities on the first day with twice as many in attendance the following day. Both local residents and visitors enjoyed a picnic, speeches, baseball games, fireworks, and a performance by a daredevil who dove off the suspension bridge into the Osage River. Dozens of motor-powered vehicles and animal-drawn wagons crossed the bridge during its first days of operation, and officials praised the structure, saying that it would unite Miller County and draw new business to Tuscumbia.[11] The local newspaper also praised Joe Dice effusively, proclaiming:

> Contractor Joseph A. Dice, who built our splendid bridge, left for his home in Warsaw last Friday morning. The best of material that could be procured has been put into the bridge, and Mr. Dice has used his best skill in its construction and can get all the recommendations here that he may ask for as to his ability as a bridge engineer and a gentleman who can be depended upon at all times.[12]

In toto, the Tuscumbia Bridge Company spent just over $10,000 to build a suspension bridge across the Osage River, and in 1905, the structure seemed destined to fulfill the transportation needs of Miller County residents for years to come.[13]

The suspension bridge owned and operated by the Tuscumbia Bridge Company served Tuscumbia well, but as the twentieth century progressed, the need for a newer, larger structure rapidly became apparent. The suspension bridge was designed to accommodate pedestrians, horses, and animal-powered vehicles, but in the early 1900s, automobile ownership in Missouri expanded rapidly. At the beginning of the century practically all of Missouri's roads were dirt paths haphazardly maintained by local and county governments, and local leaders were soon clamoring for a statewide program to lift Missouri out of the mud. The campaign for an organized state road system reached a

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[10]"Local Happenings," *Miller County Autogram*, 6 April 1905, 1; "Local Happenings," *Miller County Autogram*, 13 April 1905, 1; and "Two-Day Celebration Marked Opening of Suspension Bridge in '05," *Miller County Autogram*, 2 November 1933, 2.

[11]"Not True," *Miller County Autogram*, 3 August 1905, 1; and "The Bridge Dedication and Picnic," *Miller County Autogram*, 10 August 1905, 1.

[12]"Local Happenings," *Miller County Autogram*, 22 June 1905, 1. For additional biographical information about Joe Dice and his bridge building career, see Hayden, *Bridges over the Osage*, *passim*.

[13]"Two-Day Celebration Marked Opening of Suspension Bridge in '05," *Miller County Autogram*, 2 November 1933, 2.

climax in 1921 with the passage of Missouri's Centennial Road Law. The new law created a four-member highway commission to oversee road construction and use state funds to build highways throughout Missouri. These new roads included a 1,500-mile system of "primary highways" to link Missouri's major metropolitan areas as well as a 6,000-mile system of "secondary highways" that would link Missouri's county seats. The Centennial Road Law specifically listed several secondary highways that would be built by the state, including a road through Miller County connecting Tuscumbia to the rest of Missouri. This secondary highway was designated "Route 17" by the Missouri State Highway Commission, and state-sponsored projects to grade and gravel this new road through Miller County began in the late 1920s.[14]

C. Advocating for a toll-free bridge across the Osage River

Beginning in the late 1920s, local businessmen and political leaders began to lobby the Missouri State Highway Commission for a new, toll-free bridge across the Osage River at Tuscumbia. Although the toll bridge offered a means for travelers to cross the river, it represented a break in the path of Route 17 across Miller County. The Centennial Road Law specifically named Route 17 as a secondary highway that would be built across Miller County and through Tuscumbia, and thus local leaders believed that the Missouri State Highway Commission had both a legal and moral obligation to construct a toll-free bridge to complete the promised state highway.[15]

In response to local pressure, the Missouri State Highway Department sent a team of engineers led by Assistant State Bridge Engineer N.R. Sack to Tuscumbia in January 1931 to see if the construction of a toll-free bridge to complete Route 17 across Miller County was a feasible option. Sack reported that the site of the toll bridge across the Osage River would be an ideal spot for a state-built structure. The toll bridge was located a narrow point in the Osage River Valley, and although the local topography presented a challenge, the construction of a new bridge was possible. Sack warned that steps would need to be taken to keep the suspension bridge open during any new construction so local traffic could continue into and away from Tuscumbia.[16] Following Sack's preliminary survey, a group of representatives from Miller County visited T.H. Cutler, the Chief Engineer of the Missouri State Highway Department, and demanded to know when work

[14]Missouri State Highway Commission, *Roads and Their Builders*, 78; Richard Traylor, "Pulling Missouri Out of the Mud: Highway Politics, The Centennial Road Law, and the Problems of Progressive Identity," *Missouri Historical Review*, 98 (October 2003): *passim*; and Spearman v. Missouri State Highway Commission 53 SW(2d) 282 (1932), 1-2.

[15]"Contract for New Bridge Was Let Nov. 4, 1932," *Miller County Autogram*, 2 November 1933, 7; and "Realtor's Brief," Spearman v. Missouri State Highway Commission, Missouri Supreme Court Case Number 31753, as held by the Missouri State Archives, Jefferson City, Missouri, 3; and Spearman v. Missouri State Highway Commission 53 SW(2d) 282 (1932), 1-2.

[16]"Surveying for Bridge Approaches," *Miller County Autogram*, 29 January 1931, 1; and Missouri State Highway Department, "Preliminary Inspection Report: Bridge No. J-719," January 1931, microfiche copy in "General Correspondence File – Construction Project R17-55A," Collection 12-0246, Bridge Division, Missouri Department of Transportation General Headquarters, Jefferson City, Missouri. Materials in this collection henceforth cited as part of the "Bridge File."

on the new bridge would begin. Cutler assured them that plans for the new bridge, referred to as Bridge J-719, were being created by the department's bridge division. Cutler also noted that efforts to secure the right of way for a new bridge would likely begin around April 1, 1931, and that a contract to build the structure would be let soon afterwards.[17] The Miller County team left the meeting feeling ecstatic believing that their efforts to have the state construct a toll-free bridge across the Osage River would soon bear fruit.

In the early months of 1931, employees in the Missouri State Highway Department's Bridge Division began to work on a preliminary layout for the proposed bridge across the Osage River at Tuscumbia. Early plans called for the construction of a multi-span structure with an approximate total length of 1,084 feet. The central portion of the bridge would consist of a two-span through-truss approximately 400' long along with two deck trusses that would each be slightly more than 180' long. In addition, the bridge would feature numerous I-beam approach spans and a steep 5% grade due to local topography.[18]

While designing the new bridge across the Osage River officials with the Missouri State Highway Department approached the United States War Department's Corps of Engineers to seek permission to build the structure. Since the Tuscumbia Bridge would be built across a navigable waterway, the highway department needed federal approval before the project could move forward. When federal officials reviewed preliminary plans for the Bridge J-719, they expressed concern about the vertical clearance underneath the planned structure. Since the Osage River had previously supported significant commercial traffic, the Corps of Engineers wanted to make sure that construction of a new bridge would not prevent any potential revival of navigation on the Osage. The Corps of Engineers also ordered the Missouri State Highway Department to host a public meeting in Tuscumbia to solicit public input into the design of the new bridge and to allow local residents to express any concerns about the impact of the proposed structure. Such public meetings were extremely uncommon in the 1930s, but

[17]"Chief Engineer T.H. Cutler Makes Favorable Report," *Miller County Autogram*, 26 February 1931, 1, 3; and T.H. Cutler to Fred Spearman, Signed Letter, 21 February 1931, Bridge File. The delegation from Miller County that approached Cutler included two Miller County Judges, the Miller County Assessor, and the Miller County Road Superintendent.

[18]Missouri State Highway Department, "Sketch Showing Proposed Bridge At Highway Crossing Over Osage River Route 17 Miller County," January 1931, Bridge File; and Missouri State Highway Department, "Osage River Bridge At Tuscumbia, Missouri: Design Data," Bridge File. While preparing a preliminary design for the Tuscumbia Bridge, highway department workers also created a detailed blueprint showing the dimensions of the existing suspension bridge. Joe Dice, the designer of the suspension bridge, did not work from drawings or plans, choosing instead to build bridges by feel and improvisation. Thus, the drawing prepared by the highway department while designing Bridge J-719 represents the only known blueprint of the former Joe Dice bridge at Tuscumbia. See Hayden, *Bridges Over the Osage*, 7; and Missouri State Highway Department, "Sketch Showing Proposed Bridge At Highway Crossing Over Osage River Route 17 Miller County," April 1931, Bridge File.

nevertheless, the highway department made arrangements to host a pubic forum to discuss the future of Bridge J-719 on April 2, 1931, at the Miller County Courthouse.[19]

When the Missouri State Highway Department hosted a public meeting to discuss their plans to build a new bridge across the Osage River at Tuscumbia, the vast majority of attendees indicated that they wanted the bridge built as soon as possible. Numerous state and federal officials attended this meeting, including Assistant Bridge Engineer N.R. Sack and Lieutenant R. Whitaker from the Corps of Engineers. These officials heard from speakers ranging from local farmers to members of the Miller County Court who all favored the construction of a toll-free bridge. Most attendees at the meeting believed that the highway department needed to build the Tuscumbia Bridge to complete the construction of Route 17. Local residents complained that since their taxes were paying for the construction of a statewide highway system, there should not be any toll bridges along Missouri's state roads. In addition, several local farmers spoke in favor of a new bridge, stating that it would allow them greater access to Tuscumbia and other markets for their agricultural production. A local steamboat owner also spoke out at the meeting, proclaiming that the new bridge would not disrupt boat traffic along the Osage River. The only opposition to the proposed bridge came from H.H. Kay, an attorney representing the owners of the Tuscumbia Bridge Company. Kay argued that the Corps of Engineers had no right to issue a permit for the Missouri State Highway Department to build a bridge at the same basic location as the company's toll bridge. Kay also complained that the construction of a state-owned bridge would encroach on the property rights of the owners of the toll bridge and disrupt traffic along the privately owned structure. Despite Kay's concerns, the Corps of Engineers granted a permit to build the new structure on May 25, 1931.[20]

Following the public meeting, local residents hoped that construction of the Tuscumbia Bridge would soon begin. Throughout the spring several obstacles to the construction of a new bridge quickly fell. In May 1931 the Miller County Court announced that it had reached an agreement with the Tuscumbia Bridge Company regarding their concerns. The Miller County Court offered a settlement of $4,000 from the county treasury to compensate the bridge company for lost business. In addition, the

[19]Missouri State Highway Commission, "Resolution Authorizing Chief Engineer to Secure Approval of Plans from War Department for Crossing of Osage River on Route 17, Miller County, Near Tuscumbia," 30 January 1931, Bridge File; R. Whitaker to N.R. Sack, Signed Letter, 4 February 1931, Bridge File; and H.W. Collins to N.R. Sack, Signed Letter, 24 February 1931, Bridge File. One major concern about Bridge J-719 expressed by the Corps of Engineers was whether or not there would be sufficient vertical clearance beneath the planned structure for boats on the Osage River to pass safely. Although shipping on the Osage River had declined dramatically in the early twentieth century, the Corps of Engineers wanted to maintain the river as a viable waterway. Federal officials initially asked that the Tuscumbia Bridge feature a minimum 55' vertical clearance, but they eventually allowed the highway department to design a structure with a vertical clearance of only 38 feet. See N.R. Sack to H.W. Gallatin, Signed Letter, 31 January 1931, Bridge File; and R. Whitaker to N.R. Sack, Signed Letter, 4 February 1931, Bridge File.

[20]"War Department Is Asked to Grant Bridge Permit," *Miller County Autogram*, 9 April 1931, 1, 4; "County Court and Bridge Company Reach Agreement," *Miller County Autogram*, 14 May 1931, 1, 5; and H.W. Collins to T.H. Cutler, Signed Letter, 5 June 1931, Bridge File.

Missouri State Highway Department promised that the approaches to the toll bridge would remain open throughout construction of the new structure and that the department would pay for removal of the toll bridge when Bridge J-719 opened to traffic. In exchange for these benefits, the Tuscumbia Bridge Company promised to drop its objections to the new structure and not pursue legal action against the county court or the highway department.[21]

Several other signs in the spring of 1931 pointed toward the eminent start of construction of the Tuscumbia Bridge. The highway department was able to acquire new right of way needed for the bridge with minimal difficulty, and the department announced that it would soon let a contract for the grading and graveling portions of Route 17 located immediately south and north of the proposed bridge. By the end of May, highway department officials had announced that plans and specifications for Bridge J-719 had been completed and that the Missouri State Highway Commission would discuss construction of the proposed bridge at its regular meeting on June 9, 1931. Most observers assumed that the commission would rubber stamp the recommendations of department engineers and quickly let a contract for the construction of a new bridge. [22]

When the Missouri State Highway Commission met to discuss the proposed bridge across the Osage River at Tuscumbia, they decided to take a very cautious approach. The highway commission was very conservative during its early years, making sure that all their decisions and actions had been approved under the Centennial Road Law. The law allowed the highway commission to build bridges across non-navigable streams and waterways, but it never mentioned whether or not the commission could construct bridges across navigable rivers such as the Osage River. The highway commission thus faced a challenging quandary. Promises had been made to local leaders that every effort would be made to construct a free bridge at Tuscumbia to help complete Route 17, a secondary highway that was clearly defined by the Centennial Road Law. However, the highway commission was also afraid of overstepping its authority and having Missouri's courts declare their actions unconstitutional. When the highway commission asked its legal advisors for an opinion on the legality of building a structure such as Bridge J-719 across a navigable river, they were unable to provide a definitive opinion. No Missouri court had ruled on the matter as of June 1931, and thus the Missouri State Highway Commission took a cautious approach. The highway commission postponed the letting of a contract for the Tuscumbia Bridge, which had been scheduled for June 29, 1931, indefinitely until the legal questions surrounding the proposed structure could be settled.[23]

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[21]"County Court and Bridge Company Reach Agreement," *Miller County Autogram*, 14 May 1931, 1, 5. The Tuscumbia Bridge Company continued to exist on paper until 1935, but it ceased to be an active corporation when Bridge J-719 opened to traffic in 1933. See Missouri Secretary of State, "Forfeiture of Charter: Tuscumbia Bridge Company," 1935, copy on file at Missouri Corporations Office, Missouri Secretary of State, Jefferson City, Missouri.

[22]"Big Road Program for Miller County During 1931," *Miller County Autogram*, 16 April 1931, 1; and "Bridge Contract Letting June 29," *Miller County Autogram*, 21 May 1931, 1.

When Tuscumbia residents and local leaders heard about the highway commission's decision to postpone letting a contract to build Bridge J-719, they reacted with shock and dismay. Local newspapers complained that the existing suspension bridge was too small to accommodate traffic along a secondary state highway, and an editorial published in the *Miller County Autogram* suggested that a toll-free bridge across the Osage River was needed to help draw tourists to the Ozarks region:

> It's a bad advertisement to any state to have toll bridges on state highways. People from other states like the Ozarks, and read many glowing stories about the wonders of this region, but when they arrive and find that whichever way they turn they must pay toll to travel on state highways it most certainly dampens their enthusiasm. Toll bridges have served a good purpose in their time, but they are certainly out of date with our modern highways. Let's have free bridges or quit advertising the Ozarks.[24]

In addition, area leaders believed that the Missouri State Highway Commission had been too conservative in its interpretation of existing road laws. Instead of focusing on the original Centennial Road Law, local leaders suggested that the highway commission look at an amendment to the law that was approved by Missouri voters in November 1928. This amendment allowed the Missouri State Highway Commission to sell bonds to complete and improve the state's primary and secondary highways, and many observers believed that money raised through such bonds could legally be spent to build Bridge J-719.[25]

In an effort to move plans for the construction of Bridge J-719 forward, a delegation of county and city officials from Miller, Cole, Pulaski, and Texas counties spoke before the Missouri State Highway Commission on January 12, 1932. Fred Spearman, a Miller County farmer and a Representative in the Missouri General Assembly, led the delegation. Spearman told the highway commission that voters in the Ozarks had overwhelmingly supported the passage of Amendment 3 in November 1928

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[23]"Bridge Letting Postponed," *Miller County Autogram*, 25 June 1931, 1, 8; "Contract for New Bridge Was Let Nov. 4, 1932," *Miller County Autogram*, 2 November 1933, 7; Missouri State Highway Commission, "Minutes of the Meeting of the State Highway Commission Held in Jefferson City, Missouri, May 12, 1931," as held by the Secretary to the Missouri State Highway Commission, Missouri Department of Transportation General Headquarters, Jefferson City, Missouri, 49; Missouri State Highway Commission, "Minutes of the Meeting of the State Highway Commission Held in Jefferson City, Missouri, June 9, 1931," as held by the Secretary to the Missouri State Highway Commission, Missouri Department of Transportation General Headquarters, Jefferson City, Missouri, 56; "Respondent's Statement, Points and Authorities, Brief and Argument," Spearman v. Missouri State Highway Commission, Missouri Supreme Court Case Number 31753, as held by the Missouri State Archives, Jefferson City, Missouri, 13; and Spearman v. Missouri State Highway Commission 53 SW(2d) 282 (1932), 1-2.

[24]"Citizens Ask Commission to Build Bridge," *Miller County Autogram*, 14 January 1932, 1.

[25]"Bridge Letting Postponed," *Miller County Autogram*, 25 June 1931, 1, 8; "Road Work to Start Soon on Highways 17 and 52, *Miller County Autogram*, 20 August 1931, 1; and "Realtor's Brief," Spearman v. Missouri State Highway Commission, 7-14.

with the belief that its passage would lead to the construction of a new bridge at Tuscumbia. The existing suspension bridge was a hazard that was too small to support automobile or truck traffic along Route 17. Spearman also pointed out that the Missouri State Highway Department had already constructed bridges across navigable waterways such as the Missouri River, and he argued that despite the commission's concerns, it would be perfectly legal for the state to finance the construction of Bridge J-719.[26]

The Missouri State Highway Commission responded to Representative Spearman and the multi-county delegation with a sympathetic ear. The highway commission knew that the existing suspension bridge was inadequate, but they also believed that the law did not allow them to construct a bridge across a navigable waterway such as the Osage River. To rectify the situation, the commission suggested two possible courses of action:

> The Commission…told these gentlemen that, through its attorneys, it would be glad to work with them in an effort to get Congress to declare this section of the Osage River as unnavigable [sic]. The Commission also stated that it would, if the delegation so desired, cooperate with it in expediting a test case to be tried in the courts to determine if the Commission has the authority to build the bridge as requested.[27]

Following this meeting, the multi-county delegation decided that it would be quicker for them to file a test case to determine whether or not the highway commission could build Bridge J-719 than to attempt to change a federal law. Thus, a lawsuit was filed in February 1932 asking the Missouri Supreme Court to issue a writ of mandamus ordering the Missouri State Highway Commission to let a contract for the construction of Bridge J-719.[28] The primary plaintiff was Representative Fred Spearman, and thus the case was labeled *Fred Spearman, et al, v. Missouri State Highway Commission.*

Numerous briefs and motions were filed in the spring and summer of 1932 laying out the official positions of the plaintiffs and the defendants in *Spearman v. Missouri State Highway Commission*. The primary issue that needed to be decided by the courts was which law should take precedence, the original Centennial Road Law which forbade the use of state funds to build bridges across navigable rivers or the 1928 amendment to the Missouri Constitution which allowed the highway commission to issue bonds to finance the completion of Missouri's primary and secondary highways.[29] Following

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[26]"Citizens Ask Commission to Build Bridge," *Miller County Autogram*, 14 January 1931, 1; and Missouri State Highway Commission, "Minutes of the Meeting of the State Highway Commission Held in Jefferson City, Missouri, January 12, 1932," as held by the Secretary to the Missouri State Highway Commission, Missouri Department of Transportation General Headquarters, Jefferson City, Missouri, 1-2.

[27]Missouri State Highway Commission, "Minutes of the Meeting of the State Highway Commission Held in Jefferson City, Missouri, January 12, 1932," 2.

[28]"Highway Dept. Asked to Show Cause Why Bridge Is Not Built," *Miller County Autogram*, 11 Feburary 1932, 1, 5.

[29]For detailed arguments presented by the plaintiffs and defendants in *Spearman v. Missouri State Highway Commission*, see "Realtor's Brief," Spearman v. Missouri State Highway Commission, *passim*;

several months of consideration, the Missouri Supreme Court sitting *en banc* issued a ruling in the case on October 5, 1932, written by Justice Berryman Henwood.

Justice Henwood began his ruling in *Spearman v. Missouri State Highway Commission* by declaring that the Missouri State Highway Commission was correct in its belief that the Centennial Road Law forbade them from using state funds to build bridges across navigable streams. The legislators who crafted the original law never intended to give such power to the highway commission because the construction of such bridges would have quickly drained available funds and left the state highway system incomplete.[30] However, in 1928 Missouri voters approved an amendment that was added to Section 44, Article IV of the Missouri State Constitution. This amendment allowed the Missouri State Highway Commission to take on debt and issue bonds, "to complete and widen or otherwise improve the state system of primary and secondary highways as designated and laid out under existing state law" and also to construct "bridges across the waters of the state."[31] Based on these clauses, Henwood ruled that the highway commission could legally use state funds to build Bridge J-719:

> As hereinabove shown, State Highway 17, as designated and laid out in the Centennial Road Law, extends in a northerly and southerly direction through Miller County and across the Osage River. And, manifestly, the express authority of the state highway commission, under the constitutional amendment of 1928, to locate and construct "bridges across the rivers of the waters of the State" and "To complete…secondary highways as designated and laid out under existing law," includes the authority to construct a bridge across the Osage River as a part of State Highway No. 17, for said highway will never be completed until such bridge is constructed.[32]

Although Justice Henwood ruled that the highway commission could legally construct a bridge across the Osage River at Tuscumbia, he refused to issue a writ of mandamus ordering the commission to do so. Henwood explained that the authority to locate and construct state highways rested solely with the highway commission, and thus no local government could force the commission to undertake a specific construction project. Henwood also expressed a belief that the commission, "will exercise its authority to construct a bridge across the Osage River…and that it will not abuse its discretion in fixing the time of commencing or of completing the construction of such bridge."[33]

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and "Respondent's Statement, Points and Authorities, Brief and Argument," Spearman v. Missouri State Highway Commission, *passim*.

[30]Spearman v. Missouri State Highway Commission 53 SW(2d) 282 (1932), 2-5.

[31]*Ibid*., 6

[32]*Ibid*. Emphasis in original.

[33]*Ibid*., 8. On the same day that he issued his opinion in Spearman v. Missouri State Highway Commission, Justice Berryman Henwood also provided the majority opinion in the case *State ex rel. State*

Once the Missouri Supreme Court announced its decision, the Missouri State Highway Department immediately began to make preparations to let a contract for the construction of Bridge J-719. Plans for the new structure had been completed in the spring of 1932, and all right of way needed for the project had already been secured. In addition, the Miller County Court renewed its agreement with the Tuscumbia Bridge Company allowing the toll bridge to remain open during construction and providing a payment of $2,000 to the company to compensate for any loss of business.[34] Announcements seeking bids for the construction of the new Tuscumbia Bridge were published immediately following the ruling in *Spearman v. Missouri State Highway Commission*, and on November 4, 1932, the bids were opened and the contract awarded to the Industrial Construction Company of St. Louis, Missouri. The Industrial Construction Company offered a low bid of $108,713.15 to build Bridge J-719 and to grade and gravel the roads approaching the new bridge. The Missouri State Highway Commission approved the contract to build the Tuscumbia Bridge at a meeting on November 10, 1932.[35] The contract for Bridge J-719 called for the structure to open to traffic no later than August 1, 1933, and since the Industrial Construction Company had extensive experience building railroad bridges throughout Missouri, Illinois and Arkansas, most observers believed that the company would complete the project in a timely manner. Workers from the Industrial Construction Company arrived in Tuscumbia during the final week of November 1932, and local leaders believed that their

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Highway Commission v. L.D. Thompson, State Auditor, a landmark case which allowed the Missouri State Highway Commission to purchase privately owned toll bridges and integrate them into the state highway system as toll-free facilities. This ruling allowed the state commission to purchase toll bridges across the Missouri River in Hermann, Independence, and Jefferson City, and convert them into toll-free crossings. See State ex rel. State Highway Commission v. L.D. Thompson, State Auditor, Missouri Supreme Court Case No. 32,399, Ruling issued 5 October 1932, as held by the Missouri State Archives, Missouri Secretary of State, Jefferson City, Missouri, *passim*; and Thomas Gubbels, "Hermann Bridge," HAER No. MO-114, Historic American Engineering Record (HAER), National Park Service, U.S. Department of the Interior, 2005, 22-25.

[34]"Free Bridge at Tuscumbia Soon," *Miller County Autogram*, 13 October 1932, 1, 8; and "Osage Bridge Letting November 4," *Miller County Autogram*, 27 October 1932, 1.

[35]Missouri State Highway Commission, "Tabulation of Bids: Construction Project R17-55A," microfiche copy available from Design Division, Missouri Department of Transportation General Headquarters, Jefferson City, Missouri; and Missouri State Highway Commission, "Minutes of a Special Meeting of the State Highway Commission of Missouri, Held at the Jefferson Hotel, St. Louis, Missouri, Thursday, November 10, 1932, as held by the Secretary to the Missouri State Highway Commission, Missouri Department of Transportation General Headquarters, Jefferson City, Missouri, 58. Nineteen construction contractors submitted bids to build Bridge J-719. This was an unusually high number of bidders for a highway department project, and the project drew bids from construction companies headquartered in Missouri, Illinois, Iowa, and Kansas. The Great Depression had impacted construction contractors throughout the Midwest, and many were desperately seeking work to keep their companies afloat. Thus, the Tuscumbia Bridge project attracted a large number of bidders. The bids to build Bridge J-719 ranged from approximately $108,000 up to more than $160,000, and the second lowest bid offered by the Koss Construction Company of Des Moines, Iowa, was only $5,000 higher than the winning bid. See "Industrial Construction Company of St. Louis Awarded Tuscumbia Bridge Contract," *Miller County Autogram*, 17 November 1932, 1; and Missouri State Highway Commission, "Tabulation of Bids: Construction Project R17-55A."

efforts to convince the Missouri State Highway Commission to build a new bridge across the Osage River would soon come to fruition.[36]

D. Construction of Bridge J-719

The construction of Bridge J-719 began in December 1932. Initially the Industrial Construction Company hired a team of 30 laborers to work six days per week on the construction of the bridge's substructure. [37] Standard construction techniques were used to build the piers that would support the bridge. Workers began by unloading steel, wood, and equipment that was shipped to the worksite via the Missouri Pacific Railroad and steamboats along the Osage River. Workers also built several construction facilities and equipment onsite, including a barge that was used to float construction equipment, a concrete factory on the north bank of the Osage River near Tuscumbia, and a small tramway to carry the cement used to build the substructure into place within the river.[38] The first cement for the Bridge J-719 was poured on January 25, 1933, and the local newspaper described the occasion as, "an epoch-making event for Miller County in that it brings closer to realization the dream of a free crossing here that will bind North and South Miller County into a friendlier cord of neighborliness."[39]

The substructure of the Tuscumbia Bridge was set to bedrock underneath the Osage River through the use of cofferdams. Cofferdams are temporary structures that are built to keep water or soil out of the area where a bridge pier is to be built.[40] Several cofferdams were constructed from sheet metal within the Osage River, allowing workers to pour the cement for the piers that would support Bridge J-719. The *Miller County Autogram* provided a vivid description of the process used to build the substructure in one of its regular reports on the progress being made by the Industrial Construction Company:

> It is quite an interesting site to see the concrete mixing and pouring. The mixing plant is at the north end of the bridge, about 800 feet distant from pier 10. After the concrete is mixed under the most scientific

[36]"Industrial Construction Company of St. Louis Awarded Tuscumbia Bridge Contract," *Miller County Autogram*, 17 November 1932, 1; "Bridge Contractor s Assembling Material for Job," *Miller County Autogram*, 24 November 1932, 1; "Contract for New Bridge Was Let Nov. 4, 1932," *Miller County Autogram*, 2 November 1933, 7; and N.N. Ropes to T.H. Cutler, Signed Letter, 27 December 1933, Bridge File.

[37]"Heavy Equipment Arrives for Osage River Bridge," *Miller County Autogram*, 1 December 1931, 1; "South Pier of Bridge Will Be 106.9 Feet High," *Miller County Autogram*, 8 December 1932, 1;

[38]"Pile-Driving Is Completed for Two Bridge Piers," *Miller County Autogram*, 5 January 1933, 1.

[39]"First Concrete for Bridge Poured Wednesday, 25th," *Miller County Autogram*, 26 January 1933, 1.

[40]For a detailed explanation of how cofferdams are used to build bridge substructures, see Alex Kruggel, "Cofferdam Construction," April 1999, downloaded 6 November 2006 from https://engineering.purdue.edu/CEM/Research/coffer.htm.

> requirements, a motor car propels the concrete dump truck over the construction tramway. When the car reaches its destination, the concrete is dumped into a metal spout, made in several sections, and as weaves to and fro in the bottom of the cofferdam, it resembles an elephant's trunk.[41]

The superstructure of Bridge J-719 was also erected with the help of the temporary tramway and wooden falsework. Some of the wood used to construct the falsework used to build the superstructure of the Tuscumbia Bridge had been previously employed by the Union Electric Company during the construction of the Bagnell Dam along the Osage River.[42] A small portion of the Tuscumbia Bridge superstructure was also cantilevered, that is, built outward from a single supporting point. The span between Pier 9 and Pier 10 was built using this construction technique.[43]

Although Bridge J-719 was to be a very large structure built atop challenging topography, it initially appeared that the construction process would be a straightforward affair. The bridge was based on standard highway department designs, and the Industrial Construction Company had extensive experience building large bridge structures for major railroad companies such as the Missouri Pacific. However, numerous problems arose throughout 1933 that delayed the opening of Bridge J-719 for several months. Some delays were caused by natural factors such as cold weather and high water levels on the Osage River. Other delays were caused by an engineering mistake that forced the Industrial Construction Company to perform extra work to complete the construction of several bridge footings. The Tuscumbia Bridge opened to traffic in late October 1933, and final work on the structure was completed one month later. The original contract called for the bridge to open to traffic by August 1933, and fortunately for the Industrial Construction Company, the highway commission granted them several extensions and chose not to pursue monetary damages for late completion of the project.

Weather first impacted the construction of the Tuscumbia Bridge in February 1933 when a cold spell made it extremely difficult for the Industrial Construction Company to pour and cure concrete for the bridge substructure. From February 2 to February 12, 1933, low temperatures at night hovered around zero degrees Fahrenheit. The Industrial Construction Company had begun to pour the concrete for Pier 6 and Pier 7 in early February, and workers were forced to keep fires going day and night to prevent the concrete from freezing and cracking before it could properly set. The Industrial

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[41]"Footing Poured for Upstream Barrel Pier 10," *Miller County Autogram*, 30 March 1933, 1.

[42]"Piling to be Used for Constructing False-Work Arrives," *Miller County Autogram*, 6 July 1933, 1.

[43]Most major river crossings constructed under the auspices of the Missouri State Highway Department were built using falsework to support the erection of the superstructure. However, cantilevered construction was sometimes used when large spans needed to be built across unpredictable waterways. The former Waverly Bridge across the Missouri River, which opened to traffic in 1925, also featured a partially cantilevered superstructure prior to its demolition in 2006. See Thomas Gubbels, "Waverly Bridge," HAER No. MO-112, Historic American Engineering Record (HAER), National Park Service, U.S. Department of the Interior, 2004, 15-16; and Leif Sverdrup, "Cantilever Erection of Long Spans of Missouri River Bridge," *Engineering News-Record* 99 (1927): *passim*.

Construction Company asked the Missouri State Highway Department for an extension of ten days to complete the project because of the cold weather, but department officials refused, saying that there was sufficient leeway built into the original contract to account for such delays.[44]

Although cold weather caused minor delays during the construction of Bridge J-719, another meteorological phenomenon, rain, wreaked significantly more havoc on efforts to complete the project in a timely manner. The Osage River had historically overflowed its banks at Tuscumbia on a regular basis. However, with the construction of Bagnell Dam, many observers believed that flooding would never again be a problem on the Osage River near Tuscumbia.[45] The Industrial Construction Company shared this belief, noting that when they submitted their bid to build Bridge J-719, they "were lead [sic] to believe that the flow of the river below the dam would be more or less controlled."[46] However, in the spring of 1932 unusually heavy rains fell across the Missouri Ozarks, and the Osage River began to rise rapidly. Workers from the Industrial Construction Company knew that high water had the potential to wash away their cofferdams and the tramway that they had built, but they optimistically hoped that the Bagnell Dam would prevent any damaging floods.[47]

Unfortunately, the Osage River reached flood stage in the early weeks of June 1933, and a 120' segment of the Industrial Construction Company's construction trestle washed away while several cofferdams flooded. The Osage River returned to more manageable levels in June 1933, but the Industrial Construction Company felt compelled to ask the Missouri State Highway Commission for extra time to complete the construction of Bridge J-719. The Industrial Construction Company argued that unforeseen circumstances had cost them significant amounts of time and money and that the spring flooding should be taken into consideration by the highway commission when considering whether or not to hold the company to original deadlines. The Industrial Construction Company also hired additional crews and added a night shift to the project to make up for time lost due to flooding.[48] After a brief discussion, the Missouri State Highway Commission agreed to push back the expected date of completion for Bridge J-

[44]N.N. Ropes to T.H. Cutler, Signed Letter, 27 December 1933, Bridge File; and "Severe Weather Retards Work on Tuscumbia Bridge," *Miller County Autogram*, 16 February 1933, 1.

[45]For detailed discussions of the construction of Bagnell Dam, see Goodrich and Gentzler, *Marking Missouri History*, 138-139; and H. Dwight Weaver, *History and Geography of the Lake of the Ozarks: Volume I* (Eldon, Missouri: Osage River Trails, 2005), 13-14.

[46]H.E. Billman to Missouri State Highway Commission, Signed Letter, 2 June 1933, Bridge File.

[47]*Ibid*.; and "Erection of Steel For 180-Foot Span Now Progressing," *Miller County Autogram*, 18 May 1933, 1.

[48]H.E. Billman to Missouri State Highway Commission, Signed Letter, 2 June 1933, Bridge File; "River Reached Flood Stage Friday Afternoon," *Miller County Autogram*, 1 June 1933, 1; "Work Resumed on Midstream Pier of Tuscumbia Bridge," *Miller County Autogram*, 8 June 1933, 1; "Day and Night Crews Speed Up Work on Bridge," *Miller County Autogram*, 22 June 1933; and "Contract for New Bridge Was Let Nov. 4, 1932," *Miller County Autogram*, 2 November 1933, 7.

719 by 41 days due to damage caused by river rises in the spring of 1932.[49] The highway commission showed compassion and understanding when weather impacted efforts to build the Tuscumbia Bridge, but they would not be as forgiving when engineering errors led to construction delays.

In the early months of 1933, the Industrial Construction Company began to build a circular cofferdam to help with the construction of Pier 8 of the Tuscumbia Bridge. Based on previous soundings, the Industrial Construction Company assumed that they would find a layer of solid limestone underneath the location where Pier 8 was to be built. However, after building their cofferdam the Industrial Construction Company discovered that the riverbed at the location of Pier 8 consisted of a cherty, porous rock. This lead to the seepage of large amounts of river water into the cofferdam, making it impossible to safely pour the concrete footings needed to support the planned bridge pier. Officials with the Industrial Construction Company asked if they could resolve this problem by setting a concrete base in their cofferdam and simply pouring the footing atop the porous stone riverbed. The Missouri State Highway Department denied this request, noting that the contract called for all bridge footings to be set at least 6" into solid rock. Because of this decision, the Industrial Construction Company claimed that it was forced to spend $7,000 more than it had budgeted to build Pier 8, and the company asked the highway department to consider paying for this cost overrun. Officials in the highway department dismissed this idea outright, commenting that the Industrial Construction Company knew that any soundings provided prior to construction were merely informational and that the contract required that all bridge footings sit atop a solid foundation.[50] N.R. Sack, head of the department's bridge division, also noted that other companies had encountered similar problems and delays on other bridge projects and received no relief:

> In general, we would say that the foundation conditions encountered were no worse than could be expected on similar projects. Almost identical conditions were encountered on our bridge over the Niangua Arm of the Lake on Route 54, Camden County, for which no additional allowances were made. There is no question that the contractor has lost money on Pier #8…the contractor has spent approximately $3000.00 more than he will receive for the pier based on contract quantities and addition force account paid to date.[51]

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[49]N.N. Ropes to T.H. Cutler, Signed Letter, 27 December 1933, Bridge File. A similar incident occurred earlier in Waverly, Missouri, when flooding along the Missouri River washed away a construction tramway and led to a significant delay in the completion of a bridge project. See Gubbels, "Waverly Bridge," 12-14.

[50]H.E. Billman to Missouri State Highway Commission, Signed Letter, 2 June 1933, Bridge File; N.R. Sack to T.H. Cutler, Signed Memorandum, 2 August 1933, Bridge File, *passim*; and N.N. Ropes to T.H. Cutler, Signed Letter, 27 December 1933, Bridge File. Work on Pier 8 began in January 1933, and it took almost five months to finish the construction of this substructure element. See "Work Starts on Cofferdam for No. 8 Bridge Pier," *Miller County Autogram*, 26 January 1933, 1; and "First Structural Steel Placed for Tuscumbia Bridge," *Miller County Autogram*, 4 May 1933, 1.

[51]N.R. Sack to T.H. Cutler, Signed Memorandum, 2 August 1933, Bridge File, 3-4.

The Industrial Construction Company wanted to construct Bridge J-719 as quickly and cheaply as possible, and the overrun of several thousand dollars proved to be a costly mistake that significantly lessened the company's profits.[52]

Under current construction practices, the death of a worker at a bridge jobsite would shut down the project until an investigation could be completed and the safety of other workers assured. However, when a man was killed during the construction of Bridge J-719, work on the project continued uninterrupted. This tragedy occurred in the early morning hours of July 24, 1933, when Avery Baucom of Eldon, Missouri, started his shift erecting steel for the Tuscumbia Bridge. Baucom had just finished tightening some lug nuts when he slipped and fell from Pier 9 into the Osage River. He was not wearing any safety harness, so Baucom fell backwards into the river below. According to eyewitness accounts, Baucom first slammed into horizontal bracing underneath the incomplete superstructure, shattering his left leg. Baucom was then impaled upon metal sheeting that had been erected as part of a cofferdam, puncturing his lung. After Baucom's tortured body slammed into the Osage River his fellow workers drug him ashore. Unfortunately, Baucom died on the riverbank while waiting for an ambulance to arrive. Another employee of the Industrial Construction Company, Stanley Blackburn, had previously fallen into the river while working on Pier 9, but his injuries were not fatal. Baucom's death was ruled an accident, and work continued on the bridge. Fortunately, Avery Baucom was the only worker to lose his life during the construction of Bridge J-719.[53]

Work on the Tuscumbia Bridge continued throughout the spring and summer of 1933, and by the time fall began, the majority of the bridge had been completed. By this time local officials and the general public were calling for the Industrial Construction Company to accelerate its work schedule so the new bridge could be opened to traffic as soon as possible. Regular construction updates appeared in the local newspaper, the *Miller County Autogram*, detailing progress on the bridge and providing approximate opening dates for the structure. In addition, the Missouri State Highway Department wanted to open Bridge J-719 as soon as possible because inspections showed that the adjacent suspension bridge was beginning to fail. During construction, traffic along Route 17 was routed across the steel suspension bridge that had been built in 1905. When department engineers inspected the suspension bridge, they discovered that a large tower supporting the suspension cables had shifted since construction of Bridge J-719

[52]Although the Industrial Construction Company claimed that its cost overrun was more than $7,000, officials with the highway department concluded that the company's loss due to construction delays was closer to $3,000. See H.E. Billman to Missouri State Highway Commission, Signed Letter, 2 June 1933, Bridge File; and N.R. Sack to T.H. Cutler, Signed Memorandum, 2 August 1933, Bridge File.

[53]"Avery Baucom, Steel Worker, Falls to Death," *Miller County Autogram*, 27 July 1933, 1, 5; "Contract for New Bridge Was Let Nov. 4, 1932," *Miller County Autogram*, 2 November 1933, 7; and Missouri State Board of Health, "Certificate of Death: Avery William Baucom," File Number 23799, downloaded 21 August 2007 from http://www.sos.mo.gov/archives/resources/deathcertificates/. The official cause of Baucom's death recorded on his death certificate was "death due to shock and hemorrhage." A contributory cause of death was listed as "accidentally fell from steel bridge girder."

had begun. Inspectors also noted that the suspension bridge was beginning to slowly buckle and collapse, and they warned that unless repairs were made soon, the bridge might not survive until the new bridge could open.[54] Officials from the highway department passed along their findings to the Miller County Court and asked them to repair the suspension bridge, but no action was taken. County officials were more concerned about making sure that they could salvage as much material as possible when the suspension bridge was taken down. Fortunately, the suspension bridge did not fail under the traffic loads that it carried while Bridge J-719 was under construction. It was taken down by the Industrial Construction Company one month after the opening of the new bridge, and its cables, railing, cross-beams, and flooring were salvaged and used by Miller County for other local projects.[55]

As the Industrial Construction Company finished its work on Bridge J-719 in the late summer of 1933, local residents anxiously awaited news regarding when the new structure would open to traffic. In early September the *Miller County Autogram* announced that the final steel had been erected for the bridge's superstructure and that only 460' of bridge deck remained to be poured. The construction foreman estimated that the bridge would open to traffic by October 15, 1933. However, the actual opening of the bridge was delayed slightly due to continued work on the roads leading up to the new structure. The Industrial Construction Company needed to remove several tons of limestone from a bluff on the south side of the bridge to make way for a new approach, and the road leading from Tuscumbia to the bridge had to be graveled in anticipation of increased traffic along Route 17. Once the approach roads had been sufficiently improved, Bridge J-719 was opened to traffic on the afternoon of October 24, 1933.[56] Basic construction of the bridge had been completed, but the Industrial Construction Company still had several minor tasks to complete. The suspension bridge had to be taken down, the south approach still needed work, and the new bridge had to be sandblasted and given a coat of grey paint. These remaining tasks were completed quickly, and on November 20, 1933, a final inspection was completed and the new bridge was accepted into the state system.[57]

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[54]N.R. Sack to S.M. Rudder, Signed Letter, 31 January 1933, Bridge File; and F.L. Hunt to G.H. Pendorf, Signed Letter, 9 February 1933, Bridge File.

[55]N.N. Ropes to F.L. Hunt, Signed Letter, 16 October 1933, Bridge File; N.N. Ropes to T.H. Cutler, Signed Letter, 2 February 1934, Bridge File; "Traffic May Be Crossing New Bridge Oct. 15," *Miller County Autogram*, 24 August 1933, 1; and "New Bridge Increases Traffic Through Here," *Miller County Autogram*, 16 November 1933, 1. The *Miller County Autogram* never made its readers aware of the unsafe condition of the suspension bridge. When the suspension bridge was taken down, the newspaper stated that the structure was in excellent condition prior to its removal. It is possible that nobody at the *Autogram* knew about the highway department's concerns regarding the suspension bridge, or perhaps the newspaper's editorial staff simply decided not to publicize the deteriorating condition of the older structure.

[56]"Traffic May Be Crossing New Bridge Oct. 15," *Miller County Autogram*, 24 August 1933, 1; "Last Beam for River Bridge Is Now In Place," *Miller County Autogram*, 7 September 1933, 1; "New Bridge Will Be Opened For Traffic Oct. 20th," *Miller County Autogram*, 19 October 1933, 1; and "Traffic Over New Bridge," *Miller County Autogram*, 26 October 1933, 1.

When Bridge J-719 opened, Tuscumbia's residents reacted joyfully. Local leaders had been working toward a new bridge for years, and their efforts had finally paid off. The local newspaper marked the occasion by inviting people to cross the new bridge and visit Tuscumbia:

> So we invite the people of South Miller [County] to come over and visit us, and likewise you, the people on that side of the Osage, shouldn't invite us to come and see you unless you mean it. Well, laying all jokes aside, we are all proud of the new bridge and happy to know that the Osage river [sic] is now only an imaginary dividing line between the South Side and the North Side. So let's be friendly.[58]

To commemorate the opening of the new bridge, the Miller County Court hosted a daylong celebration on October 28, 1933. Over 5,000 revelers attended the opening celebration, and they were treated to a parade, speeches by local and state leaders including Governor Guy Park, performances by community bands, and a free barbecue dinner featuring spareribs, mutton, pork and beef.[59] The opening of Bridge J-719 led almost immediately to increased traffic on Route 17. Observers noted that on November 12, 1933, approximately 700 cars crossed the toll-free bridge, and, at times, there were ten to twenty vehicles moving across the bridge at the same time.[60] The completion of Bridge J-719 fulfilled the wishes of local leaders, and many hoped that the new structure would satisfy the transportation needs of Tuscumbia and Miller County for years to come.

E. Post-construction history of Bridge J-719

Although Bridge J-719 has served Miller County well since it opened in the early 1930s, the structure is no longer sufficient to accommodate modern transportation needs. The bridge features driving lanes that are only 10' wide, making the bridge insufficient to handle large trucks and oversize personal vehicles. It is not uncommon to see mirrors on the side of the road that have been knocked off the sides of large trucks that have passed each other while crossing the bridge. The bridge itself is also in poor condition. The bridge piers and the driving surface show signs of decay, and sections of the approaches have eroded away. In a recent interview, a Tuscumbia resident vividly described the fears that locals experience while crossing Bridge J-719:

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[57]"New Bridge Increases Traffic Through Here," *Miller County Autogram*, 16 November 1933, 1; "Painting the Bridge," *Miller County Autogram*, 7 December 1933, 1; and D.B. Levi to N.N. Ropes, Signed Letter, 1 December 1933, Bridge File.

[58]"Traffic Over New Bridge," *Miller County Autogram*, 26 October 1933, 1.

[59]"Gov. Park Will Speak at Bridge Dedication 28th," *Miller County Autogram*, 19 October 1933, 1; "Gov. Park to Speak Here Saturday at 12:30 P.M.," *Miller County Autogram*, 26 October 1933, 1; and "Great Crowd Attends Bridge Celebration," *Miller County Autogram*, 2 November 1933, 1, 5.

[60]"New Bridge Increases Traffic Through Here," *Miller County Autogram*, 16 November 1933, 1.

> That there hasn't been any wrecks on this bridge, any serious wrecks, is truly a miracle in my view. I'm just afraid we may be running out of miracles. I'm scared for my family. I'm scared for people I care about. Just people in general, and yeah, I've been scared too.[61]

Back in the 1930s, the Missouri State Highway Department responded to local transportation needs when it built the Tuscumbia Bridge, and the Missouri Department of Transportation continues today to do its best to provide a world-class transportation experience for all Missourians. To keep this promise, the department will soon replace Bridge J-719 with a larger structure to accommodate current and future traffic levels in Miller County. An historic structure will be lost, but a transportation department dedicated to delighting the traveling public will once again fulfill the transportation needs of Miller County's citizen by building a new bridge for their use and convenience.

III. Bridge Contractor: The Industrial Construction Company

Archival research yielded limited information about the Industrial Construction Company. The company was originally known as the Lister Real Estate Company. It was chartered in the City of St. Louis in 1903 by Herman Tulhoske and his wife Sophia. Herman Tuholske was a surgeon who lived and practiced in St. Louis, Missouri.[62] He was the majority shareholder in the Lister Real Estate Company, owning $75,000 of the corporation's initial $100,000 capital. The remaining capital was divided between Tuholske's wife and two other St. Louis surgeons, Ernst Jonas and Samuel Lederer. The company was named after the Tuholskes' son Lister Tuholske, and according to its charter, the company was created, "to buy sell and own real estate in the City of St. Louis and elsewhere, and to construct buildings for investment or for sale in the City of St. Louis or elsewhere." The Lister Real Estate Company was most likely founded as an investment opportunity for Herman Tulhsoke and his fellow surgeons, but no information was found regarding any buildings or subdivisions built or sold by the company.

In the summer of 1918, the stockholders of the Lister Real Estate Company decided to change the name of their corporation to the "Industrial Track Construction Company."[63] The company also amended its articles of incorporation, adding a line stating that an additional purpose for the company was, "to do a general contracting business with the power to buy own and sell all tools, implements and to employ labor

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[61]Marika Lorraine, "Residents worry about Tuscumbia Bridge: A fact finder report," 7 July 2006. Downloaded August 11, 2006, from http://www.krcg.com/news/news_story.aspx?id=12542.

[62]Lister Real Estate Company, "Articles of Association of the Lister Real Estate Company," 1903, copy on file at Missouri Corporations Office, Missouri Secretary of State, Jefferson City, Missouri; and United States Bureau of the Census, "1900 Population Census: City of St. Louis, Missouri," microfiche copy available from Missouri State Archives, Jefferson City, Missouri.

[63]Lister Real Estate Company, "Change of Name to Industrial Track Construction Company," 1918, copy on file at Missouri Corporations Office, Missouri Secretary of State, Jefferson City, Missouri.

and do any other acts incident to general contracting business."[64] Ten years later, the name of the corporation was shortened to "Industrial Construction Company."[65] The Industrial Construction Company continued to operate within Missouri until the mid-1930s when its charter was forfeited due to its failure to file proper paperwork with the Missouri Secretary of State.[66]

Little information is known about the construction projects built by the Industrial Construction Company or its predecessor, the Industrial Track Construction Company. It appears that the company's primary focus was the construction of railroad lines, trestles, and bridges. For example, newspaper accounts from the *Miller County Autogram* stated that the Industrial Construction Company delivered material to its jobsite in Miller County via the Union Pacific Railroad because of the numerous construction projects it had built for the railroad line.[67] In addition, several corporate officers named in various paperwork filed by the Industrial Construction Company are enumerated in census records as railroad contractors.[68] The Industrial Track Construction Company was also involved in an Oklahoma Supreme Court ruling from 1933 concerning the workman's compensation claims of an employee who had been injured while carrying railroad ties to a company jobsite.[69] Finally, in an autobiography written to commemorate his 75th birthday, William Meacham describes his experiences working for the Industrial Track Construction Company in the early 1930s:

> After about three weeks of this Mr. Billman…asked if I wanted to work on his railroad crew. I did and became a time keeper [sic] on the Industrial Track Construction Company, laying new heavy rails between Carthage, Illinois and Keocuk [sic], Iowa. We had about sixty black laborors [sic] and I really learned about life from them! There were five whites who

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[64]Industrial Track Construction Company, "Extension of Business Purposes," 1918, copy on file at Missouri Corporations Office, Missouri Secretary of State, Jefferson City, Missouri.

[65] Industrial Track Construction Company, "Certificate of Amendment," 1928, copy on file at Missouri Corporations Office, Missouri Secretary of State, Jefferson City, Missouri.

[66]Missouri Secretary of State, "Forfeiture of Charter: Industrial Construction Company," 1935, copy on file at Missouri Corporations Office, Missouri Secretary of State, Jefferson City, Missouri.

[67]"Industrial Construction Company of St. Louis Awarded Tuscumbia Bridge Contract," *Miller County Autogram*, 17 November 1932, 1; and "Heavy Equipment Arrives for Osage River Bridge," *Miller County Autogram*, 1 December 1932, 1.

[68]An example can be found in the paperwork filed in 1928 changing the name of the company to Industrial Construction Company. The paperwork lists the president of the company as H.E. Billman, and Billman was enumerated in the 1920 census as a St. Louis contractor who specialized in railroad construction. See Industrial Track Construction Company, "Certificate of Amendment"; and United States Bureau of the Census, "1920 Population Census: City of St. Louis, Missouri," microfiche copy available from Missouri State Archives, Jefferson City, Missouri.

[69]Industrial Track Construction Company v. Colthrop 19 P(2d) 1084 (1933), downloaded 13 December 2006 from http://www.oscn.net/applications/oscn/DeliverDocument.asp?CiteID=33966.

> were the bosses and we were fed wonderful meals and had nice Pullman cars to live in. I could ride the Wabash Rail Lines into St. Louis when I wanted to on weekends without charge. So, it was a nice life.[70]

No records were found indicating that the Industrial Construction Company won any other contracts from the Missouri State Highway Department other than the contract to build Bridge J-719.

IV. Physical Description of Bridge J-719

As a whole, Bridge J-719 measures just less than 1,084' in length, and it features a 5% upward grade traveling north to south. The bridge superstructure is composed of six 40' I-beam spans, two 180' deck truss spans, and a single two-span through-truss that is approximately 400' long. The deck trusses and the through-truss both feature a Warren web design. The substructure of Bridge J-719 features reinforced concrete bents, piers, and an abutment. The structure was built by the Industrial Construction Company of St. Louis at a total cost of $109,112.80.[71]

Beginning on the north end of the bridge nearest to Tuscumbia, the substructure elements are numbered from 1 to 13 on the plans for Bridge J-719. The six I-Beam spans are supported by End Bent 1, Bents 2, 3, 4, 5, 6, and12, and Abutment 13, while the two deck truss spans and the through-truss span are supported by Piers 7, 8, 9, 10, and 11. End Bent 1 rests atop creosoted timber piles and rectangular footings measuring 6' x 10' with a thickness of 2'-6". The columns of End Bent 1 measure slightly less that 16'-4" in height from the top of the footings to the base of the crown. The wings of End Bent 1 flare out to a total length of 38'-7 1/2", and a light stone revetment was placed behind the end bent to provide additional protection and support.

The five end bents on the north side of Bridge J-719, End Bents 2, 3, 4, 5, and 6, are similar in design, but they vary in size due to the increasing grade across the entire bridge. For example, End Bent 2 rests atop square concrete footings that measure 6' x 6' with a thickness of 2'-6", while the footings for End Bent 6 measure 7' x 7' with the same thickness. In addition, End Bent 2 measures 26'-6" in total height from the base of its footings to the top of its crown, while End Bent 6 has a total height of 38'-6 1/4". The crown of each end bent on the north side of the bridge is 21'-6" long and 2'-6" thick.

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[70]William Meacham, "Memoire of Dr. William F. Meacham (1913-1999)," downloaded 13 December 2006 from http://freepages.genealogy.rootsweb.com/~wmeacham/memoire.htm.

[71]The physical description of Bridge J-719 is based on the original construction plans for the structure with additional details drawn from additional primary and secondary sources. See Missouri State Highway Department, "Bridge over Osage River: Project No. R-17-S5A," microfiche copy available from Bridge Division, Missouri Department of Transportation General Headquarters, Jefferson City, Missouri, *passim*; Clayton Fraser, "HAER Inventory: Osage River Bridge J-719," in *Missouri Historic Bridge Inventory: Draft Inventory Report* (Loveland, Colorado: Fraserdesign Inc., 1996); and Missouri State Highway Commission, *Ninth Biennial Report of the State Highway Commission of Missouri for the Period Ending December 1, 1934* (Jefferson City, Missouri: Hugh Stephens Press, 1934), 188.

The substructural elements underneath the southern portion of Bridge J-719 vary slightly in size and design from their counterparts beneath the northern end of the structure. End Bent 12 rests atop square footings that measure 4'-6" x 4'-6" with a thickness of 2'-6", and its columns measure 2' x 2' with a height of 17'-3" from the top of the footings to the base of the crown. The crown of End Bent 12 is 2'-6" thick and flares out to a length of 22'-1". The total height of End Bent 12 from the bottom of its footings to the top of its crown is 27'-6". Bent 12 also features a 2' x 2' concrete connector between its two columns. The far southern end of Bridge J-719 rests atop a 21'-6" wide reinforced concrete abutment. The height of this abutment varies from 7'-7 3/8" to 6'-7 3/8", and a note on the original plans comments, "height of wings may vary with rock line. Carry base at least 6" into firm, undisturbed rock."[72]

The substructural elements of Bridge J-719 that are directly exposed to the Osage River are described by the original construction plans as piers. Pier 7 rests atop creosoted timber piles, as do all elements of the substructure. It features massive concrete footings measuring 9' x 12' with a 3' thickness. The columns of Pier 7 shrink in size as they rise, measuring 8' in thickness immediately above the footings and 3'-6" in thickness at the base of the crown. The crown of Pier 7 is 3' tall, 4'-8" wide, and measures 14' in length between the centers of its twin columns.

Pier 11 on the south side of Bridge J-719 varies significantly from Pier 7. Pier 11 rests atop a single concrete footing measuring 19'-6" x 11" with a thickness of 10'-6". The columns of Pier 11 are not battered. Unlike the columns of the other piers that are part of Bridge J-719, the columns of Pier 11 do not narrow as they rise from their footings to their crown. The columns of Pier 11 are 3'-6" x 3-6", and their height measures 24' from the top of the footings to the base of the crown. The crown of Pier 11 is 18'-8" long, 3' wide, and 3' thick. Pier 11 is also unique in that it is a flow-through pier. It features no concrete between its columns. In contrast, the other four piers beneath Bridge J-719 have no open space between their two support columns.

The most imposing elements of the substructure of Bridge J-719 are three massive river piers. Pier 8 and Pier 10 were built from identical designs, but they differ in size. The square footings beneath Pier 8 measure 11' x 11' with a thickness of 25', while the footings of Pier 10 measure 12' x 12' with a thickness of 22'-6". The columns of both piers taper as they rise. The columns of Pier 8 measure 7'-10" in diameter just above the footings, but they taper to a diameter of only 4' near the base of the crown. The columns of Pier 10 also measure 4' at the base of its crown, but near its footings, the columns of Pier 10 are 9'-1" in diameter. Pier 8 has a total height of 64'-3 1/4" when measured from the top its footings to the top of its crown, while the height of Pier 11 totals 84'-3". The crowns of Pier 8 and Pier 10 are both 23'-3" long, 5'-2" wide, and 3' thick.

Pier 9 is the single largest substructural element of Bridge J-719, and it was the most difficult for the Industrial Construction Company to build. Pier 9 sits atop massive concrete footings that measure 17' x 17' with a thickness of 24'. At the top of the footings, the columns of Pier 9 feature of diameter of 9'-2" which narrows to a diameter

[72]Missouri State Highway Department, "Bridge over Osage River: Project No. R-17-S5A", 6.

of 4’-9” immediately below the crown. The crown of Pier 11 is 23’-3” long, 5’-11” wide, and 3’ thick. Pier 9 has a height of 73’-11” when measured from the top of its footings to the top of its crown.

Eight of the twelve spans that compose the superstructure of Bridge J-719 are simple steel-stringer approach spans. Although the stringer spans are generally described as each being 40’ long, they actually vary in length from 38’-7 15/16” to 41’-3 7/8” depending on their location within the bridge. Each stringer span is primarily composed of four massive steel I-beams that run the entire length of the span. These I-beams are each 27” long and are composed of Carnegie steel. The four I-beams within each stringer are linked by 15” channels and bracing composed of steel angles measuring 3” x 3” x 1/4”. The top of each stringer span is flush with the roadway above.

In addition to the steel stringer spans, the superstructure of Bridge J-719 also contains two 180’ Warren web deck spans. These deck spans each feature ten panels that are approximately 18’long. The roadbed across Bridge J-719 sits atop the upper chords of the deck truss spans. The upper chord of the deck truss spans is composed in some places of two angles measuring 6” x 3 1/2” x 3/8”, while at other points it was constructed using two 15” steel channels. The lower chords feature two 15” steel plates joined together by gusset plates, and there is 19’ of vertical space between the center of the upper chords and the center of the lower chords. The upper lateral bracing and the lower lateral bracing of the deck trusses is composed of a single angle measuring 4” x 3” x 5/16”, while the struts along the upper and lower chords were built using a single steel angle 4” x 3” x 5/16”. The diagonals carrying both compressive and tensile forces across the Warren webs of the deck truss spans feature two channels that vary in size from 12” to 15”, while the verticals are composed of 10” I-beams. The floor beams directly underneath the roadbed are composed of 18” I-beams, while the struts along the lower chord are composed of either a single angle or two angles that in both cases measure 4” x 3” x 5/16”.

The most prominent feature of the superstructure of Bridge J-719 is a 400’ two-span through-truss featuring a Warren web design, inclined end posts, and a polygonal upper chord. The upper chord of the Warren through-truss is composed of two 12” channels and square cover plates measuring 18” x 18” with a thickness of 3/4”. The lower chord is also composed of two 12” channels, and both the upper and lower chord of the span feature double lacing. The diagonals vary in length across the length of the span, but they are all composed of two channels either 10” or 12” in size. The verticals along the bridge also vary in length due to the polygonal upper chord, and they were made from 10” steel flanges. The lateral bracing joining at both the upper and lower chords of the Warren through-truss is composed of 2 steel channels measuring 3” x 3” x 1/4”, while all of the span’s struts are composed of 4 angles measuring 4” x 3” x 1/4” joined by steel tie plates and steel bracing. The distance between the upper and lower chords varies across the bridge, from a minimum vertical clearance of 14’ at the entry portal to 30’ at its center. Sway bracing composed of intersecting steel angles measuring 4” x 3” x 1/4” was installed at alternate panels to provide extra strength.

The Missouri State Highway Department frequently employed the Warren web design for its large through-truss spans. When such spans were built across large expanses the highway department often employed cantilever construction techniques rather than using traditional falsework. When a bridge is cantilevered, it is built outward from a single point and joined to another cantilevered section in the middle of the structure.[73] Based on available archival evidence, it is unclear whether the 400' Warren through-truss was cantilevered or built as a continuous truss. In his inventory of Missouri's highway bridges Clayton Fraser desrcibes Bridge J-719 as a rigid-connected cantilevered through-truss.[74] However, original construction plans describe the structure as a continuous through-truss as do other highway department records from the 1930s.[75] Contemporary news accounts of the construction of Bridge J-719 suggest that one of the 400' Warren through-trusses was built using both standard falsework and cantilever construction techniques. A news story describes how surplus wood was floated down the Osage River from the Bagnell Dam construction site and used to build falsework to assist in the construction of the through-truss between Pier 8 and Pier 9.[76] A later account indicates that that approximately 90 feet of the superstructure was cantilevered southward from Pier 9 toward Pier 10 while the remainder of the span was built using falsework.[77] Although the exact construction techniques employed by the Industrial Construction Company remain unclear, Bridge J-719 still represents one of the highway department's largest through-truss bridges at a river crossing other than those across the Missouri and Mississippi Rivers.

The superstructure of Bridge J-719 rests atop both fixed and expansion shoes at various points. These shoes were based on standard highway department designs, and they allow the bridge to expand and contract without impacting its integrity. The roadbed across the bridge is 20' wide with a 1" crown. The roadbed is composed of 7 3/4"-thick cement poured atop large floor beams composed of several steel I-beams. The bridge does not feature any sidewalks, but it does feature 12" concrete curbs and a guardrail composed of simple steel channels. The bridge originally featured standard nameplates at both ends of the structure, but they have been removed. No major renovations of Bridge J-719 have occurred since it opened to traffic, but the original concrete roadbed has been reinforced by the application of an asphalt coat.

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[73]For a detailed explanation of the cantilever process, see Fraser, *Missouri Historic Bridge Inventory: Draft Inventory Report*, 121-122.

[74]*Ibid*., 122.

[75] Missouri State Highway Department, "Bridge over Osage River: Project No. R-17-S5A"; Missouri State Highway Commission, *Ninth Biennial Report of the State Highway Commission of Missouri for the Period Ending December 1, 1934*, 188; and D.C. Wolfe to N.R. Sack, Signed Memorandum, 5 September 1933, Bridge File.

[76]"Piling to be Used for Constructing False-Work Arrives," *Miller County Autogram*, 6 July 1933, 1.

[77]"Work Proceeds on Main Span of Tuscumbia Bridge," *Miller County Autogram*, 3 August 1933, 1.

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MISSOURI STATE HIGHWAY DEPARTMENT

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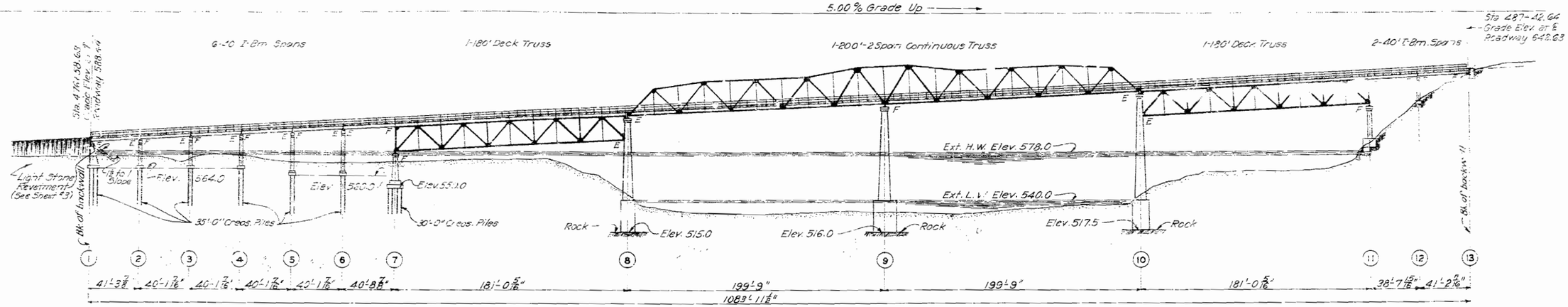
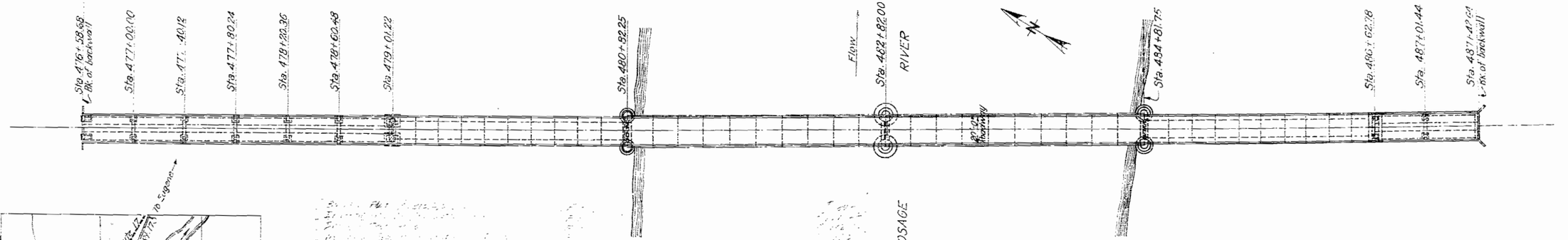
5	MO.	R17 S5A	'33		



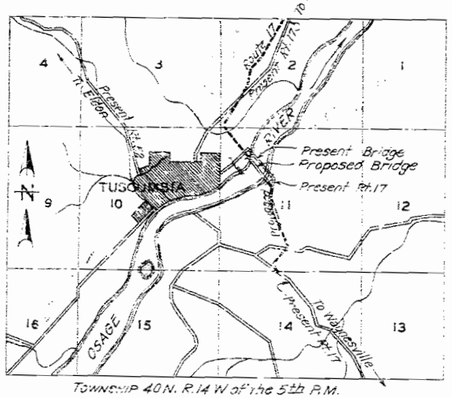
Note - No piling to be ordered until authorized by the Engineer in writing.
Pile lengths include 3'-0" cut-offs.

GENERAL ELEVATION

SCALE 1" = 40'



PLAN



TOWNSHIP 40 N. R. 14 W. of the 5th P.M.

SCALE : 1" = 2640'

LOCATION SKETCH

ESTIMATED QUANTITIES

ITEM		SUBSTRUCTURE	SUPERSTR.	TOTAL
Bridge Excavation Bents 1-7 incl.	Cu. Yds.	690		690
Bridge Excavation Bents 11-13 incl	Cu. Yds.	130		130
Concrete 1:2:4 mix. Class "B" (Piers No. 8, 9 & 10)	Cu. Yds.	1561.1		1561.1
Concrete 1:2:4 mix. Class "B" (Piers No. 1 to 7 & 11 to 13 incl.)	Cu. Yds.	359.3		359.3
Concrete 1:2:3½ mix. Class "X"	Cu. Yds.		582.3	582.3
Fab. Str. Steel (Truss, all bracing and misc.)	Lbs.		790,000	790,000
Fab. Str. Steel (I-Bm. span stringers & all floor metal)	Lbs.		371,000	371,000
Cast Steel	Lbs.		21,600	21,600
Bearing Castings	Lbs.		3,100	3,100
Reinforcing Steel	Lbs.	73,540	176,330	249,870
Creos. Timber Piles	Lin. Ft.	2,616		2,616
Creos. Timber Pile Cut-Offs	Lin. Ft.	228		228
3" ℗ Gas Pipe Handrail	Lin. Ft.		2,170	2,170
2½" ℗ Gas Pipe Handrail	Lin. Ft.		2,175	2,175

Note:- Cost of excavation for Piers No. 8, 9 and 10 to be included in price bid for concrete in Piers No. 8, 9 and 10.
Linear feet of piling shown in estimated quantities include four feet per pile in accordance with specifications for metal shoes.

INDEX TO SHEETS:-

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

B.M. Elev. 575.94. N. & W. in Root 8" Maple 100' Lt. Sta. 480+30.
B.M. Elev. 572.90. N. & W. in Root 30" White Oak 200' Lt. Sta 486+25.

BRIDGE OVER OSAGE RIVER

STATE ROAD FROM TUSCUMBIA TO WAYNESVILLE

ABOUT 11 MILES S.W. OF EUGENE

PROJECT NO. R17-S5A STA 475+58.58 ℄ P.T. 17

MILLER COUNTY

SUBMITTED BY _____ DATE 10/19/32 BRIDGE ENGINEER

APPROVED BY _____ DATE 10/19/32 CHIEF ENGINEER

STD. S918

J-719

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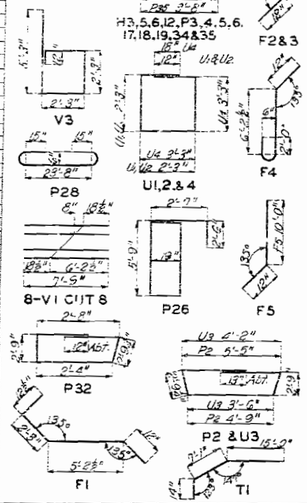
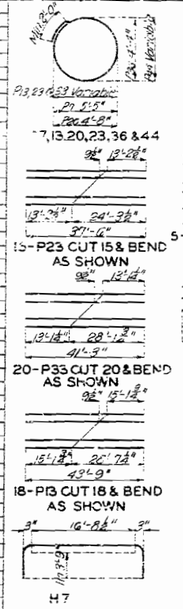
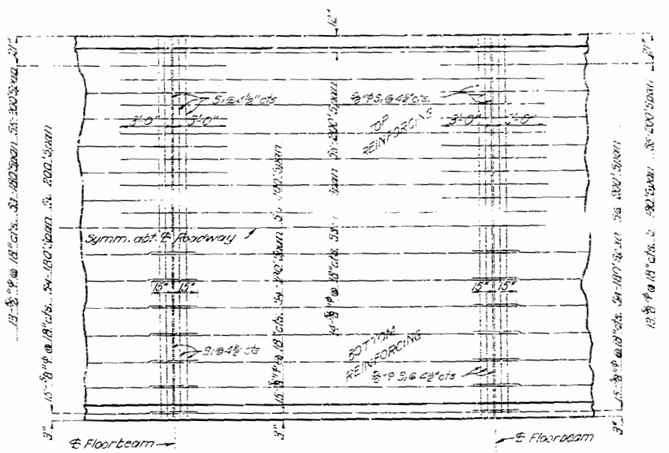
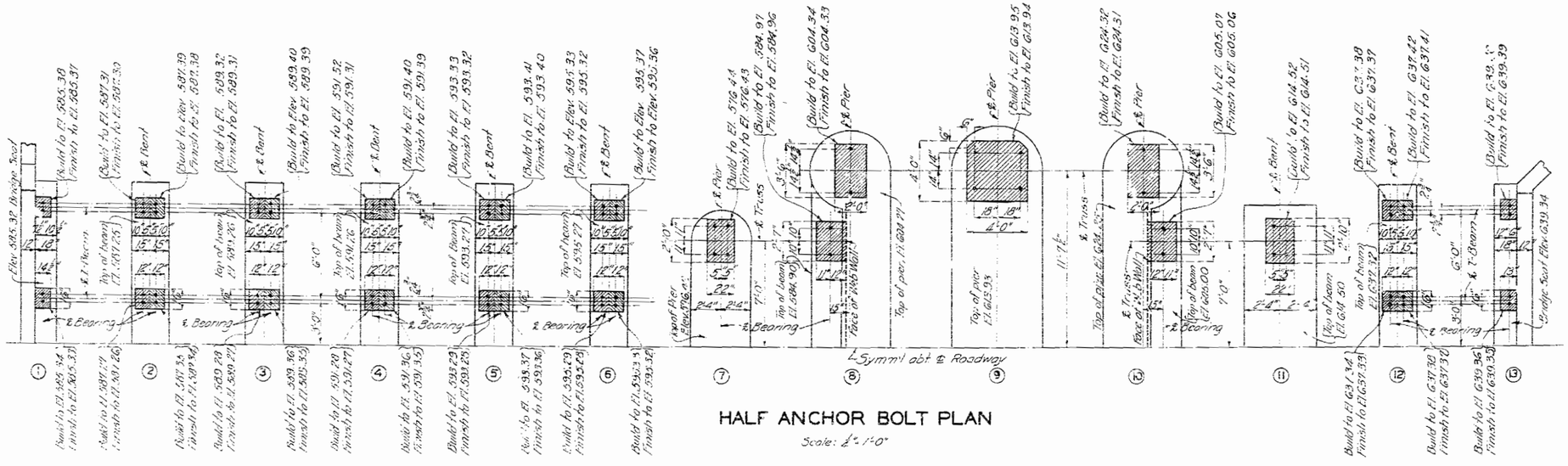
Drawn April 1931 By R.J.G.
Traced April 1931 By R.J.C.
Checked Oct. 1932 By [illegible]









FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO	TOTAL SHEETS
5	MO	R17-S5A	19		

MISSOURI STATE HIGHWAY DEPARTMENT

COMPLETE BILL OF REINFORCING STEEL

No	Size	Length	Mark	Location
		Substructure		
		Bent No. 1		
12	¾" ϕ	5'-3"	D1	Footing
8	¾" ϕ	3'-6"	F1	Haunch
8	¾" ϕ	10'-3"	F2	"
4	⅞" ϕ	12'-6"	H1	Wing Wall
3	⅞" ϕ	19'-6"	H2	" "
7	1" ϕ	23'-3"	H3	Beam
2	¾" ϕ	21'-3"	H4	"
[illegible]	[illegible]	23'-3"	H5	
[illegible]	[illegible]	23'-3"	T1	[illegible]
2	½" ϕ	17'-6"	T2	" "
8	½" ϕ	7'-9"	V1	Wing Wall
2	½" ϕ	6'-3"	V2	" "
21	⅝" ϕ	13'-0"	V3	Back Wall
12	¾" ϕ	18'-9"	V4	Cols.
		Bent No. 2		
16	⅞" ϕ	5'-9"	D2	Footing
10	1" ϕ	10'-3"	F3	Haunch
10	1" ϕ	10'-0"	F4	"
12	1" ϕ	23'-3"	H3	Beam
2	¾" ϕ	21'-3"	H4	"
21	½" ϕ	10'-0"	U1	"
24	¼" ϕ	10'-0"	U2	Cols.
16	⅞" ϕ	20'-6"	V5	"
		Bent No. 3		
16	⅞" ϕ	5'-9"	D2	Footing
10	1" ϕ	10'-3"	F3	Haunch
10	1" ϕ	10'-0"	F4	"
12	1" ϕ	23'-3"	H3	Beam
2	¾" ϕ	21'-3"	H4	"
21	½" ϕ	10'-0"	U1	"
26	¼" ϕ	10'-0"	U2	Col.
16	⅞" ϕ	22'-3"	V6	"
		Bent No. 4		
16	⅞" ϕ	5'-9"	D2	Footing
10	1" ϕ	10'-3"	F3	Haunch
10	1" ϕ	10'-0"	F4	"
12	1" ϕ	23'-3"	H3	Beam
2	¾" ϕ	21'-3"	H4	"
21	½" ϕ	10'-0"	U1	"
28	¼" ϕ	10'-0"	U2	Col.
16	⅞" ϕ	24'-3"	V7	"

Bending Sketches & Cutting Diagrams

No	Size	Length	Mark	Location
		Bent No. 5		
16	⅞" ϕ	6'-6"	D3	Footing
10	1" ϕ	10'-3"	F3	Haunch
10	1" ϕ	10'-0"	F4	"
12	1" ϕ	23'-3"	H3	Beam
2	¾" ϕ	21'-3"	H4	"
21	½" ϕ	10'-0"	U1	"
36	¼" ϕ	10'-0"	U2	Col.
16	⅞" ϕ	29'-9"	V8	"
		Bent No. 6		
16	⅞" ϕ	6'-6"	D3	Footing
10	1" ϕ	10'-3"	F3	Haunch
10	1" ϕ	10'-0"	F4	"
12	1" ϕ	23'-3"	H3	Beam
2	¾" ϕ	21'-3"	H4	"
21	½" ϕ	10'-0"	U1	"
38	¼" ϕ	10'-0"	U2	Col.
16	⅞" ϕ	31'-9"	V9	"
		Pier No. 7		
6	¾" ϕ	5'-3"	P34	Cap
6	¾" ϕ	6'-3"	P35	"
4	¾" ϕ	6'-6"	P16	"
2	½" ϕ	15'-9"	P36	"
6	½" ϕ	14'-3"	U3	"
10	¾" ϕ	14'-9"	P38	"
16	½" ϕ	14'-3"	P39	Web
4	1" ϕ	17'-6"	P40	"
14	½" ϕ	20'-0"	P41	"
24	1" ϕ	20'-0"	P42	Shaft
24	1" ϕ	9'-9"	P43	Footing
5	½" ϕ	25'-6"	P44	Shaft
		Pier No. 8		
32	1" ϕ	9'-0"	P11	Base
62	½" ϕ	23'-6"	P15	Web
4	1" ϕ	23'-6"	P16	"
8	¾" ϕ	4'-9"	P17	Cap
8	¾" ϕ	6'-6"	P18	"
4	¾" ϕ	6'-9"	P19	"
2	½" ϕ	16'-9"	P20	"
72	1" ϕ	24'-0"	P21	Shaft
15	½" ϕ	37'-6"	P23	"
60	½" ϕ	22'-9"	P24	Web
34	⅝" ϕ	19'-9"	P26	Beam
4	1" ▫	23'-9"	P27	"
2	1" ▫	27'-9"	P28	"
6	1" ▫	10'-0"	P29	"
8	1" ▫	9'-3"	P30	"
10	¾" ϕ	23'-6"	P31	Cap
10	½" ϕ	11'-6"	P32	"

No	Size	Length	Mark	Location
		Pier No. 9		
12	¾" ϕ	23'-3"	P1	Cap
9	½" ϕ	16'-9"	P2	"
6	¾" ϕ	4'-6"	P3	"
6	¾" ϕ	6'-9"	P4	"
6	¾" ϕ	7'-6"	P5	"
[illegible]	¾" ϕ	7'-9"	P6	"
[illegible]	½" ϕ	19'-0"	P7	"
32	1" ϕ	27'-6"	P8	Shaft
[illegible]	1" ϕ	27'-6"	P9	"
88	1¼" ▫	27'-6"	P10	"
20	1" ϕ	9'-0"	P11	Base
44	¼"	10'-0"	P12	"
18	½" ϕ	43'-9"	P13	Shaft
60	½" ϕ	26'-0"	P14	Web
70	½" ϕ	23'-6"	P15	"
4	1" ϕ	23'-6"	P16	"
		Pier No. 10		
32	1" ϕ	9'-0"	P11	Base
82	½" ϕ	23'-6"	P15	Web
4	1" ϕ	23'-6"	P16	"
8	¾" ϕ	4'-9"	P17	Cap
8	¾" ϕ	6'-6"	P18	"
4	¾" ϕ	6'-9"	P19	"
2	½" ϕ	16'-9"	P20	"
72	1" ϕ	30'-9"	P22	Shaft
60	½" ϕ	29'-6"	P25	Web
34	⅝" ϕ	19'-9"	P26	Beam
4	1" ▫	23'-9"	P27	"
2	1" ▫	27'-9"	P28	"
6	1" ▫	10'-0"	P29	"
8	1" ▫	9'-[illegible]"	P30	"
10	¾" ϕ	23'-6"	P31	Cap
10	½" ϕ	11'-6"	P32	"
20	½" ϕ	41'-3"	P33	Shaft
		Pier No. 11		
40	1" ▫	8'-0"	D4	Footing
8	1" ▫	11'-0"	F5	Haunch
5	1" ▫	19'-9"	H6	Beam
5	1" ▫	25'-0"	H7	"
2	¾" ϕ	18'-3"	H8	"
12	½" ϕ	14'-3"	U3	"
48	½" ϕ	14'-6"	U4	Col.
16	1" ▫	16'-0"	V10	Col.
24	1" ▫	26'-9"	V11	"

Bending Sketches & Cutting Diagrams

No	Size	Length	Mark	Location
		Bent No. 12		
16	⅞" ϕ	6'-[illegible]	[illegible]	Footing
10	1" ϕ	[illegible]	[illegible]	Haunch
10	1" ϕ	10'-0"	F[illegible]	"
12	1" ϕ	23'-3"	H3	Beam
2	¾" ϕ	21'-3"	H4	"
21	½" ϕ	10'-0"	U1	"
23	¼" ϕ	10'-0"	U2	Col.
8	⅞" ϕ	19'-6"	V13	Col.
8	⅞" ϕ	31'-6"	V14	Col.
		Bent No. 13		
3	¾" ϕ	23'-3"	H12	Beam
1	½" ϕ	21'-3"	H13	Back Wall
22	½" ϕ	3'-3"	H14	Beam
3	¾" ϕ	21'-3"	T3	Back Wall
20	½" ϕ	5'-3"	V15	" "
		Superstructure		
		I-Beam Spans		
128	⅝" ϕ	21'-3"	C1	Curb
400	⅝" ϕ	3'-9"	C2	"
1708	⅝" ϕ	21'-3"	S1	Slab
464	⅜" ϕ	21'-3"	S2	"
		Deck Truss Spans		
480	⅝" ϕ	3'-9"	C2	Curb
96	⅝" ϕ	32'-0"	C3	"
1920	⅝" ϕ	21'-3"	S1	Slab
216	⅝" ϕ	24'-0"	S3	"
240	⅝" ϕ	20'-6"	S4	"
27	⅝" ϕ	21'-0"	S9	"
14	⅝" ϕ	22'-0"	S10	"
13	⅝" ϕ	20'-0"	S11	"
30	⅝" ϕ	19'-3"	S12	"
15	⅝" ϕ	20'-3"	S13	"
15	⅝" ϕ	18'-3"	S14	"
		Continuous Truss Span		
480	⅝" ϕ	3'-9"	C2	Curb
112	⅝" ϕ	30'-9"	C4	"
2136	⅝" ϕ	21'-3"	S1	Slab
216	⅝" ϕ	26'-0"	S5	"
240	⅝" ϕ	22'-5"	S6	"
54	⅝" ϕ	23'-0"	S7	"
60	⅝" ϕ	21'-3"	S8	"

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

TYPICAL INT. PANEL SHOWING REINFORCING IN 180' DECK TRUSS & 200' CON'T. TRUSS SPANS

LONG. STEEL END PANELS

SPAN	AT PIER NO.	TOP REINF.		BOTTOM REINF.	
		NO. BARS	MARK	NO. BARS	MARK
180'	7	13	S9	15	S12
	8	14	S10	15	S13
200	8	13	S7	15	S8
	9	14	S7	15	S8
	9	13	S7	15	S8
	10	14	S7	15	S8
180	10	13	S11	15	S14
	11	14	S9	15	S12

INSTRUCTIONS FOR FINISHING BENT CAPS & PIER COPINGS:-

Substructure contractor shall build tops of bents and piers to elevations given, and the raised shaded areas to not less than elevations given on Anchor Bolt Plan. These raised shaded areas shall be monolithic with the bent caps and pier copings.

Superstructure contractor shall have the raised shaded areas ground, or dressed down to a true and horizontal surface at the elevations given for finish on Anchor Bolt Plan. Adequate protection of the finished surfaces shall be provided until the shoes are set. Shoes shall be set on ⅛" of sheet lead, extending ½" beyond the edges of shoes, and over the entire shoe area; the lead sheet being placed on the surfaces prepared in accordance with the above instructions. Cost of lead sheets to be included in the price bid for other items.

HALF ANCHOR BOLT PLAN

Scale: ⅛" = 1'-0"

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

Designed Mar. 1931 By F.W.H.
Drawn April 1931 By H.E.C.
Traced April 1931 By H.E.C. & G.W.
Checked Oct. 1932 By L.C.H.

Sheet No. 2 of 14

BRIDGE OVER OSAGE RIVER

STATE ROAD FROM TUSCUMBIA TO WAYNESVILLE
ABOUT 11 MILES S.W. OF EUGENE
PROJECT NO. R.17-S5A STA. 476+58.68
MILLER COUNTY

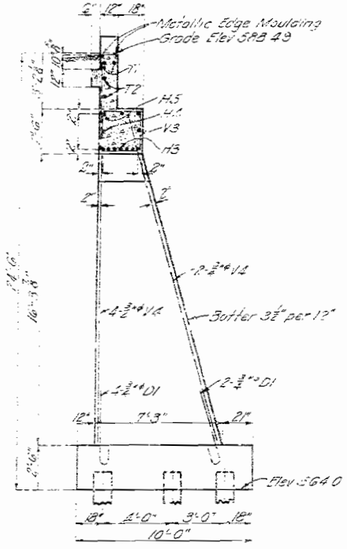
SUBMITTED BY ______ DATE 10/17/32
BRIDGE ENGINEER
APPROVED BY H Cutler DATE 10/17/32
CH. OF ENGINEER

J-719

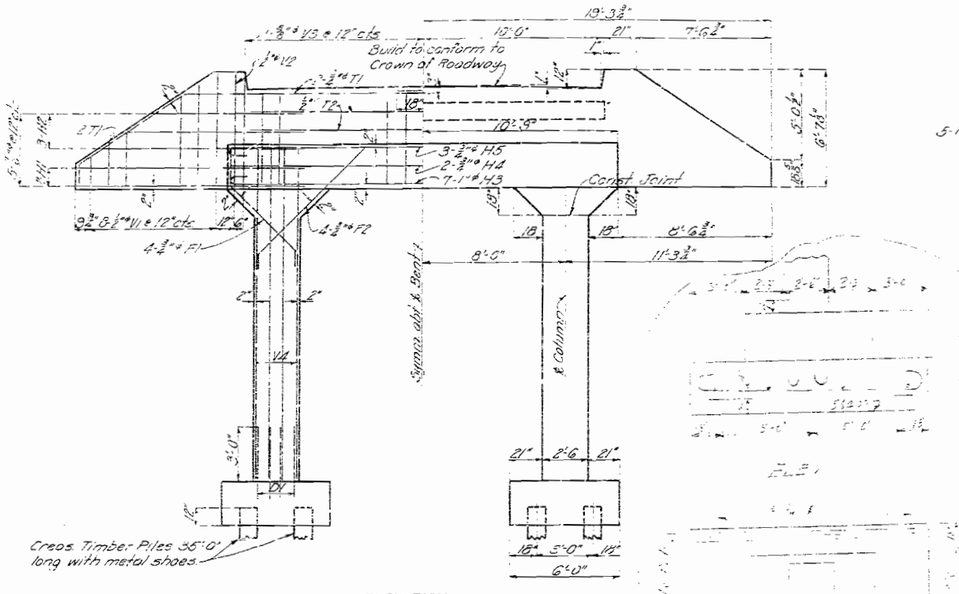
BAR BILL AND ANCHOR BOLT PLAN

MISSOURI STATE HIGHWAY DEPARTMENT

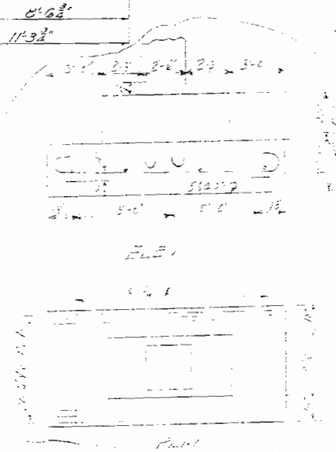
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	MO.	P.17-S5A	13		



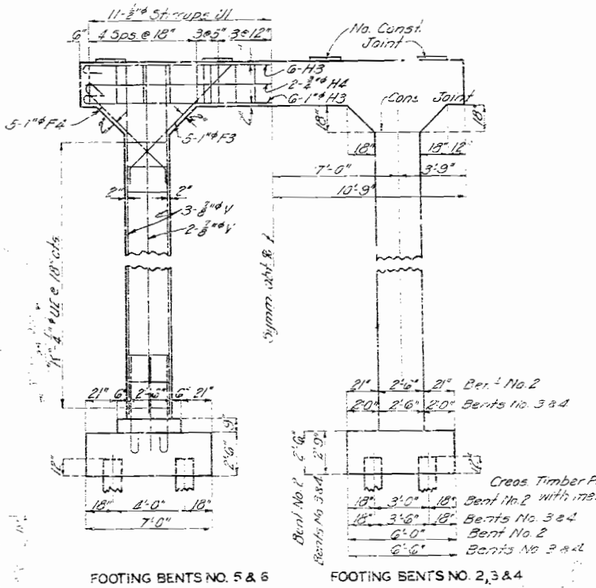
SECTION AT ℄



ELEVATION

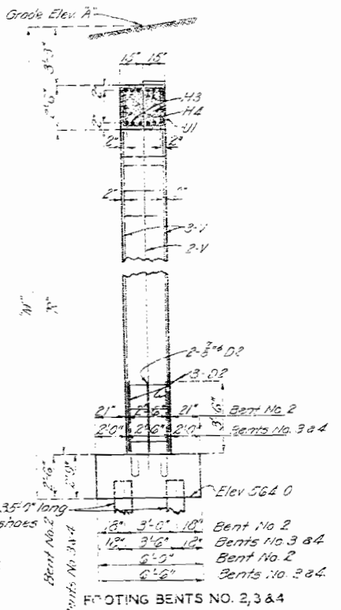


PLAN

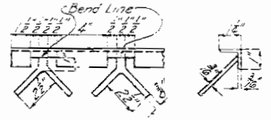


FOOTING BENTS NO. 5 & 6
ELEVATION

FOOTING BENTS NO. 2, 3 & 4

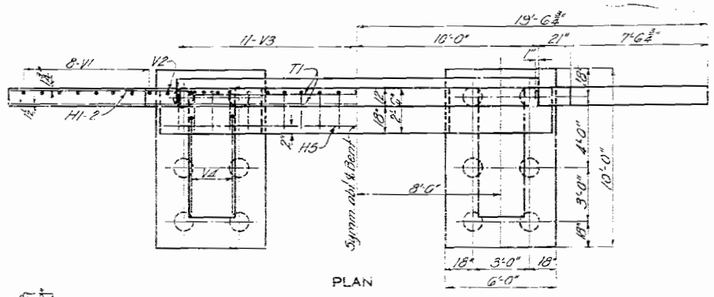


FOOTING BENTS NO. 2, 3 & 4
SECTION AT ℄



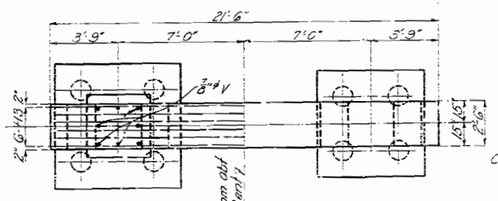
METALLIC EDGE MOULDING

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

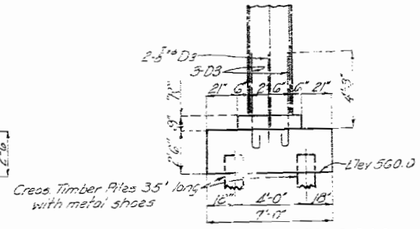


PLAN

DETAIL OF END BENT NO. 1



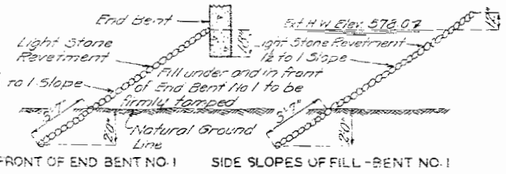
FOOTING BENTS NO. 5 & 6



FOOTING BENTS NO. 2, 3 & 4

PLAN

DETAILS OF BENTS NO. 2, 3, 4, 5 & 6



FRONT OF END BENT NO. 1 SIDE SLOPES OF FILL - BENT NO. 1

Note: Light stone revetment to be placed on fills at End Bent No 1 as shown in sketches. Approximately 140 sq. yds. of light stone revetment work included in road contract.

REVETMENT SKETCHES

TABLE OF VARIABLES					
VARIABLES	BENTS				
	No. 2	No. 3	No. 4	No. 5	No. 6
"A"	590.30	592.31	594.31	596.52	598.52
"M"	26'-6"	26'-6⅝"	30'-6⅝"	36'-6⅝"	38'-6⅝"
"P"	18'-3"	20'-0⅝"	22'-0⅝"	27'-2"	29'-6⅝"
"V" Bars	V5	V6	V7	V8	V9
"K"	12	13	14	15	19

Notes:-
Cost of metallic edge moulding to be included in price bid for other items.
For detail of pile shoe, see Sheet No. 4.
For general substructure notes, see Sheet No. 6.
All caps under shoes are to be built to elevation and finished in accordance with instructions on anchor bolt plan, Sheet No. 2.
These blocks under shoes are to be monolithic with bent cap.

Note: This drawing is not to scale Follow dimensions.

BRIDGE OVER OSAGE RIVER

STATE ROAD FROM TUSCUMBIA TO WAYNESVILLE

ABOUT 11 MILES S.W. OF EUGENE

PROJECT NO. R17 S5A STA 475+58.68

MILLER COUNTY

SUBMITTED BY _____ DATE 6/9/32 BRIDGE ENGINEER

APPROVED BY _____ DATE 7/9/32 CHIEF ENGINEER

Designed April 1931 By F.W.H.
Drawn April 1931 By H.E.C.
Traced April 1931 By G.W.
Checked Oct 1932 By L.E.R.

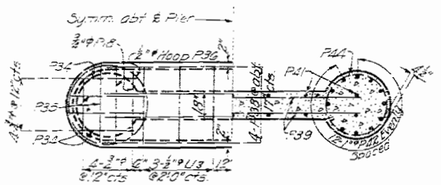
J-719

Sheet No 3 of 14 Sheets

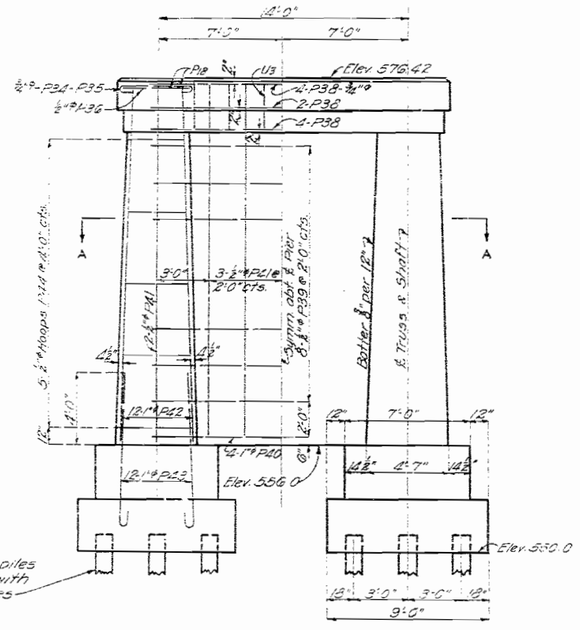
BENTS NO. 1-2-3-4-5 & 6

MISSOURI STATE HIGHWAY DEPARTMENT

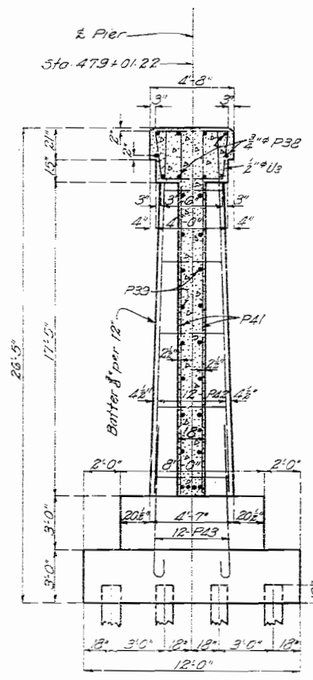
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	MO.	RM-55A	19		



HALF PLAN OF TOP HALF SECTION A-A

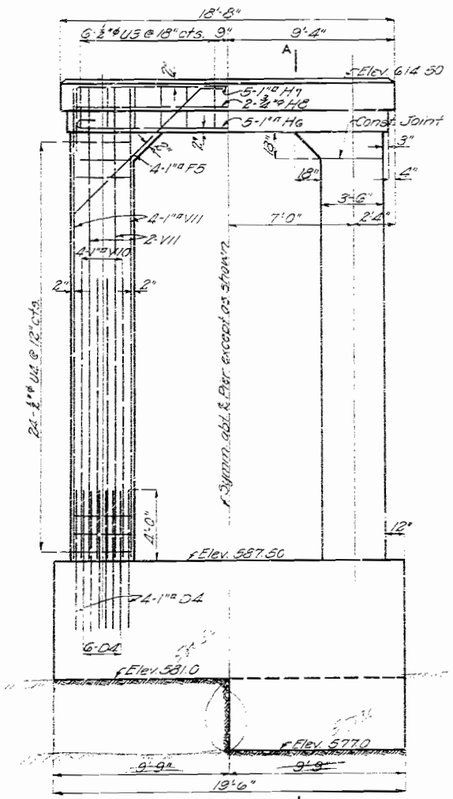


ELEVATION

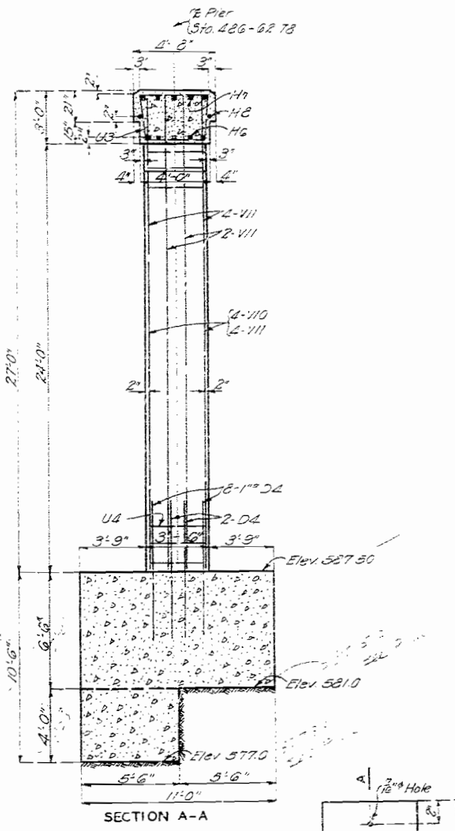


SECTION AT ℄

DETAIL OF PIER NO. 7



ELEVATION



SECTION A-A

PLAN

DETAIL OF PIER NO. 11

ELEVATIONS

SECTION A-A

DETAILS OF PILING SHOE

76 REQ'D.

Note: For General substructure notes see Sheet No. 6.
All pier copings under shoes are to be built to elevation and finished in accordance with instructions on anchor bolt plan, Sheet No 2
These blocks under shoes are to be monolithic with pier copings.

BRIDGE OVER OSAGE RIVER

STATE ROAD FROM TUSCUMBIA TO WAYNESVILLE

ABOUT 11 MILES S.W. OF EUGENE

PROJECT NO. R17-55A STA. 476+58.68

MILLER COUNTY

J-719

Designed Oct 1932 by R.W.R.
Drawn Oct 1932 by H.E.C.
Traced Oct 1932 by G.V.
Checked Oct 193 by

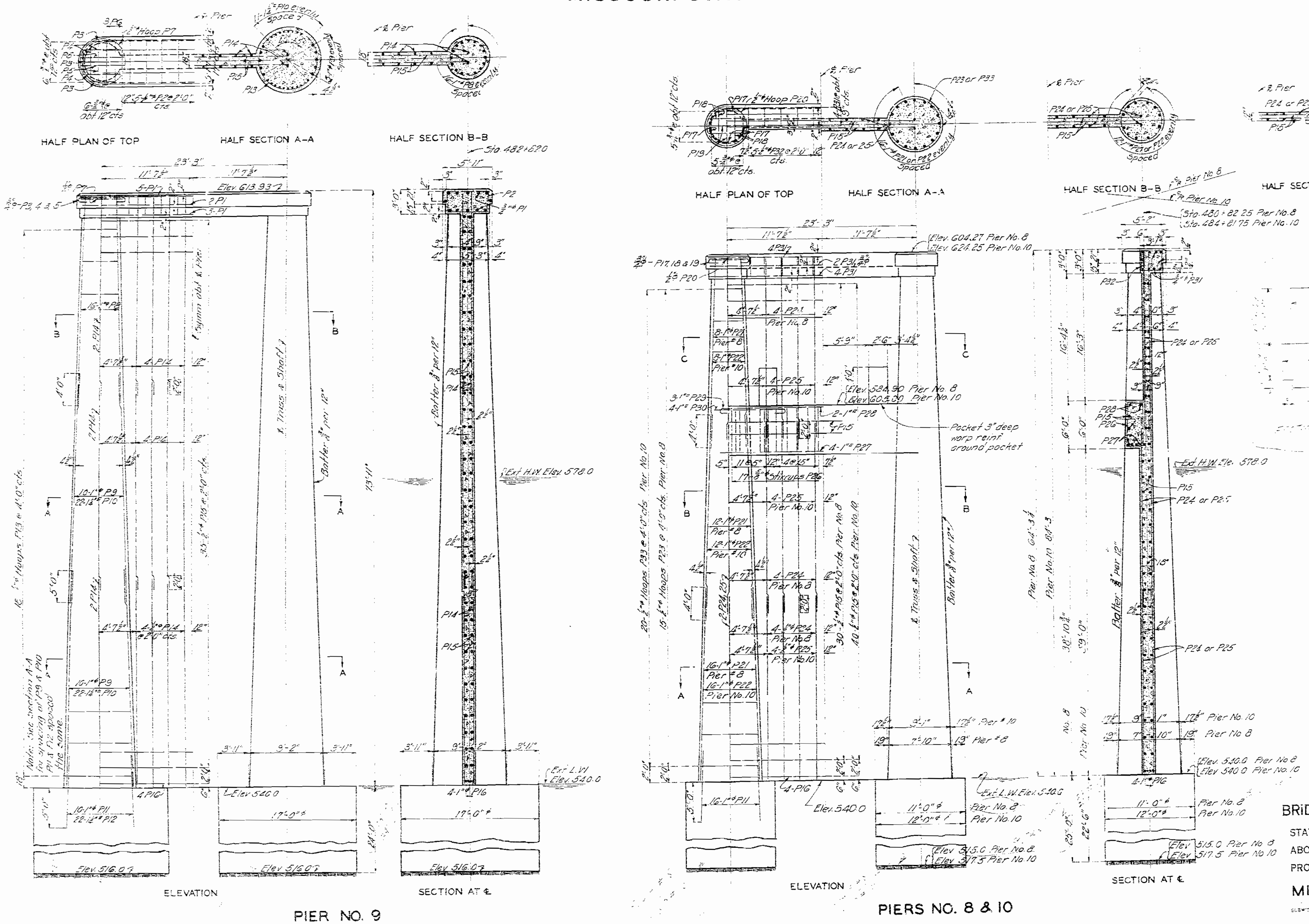
Note: This drawing is not to scale. Follow dimensions

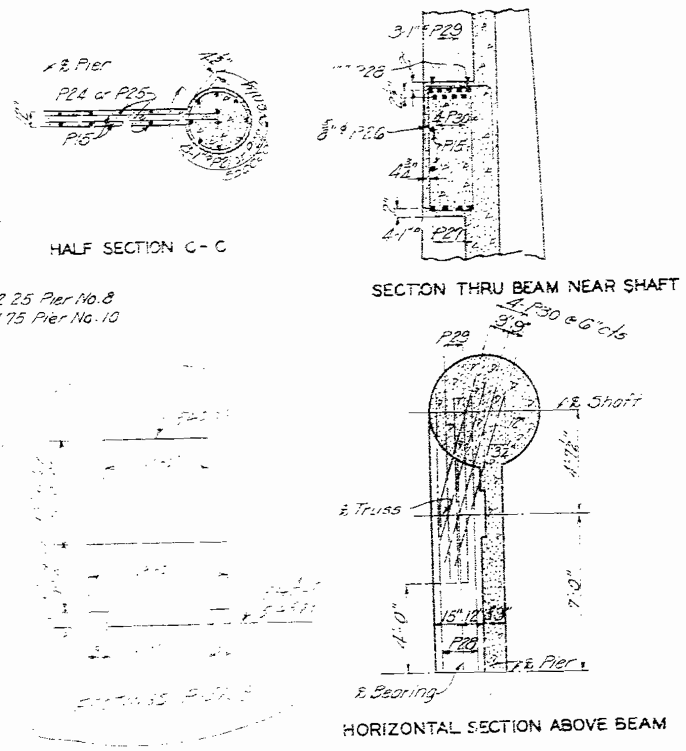
Sheet No 4 of 14

PIERS NO. 7 & 11

MISSOURI STATE HIGHWAY DEPARTMENT

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	MO	R17-S5A	13		





Notes:
For general substructure notes see Sheet No. 6.
All pier copings under shoes are to be built to elevation and finished in accordance with instructions on anchor bolt plan, Sheet No. 2.
Bases of Piers No. 8, 9 & 10 may be made square with sides equal to diameters shown. For payment of concrete in bases and for payment of excavation for bases, see Special Provisions.
Blocks under shoes are to be monolithic with pier copings and of size shown on Sheet No. 2

Note: This drawing is not to scale
Follow dimensions.

BRIDGE OVER OSAGE RIVER

STATE ROAD FROM TUSCUMBIA TO WAYNESVILLE
ABOUT 11 MILES S.W. OF EUGENE
PROJECT NO. R17 S5A   STA 476+58.68

MILLER COUNTY

SUBMITTED BY N. R. [illegible] DATE 10/7/32 BRIDGE ENGINEER
APPROVED BY T. H. Cutler DATE 10/7/32 CHIEF ENGINEER

J-719

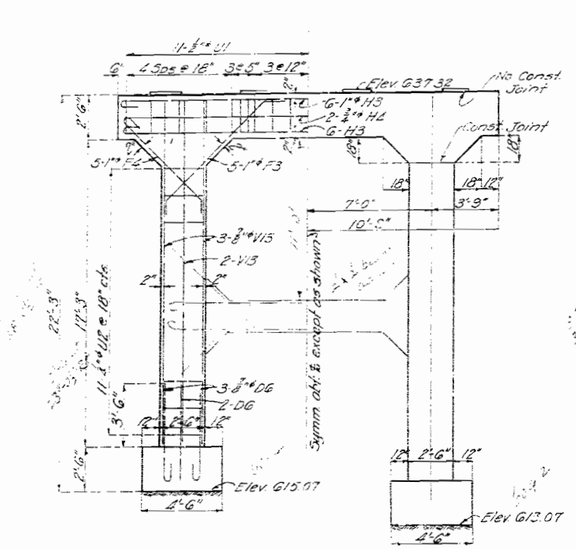
Designed April 1931 By R.W.H.
Drawn April 1931 By H.E.C.
Traced April 1931 By G.W.
Checked Oct. 1932 By [illegible]

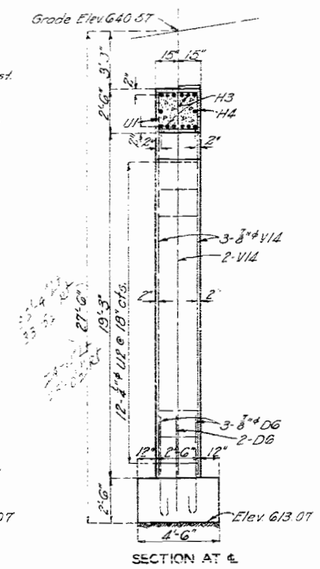
Sheet No. 5 of 14

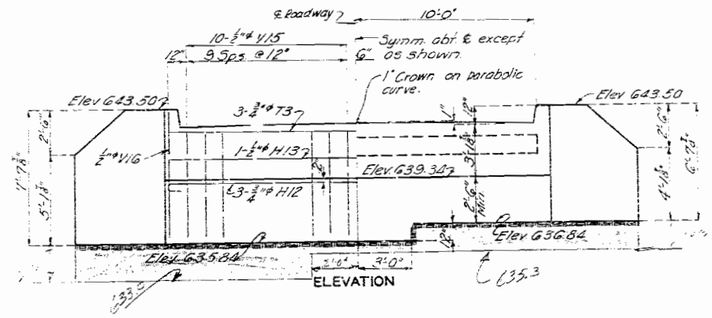
PIERS NO. 8, 9 & 10

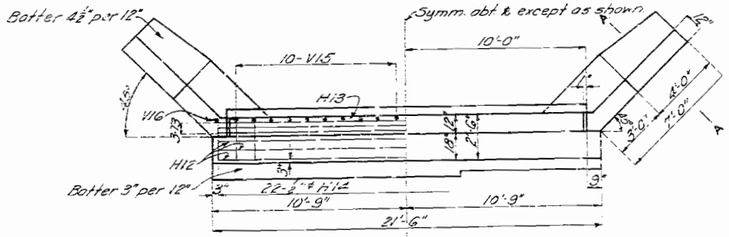
MISSOURI STATE HIGHWAY DEPARTMENT

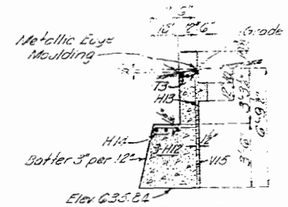
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	MO.	(P.T.-55A)	19		

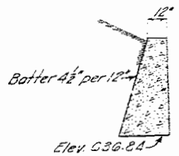






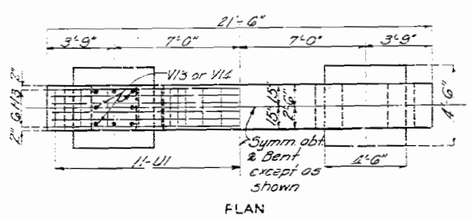






Note:- Height of wings vary with rock line. Carry base at least 6' into firm, undisturbed rock. For stepping wings to conform to rock make sides of slopes vertical and bearing surface horizontal.

DETAIL OF ABUTMENT NO. 13



DETAIL OF BENT NO. 12

GENERAL SUBSTRUCTURE NOTES:

All substructure concrete to be 1:2:4.
Exposed edges shall be beveled ¾" where no other bevel is noted.
Provide substantial keys at all construction joints.
Lap splices in reinforcing bars 48 diameters except as otherwise noted.
Bends, except hooks, shall have a radius of not less than 16 diameters.
Hooks as shown 8 diameters unless otherwise noted.
All footings on rock shall be carried at least 6" into solid rock. Rock to be capable of carrying a foundation load of 15 ton per square foot. See Special Provisions.
All cofferdam bracing which interferes with shafts or webs, is to be removed as the shafts or webs are concreted. No bracing shall be placed against any of the completed portions until they have attained sufficient strength. All cofferdams to be removed down to Elev. 540.0 before final acceptance of work.
Care shall be taken in placing reinforcing steel in bent caps and pier copings to clear the location of anchor bolt wells. See Specifications.
Changes may be made in construction of Piers No. 6, 9 and 10 below Elev. 540.00, providing the minimum distance from the centerline of shaft to the edge of concrete is not less than ½ the base diameter shown on the pier plans. If any changes are made from the details shown on the plans, complete working drawings and an outline of the construction methods shall be submitted to the Missouri State Highway Department before construction of the same begins. The cost of any additional concrete or excavation required by such changes shall be paid by the contractor.
All piling shall be creosoted; shod with pile shoes as shown on Sheet No. 4; and driven to a minimum bearing of 20 ton per pile.
No piling shall be ordered until authorized by the Engineer in writing.

Notes:
All caps under shoes are to be built to elevation and finished in accordance with instructions on anchor bolt plan, Sheet No. 2.
These blocks under shoes are to be monolithic with bent caps.

BRIDGE OVER OSAGE RIVER

STATE ROAD FROM TUSCUMBIA TO WAYNESVILLE

ABOUT 11 MILES S.W. OF EUGENE

PROJECT NO. R17-55A STA. 476+58.68

MILLER COUNTY

SUBMITTED BY _____ DATE 1/17/32 BRIDGE ENGINEER

APPROVED BY _____ DATE 1/17/32 CHIEF ENGINEER

J-719

Designed April 1931 By F.W.H
Drawn April 1931 By H.E.C
Traced April 1931 By G.W.
Checked Oct 1932 By LDK

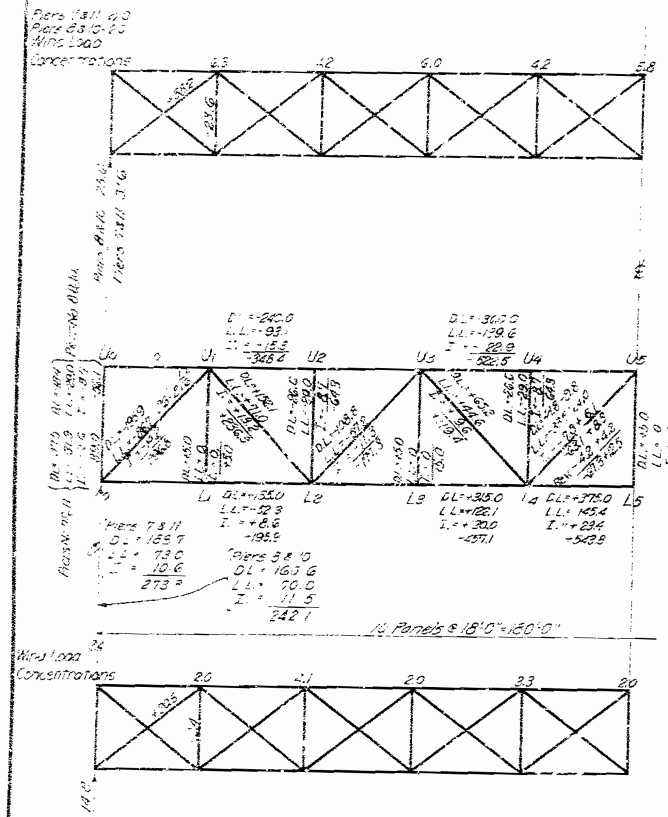
Note: This drawing is not to scale. Follow dimensions.

Sheet No. 6 of 14

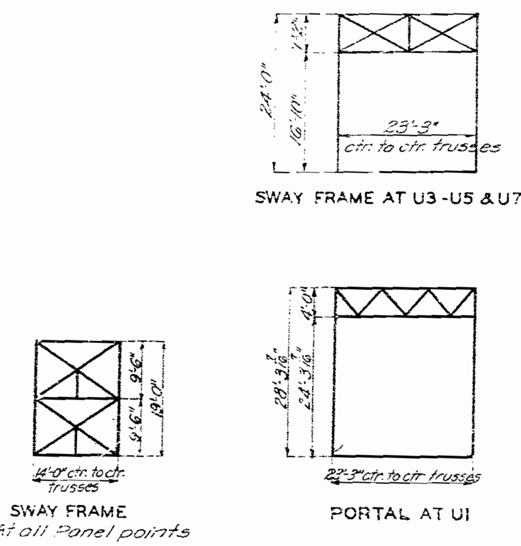
BENT NO. 12 & ABUTMENT NO. 13

MISSOURI STATE HIGHWAY DEPARTMENT

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
6	MO.	[illegible]	[illegible]		



All dimensions are Normal. For camber see Sheet No. 9.
For Truss Sections, see Sheets No. 9 and 10.



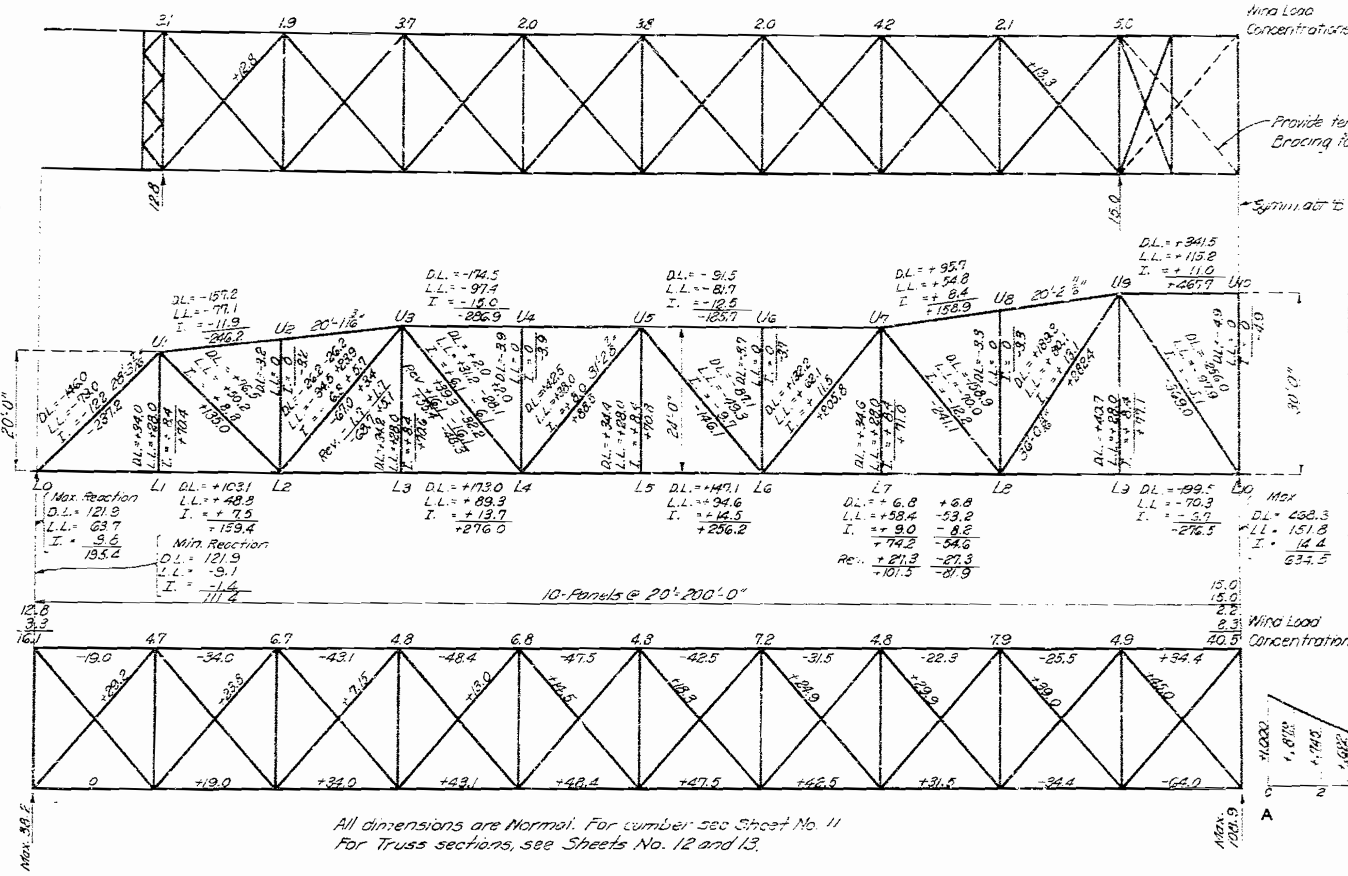
SWAY FRAME AT U3-U5 & U7

SWAY FRAME
At all Panel points

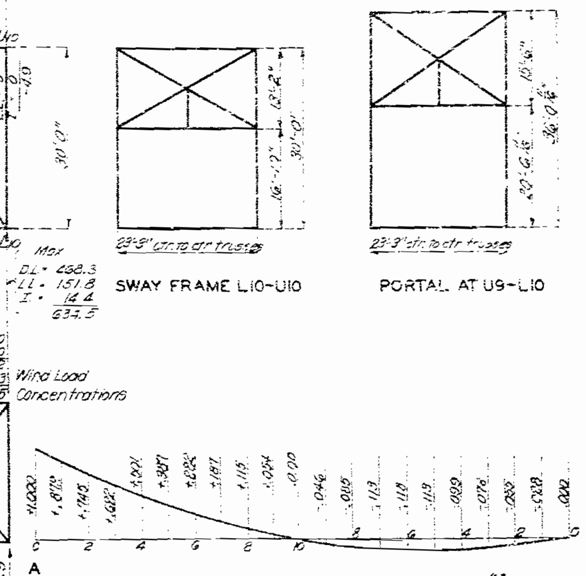
PORTAL AT U1

TABLE OF DEAD LOAD PANEL CONCENTRATIONS ON ONE TR.							
	Lo		L1	L2	L3	L4	L5
Trusses & Bracing Top Chord	32.5	2.5	5.2	3.5	5.0	3.9	4.8
Trusses & Bracing Bottom Chord	2.7	2.7	3.2	5.0	3.5	4.6	3.7
Floor Metal & Misc.	2.5	2.4	3.7	3.6	3.6	3.6	3.6
Total Structural Steel	37.7	7.6	12.1	12.1	12.1	12.1	12.1
Floor Slab & Curb	9.8	10.8	19.5	19.5	19.5	19.5	19.5
Total	47.5	18.4	31.6	31.6	31.6	31.6	31.6

At Piers No. 7 & 11 — At Piers No. 8 & 10



All dimensions are Normal. For camber see Sheet No. 11
For Truss sections, see Sheets No. 12 and 13.



SWAY FRAME L10-U10

PORTAL AT U9-L10

ELASTIC CURVE FOR END REACTION AT "A"

TABLE OF DEAD LOAD PANEL CONCENTRATIONS ON ONE TRUSS											
	Lo	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10
Trusses & Bracing Top Chord	0.0	5.16	3.19	4.56	3.90	4.94	3.74	5.50	3.28	10.67	4.94
Trusses & Bracing Bottom Chord	3.72	2.56	3.74	3.20	3.78	2.96	4.43	2.60	5.55	3.73	12.25
Floor Metal & Misc.	4.20	4.60	4.62	4.74	4.74	4.74	4.74	4.74	4.74	4.74	4.74
Total Structural Steel	7.92	12.32	11.55	12.50	12.42	12.66	12.91	12.84	13.57	19.14	21.93
Floor Slab & Curb	10.86	21.72	21.72	21.72	21.72	21.72	21.72	21.72	21.72	21.72	21.72
Total	18.78	34.04	33.27	34.22	34.14	34.38	34.62	34.56	35.29	40.86	43.65

GENERAL NOTES FOR SUPERSTRUCTURE:

Specifications:- Designed in accordance with the A.A.S.H.O. Conference Specifications for Structural Steel Highway Bridges of 1929, with exceptions as noted.

Loading:- Dead load as computed from detail drawings. Live load; H15 A.A.S.H.O. 1929, except equivalent uniform load of 510 lbs. per linear foot with 7500 lb. concentration for moment and 15000 lb. concentration for shear. Equivalent loads are distributed over a 9 foot traffic lane, with no reduction in L.L. for loaded widths over 18 feet. Wind load combined with dead load:- Transverse, 30# per sq. ft. on the vertical projection of 2 trusses, 2 handrails and one floor; but not less than 300# per lin. ft. of loaded chord and 150# per lin. ft. of unloaded chord. Longitudinal wind 50% of transverse. Wind load combined with dead load, live load and impact, 50% of above.

Impact:- A.A.S.H.O. formula, (50÷(L+125)), but not to exceed 30%. All stringers and intermediate floorbeams, 30%. End floorbeams and all floorbeam connections, 60%.

Design Unit Stresses:- Tension = 16000# per sq. in. Compression = $\frac{16000}{1+\frac{1}{13500}(l/r)^2}$, but not to exceed 14300# per sq. in.

Rivets:- Shop, 12000# □" shear, 24000# □" bearing; Field (and turned bolts), 10000# □" shear, 20000# □" bearing.

Figures thus ④ indicate total number of rivet holes out of each tension member.

Stresses are given in 1000 of lbs.

Erection stresses shall not exceed design stresses by more than 50% and particular attention to column action shall be given to tension members which may carry erection compression.

Rivets:- Rivets in trusses and floor system 7/8"φ (except in flanges of 10" I's, 3/4"φ). Rivets in I-Bm. Spans, bracing, and handrail, 3/4"φ. Maximum pitch of rivets as per Article 1504. Pitch in ends of compression members as per Article 1503. Stitch rivets as per Article 1505. Article references are to A.A.S.H.O. specifications of 1929.

Shop Practice:- Detail shop drawings for all structural and cast steel shall be submitted to the State Highway Department in duplicate, and shall be approved before steel is fabricated. Punching, reaming and other shop requirements shall be in accordance with the specifications. These requirements shall be clearly noted on the shop drawings to avoid oversight.

Erection Requirements:- The contractor shall furnish the Missouri State Highway Department with complete plans of his erection method for approval before preparing shop drawings. Should the contractor find it necessary to use additional metal due to erection stresses, the required modifications shall be made subject to the approval of the Missouri State Highway Department, but the expense of all additional metal shall be paid by the contractor.

All stringers are to be fabricated for Normal panel lengths. All diagonals of the lateral systems are to be fabricated for Normal panel lengths.

Concrete in Roadway and Curb:- Concrete to be 1:2:3½ mix "X." Exposed edges shall be beveled ¾" where no other bevel is noted. Floor slab is to be brought to grade and dead load deflection of stringers shall be taken care of by increasing slab thickness.

Where rubber compound is used in roadway joints, stitch securely to one face of concrete with copper wire.

Paint:- Shop Paint:- None. Field Paint:- Surfaces inaccessible after erection, four coats of red lead. No other paint to be applied by contractor.

All paint required will be furnished by the Missouri State Highway Department.

Pins, pin bearings, and all machined surfaces of castings, to be protected until installed, by a coat of white lead and tallow.

Normal Dimensions:- Where dimensions are given in terms of "Normal," the dimensions are to be taken to occur at 60° Fahrenheit, and with uncambered truss dimensions as shown on stress diagrams.

Name Plate:- Two name plates type "B" as shown on Std. 5918 to be furnished and placed by contractor. Cost of name plates to be included in price bid for other items.

Handrail Erection:- Handrail shall be aligned, field connections reamed and riveted, after the floor slab is poured and before curb is placed.

Note: This drawing is not to scale
Follow dimensions.

Designed Mar. 1931 By F.W.H.
Drawn May 1931 By H.E.C
Traced May 1931 By H.E.C & G.W.
Checked Oct. 1932 By L.B.

BRIDGE OVER OSAGE RIVER

STATE ROAD FROM TUSCUMBIA TO WAYNESVILLE

ABOUT 11 MILES S.W. OF EUGENE

PROJECT NO. R.17-S.5A STA. 476+58.68

MILLER COUNTY

SUBMITTED BY N. R. Sack DATE 10/17/32 BRIDGE ENGINEER

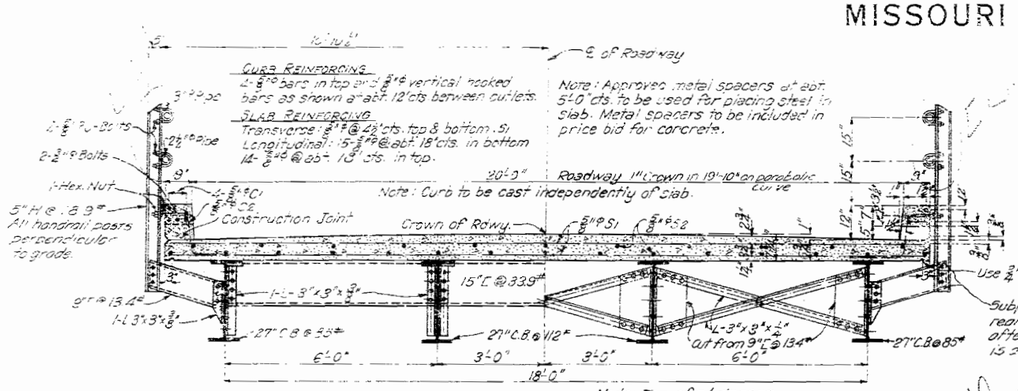
APPROVED BY T.H. Cutler DATE 10/17/32 CHIEF ENGINEER

J-719

STRESS SHEET AND GENERAL NOTES

MISSOURI STATE HIGHWAY DEPARTMENT

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
6	MO.	RII-55A	19		

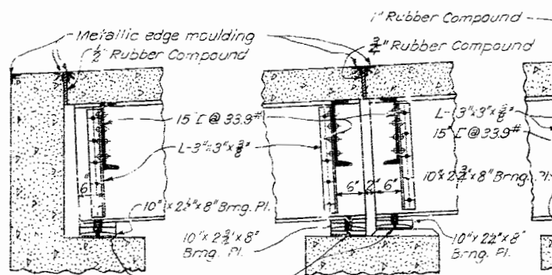


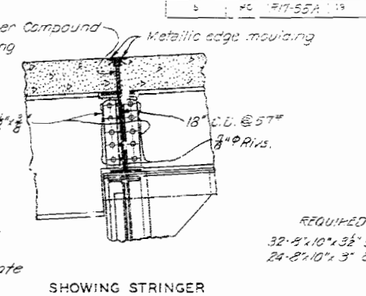
Note: Top of channel separators at ends of each I-Beam Span to be flush with bottom of floor slab.

SECTION AT BENT
SHOWING END SEPARATORS

Note: Top of stringers to be flush.

SECTION THRU SPAN
SHOWING INT. SEPARATORS

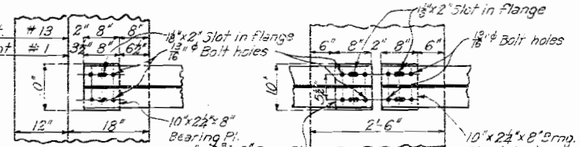




REQUIRED:
32-8'-4"x10"x35# Brgs. Exp.
24-8'-4"x10"x 3" Brgs. Fix.

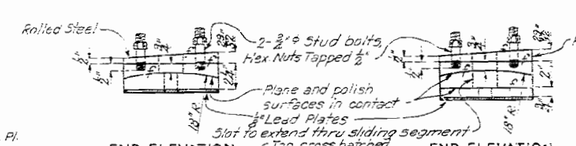
DETAILS OF BEARING (inside stringers shown)

SUBSTITUTIONS PERMITTED	
Carnegie	Bethlehem
27"C.B @ 85#	28"B.I. @ 85#
27"C.B. @ 112#	28"B.I. @ 112#

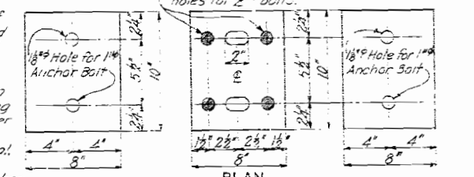


All dimensions for substructure are computed on use of Carnegie Beams. If delt. then Beams are used, the contractor shall check all dimensions and report changes. See Special Provisions in regard to substitutions and payment.

TYPICAL DETAILS OF BEARING

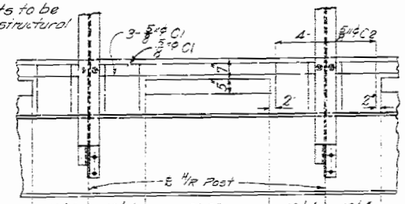


Note: A mixture of flake graphite and oil to be applied to surfaces in contact before placing plates in structure. Bearing plates to be either cast steel or Meehanite metal. See Special Provisions. Anchor bolts to be 1"ø no heads. Hex. nuts and to extend 12" into concrete. Bolts and nuts to be paid for as structural steel.



Note: Plan same for fixed or expansion end.

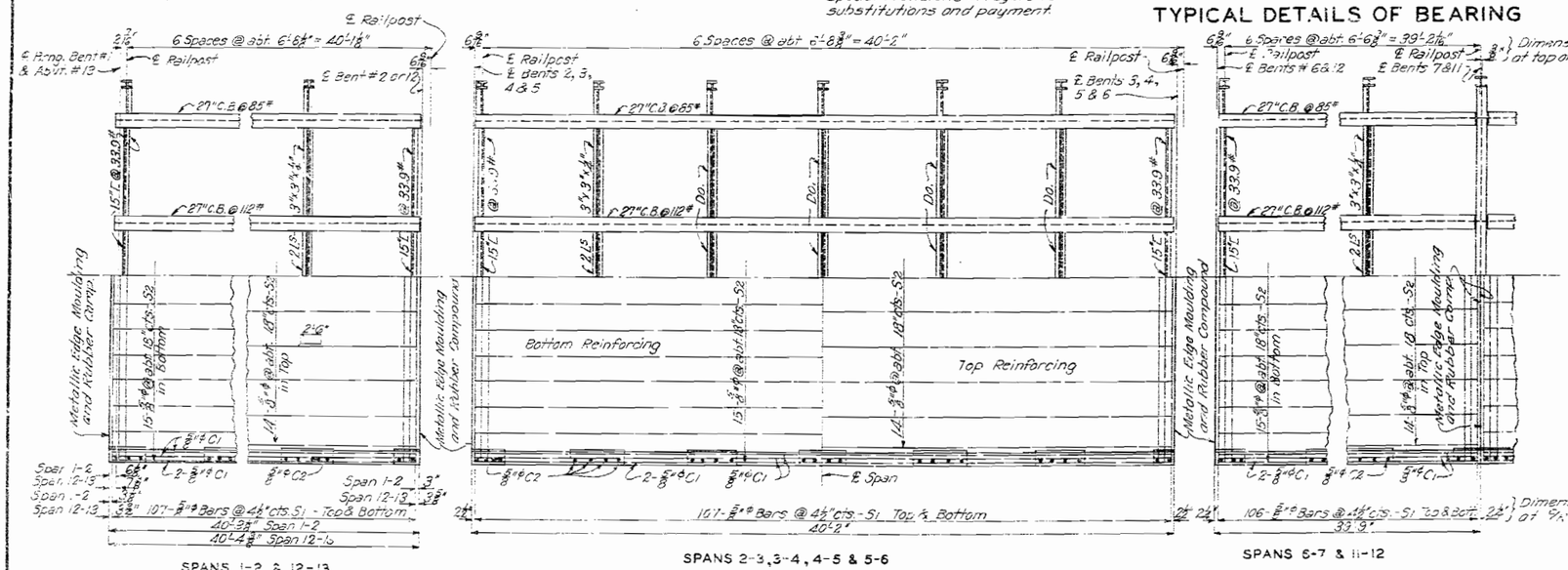
DETAILS OF BEARING PLATES



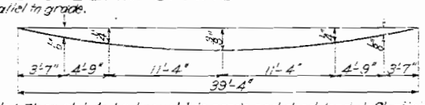
19⅞"	19⅞"	3'-6"	19⅞"	19⅞" Spans 1-2 & 12-13
19"	19⅞"	3'-0"	19⅞"	19⅞" Spans 2-3 to 5-6 Incl.
18⅞"	18⅞"	3'-6"	18⅞"	18⅞" Spans 6-7 & 11-12
		6'-8⅝"		Spans 1-2 & 12-13
		6'-8⅝"		Spans 2-3 to 5-6 Incl.
		6'-6⅜"		Spans 6-7 & 11-12

TYPICAL DETAIL OF OUTLETS

Note "A" post spacing may be varied 1" at option of fabricator.

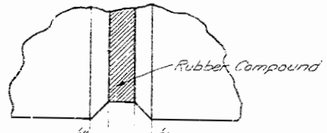


PART PLAN OF 40' I-BEAM SPANS
All dimensions parallel to grade.



Note: Floor slab to be brought to grade and dead load deflection taken care of by increasing slab thickness. Depth of slab at outside face of curb to be kept uniform and bottom surface of slab warped between curb and outside beam to obtain required thickness at beam. Payment will be allowed for additional concrete required for thickening slab. This additional concrete is included in "Estimated Quantities."

DEFLECTION DIAGRAM



Note: Use bevel as shown for exposed faces of all joints consisting of rubber compound except at top surface of roadway slab. Use metallic edge moulding at top surface of roadway slab each side of rubber compound joints.

DETAIL OF BEVEL FOR RUBBER COMPOUND JOINTS

Notes: For general superstructure notes, see Sheet No. 7
Rivets ⅞"ø except at bents No. 1 and 11.
For detail of metallic edge moulding see Sheet No. 3.

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

BRIDGE OVER OSAGE RIVER

STATE ROAD FROM TUSCUMBIA TO WAYNESVILLE

ABOUT 11 MILES S.W. OF EUGENE

PROJECT NO. R17-55A STA. 476+58.66

MILLER COUNTY

SUBMITTED BY _____ DATE 10-10-32
BRIDGE ENGINEER

APPROVED BY T.H. Cullen DATE 10-10-32
CHIEF ENGINEER

J-719

Designed Feb. 1931 By F.W.H.
Drawn April 1931 By R.J.G.
Traced April 1931 By R.J.G.
Checked Oct. 1932 By [illegible]

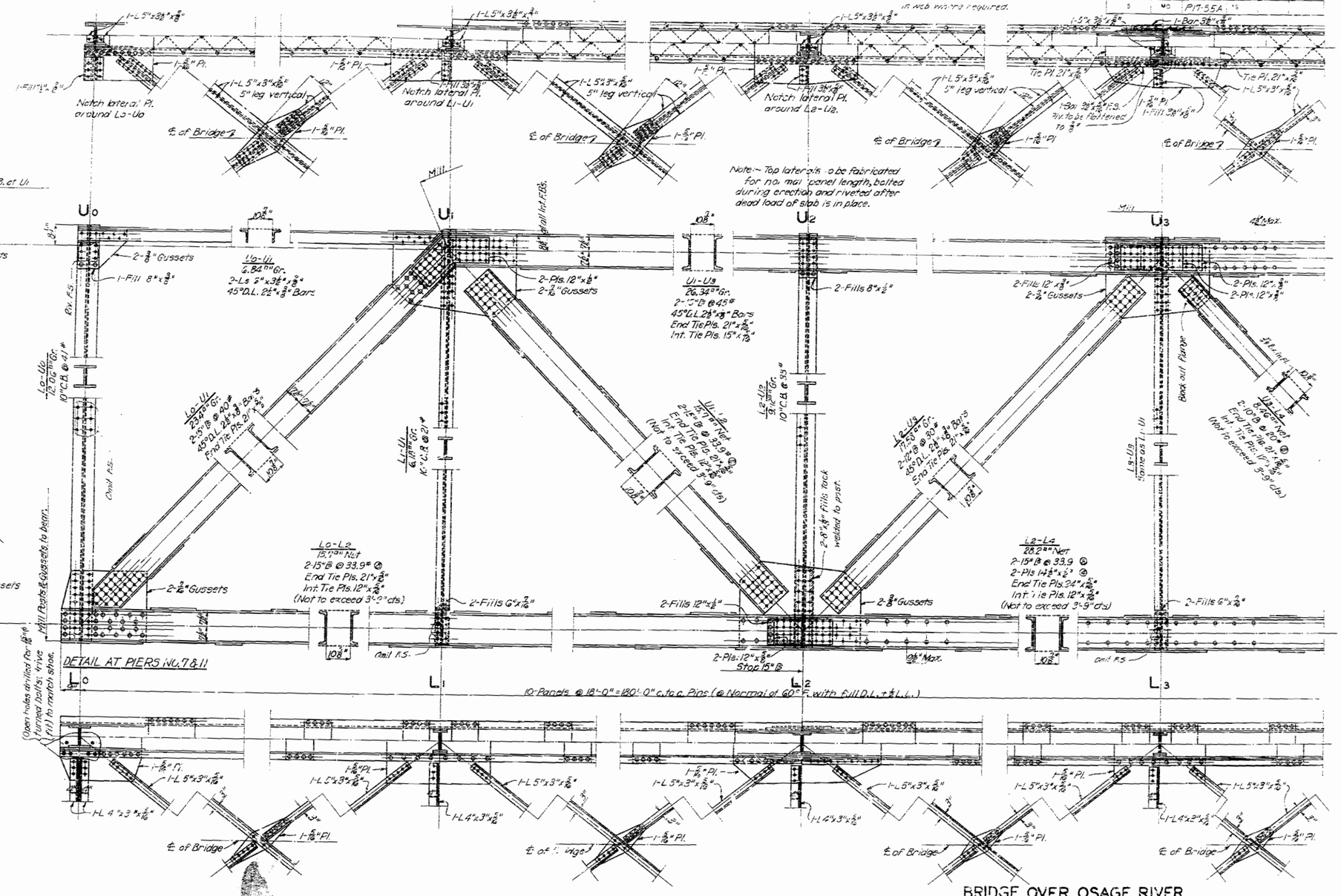
Sheet No. 8 of 14

40'-0" I-BEAM SPANS

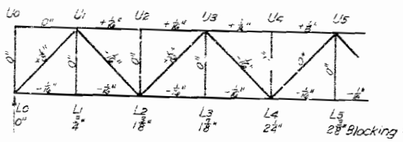
MISSOURI STATE HIGHWAY DEPARTMENT

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	MO.	P.17-55A	'39		

Note:- Flange rivets to stagger with rivets in web where required.



DETAIL OF INCLINED POSTS



Note:- Camber diagram shows in inches the amount members are to be lengthened or shortened to make top chord a straight line from Uo to Uo' and the verticals perpendicular to the top chord, when truss is under dead load + ½ live load assuming live load uniformly distributed over entire length of span.
+ = lengthening. − = shortening.

CAMBER DIAGRAM

Note:- For general superstructure notes see Sheet No. 7
For stress diagram, and dimensions see Sheet No. 7
For sway frames and roadway sections see Sheet No. 10
For shoes see Sheet No. 14.
For substitutions for C.B. sections see Sheet No. 10
Rivets - ⅞" ø in trusses and floor system.
¾" ø in bracing and handrail.

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

BRIDGE OVER OSAGE RIVER

STATE ROAD FROM TUSCUMBIA TO WAYNESVILLE
ABOUT 11 MILES S.W. OF EUGENE
PROJECT NO. R.17-55A STA. 476+58.68

MILLER COUNTY

SUBMITTED BY _____ DATE _____ BRIDGE ENGINEER
APPROVED BY _____ DATE _____ CHIEF ENGINEER

Designed Feb. 1931 By F.W.H.
Drawn Mar. 1931 By H.E.C.
Traced April 1931 By H.E.C.
Checked Oct. 1931 By [illegible]

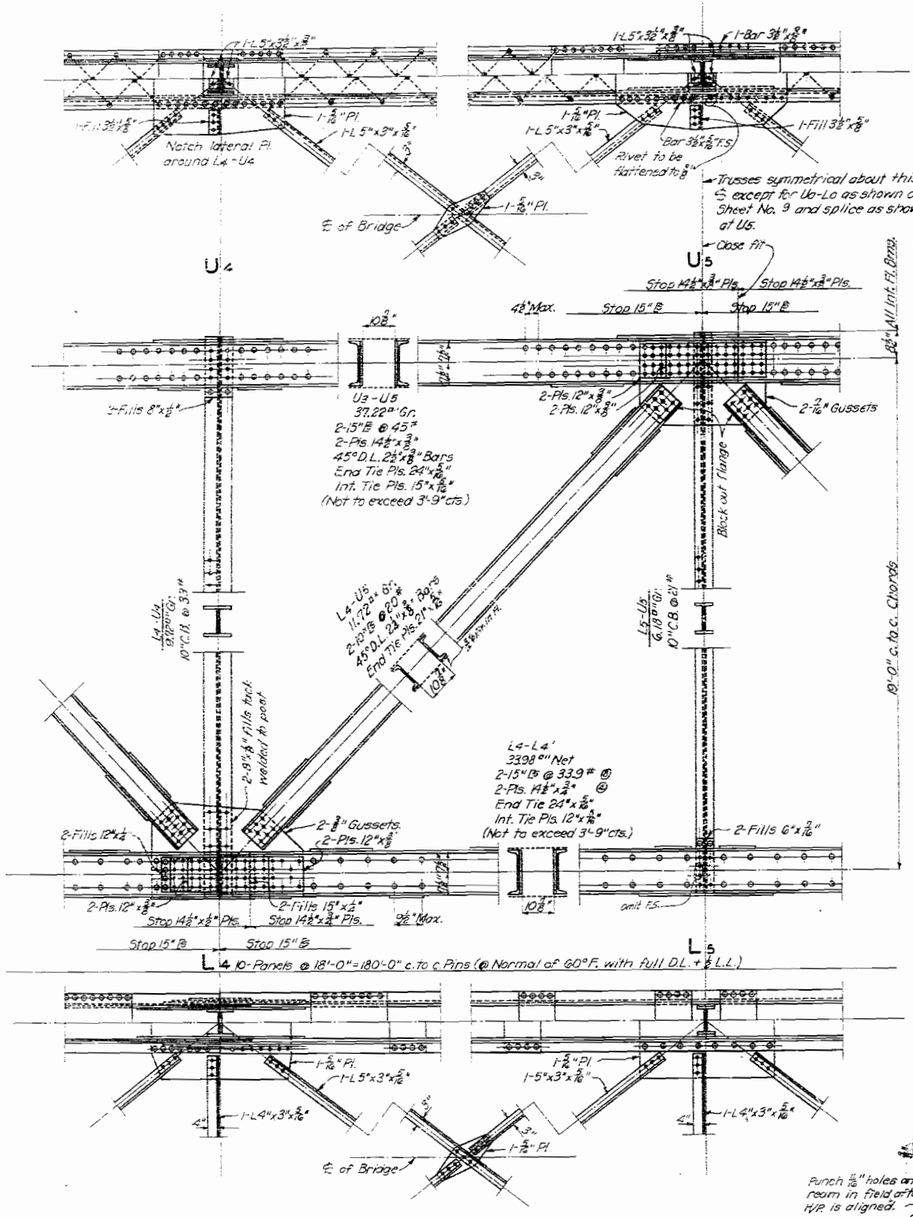
Sheet No. 9 of 14

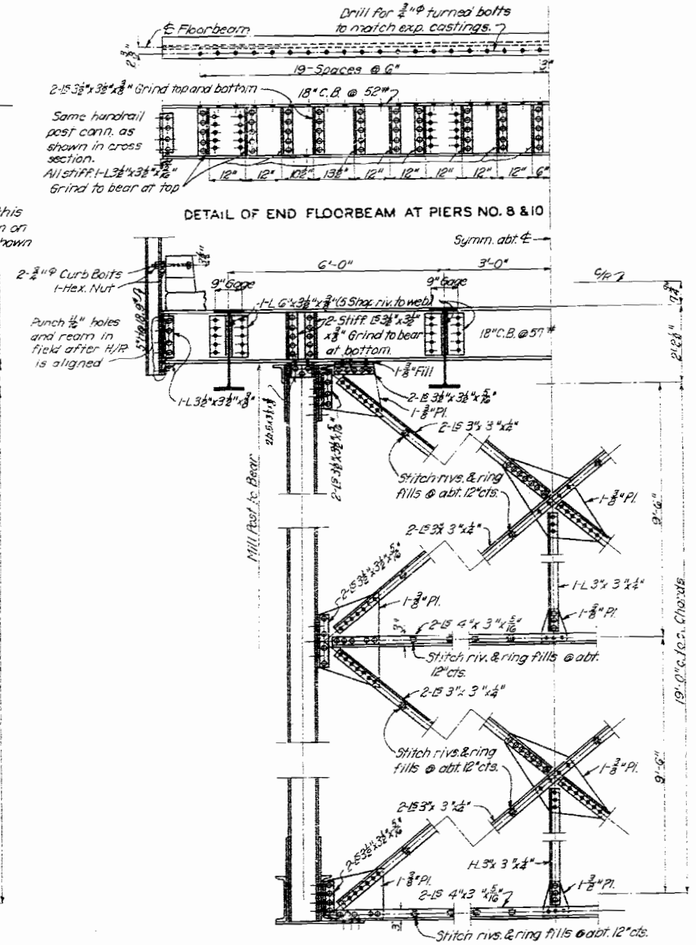
J-719

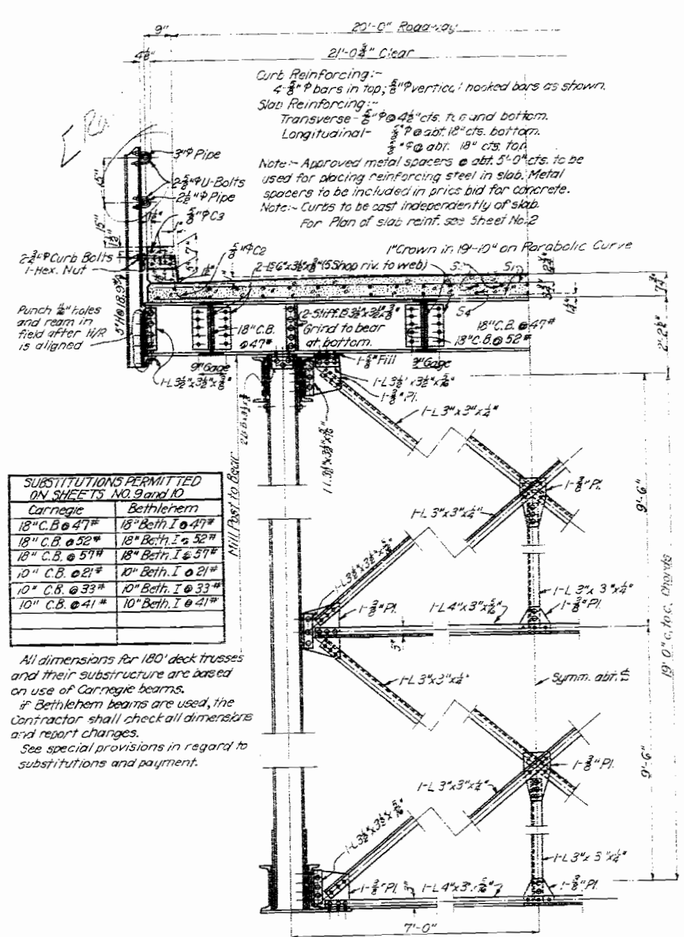
180' DECK TRUSS

MISSOURI STATE HIGHWAY DEPARTMENT

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	MO.	R-17-55A	19		







SUBSTITUTIONS PERMITTED ON SHEETS NO. 9 and 10	
Carnegie	Bethlehem
18"C.B @ 47#	18" Beth. I @ 47#
18"C.B @ 52#	18" Beth. I @ 52#
18"C.B. @ 57#	18" Beth. I @ 57#
10"C.B. @ 21#	10" Beth. I @ 21#
10"C.B. @ 33#	10" Beth. I @ 33#
10"C.B. @ 41#	10" Beth. I @ 41#

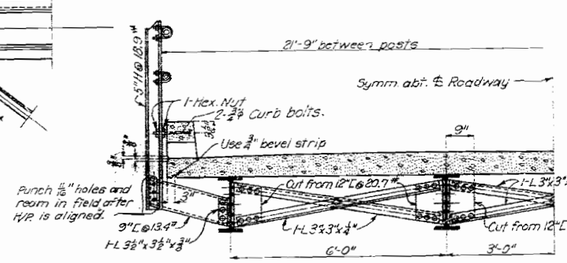
All dimensions for 180' deck trusses and their substructure are based on use of Carnegie beams. If Bethlehem beams are used, the Contractor shall check all dimensions and report changes. See special provisions in regard to substitutions and payment.

HALF END ELEVATION 180' TRUSS SPAN

Note:- Floorbeam shown above at Piers No. 7 & 11

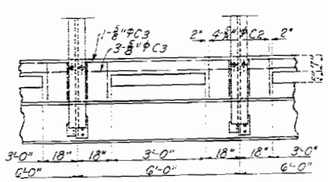
HALF CROSS SECTION 180' TRUSS SPAN

Showing Int. Floorbeam



HALF CROSS SECTION BETWEEN PANEL POINTS

Posts and cross frames as shown above to be at one-third point in each panel.



TYPICAL OUTLET DETAIL

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

NOTES:-

For general superstructure notes see Sheet No. 7
For stress diagrams, and dimensions see Sheet No. 7
For expansion devices see Sheet No. 11
For shoes see Sheet No. 14
Rivets:- ¾"ℙ in Trusses and Floor System.
⅝"ℙ in Bracing and Handrail.

BRIDGE OVER OSAGE RIVER

STATE ROAD FROM TUSCUMBIA TO WAYNESVILLE

ABOUT 11 MILES S.W. OF EUGENE

PROJECT NO. R 17-55A STA. 476+58.68

MILLER COUNTY

SUBMITTED BY M K Foutch DATE 10/17/32
BRIDGE ENGINEER

APPROVED BY T H Cutler DATE 10/17/32
CHIEF ENGINEER

J-719

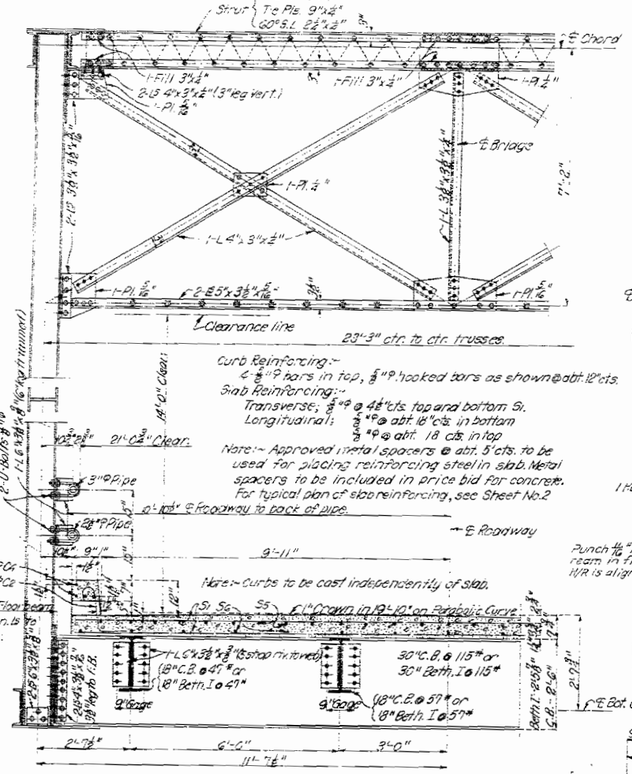
Designed Feb. 1931 By F.W.H.
Drawn Mar. 1931 By H.E.C.
Traced Apr. 1931 By H.E.C.
Checked Oct. 1932 By [illegible]

Sheet No. 10 of 14

180' DECK TRUSS

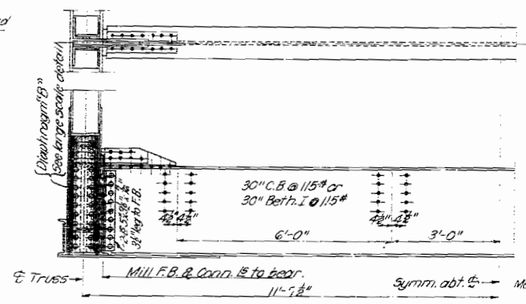
MISSOURI STATE HIGHWAY DEPARTMENT

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	MO.	RI7-55A	19		



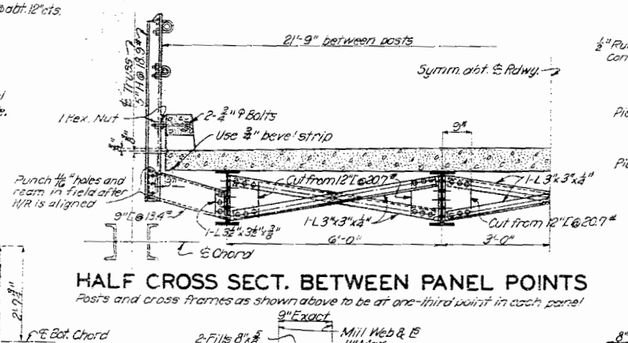
HALF CROSS SECTION

Showing typical intermediate floorbeam, roadway slab, reinforcing, curb, handrail and sway frame. Sway frames at U3, U5 & U7.



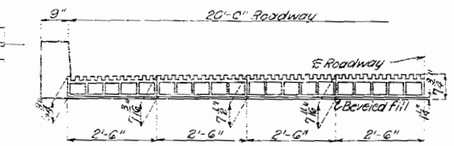
HALF ELEV. & PLAN OF FLOORBEAM AT L.10

Showing connection to truss and diaphragm ties.

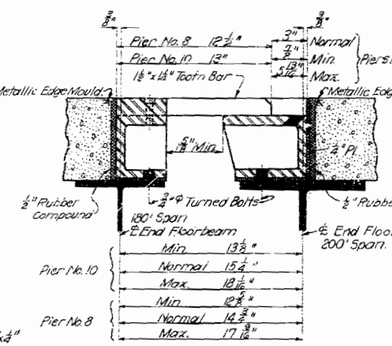


HALF CROSS SECT. BETWEEN PANEL POINTS

Posts and cross frames as shown above to be at one-third point in each panel

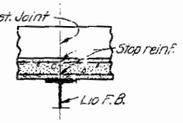


HALF END ELEVATION SHOWING POSITION OF CASTING SECTIONS

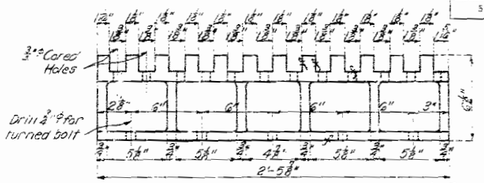


EXPANSION DEVICE AT PIERS NO.8&10

Dimensions parallel to grade.

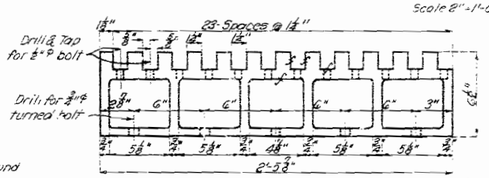


CONST. JOINT THRU SLAB & CURB AT L.10

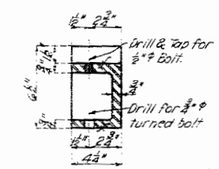


TYPICAL ELEVATION OF ONE SECTION CASTING "B"

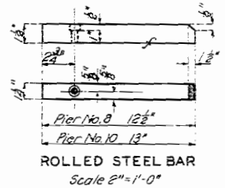
SECTION THRU CASTING "B"



TYPICAL ELEVATION OF ONE SECTION CASTING "A"

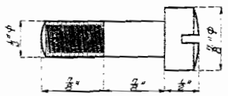


SECTION THRU CASTING "A"



ROLLED STEEL BAR

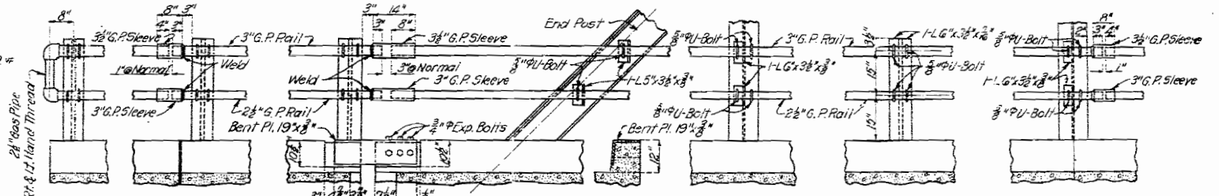
Scale 2"=1'-0"



STUD BOLT FOR BARS

Full Scale

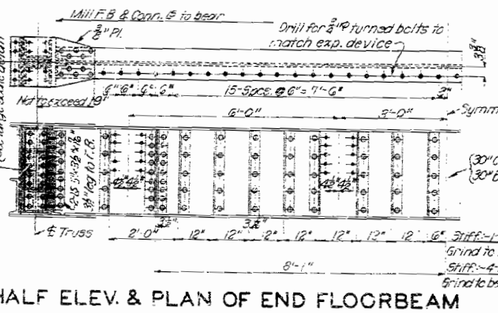
CASTING DETAILS



BENT NO.1 & ABUT. NO.13 | BENTS NO.2,3,4,5,6&12. PIERS NO.7&11. | PIERS NO.8&10 | SECTION THRU CURB | TYPICAL CONN. TO 200' TRUSS VERTICAL | TYPICAL HANDRAIL POST | L5&L10 200' TRUSS

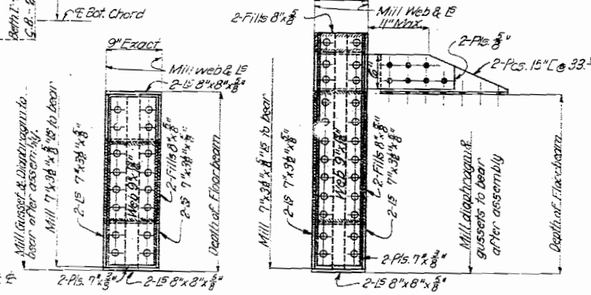
DETAILS OF HANDRAIL CONNECTIONS

Handrail Notes:- I Beam span handrail posts are located as shown on Sheet No.8
Deck truss handrail posts are located as shown and noted on Sheet No.10
200' span handrail posts are to be located at ⅓ points of truss panels, except panels L0-L1 and L11-L12, where only one post shall be used spaced 6'-3" each way from ℄ of L1. Handrail shall be connected to all truss verticals. Handrail shall be connected to diagonals L0-U1 and U11-L12 only.

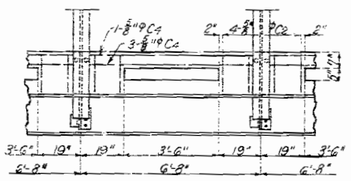


HALF ELEV. & PLAN OF END FLOORBEAM

Showing conn. to truss, stiffeners, and location of holes for expansion device.



DIAPHRAGM "A" DIAPHRAGM "B"



TYPICAL DETAIL OF OUTLETS

Outlets to be placed at ⅓ and ⅔ points in each panel.

NOTES:-

For general superstructure notes, see Sheet No.7
For details of 200'-0" 2 Span continuous truss, see Sheets No.12 and 13.
All end connection angles of floorbeams to be milled to bear.
End connection angles of stringers shall be riveted to the webs with the whole stringer assembled in an iron frame so as to give the correct length of stringers and correct position of angles.
Rivets:- ¾"ϕ in trusses and floor system.
¾"ϕ in bracing and handrail.
Grade of steel in castings and annealing to be in accordance with the specifications.
Rolled steel bars, bevel fills, and stud bolts for expansion devices to be paid for as structural steel.
All fillets in expansion device castings to be ¾" radius.

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

BRIDGE OVER OSAGE RIVER

STATE ROAD FROM TUSCUMBIA TO WAYNESVILLE

ABOUT 11 MILES S.W. OF EUGENE

PROJECT NO. RI7-55A STA. 476+58.68

MILLER COUNTY

SUBMITTED BY M.R. Sark, BRIDGE ENGINEER, DATE 10-17-32

APPROVED BY T. H. Cutler, CHIEF ENGINEER, DATE 10-17-32

J-719

Designed Mar. 1931 By F.W.H.
Drawn April 1931 By F.W.H. & H.E.C.
Traced April 1931 By H.E.C.
Checked Oct. 1932 By J.B.K.

MISSOURI STATE HIGHWAY DEPARTMENT

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
8	MO.	R17-S5A	19		

Note: Camber diagram shows in inches the amount members are to be lengthened or shortened to make trusses conform to dimensions given on stress diagram (see Sheet # 7) under dead load + ½ live load (uniform live load only, concentrated load omitted) distributed over entire length of span. + for lengthening - for shortening.

NOTES:-
For general superstructure notes and stress diagrams see Sheet No 7.
For expansion device at L0 see Sheet # 11
For sway frames at U3 and U5 see Sheet No. 11.
For truss shoes see Sheet No. 14.
For handrail and handrail connections to truss, see Sheet No 11.
Rivets:- ⅞" ϕ in trusses and floor system.
¾" ϕ in bracing and handrail.

Note: This drawing is not to scale
Follow dimensions.

Sheet No 12 of 14.

BRIDGE OVER OSAGE RIVER

STATE ROAD FROM TUSCUMBIA TO WAYNESVILLE
ABOUT 11 MILES S.W. OF EUGENE
PROJECT NO. R17 S5A STA 476 + 58.58
MILLER COUNTY

SUBMITTED BY [illegible] DATE [illegible]
BRIDGE ENGINEER
APPROVED BY T. H. Cutler DATE [illegible]
CHIEF ENGINEER

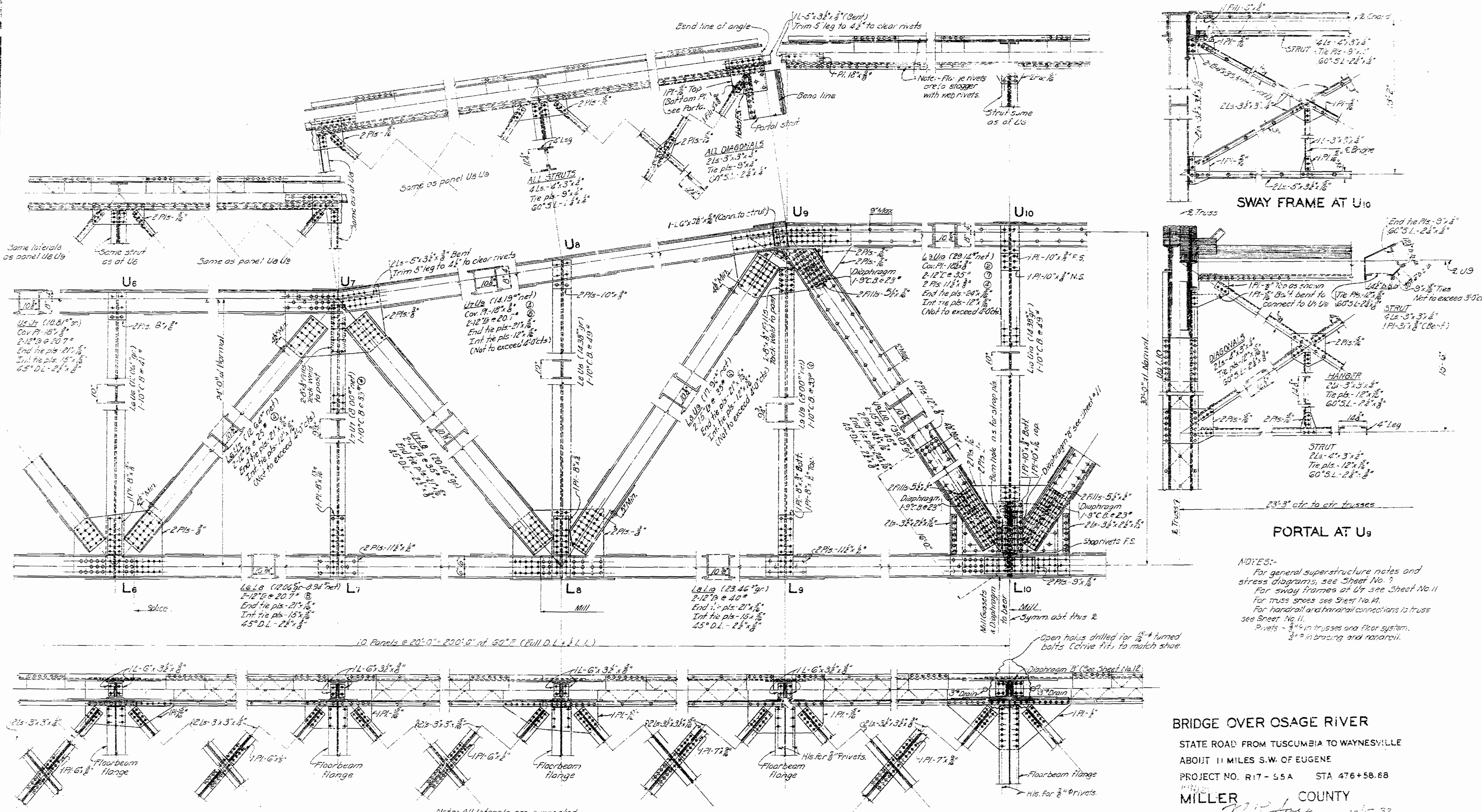
J-719

Designed March 1931 By F.W.H.
Drawn March 1931 By F.W.H
Traced April 1931 By G.W.
Checked Oct. 1932 By L.S.

200'-0" 2 SPAN CONTINUOUS TRUSSES

MISSOURI STATE HIGHWAY DEPARTMENT

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	MO.		15		



NOTES:-
For general superstructure notes and stress diagrams, see Sheet No. 7
For sway frames at U9 see Sheet No. 11
For truss shoes see Sheet No. 14.
For handrail and handrail connections to truss see Sheet No. 11.
Rivets - 7/8" ø in trusses and floor system. 3/4" ø in bracing and handrail.

Note: All laterals are supported from inside stringers, as shown for panel L0 L2, sheet #12.

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

Designed March 1931 By F.W.H.
Drawn March 1931 By F.W.H.
Traced April 1931 By G.W.
Checked Oct. 1932 By

BRIDGE OVER OSAGE RIVER

STATE ROAD FROM TUSCUMBIA TO WAYNESVILLE
ABOUT 11 MILES S.W. OF EUGENE
PROJECT NO. R17-55A STA. 476+58.68
MILLER COUNTY

SUBMITTED BY [signature] DATE 10/17/32 BRIDGE ENGINEER
APPROVED BY T.H. Cutler DATE 10/17/32 CHIEF ENGINEER

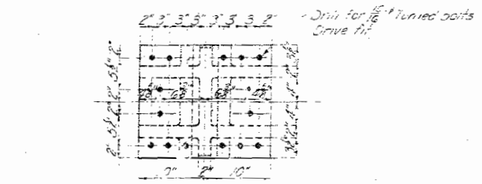
J-719

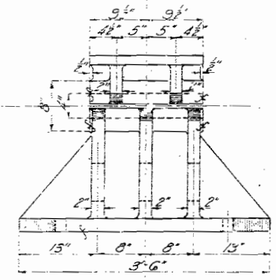
Sheet No. 12 of 14.

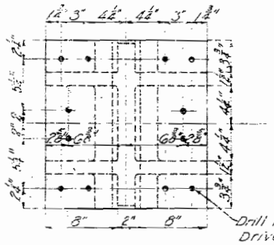
200'-0" 2 SPAN CONTINUOUS TRUSSES

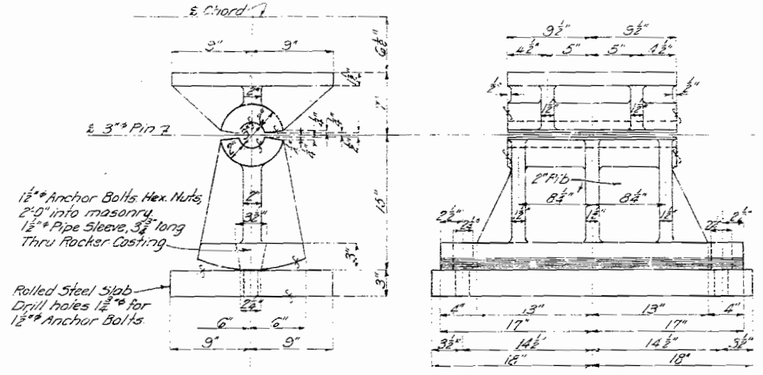
MISSOURI STATE HIGHWAY DEPARTMENT

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
7	MO.		33		



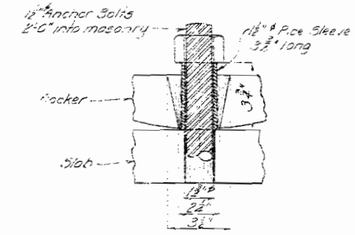






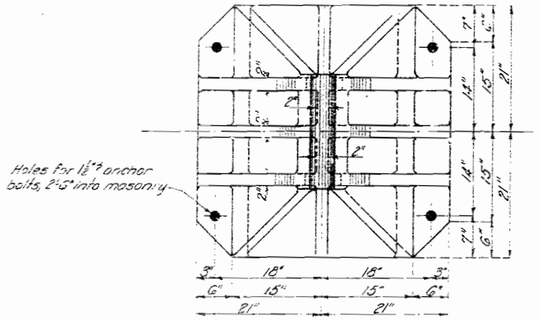
200' SPAN SHOE (EXPANSION END)

Scale:- 1½" = 1'-0"
4 - Required



SECTION THRU ROCKER SHOWING PIPE SLEEVE
Scale:- 3" = 1'-0"

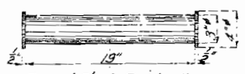
NOTES:-
For General Notes on Superstructure, see Sheet No.7.
All fillets 1" radius unless otherwise noted.
Rolled steel slabs, bolts, washers and pins to be paid for as structural steel.
Grade of steel for castings and annealing to be in accordance with the specifications.
Shoes shall be set on ⅛" sheet lead in accordance with the instructions on Sheet No.2. Cost of lead sheet to be included in price bid for other items.
All pockets in shoes to be filled with cement mortar after shoes are in place. Mortar to be surfaced so that water will drain out of core holes.



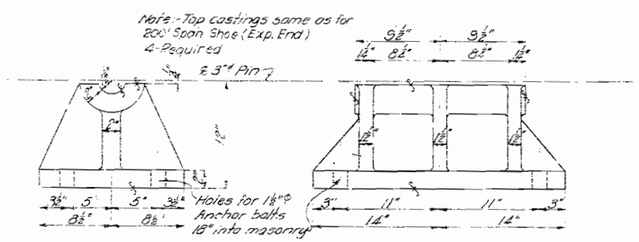
200' SPAN SHOE (FIXED END)

Scale:- 1" = 1'-0"
2 - Required

DETAIL OF PIN (FIXED END)
Scale:- 1½" = 1'-0"
2 - Required

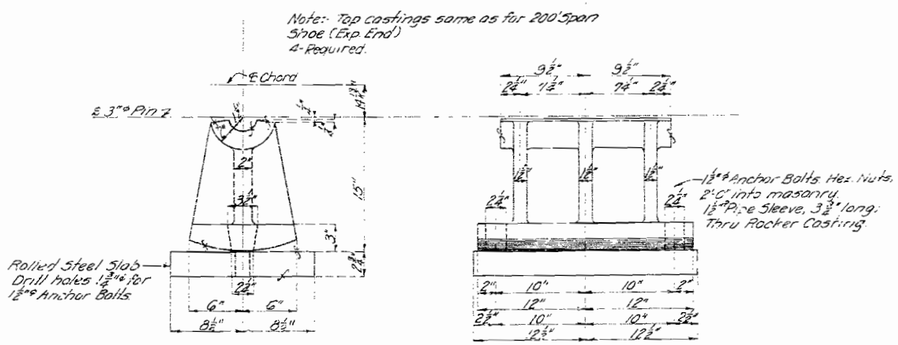


DETAIL OF PIN (DECK TRUSSES & EXP. END 200' SPAN)
12 - Required.



180' SPAN SHOE (FIXED END)

Scale 1½" = 1'-0"
4-Required



180' SPAN SHOE (EXPANSION END)

Scale:- 1½" = 1'-0"
4 - Required

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

BRIDGE OVER OSAGE RIVER

STATE ROAD FROM TUSCUMBIA TO WAYNESVILLE
ABOUT 11 MILES S.W. OF EUGENE
PROJECT NO. R17-55A STA 476+58.68
MILLER COUNTY

SUBMITTED BY M.R. Davis, BRIDGE ENGINEER, DATE 10.17.32
APPROVED BY T.H. Cutler, CHIEF ENGINEER, DATE 10.17.32

Designed March 1931 By F.W.H.
Drawn April 1931 By H.E.C.
Traced April 1931 By G.W.
Checked Oct. 1932 By [illegible]

Sheet 11 to 14 of 14.

J-719

SHOES

Osage River Bridge at Tuscumbia (Bridge No. J-719)
Route 17, Miller County, Missouri

Randall Dawdy, Photographer
March 2008

Photo Index:

1. Bridge No. J-719. South nameplate. View to north.
2. Bridge No. J-719. South approach. View to north.
3. Bridge No. J-719. South portal. View to north.
4. Bridge No. J-719. South portal. View to north.
5. Bridge No. J-719. Through truss details. View to north.
6. Bridge No. J-719. Deck truss at Pier 10. View to north.
7. Bridge No. J-719. Through truss at pier 10. View to northeast.
8. Bridge No. J-719. West side. View to northeast.
9. Bridge No. J-719. West side. View to northeast.
10. Bridge No. J-719. South end. View to southeast.
11. Bridge No. J-719. West side. View to southeast.
12. Bridge No. J-719. Pier 8. View to southeast.
13. Bridge No. J-719. Deck truss at Pier 7. View to southeast.
14. Bridge No. J-719. Pier 7. View to southeast.
15. Bridge No. J-719. Pier 7 detail. View to southeast.
16. Bridge No. J-719. Pier 6. View to northeast.
17. Bridge No. J-719. North end. View to northeast.
18. Bridge No. J-719. North end. View to southeast.
19. Bridge No. J-719. East side. View to southwest.

20. Bridge No. J-719. North end. View to southwest.

21. Bridge No. J-719. Deck truss at Pier 7. View to southwest.

22. Bridge No. J-719. Continuous through truss. View to southwest.

23. Bridge No. J-719. South end. View to southwest.

24. Bridge No. J-719. Pier 9. View to southwest.

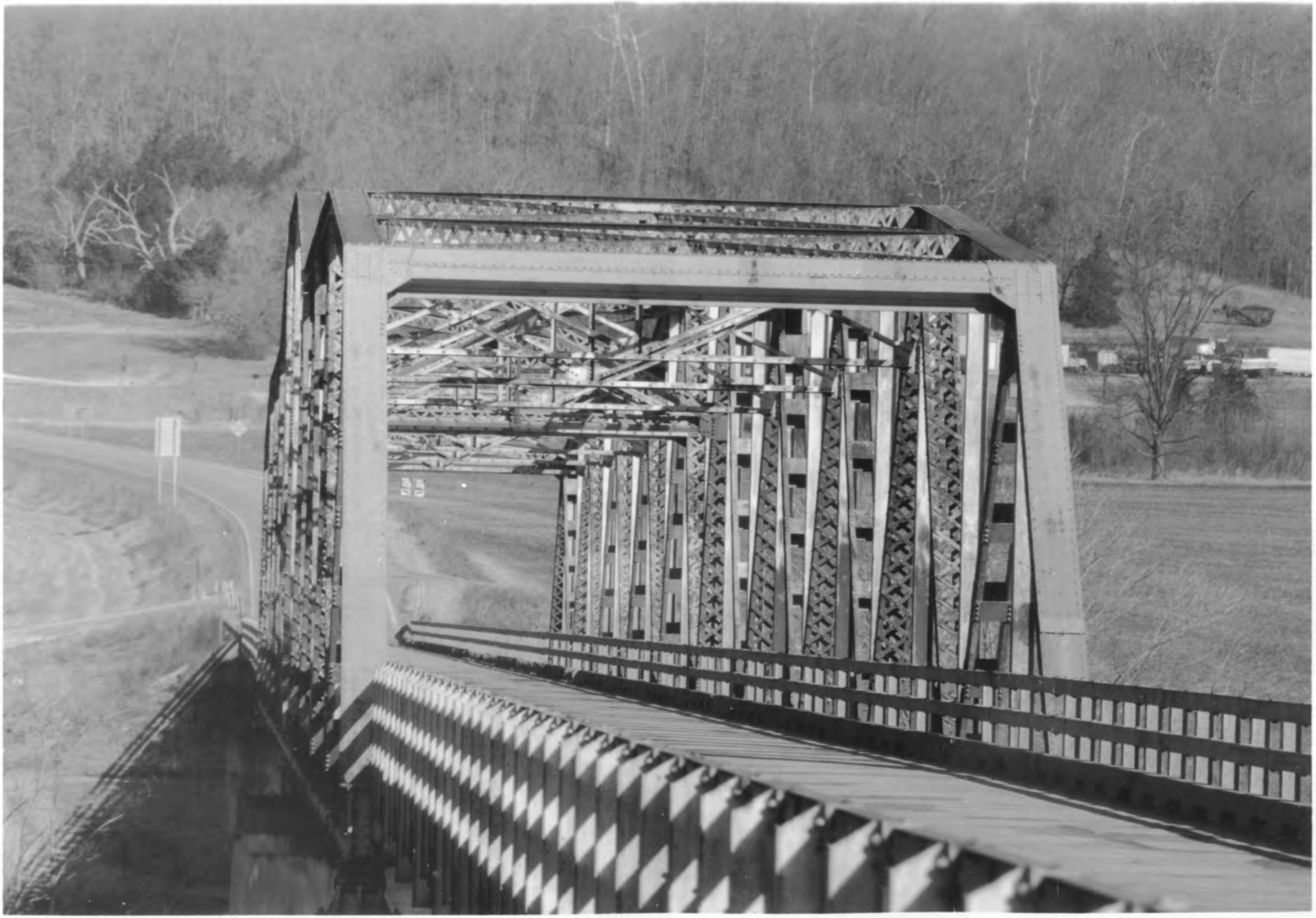
25. Bridge No. J-719. Through truss detail at Pier 9. View to southwest.

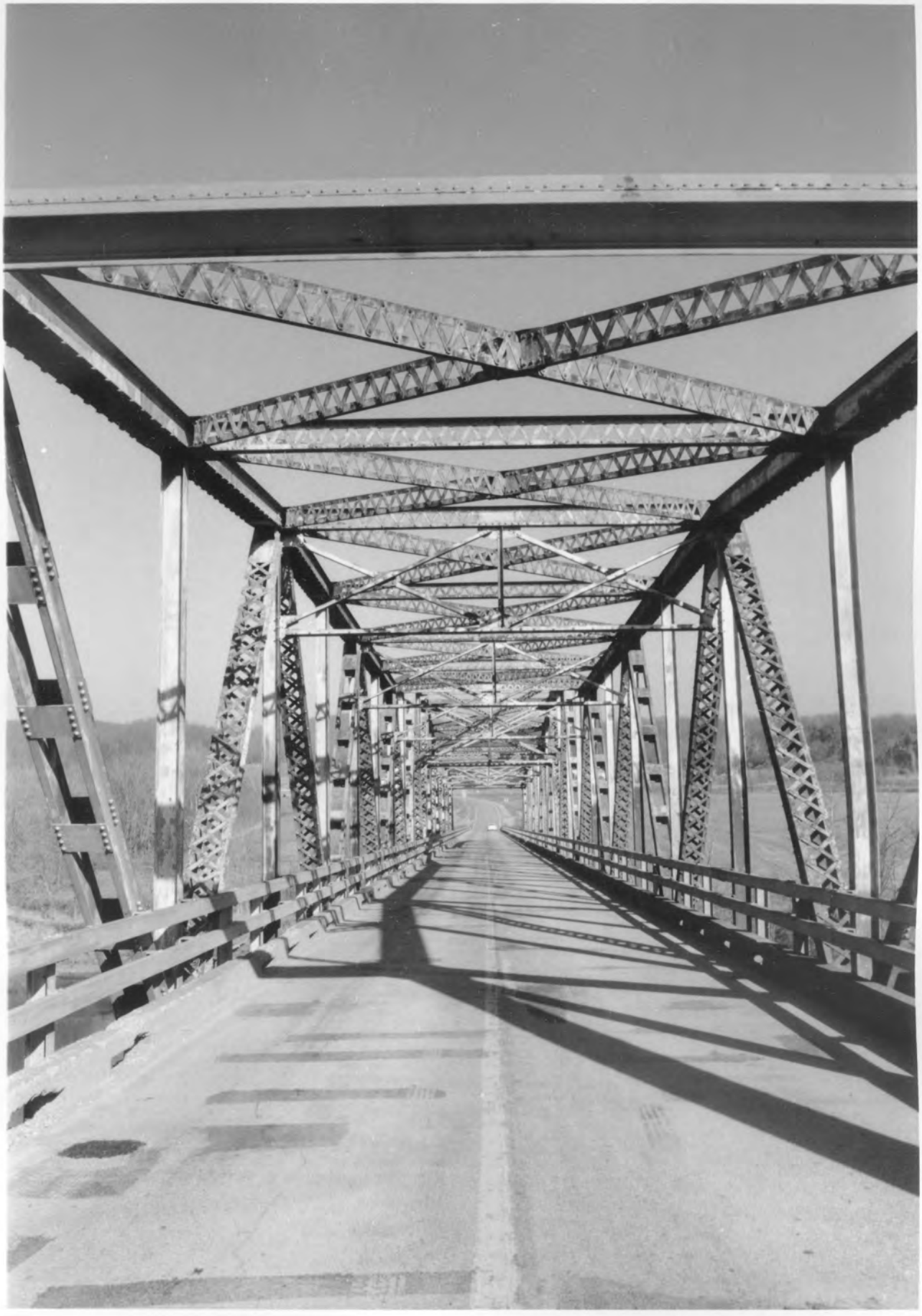
26. Bridge No. J-719. Detail at Pier 8. View to southwest.

27. Bridge No. J-719. North portal. View to south.

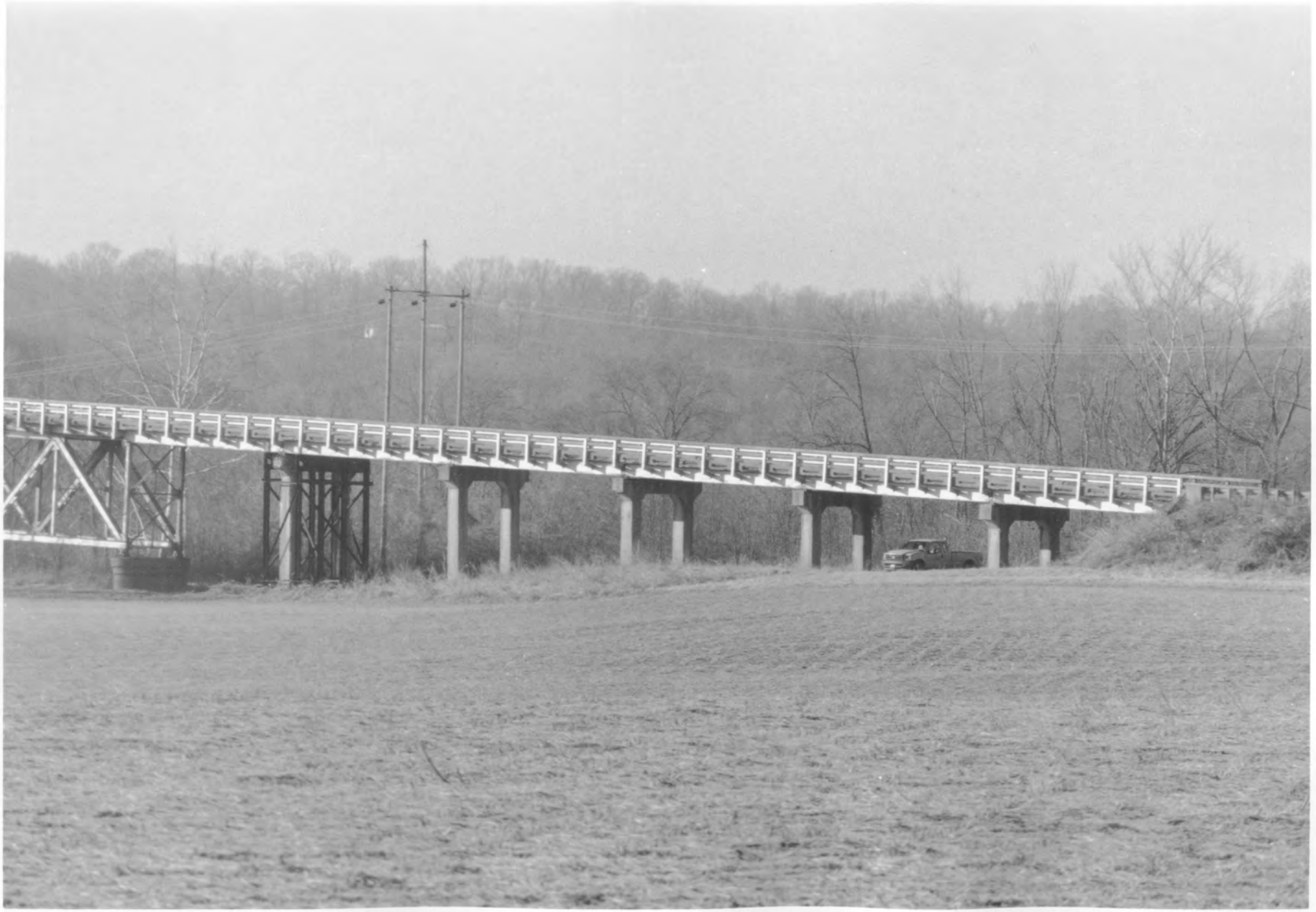
28. Bridge No. J-719. North nameplate. View to south.

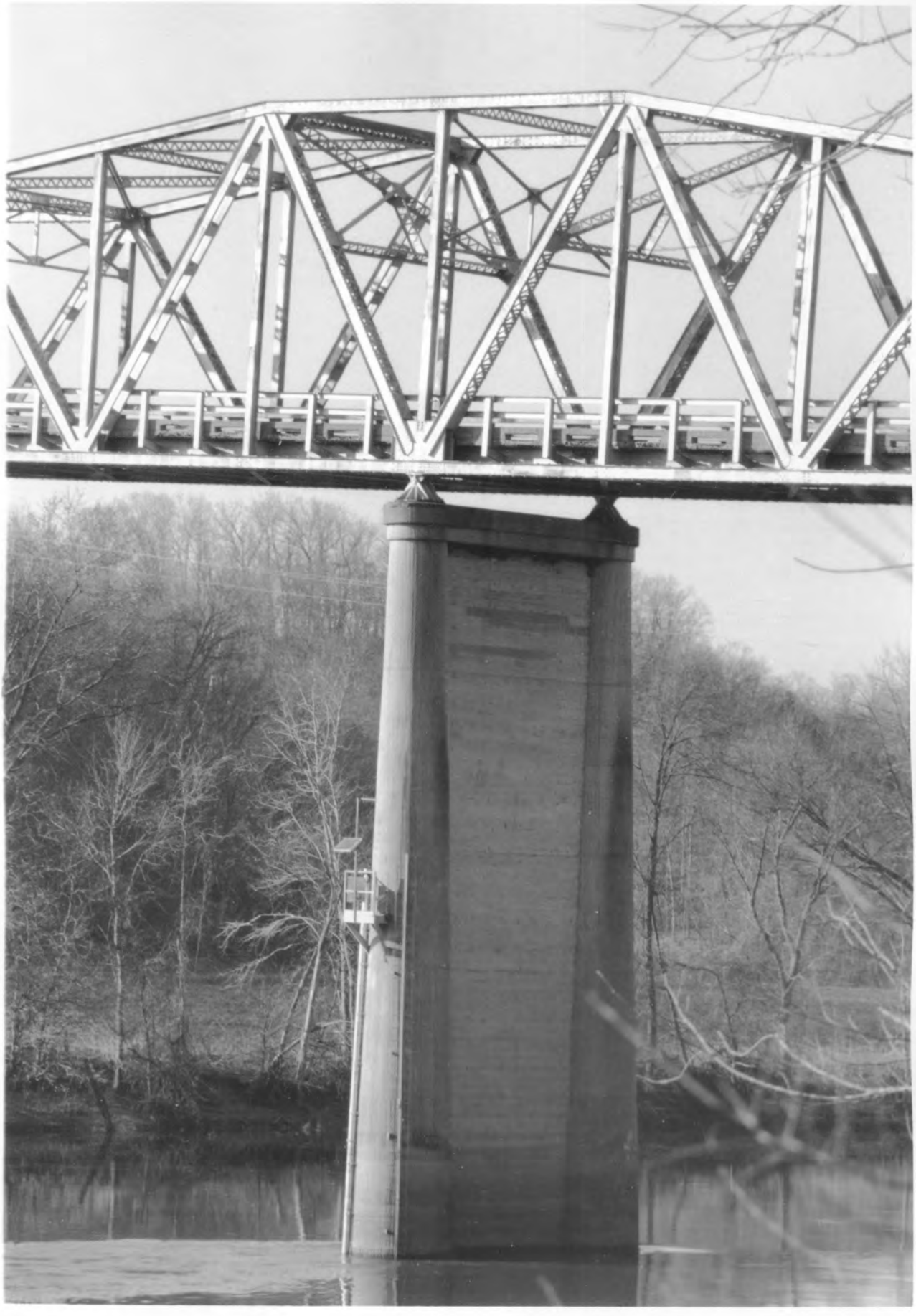
MISSOURI DEPT
HIGHWAY
BRIDGE NO. J-718

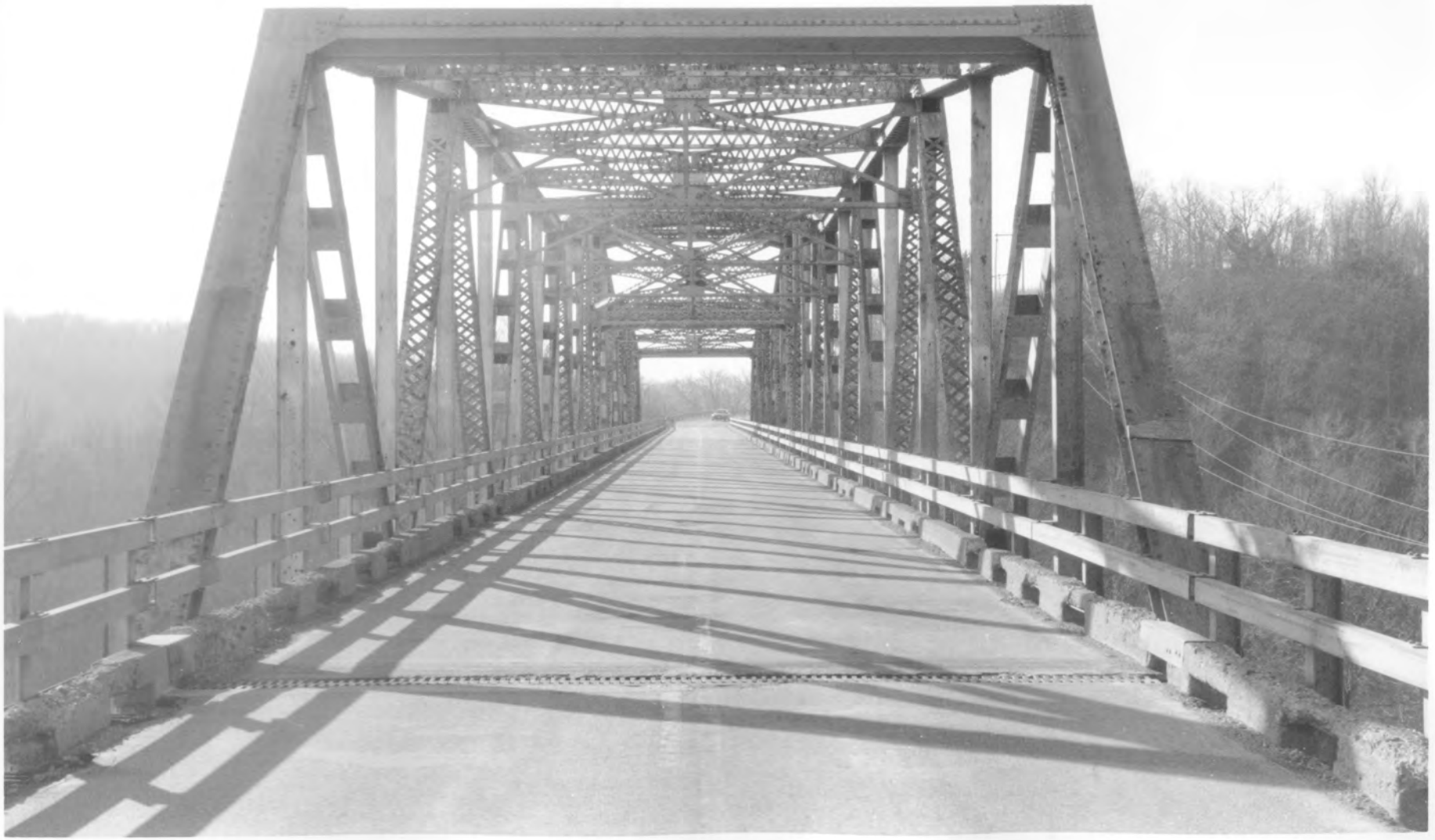





OSAGE
RIVER








MISSOURI
HIGHWAY DEPT
BRIDGE No J-719
1932