Documentation of the Historic Tarkio River Bridge

Bridge No. G0355R
Atchison County, Route 59
May 2012

MoDOT
U.S. Department of Transportation
Federal Highway Administration

TARKIO RIVER BRIDGE
BRIDGE NUMBER G0355R

ROUTE 59, ATCHISON COUNTY, MISSOURI
MODOT SAFE & SOUND PROJECT 5B8D1AQB

HISTORICAL AND PHOTOGRAPHIC DOCUMENTATION

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MAY 2012

TARKIO RIVER BRIDGE (BRIDGE NO. G0355R)
ROUTE 59, ATCHISON COUNTY, MISSOURI

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May 2012

Introduction

The Missouri Department of Transportation has proposed improvements to the Route 59 crossing of the Tarkio River in Atchison County, approximately 2.75 miles north of Fairfax, Missouri. This undertaking involves replacing the Tarkio River Bridge, Bridge G0355R, as part of the Missouri Safe & Sound Design-Build Contract Project No. J5B0800. The Safe & Sound project will replace 554 bridges and rehabilitate 248 bridges throughout the state. The project will have an adverse effect on Bridge G0355R, a property that fulfills eligibility criteria for listing on the National Register of Historic Places.

Through consultation, the Missouri State Historic Preservation Office, the Federal Highway Administration, and the Missouri Highway and Transportation Commission developed a Memorandum of Agreement (MOA) to mitigate the adverse effect. The mitigation stipulates documentation of the historic bridge with archival photographs, copies of the original construction plans, and historic narrative. This documentation has been prepared to fulfill the mitigation requirements.

Historical Narrative

The Tarkio River Bridge, Bridge G0355R, is located on Route 59 in central Atchison County.[1] Erected in 1937, it is a replacement bridge that utilizes trusses from the previous highway bridge assembled in 1923. The Tarkio River Bridge is a skewed, steel, six-panel, rigid-connected Baltimore through truss, with one Pratt pony truss and three steel stringer approach spans. It measures 348 feet in length; the roadway width is 22 feet. When it was evaluated for its historical significance in the 1980s, it was identified as a Pratt through truss bridge erected in 1923. Without knowledge of the 1937 construction activities, the bridge was considered relatively unaltered and possibly eligible for the National Register of Historic Places as an atypically configured example of a 1920s Missouri State Highway Department truss design.[2]

Although the facts regarding the adaptation and repositioning of the bridge in the 1930s were unknown at the time of its historical evaluation, further research supports the historical significance of the bridge, hence its appropriate determination as a historic property. The key design characteristic of the bridge, the significant 1920s-era trusses, survive in the 1937 replacement bridge. Because it was not specifically typed prior to its evaluation, aspects of its significance were undetected. A subtype of the Pratt through truss, the Baltimore through truss is uncommon in Missouri. Historical bridge reports prepared for Missouri Department of

[1] Project plans on file at the Bridge Division, Missouri Department of Transportation, reveal this bridge has had several numbers throughout its history: G 355 (1922), G 355 A (1923), G 355 AR (1936), G-355 R (1985), and is presently known as G0355R.

[2] Clayton B. Fraser, *Missouri Historic Bridge Inventory*, 5 Vols., Missouri Department of Transportation, Project No. NBIH(6) (Loveland, Colorado: FRASERdesign, Inc., 1996), "Big Tarkio River Bridge, ATCH01" Inventory Data Sheet, Vol. 1, hereafter cited Fraser *Missouri Historic Bridge Inventory*, 1996.

Transportation bridge replacement projects are available for more than 75 historic Missouri bridges, but none is known to exist for this type of bridge. Clayton Fraser's statewide bridge study, *Missouri Historic Bridge Inventory*, includes survey results for approximately 11,000 pre-1951 roadway bridges and categorizes only two as the Baltimore through truss type. One of these no longer survives and the status of the other--a county bridge no longer in the state highway transportation system--is undetermined.[3]

Location

The Route 59 bridge crossing the Tarkio River in Atchison County is almost equal distance from the towns of Tarkio to the north and Fairfax to the south.[4] It is approximately 3.5 miles south of Tarkio and 2.75 miles north of Fairfax. Atchison County is located in the extreme northwest corner of Missouri, bordered by Iowa to the north, and the Missouri River and Nebraska to the west. The history of the Tarkio River Bridge is integral to the development of the expanding highway and transportation system in the northwest Missouri region. The highway evolved in the vicinity of other corridors: the Tarkio River which it intersects, the Burlington Northern Railroad (historically the Tarkio Valley Branch of the Kansas City, St. Joseph & Council Bluffs Railroad) located east of the river, and to a lesser degree, the Little Tarkio Creek farther to the east. Both Tarkio and Fairfax were railroad towns, laid out one year apart in 1880 and 1881. Tarkio preceded Fairfax; however, both were incorporated in 1881.[5] The first state highway to link Tarkio and Fairfax was built parallel to the railroad alignment and similarly connected the two railroad communities at either end. The towns were keenly interested in securing the highway alignment and competed for the advantage.[6] Ultimately, both towns succeeded. The new highway bridge was a transportation advance as well, affording public crossing of the river between the communities. Prior to the construction of the Tarkio River highway bridge, bridges in Atchison County had long been recognized an important asset, worthy of investment and regular maintenance. In 1882, there were already 119 bridges in Atchison County and three more were under contract. According to one historical account, the county expended about $7,000 annually for the erection of bridges and repairs.[7] A private bridge

[3] Ibid. The rarity of the type (or at least its documentation) may be a national as well as state phenomenon. In January 2012, an internet search identified Historic American Engineering Record (HAER) documentation exists for approximately 54 Baltimore through truss bridges in the country (downloaded from Library of Congress, American Memory, Built in America Collection at http://memory.loc.gov/cgi-bin/query on January 26, 2012). Another search was performed on May 10, 2012 using the Library of Congress' enhanced on-line searching capabilities which yielded 128 hits for "Baltimore Truss Bridge" prints and photographs; however, more appear to pertain to railroad bridges (24 hits) than vehicular bridges (21 hits), and occasionally, the same bridge is represented more than once due to multiple images for some (http://www.loc.gov/search/?q=baltimore%20truss%20bridge&fa=digitized:true).

[4] The Tarkio River is also known as the Big Tarkio River and noted on highway bridge construction plans as Tarkio Creek.

[5] National Historical Co., *The History of Holt and Atchison Counties, Missouri*, (National Historical Co., St. Joseph, MO, 1882), 726-729, 793, 891. Hereafter cited National Historical Co.

[6] An article regarding local opinions and controversy about the highway alignment is presented in "Some Facts about the State Highway," *The Fairfax Forum*, July 11, 1924, 1.

[7] National Historical Co., 1030; 1033.

spanning the Tarkio River existed before the construction of the highway bridge. Located on a private road at a parcel ultimately bordering the north side of the highway and in the immediate vicinity of the new bridge, it was owned by Ester R. Giffen. It remained undisturbed by the highway project although a portion of Giffen's private road was incorporated in the new highway alignment.[8]

Route 59 Historical Overview

Up through the first decades of the twentieth century, roads in Missouri were primarily the result of private endeavors and to a lesser extent, some local government involvement. Gradually, road segments were connected and a system of routes began to emerge. In 1911, for example, a series of interstate trails connecting cities in Iowa, Missouri, and Minnesota was established. Covering 503 miles, these routes linked county seats and contributed to the primary road systems in these three states, eventually comprising portions of the Jefferson Highway, stretching through five states from Baton Rouge to Winnipeg.[9] The Missouri State Highway Department was established in 1913, launching the transition from local to state control over road construction which was further enabled by legislation such as the Hawes Road Law of 1917, the McCullough-Morgan Act of 1919, and the Centennial Road Law of 1921. In June 1917, the State Highway Board (precursor to the Highway Commission) approved a tentative 5,000-mile highway system that connected all the counties and the larger population centers. This proposal, conceived by the first State Highway Engineer, Alexander W. "Boss" Graham through the assistance of the county courts and State Highway Board, became the foundation of Missouri's road system. The location of the north and south state road in Atchison County was considered at state commission meetings in 1921 and 1922, with representatives from Fairfax, Rockport, and Tarkio present to debate the proposed alignment and its effect on the communities. Some recommended a northwest/southeast route between Fairfax and Rockport instead of a northern/southern route from Fairfax to Tarkio to enable direct access to the county seat at Rockport, while others supported the Fairfax to Tarkio route that was on a direct line between St. Joseph and Omaha and better served tourists. On May 9, 1922, the commission approved the location of the highway in Atchison County between Fairfax and Tarkio.[10]

The first portion of this first official state highway to connect Tarkio and Fairfax and cross the Tarkio River, Route 1, was constructed from 1923 to 1924. The project involved grading earth for a width of 30 feet for 4.864 miles. The roadbed was nine feet wide and constructed of Portland cement concrete, leaving a generous 21' width of graded earth for shoulders and future highway widening. The state highway map for 1926 shows Highway 1 extending from Mound City in Holt County to the Missouri-Iowa state line; however, only about half of it was surfaced. The north-south trending portion from Fairfax to Tarkio, as well as the east-west segment from Tarkio to Rockport was paved. The portion from Mound City to Craig

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[8] Missouri State Highway Department, "Plan and Profile of Proposed State Road, Atchison County, Route 1 & 61," [highway plans, 12 sheets], 1924, housed at the Design Division, Missouri Department of Transportation, Jefferson City.

[9] Fraser, *Missouri Historic Bridge Inventory*, 1996, Vol. 1, 22.

[10] "Minutes of the State Highway Board Meeting, May 9-14, 1921," 80; "Minutes of the State Highway Commission Meeting, April 20, 1922," 3; "Minutes of the State Highway Commission Meeting, May 9, 1922," 6a; Missouri Department of Transportation, Jefferson City.

was graded earth or the grading was under contract, whereas the remainder of the Highway 1 was identified as a maintained state road. By 1931, the name of the highway had changed to Route 275, and maintenance activities of the facility consisted of oiling alongside the nine feet wide concrete roadway for 5.376 miles. According to the state highway map for 1936, the same alignment known as Highway 1 the previous decade was completely paved. The route connected Mound City, Craig, Fairfax, and Tarkio before jogging west to Rockport and continuing north to the state line, just south of Hamburg, Iowa. Not only was Route 275 important for the direct highway access it provided to these small rural towns, but also for its role in linking them and the more distant, larger cities on the transcontinental route.[11]

The 1936 map reveals that portions of Route 275 also were dual designated Route 59, following the highway department's practice of renaming many of the shorter routes and linking them together as longer routes when expanding the state's transportation system. While Highway 275 extended from Omaha to St. Joseph, Highway 59 followed the same 275 alignment from north of Fairfax to St. Joseph. This included the highway crossing the Big Tarkio River between Fairfax and Tarkio where the bridge was erected. Significant improvements were made with federal assistance in 1937 when existing Route 275 was widened to 20' by adding an additional 11' concrete road surface for nearly three miles as project 275-FAP-793E. Along with this federal aid project was its companion bridge project, 275-FAP-793E-1, the same year. The bridge length was 0.066 mile and the roadway was 22 feet wide. By 1966, when the highway was resurfaced with concrete, its name had changed solely to Route 59. The highway and bridge were resurfaced again in 1986.[12]

Early Route 59 Highway and Bridge Development, 1920s

The early history of Route 59 (when it was first known as Route 1 and later Route 275) and Bridge G0355R dates to their origin in the early 1920s. Field preparations for the new highway's construction began in March 1923 with the establishment of a workers' camp on the Giffin property and the ensuing arrival of workers, materials, and equipment. Housing for the workmen--small portable buildings on wheels with sleeping quarters, dining rooms, and kitchens--was under construction at the local lumberyard. The men would divide into two gangs operating at different locations; one situated at the Fairfax city limits and working north, while the other worked at the north end of the five mile project and proceeded south. Besides the highway work, plans for the bridge construction were in place:

> The concrete men are also expected here next week to begin work on the bridge which will be built across the Big Tarkio river. This bridge will be 300 feet long, 20 feet wide and will have a carrying capacity of 20 tons, and will be the largest bridge of its kind in

[11] As partial testimony to the local significance of the highway, high schools in these neighboring towns adopted its name for a regional basketball tournament. Despite later route number changes, the "275 Conference" survives and continues to be an annual competitive tradition in these northwest Missouri communities.

[12] Project History Maps for Route 59 and Missouri State Highway Maps from 1926 and 1936 downloaded from Missouri Department of Transportation, Planning Division, Jefferson City, 2012 at http://wwwi/intranet/tp/products.htm

northwest Missouri. It will meet Federal requirements, and this will aid in the ultimate aim of those interested in the road, that of making it a Federal Primary road.[13]

Anticipation and excitement over the new highway and bridge fostered community pride and boosted local maintenance and enhancement projects. The contractors' road grading and blasting actions became contagious as citizens worked on their yards and grounds removing accumulated filth and debris and even planting trees to beautify the town. The mayor urged residents and business owners to spruce up their town and issued a proclamation designating April 23 to 28, 1923, Clean-Up Week, ". . . whereas Fairfax is fortunate in having a State Highway through the business district and for that reason should present to tourists a beautiful view of well kept houses and public places."[14] Beautification and promotional efforts continued through the summer season as civic organizations like the Booster's Club readied the city park as a suitable tourist camp by building brick ovens, tables, benches and other conveniences to welcome automobile travelers. Creating camps where motorists could stay for the night was not a concept unique to Fairfax but one "being carried out by all the cities and towns located on trans-continental roads." [15] The need for such a camp was demonstrated within the month as two different traveling parties had stopped to use the facility.[16]

About the time Fairfax citizens were developing their tourist camp, the bridge contractors appeared in town. The headlines, "Bridge Gang Arrives," identified that the Pittsburg-Des Moines Steel & Bridge Co. would erect the bridge over the Big Tarkio river north of Fairfax. The foreman, A.G. Bland, and a "force of workmen" had arrived and begun working on the bridge. The press carried the brief announcement on June 15, 1923, and then remained reticent on bridge progress the next three months while providing regular updates on the highway construction. In September 1923, the bridge was back in the news:

> The steel for the bridge over the Big Tarkio is being unloaded from the cars and is being hauled to the site of the bridge. It will take about 20 days to assemble it, and there is still some concrete work to be done on the bridge.[17]

The work continued, but not without complications and delays. Sketchy newspaper accounts regarding highway problems surfaced over the next several months—a big tractor that went through the bridge, condemnation suits against property owners who refused to relinquish land as right-of-way for the new highway, debates over which shoulder option to pursue, weather issues and erosion—all took their toll on the project schedule. Finally, after months of variable progress, the new highway opened in late July 1924 and was hailed "the first paved state highway in Atchison County."[18]

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[13] *The Fairfax Forum*, "Start Road Work Soon," March 9, 1923, 1.

[14] *The Fairfax Forum*, "A Proclamation," April 20, 1923, 1

[15] *The Fairfax Forum*, "Preparing Tourist Camp," June 22, 1923, 1.

[16] *The Fairfax Forum*, "Tourists Using Camp," July 15, 1923, 1.

[17] *The Fairfax Forum*, "Work on Highway Progressing," September 14, 1923, 1.

[18] *The Fairfax Forum*, "Road is Opened," July 25, 1924, 1.

Route 59 Highway and Bridge Improvements, 1930s

The facility functioned as a dual highway surface, half paved and unpaved, for more than a decade until the state highway department secured the necessary funding to fully develop the north-south primary route. The Tarkio River bridge erected in 1923 lied on a reverse curve in the highway which needed to be straightened before the route could be widened, and thus required a new bridge location or alignment manipulation. The Highway Department's Bureau of Bridges preliminary layout for the new bridge over "Big Tarkio Creek" (Tarkio River) on Route 275, dated June 14, 1935, materialized into final plans within the year.[19] The new project called for replacing the existing bridge so it would no longer lie on a reverse curve in the highway, but rather in a new position that would eliminate the curve yet ultimately require a longer structure to span the greater distance. Reusing the existing bridge's trusses of the 140' span and also the 75' span was proposed for the new bridge, while the rest of the new bridge would consist of entirely new material, in particular the three new 40' I-beam spans to increase the bridge length. The two present trusses, along with the new I-beam spans would extend the length of the bridge from 256'-9" to 348'.[20]

On July 16, 1936, local newspapers announced the work to widen Route 275 from Mound City to the Holt/Atchison County line would start within a few days. The Atchison County section of Route 275 involving the bridge—the portion from the Holt/Atchison county line to six miles north of Fairfax—would not be widened until the following year.[21]

By November, bids were being solicited for the bridge. The Highway Commission advertised for "bids for the construction of a bridge across the Tarkio River, north of Fairfax," which coincided with making Highway 275 and 59 full width pavement. Because the present bridge "stands at an angle and necessitates a dangerous curve in the highway," it would be straightened the same time the highway was finished full width. The deadline for bridge construction bids at the highway department in Jefferson City was December 1, 1936.[22] Local papers captured highway progress on a regular basis, generally weekly but sometimes semi-monthly. That following month, *The Fairfax Forum* reported that bridge work would start soon, with grade improvements being one of the first construction activities. Besides being longer, the

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[19] Missouri State Highway Department, Bureau of Bridges, "Preliminary Layout" microfiche worksheet dated July 30, 1935 in Bridge G0355R Correspondence Files, 1935-1985, Missouri Department of Transportation, Jefferson City.

[20] Missouri State Highway Department, "Bridge Over Tarkio River, State Road from Fairfax to Tarkio, About 2 ¾ Miles from Fairfax, Project No. R157, Sta. 405+15" [Bridge Plans, G355, 2 sheets, 1922 and 1923] microfiche, Bridge Division, Missouri Department of Transportation; "Bridge Over Big Tarkio Creek," State Road from Tarkio to Fairfax about 3.25 Miles North of Fairfax, Project No. FAP 793E (U.S. 275), Sta. 135+50.0, Atchison County [Bridge Plans, G-355AR, 8 sheets, 1936], Bridge Division, Missouri Department of Transportation, Jefferson City; Correspondence from Chester Mann, Senior Structural Engineer, Omaha, Nebraska to Missouri State Highway Department District Engineer Clifford Shoemaker, September 13, 1936, microfiche in Bridge Division Correspondence Files, Missouri Highway and Transportation Department.

[21] *The Fairfax Forum,* "Start Paving Soon," July 16, 1936, 1.

[22] *The Fairfax Forum,* "Advertise for Bids on Tarkio Bridge," November 27, 1936, 1.

new bridge was designed to be two feet wider than the old bridge. The bridge substructure would be reconstructed while steel from the old superstructure would be reused in the new bridge.

Special provisions for the Route 275 project specified the work to be performed for Federal Aid project 793E-I at Station 135+50.0, the new location for the Tarkio Creek bridge. The existing bridge would be disassembled, but its trusses would be re-used, while other elements would be completely replaced. The work consisted of removing the concrete slab bridge floor, floor beams, pipe handrail, lateral system (both upper and lower laterals), portals, sway bracing from the truss spans, and the substructure. The structural steel, still serviceable, would be adapted by cutting some old rivets, plugging existing holes no longer necessary in the new structure and drilling fresh ones required for new connections. The trusses of the existing bridge, at right angles in their present position, would be skewed one panel when securely relocated to the new substructure. The contractors were instructed to protect the trusses during the dismantling and reworking process, safeguarding them for their continued life:

> The old trusses shall be carefully handled, and shall be securely braced and properly supported at all times during moving and reworking to avoid possible overstress and deformation to any member of the trusses. The Contractor shall be fully responsible for the safety and security of these trusses at all times after beginning work and shall replace any damaged part or parts without cost to the state.[23]

Work on the replacement bridge commenced in early 1937, following the arrival of construction equipment at the bridge site shortly before New Year's Day. The R. G. Aldridge Construction Co. of Kansas City, Kansas, secured the contract for the construction of the new bridge.[24] The bridge location would be shifted slightly through this straightening process. Once the road was closed for widening and paving activities, the bridge would be moved or "swung to its new position" as stated by the local press.[25] The south approach would be about 60 feet farther to the west than the existing approach and the north end of the bridge would remain where it was at Station 135+50.0. In order to incorporate the structure on the modified alignment, a new road bed about 900 feet in length to the south (where it met the present road south of the bridge) would be required.[26] Five months later in the midst of a productive spring

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[23] Missouri State Highway Department, "Route 275, Projects FA 793D-I & E-I, Atchison County, Special Provisions, (undated) Microfiche, Bridge Division, Bridge Correspondence Files, Missouri Department of Transportation.

[24]The "Final Inspection and Final Acceptance" document for FAP-793E (Microfiche) identifies R.G. Aldridge as the bridge contractor and Sheffield Steel Corporation, Kansas City, as the source of material, Bridge Division, Bridge Correspondence Files, Missouri Department of Transportation; *The Fairfax Forum,* "Bridge Work to Start Soon," January 1, 1937, 1.

[25] *The Fairfax Forum*, "Boonville Company Bids Low on Highway Work," April 23, 1937, 1; "Will Start Highway Work on May 20th," May 14, 1937, 1.

[26] *The Fairfax Forum,* "Bridge Work to Start Soon," January 1, 1937, 1.

construction season and highway paving getting underway, the newspaper announced, "Work of swinging the Tarkio Bridge in its new position will start as soon as the highway is closed."[27]

Highway 275 improvements on either end of the bridge—between Fairfax and the wye approximately six miles north of Fairfax—were let in two projects, both approximately three miles each. These two jobs were among the five Highway 275 projects planned to continue the widening improvements from northern Holt County through Atchison County, south of Tarkio. These five federal aid projects--Projects 275-FA793A, 793B, 793C, 793D, and 793E--totaled roughly 16 miles in all. The Highway Commission received bids for the five jobs on April 10, 1937 and during the Commission meeting on April 13, authorized the Chief Engineer to award the contracts upon receiving concurrence of the Bureau of Public Roads.[28] They, along with approximately 30 other federal aid projects throughout the state, represented the department's first major road letting for the year. Altogether, these 30 or so projects accounted for roughly $1,070,000 of the state highway commission's $28,537,251 disbursements for 1937.[29]

The estimated cost of widening approximately 16 miles of Route 275 from the existing pavement width of 9 feet to 20 feet was $273,020, thus more than one-quarter of the April funds were devoted to improving a single alignment.[30] The Route 275 project was significant not only for the cost and scale, but also for its regional prominence. It was touted, "the only project in this [northwest] part of the state on which bids will be received at this letting."[31] The other April letting projects were located throughout the state in the counties of Cape Girardeau, Crawford, Washington, Jasper, Knox, Shelby, Callaway, Montgomery, Johnson, Osage, and Webster with the remaining funds distributed among them. Following the Route 59 projects, the second most expensive undertaking in the April letting was five Route 40 projects in Callaway and Montgomery counties totaling nearly $110,000, closely trailed by four Route 15 projects in Knox and Shelby counties at a cost of $108,143. Both the Route 40 and 15 projects combined did not match the funding dedicated to Route 275.[32] The Route 59 projects, as part of the federal aid program, would be financed with state funds until its completion, at which time the federal

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[27] Ibid., "To Close Highway Friday," May 21, 1937, 1.

[28]"Minutes of the State Highway Commission Meeting, April 13, 1937," 84-85, Missouri Department of Transportation, Jefferson City.

[29] Ibid. and the Missouri State Highway Commission, *Eleventh Biennial Report of the State Highway Commission of Missouri for the Period Ending December 31st, 1938* (Jefferson City: Midland Printing Company), table between pages 24 and 25 ("Missouri State Highway Funds—Summary of Disbursements by Years"). The Commission's biennial report identifies that of these nearly $29 million expenditures for 1937, road construction accounted for almost $12 million, a figure more closely matching the anticipated $9 million Road Fund reported by *The Fairfax Forum (The Fairfax Forum*, "$9,000,000 Road Program," January 15, 1937, 1 and "113 Miles of New Road," April 9, 1937, 1).

[30] Minutes of the State Highway Commission Meeting, April 13, 1937," 84-85, Missouri Department of Transportation, Jefferson City.

[31] *The Fairfax Forum*, "113 Miles of New Road," April 9, 1937, 1.

[32] Minutes of the State Highway Commission Meeting, April 13, 1937," 84-85, Missouri Department of Transportation, Jefferson City.

government would reimburse the state its contribution or about 50% of the cost. The Davis Construction Co., Boonville, was the low bidder for each of the five pavement projects totaling 16 miles from Craig (Holt County) to the wye six miles north of Fairfax (Atchison County).[33] With a contractor and work schedule in place, it was anticipated that Highway 275 would be a "full-width modern highway" before the end of summer.[34]

As Fiscal Year 1936 federal aid projects, federal labor selection and wage requirements applied to contracts for the construction of the highway and Tarkio Bridge. Contractors were obligated to employ "all qualified unskilled labor and such qualified labor of intermediate grade as is locally available," as much as possible, through the assistance of a designated employment agency. Wages ranged from 30 to 60 cents an hour: unskilled workers earned 30 cents; intermediate laborers were paid 40 cents; and skilled employees commanded 60 cents an hour. Furthermore, employees could not exceed 40 hours per week unless they were making up lost time due to weather or shutdowns which were incurred over a three-week period. These employment hour provisions did not apply to "camp help, i.e., cooks, cooks' helpers, hostlers, yardmen, stablemen and watchmen." Contractors who operated camps could deduct wages for employees' camp lodging and meals, but only up to 75 cents per day; a deduction more than that was considered a violation of the minimum wage. The policy also protected employees' freedom to choose their boarding arrangements and were allowed to lodge, board, and trade where and with whomever they elected.[35]

The Tarkio Bridge and Route 275 highway projects were not the only federal aid projects in the area. According to newspaper accounts, there were 100 to 150 men employed on Works Progress Administration projects in Atchison County the summer of 1936.[36] In some cases, crews spent more than a single season on the job, with their residency lasting approximately six months while they completed construction projects. In the fall of 1937, *The Fairfax Forum* reported: "The force of engineers which has been here since spring has about another month's work here before the office is closed and the men are sent to another location."[37] The impact of the construction workers on various aspects of the community has not been analyzed, but their presence likely brought a boon to the local economy.

Before widening the Highway 275 section from Craig to north of Fairfax, a detour from Craig to Rock Port needed to be built. Once completed, the existing highway could be closed so

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[33] *The Fairfax Forum*, "Boonville Company Bids Low on Highway Work," April 23, 1937, 1.

[34] *The Fairfax Forum*, "Highway 275 Will Be Completed Soon." April 2, 1937, 1.

[35] Bridge Division, Bridge Correspondence Files for FAP-793E, Microfiche Records 1062-1069 and 1071-1075, Missouri Department of Transportation, Jefferson City. According to Ms. Aldridge, her father, the contractor R.G. Aldridge, believed one way to attract and retain some of the best construction workers during the era (before motels and restaurants were common) was to employ a great cook to prepare the crews' meals at the job sites or construction camps. Following a favorite cook's resignation announcement, a poker game ensued. The cook lost his money during the game and soon reconsidered his departure plans, deciding to continue working for Aldridge until he could earn back his wages (Donna Aldridge [Overland Park, Kansas] telephone interview with Toni Prawl, April 13, 2012).

[36] *The Fairfax Forum*, "WPA Work in County," July 16, 1936, 1.

[37] *The Fairfax Forum*, "Highway Open for All Traffic Sept. 15," September 10, 1937, 1.

work could proceed on it and the bridge could be relocated. Construction activities to widen the highway were scheduled to commence on May 20, 1937, but were delayed a day until the detour route could be completed. The highway was closed on May 21 and paving work started immediately, beginning with the south portion in Holt County, at the north city limits of Craig and continued north past the county line. Davis Construction Co., contractors for the project, erected temporary project headquarters in Craig. After the first section of the road was paved, the contractors moved its headquarters to Fairfax where operations both north and south of town could be directed. The local paper gives an account of the project's progress and the effects of the road closure on the community:

> Fairfax has been "off the map" so far as highway connections are concerned since Friday of last week. On that day gates were erected at both ends of the portion to be improved and all highway traffic ordered to use the detour or other highways.
>
> As a consequence Fairfax has seen one of the quietest weeks in recent years. There has *[sic]* been no busses or other through traffic, and those who wished to come here or go from here to some other place have had to use the dirt roads, and part of the time they have been muddy.
>
> With the closing of the highway, work started on the straightening of the Tarkio river bridge. The dynamiting of the floor of the north approach Friday sounded like machine gun fire. Paving work will start at Craig the latter part of the week and proceed this way. Most of the necessary material and equipment are on the ground.[38]

In less than two weeks after the highway was closed and construction commenced, about 2.5 miles were paved. When construction conditions were favorable, the contractor could lay an average of 2,250 feet of pavement daily. Although inclement weather, material shortages, or other challenges occasionally interfered with paving progress, the bridge work stayed on schedule. By June 11, the substructure was almost finished and the north span of the old bridge had been moved south and incorporated in the new structure.[39]

Within one week, nearly another two miles were paved passing the county line and increasing the total length to 4.25 miles.[40] A lack of materials delayed paving progress, eventually halting construction for nearly two weeks and ultimately reducing the five-day work week to four days. Average paving, formerly 2,250 feet per day, slowed to 1,600 to 1,900 feet each day. The material shortage, specifically crushed rock, was the result of a labor strike in Kansas City where the rock was shipped.[41] The local news reported on the situation:

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[38] *The Fairfax* Forum, "Highway is Closed; Paving Work Starts," May 28, 1937, 1.

[39] *The Fairfax Forum*, "About 2 ½ Miles of Paving is Finished," June 11, 1937, 1.

[40] *The Fairfax Forum*, "Pavement Past County Line," June 18, 1937, 1.

[41] *The Fairfax Forum*, "Lack of Material Delays Paving Work," June 25, 1937, 1; "About 2 ½ Miles of Paving is Finished, June 11, 1937, 1; "New Paving Within 4 ¼ Miles of Fairfax," July 2, 1937, 1.

> According to the present schedule, there will be four working days of ten hours each per week of actual paving, although shoulder crews and some other employees will work six days a week. The forty-hour week is about sufficient to use the material as fast as it is received. On such a schedule it will take approximately three weeks for the pavement to be laid to town.[42]

While crews adjusted their hours to better manage the limited supply of materials, the concrete bridge floors were poured on the three north spans the first week of July, finishing with the fourth south span a few days later. During the third week of July, the Peterson drag lines began the dirt work on the approaches to the south.[43] Through the crews' steady progress, the new hard surface reached Fairfax city limits by July 21. Final work on this last section of new pavement was expected to continue to the north the following week where it would meet the existing full width pavement in the town's business district. The connection of the two pavements would result in a 20 feet wide pavement through Fairfax and south of town. With the approaches of the new Tarkio River bridge under construction and completion expected within ten days, pavement construction north of town would commence immediately.[44]

The two pavements—the new pavement to the south of Fairfax and the existing pavement in Fairfax—were united at the White Eagle Service Station corner in Fairfax on July 23, 1937. The barricades were removed on the south pavement, but the road was not yet officially open and motorists traveled at their own risk. The remaining shoulder and finishing work were anticipated to take another three weeks before the south highway paving project would be completed. The bridge project was nearing completion also, with dirt work still remaining on the south approach. The same week crews finished paving the south project, they initiated paving work on the north highway project. After paving the first mile north of Fairfax, work was halted on the northern project to make a change in the finishing machine. A different machine was necessary to accommodate a new mixture of concrete known as vibratory concrete, an experimental mixture.[45]

In mid-August, construction workers turned their attention from paving on the north project to preparing the new grades on the approaches for the new Tarkio River bridge. The pavement was finished on both sides of the new bridge, up to the new grade, thus only the new grade on the approaches needed to be readied for laying concrete. This preparation involved jetty work, whereby water is pumped onto the grade and allowed to stand for 56 hours so the graded earth will thoroughly settle. Paving operations resumed a week later, taking only two to three days to finish pouring the 2,050 feet concrete slab over the new grade, 20 feet wide, both north and south of the Tarkio bridge.[46]

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[42] *The Fairfax Forum*, "New Paving Within 4 ¼ Miles of Fairfax," July 2, 1937, 1.

[43] *The Fairfax Forum*, "New Paving Within 4 ¼ Miles of Fairfax," July 2, 1937, 1; "Pavement 3 ¼ Miles South," July 9, 1937, 1; "Pavement 2 Miles From Town," July 16, 1937, 1.

[44] *The Fairfax Forum*, "Pavement Crew Now Working in Town," July 23, 1937, 1.

[45] *The Fairfax Forum*, "Pavement Now a Mile North of Town," July 30, 1937, 1; "Start Paving from Wye," August 6, 1937, 1.

[46] *The Fairfax Forum*, "All Paved Now But Grade at Bridge," August 20, 1937, 1.

By September 3, the highway department had accepted all the highway improvements constructed between Craig and Fairfax, as well as two miles of the highway north of the Fairfax city limits. The last concrete was poured for the new pavement on September 3, while the finishing work followed the next week and the highway remained closed to expedite the final detailing. The contractor, Davis Construction Co., was in the process of removing some of its equipment from the project area to begin its next paving job near Kirksville, but left its crane and some other items for future contract work it had secured on Highway SK east of Fairfax.[47]

After being closed three and one-half months for construction, Federal Highway 275 through Fairfax officially opened on September 15 as a full width high-type road stretching about 150 miles from St. Joseph to Omaha.[48] On behalf of the state highway department, Division Engineer Brown accepted the job, one of the highest type highways in Missouri--all concrete, 20 feet wide.[49] With these state of the art improvements, traffic between the two cities was expected to increase on the popular Highway 275 corridor. Because a portion of the facility doubled as Highway 59 sharing the same alignment from the wye north of Fairfax to St. Joseph, there would be a greater volume of local traffic also.[50] The project was celebrated by area residents and the press praised it, confirming it was indeed worth the wait. The new, wider pavement was superior to the narrow, former highway in place since 1924, and it was an asset to the rural region:

> Those who have driven on the new pavement recently completed on Highway 275, have found the new side of the slab to be one of the finest pieces of road construction work in this part of the country. Unless one watches his speedometer closely he is likely to be driving five or ten miles faster than he thinks.
>
> Cities and centers of population as a rule, got the first pavement under the road program. But now they have the poorest and narrowest pavement in the state. Experience has been a good teacher and roads that have been built within the past two or three years are great improvements over the earlier ones. Patience and delay sometimes have their rewards, and in road construction the communities that have had their highways built last have the best ones.[51]

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[47] *The Fairfax Forum*, "Highway Open for All Traffic, Sept. 15," September 10, 1937, 1.

[48] Ibid., and 1938 state highway maps for Missouri and Iowa. In 1938, there was more Route 275 mileage in Missouri than Iowa: St. Joseph to the Iowa state line totaled 94miles; the state line to Council Bluffs was 57 miles where the route terminated at the Missouri River just east of Omaha, Nebraska.

[49] Missouri Department of Transportation, Bridge Division Correspondence Files for 275 FAP-793, Final Inspection and Final Acceptance document (microfiche); *The Fairfax Forum*, "Highway Finished, Opened Wednesday," September 17, 1937, 1.

[50] *The Fairfax Forum*, "Finish the Highway Paving Thursday," September 10, 1937, 1; "Highway Finished; Opened Wednesday," September 17, 1937, 1.

[51] *The Fairfax Forum*, "Fine Pavement," October 1, 1937, 1.

Although not mentioned, the new bridge undoubtedly improved the safety of the highway facility and enhanced one's driving experience. Moreover, it was the catalyst for the paving project as reports from the previous year explained, "It has been generally understood that the section of highway through Fairfax would not be finished full width until the bridge was straightened."[52] What had begun as a two-span bridge and its companion 9' wide paved road in the early 1920s eventually evolved into a five-span bridge and premium 20' highway of the mid-1930s. While it took more than a decade to reach fruition, the actual construction period for the transformation required nine months and marked a significant accomplishment in the growth of the state's transportation system in northwest Missouri.[53]

R. G. Aldridge Construction Company

Prior to securing the Tarkio River Bridge project, the R. G. Aldridge Construction Company performed work for local road projects in Kansas City and the surrounding area. The company founder, Ralph G. "Red" Aldridge was born on November 5, 1895. He started his construction career in his early 20s by excavating basements with mules. Mules were an important part of his business and his family heritage; he was the third and possibly fourth generation to work mules. His father, grandfather, and great grandfather all reputedly operated 20-mule teams and were established in the freight industry. Although he did not pursue the freight hauling business, he continued the family tradition of using mules as part of his workforce through the 1930s. He gradually expanded his operations by offering additional construction services and acquiring more equipment, including motorized heavy machinery, yet he continued to use mules also. According to his daughter, "In 1937, he was the last contractor in the Midwest to stop using mules." The year coincides with the construction of the Tarkio River Bridge, but it is undetermined if mules were used to assist in its erection. The newer equipment enabled Aldridge to perform a variety of construction services for a period before he ultimately became specialized as a heavy earthwork contractor in later years.

Business headquarters were located at 10th and State Avenue until a new office and shop were constructed in the mid-1940s at nearby 1610 Nebraska Street in Kansas City, Kansas, while the Aldridge family resided in the neighborhood at 2201 Nebraska Street. By the 1950s, his contracts included projects in Kansas, Missouri, Oklahoma, and Texas; perhaps one of the most notable is the Denison Dam on the Red River between Texas and Oklahoma completed in 1943. After more than 60 years in the construction business, Aldridge closed his office and retired at the age of 82; he died four years later in April 1982. Among his accomplishments, Aldridge served on the Board of Directors and was a Trustee at William Woods University for 20 years. His company built roads and dredged Junior Lake on the campus, and a university building--Aldridge Recreational Center--is named in his honor.[54]

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[52] *The Fairfax Forum*, "Advertise for Bids on Tarkio Bridge," November 27, 1936, 1.

[53] This period is calculated from the initial bridge construction work in January 1937 to the official opening of the completed highway in September 1937.

[54] Donna Aldridge (Overland Park, Kansas) telephone interview with Toni Prawl, April 13, 2012; "Building Denison Dam," downloaded from http://www.texomaliving.com/denison-dam on March 30, 2012; Rebecca Quintero, "Father's Portrait Finally Comes 'Home,'" *The Woods*, Fall/Winter 2002, 14 downloaded from "Donna Aldridge Studios," http://aldridgestudios.com/600-WWU-PrtrtArtcl.html; and other sources such as Social Security and city directory information (*Polk's City Directory for Kansas City, Wyandotte County, Kansas*, p. 588 [1940]

Bridge Design and Description

Bridge No. G0355R spanning the Tarkio River at Route 59 consists from north to south of three 40'simple I-beam spans; a steel six-panel, rigid-connected Baltimore through truss span 140' in length; and one Pratt Pony truss 75' in length (see Photo #35). The superstructure is carried on a 25 degree skew by reinforced concrete bents and piers on 40' plain timber piling. With the exception of the outer bents (Bent Nos. 1 and 6) supporting the end spans, the cap beam of all the bents and piers holds two fixed and two expansion bearings for each intermediate span. The total length of the bridge is 348'. It has a deck width of 22'-11".

Substructure

The substructure consists of four bents and two piers of reinforced concrete construction. They are numbered 1 through 6, from north to south, in the following sequence: Bent No. 1, 2 and 3; Pier No. 4 and 5; and Bent No. 6. Bent No. 1 on the north end, supporting the first of three 40' I-beam approach spans, is a two-column open bent set on rectangular footings measuring 6' wide x 9' long x 2'-6" high (see Photo #33). The columns, centered 22'-2 ¼" apart, have a front batter of 3" per 1', and are 2'-6" wide and 17'-1 ½" high. The columns are connected by a cap beam with a backwall and wings extending 46'-8 ¼" across. The bridge seat is at the grade elevation of 905.70', with fixed bearings centered over the columns. The bearing plates measure 12" x 2 ½" x 8" and rest on lead plates. There are four, evenly spaced fixed bearing plates atop the cap beam of Bent No. 1, one supporting each of the four I-beam (two outside and two inside) stringers that extend to Bent No. 2. The bent is backfilled and protected by light stone revetment with a 1 ½ to 1: sloped side.

Bents No. 2 and 3 supporting the second and third I-beam spans are nearly identical. Each is a two-column bent with a cap beam. The footings for both measure 6' x 6' x 2'-6". The rectangular columns, centered 16'-3" apart, are the same width and length--2'-6" x 2'-6"--but the height varies by approximately one inch making Bent No. 2 slightly taller than Bent No. 3. The column height for Bent No. 2 is 17'-4 ½"; Bent No. 3 measures 17'-3 ¾". The column height includes the flared portion at the top directly between the construction joint and beam. This triangular area with 45 degree angles functions like an impost or capital and is centered directly above the column. At its widest point it extends 18" beyond either side of the 2'-6" wide column, resulting in a width 5'-6". Expansion bearings at Bent Nos. 2 and 3 are used for the south end of the I-beam stringers, while fixed bearings support the north ends.

Pier No. 4 is an open pier with an upper web wall (see Photo #15 and 37). It supports the north end of the six-panel through truss main span. The pier is set on large square footings 12' x 9' x 5'. The two pier columns are tapered and cylindrical with a basal diameter of 6', battered to a top width of 4'-2". They are centered 27'-1 ¾" apart. The columns are 21'-7" in height up to

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and p. 21 [1945] downloaded from ancestery.com on March 30, 2012--
http://search.ancestry.com/cgibin/sse.dll?indiv=1&db=ssdi&rank=1&new=1&MSAV=0&msT=1&gss=angsd&gsfn=Ralph+G.&gsln=Aldridge&msbdy=1895&msddy=1982&dbOnly=_F00032DD%7c_F00032DD_x&uidh=v23&msbdd=5&msbdm=11&msddm=4&pcat=34&fh=0&h=575415&recoff=13+12.

the cap beam. The web wall begins 10' from the top of the footings, and is 15" thick. The cap beam has a backwall 14" wide and 2'-2 ¾" high to form the bridge seat for the I-beam span. The cap beam is 4'-8" wide and has fixed bearings for the through truss (see Photo #38).

Pier No. 5 is similar to Pier No. 4, but its columns are a little wider to support the south end of the six-panel through truss and the north end of the pony truss (see Photo #39). Pier No. 5 has square footings 12' x 12' x 5'. Its two cylindrical columns have basal diameters of 6'-10", battered to a top width of 5'-1". The columns are 21'-1" high. The bottom of the connecting web wall is 12'-4" above the footing. Expansion rocker bearings are used for the south end of the through truss; fixed bearings on raised blocks support the north end of the pony truss (see Photos #10 and 11).

Bent No. 6 at the bridge's south end, resembles Bent No. 1, although it is slightly larger. Bent No. 6, supporting the south end of the 75' Pratt pony truss, is a two-column open bent set on rectangular footings measuring 6' wide x 12' long x 2'-6" high (see Photo #41). The columns are off-centered; the outside (east or left) column is closer to the outside edge of the capwall than the inside (west or right) column. The center of the left column is 14'-7 3/8" from the center line of the roadbed, whereas the center of the right column is 12'-6 3/8" from the center line of the roadbed. Both columns have a front batter of 3 7/8" per 1', and are 3' wide and 25'-8 ½" high. The columns are connected by a cap beam with a backwall and wings extending 49'-6 ¾" across. The cap beam has a backwall 12" wide and 4'-6 ¾" high to form the bridge seat. Like Bent No. 1, the bridge seat is at the grade elevation of 905.70', with cast steel expansion rocker bearings centered over the columns. The bent is backfilled and protected by light stone revetment with a 1 ½ to 1: sloped side (see Photo #42).

Superstructure

The superstructure consists of two Pratt truss forms: a Pratt through truss and Pratt pony truss (see Photo #4). The Pratt truss was designed by Thomas Pratt in 1842 and became the most popular truss for moderate spans in the United States by the turn of the century. Large numbers were erected during the last quarter of the nineteenth century and through the first decades of the twentieth century for both railroads and highways until the Warren truss began to supersede its widespread use.[55] In 1916, bridge engineer J.A.L. Waddell proclaimed, "The Pratt truss is the type most commonly used in America for spans under two hundred and fifty feet in length."[56] Six years later in 1922, the Missouri State Highway Department was developing standard Pratt truss bridge plans that ultimately were used for a number of bridges, including the Tarkio River bridge erected the following year and again in 1937.[57]

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[55] Parsons Brinckerhoff and Engineering and Industrial Heritage, *A Context for Common Historic Bridge Types*, NCHRP Project 25-25, Task 15 (Washington, D.C.: National Cooperative Highway Research Program, 2005), 3-25.

[56] Clayton B. Fraser, "Pratt Truss Subtypes," in *Missouri Historic Bridge Inventory*, 5 Vols., Missouri Department of Transportation, Project No. NBIH (6) (Loveland, Colorado: FraserDesign, Inc., 1996), Vol. 1: 83.

[57] Missouri State Highway Department, "Stress Diagrams, Standard Pony Trusses, Concrete Floor without Joists, Spans 50' to 100', Roadway 20'," December 1922 [Standard Bridge Plans, 1 sheet, 1922], Microfiche; and "Bridge Over Tarkio River, State Road from Fairfax to Tarkio about 2 ¾ miles from Fairfax," Project #R157, May 1923, Bridge Division, Missouri Department of Transportation, Jefferson City.

The late nineteenth and early twentieth centuries represent the state's most frenetic bridge construction period when the Pratt truss received almost universal use. Fraser concludes, "More Pratts were erected during this stage than all other truss types combined, and today, despite a terrible attrition of old iron and steel spans, the Pratts remain the most populous truss type."[58] The Pratt pony truss at the south end of Bridge G0355R represents one of the common Pratt types; however, the larger 140' Baltimore truss in the center of the bridge is an unusual Pratt type in Missouri. As a subtype of the Pratt truss, the Baltimore truss has additional bracing in the lower section of the truss to prevent buckling in the compression members and to control deflection. It, as well as another Pratt truss subtype, the Pennsylvania truss, were developed by railroad companies for long span bridges in the 1870s. The reinforced truss that first supported heavy locomotives was adapted for highway use a decade following its introduction. The Baltimore truss was developed in 1871 and the Pennsylvania truss followed in 1875. Both the Baltimore and Pennsylvania trusses were named for their origin, the Baltimore and Ohio (B&O) Railroad and the Pennsylvania Railroad. Each truss follows the form of the Pratt, but includes subdivided panels with sub-diagonals and sub-struts that provide additional bracing for each diagonal.[59]

The Baltimore through truss span may be considered a rare surviving type built by the Missouri State Highway Department. Highway drawings for the Tarkio River Bridge reveal its design progression in three stages. First, when Bridge G 355 was conceived on paper in 1922, it utilized Standard Plan S1140 and was designed with only one truss--the 140' Baltimore truss. Second, while still in the design phase, the bridge was renumbered G 355 A and expanded with the 75' Pratt pony truss; it was erected with both trusses in 1923. Third, the bridge was renumbered G-355 AR when plans to modify it again were prepared in 1935 and it was relocated/reconstructed in 1937. For its 1935/1937 adaptation, the trusses were reused and the structure was extended 120' further with three 40' I beam spans. The first designs specifically for Bridge G 355 reference Standard Plan 1140, two plan sheets dated July 1920 for a "Standard High Truss" with a 140' span and 18' roadway. The design reveals it is, more accurately, a Baltimore truss.[60] While the drawings prepared in October 1922 (checked in November 1922) show the 140' Baltimore through truss as the only span for the Tarkio River Bridge, it was not erected that way. Updated plans drawn and checked in May 1923 reveal the addition of the 75' Pratt pony truss. This revision demonstrates the highway department's experimentation with standard bridge designs used in various combinations. The plans from 1922 used three standard plans: Standard 1, 2, and 1140, whereas the 1923 plans also incorporated another component, Standard 13--the Pratt truss. These and other standard plans helped provide universal designs for repeated use from one project or location to another; however, individual projects often had specific needs that required customization and special attention to details. The 1923-1924

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[58] Clayton B. Fraser, "Pratt Trusses," in Missouri Historic Bridge Inventory, 5 Vols., Missouri Department of Transportation, Project No. NBIH (6) (Loveland, Colorado: Fraserdesign, Inc., 1996), Vol. 1: 83.

[59] Parsons Brinckerhoff and Engineering and Industrial Heritage, *A Context for Common Historic Bridge Types*, NCHRP Project 25-25, Task 15 (Washington, D.C.: National Cooperative Highway Research Program, 2005), 3-32, 3-37.

[60] Standard Design S1140 is for a 14-panel Baltimore truss in contrast to the 12-panel Baltimore truss erected for the Tarkio River crossing. Both trusses span 140' (14 x 10' and 12 x 11'-8" each equal 140').

Highway Commission's biennial report explains, "During the past two years the Bureau [of Bridges] has been largely engaged in preparing special designs for the bridges needed on various road projects initiated during this time. The designs embrace structures ranging in length from 12 feet to 1,200 feet and costing from $1,200 to $121,000."[61]

With few documented examples of Baltimore trusses in the state transportation system, it appears the highway department's experimentation with this Pratt subtype was short lived. At a time when use of the truss was decreasing nationally, the form began appearing in Missouri. Once the Baltimore truss was adapted from rails to roads in the 1880s, it was used for moderate and longer highway bridge spans until the 1920s.[62] In contrast to this 40-year period for the type in some regions, Fraser's study confirms that it was employed for new bridges only a fraction of that time in Missouri. While state highway bridge engineers experimented with 100-foot Baltimore trusses briefly in the early 1920s, they preferred straightforward, standard Pratts for medium-span through trusses and soon abandoned the Baltimore subtype as less efficient.[63] By some standards, the type arrived late in Missouri, yet considering the state highway department had existed less than a decade by 1920, engineers were quick to adopt it. The Baltimore truss spanning the Tarkio River appears to be an anomaly for at least two reasons: the initial, uncommon use and experimentation of the truss in the early 1920s, as well as its revitalization in the 1930s when engineers specified its relocation in conjunction with Route 275 highway improvements.

The rarity of the Baltimore truss in Missouri is not fully known. Fraser's 1996 study describes the subtype as "Pratt configurations with subdivided panels" and it identifies two Baltimore truss bridges in the state. One, the Honey Creek Bridge in Grundy County (GRUN01) was removed while Fraser's draft inventory was being prepared. The remaining one, the McCracken Street Bridge over the Finley River in Christian County County (CHRI09), was erected by the highway department in 1922.[64] If other Baltimore truss bridges like Bridge G0355R were surveyed but not categorized as such, more examples exist or once existed. In his evaluation of the McCracken Street Bridge, Fraser comments that as "one of only two such Baltimore-truss structures remaining in place from this period . . . it enjoys a degree of technological significance for its representation of experimental design conducted during the formative years of the highway department," an assessment equally appropriate for the Tarkio River bridge given its early 1920s conception.[65]

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[61] Missouri State Highway Commission, *Fourth Biennial Report of the State Highway Commission of Missouri for the Period Ending December 1, 1924* (Jefferson City: Hugh Stephens Company, Printers), 119.

[62] Parsons Brinckerhoff and Engineering and Industrial Heritage, *A Context for Common Historic Bridge Types*, NCHRP Project 25-25, Task 15 (Washington, D.C.: National Cooperative Highway Research Program, 2005), 3-32, 3-37.

[63] Fraser, "Missouri Historic Bridge Inventory," Vol. 1, 103 and Vol. 5, "McCracken Street Bridge, CHR109" Inventory Sheet.

[64] Fraser, Vol. 1, 106 and Vol. 5, "McCracken Street Bridge, CHRI09" Inventory Sheet.

[65] Ibid, Vol. 5, "McCracken Street Bridge, CHR109" Inventory Sheet and Vol. 1, "Big Tarkio River Bridge, ATCH01" Inventory Sheet. Fraser's significance rating score for the McCracken Street Bridge is 73, compared to 53 for the Tarkio River Bridge (G355). The McCracken Street Bridge was recommended eligible for the National

The Baltimore through truss for the Tarkio River bridge is 140' long as measured between the centers of the bearings. The truss has six panels, subdivided into twelve panels of 11'-8", and is rigid-connected with 5/8" diameter rivets. The trusses are centered 21'-6" apart and are 23' high at the vertical members. The upper chord and inclined end posts are constructed of two 12" channels with 16" cover plates, single lacing, and end tie plates (see Photos #22 and 23). The lower chord consists of two 20" channel plates connected with batten plates on the top and bottom (see Photos #14, 32, and 45). There are five verticals extending from the lower chord to the upper chord. Two of these verticals are alike; whereas the other three verticals match. The two hip verticals, or the first vertical (designated as lower chord 2 to upper chord 2 on project plans, or L2-U2) and last vertical (lower chord 2 prime to upper chord 2 prime, or L2'-U2') are the same. They are comprised of four angles with central, single bar lacing. The three central verticals (L4-U4, L6-U6, and L4'-U4') are heavier members than the hip verticals, each comprised of two channels with tighter single bar lacing and batten plates. The shorter verticals that subdivide the six panels, the substruts, extend half the distance of the five verticals, spanning from the lower chord to the center height of the truss. They are comprised of four angles with single lacing. Diagonal members are two angles with batten plates (see Photo #29). Wide flange I-beams form the two portal struts; there is no portal bracing, although it is drawn on the project design plans (see Sheet 414). I-beams also form each of the three intermediate struts for the top lateral system; the lateral cross bracing between the struts is formed of two intersecting single angles with bent plate connections. The floor system of the Baltimore through truss includes 27" wide flange beams for the end and floor beams and lower lateral cross-bracing made of single angles on lateral hangers composed of 10" channels with batten plates. Both top and bottom lateral plates, reused from the former bridge, have new holes drilled for 7/8" bolts and old holes within 2" inches of these new holes closed by welding.

Besides the Baltimore truss, the Pratt pony truss span comprising Bridge G0355R was based, in general, on a standard design developed by the Missouri State Highway Department (Standard Drawing S13). Standard Drawing S13 features six stress diagrams for standard pony trusses designed to be used with concrete floors without joists. The illustrated variations range from four to eight panels, spanning a distance from 50' to 100', for a roadway 20' wide. Dated December 1922, the stress diagrams for these six pony trusses are numbered in ascending order as their panels and spans increase, indicating the distance each pony truss spans: Number 550 (4 panels, 50'), 560 (5 panels, 60'), 570 (6 panels, 70'), 580 (7 panels, 80'), 590 (8 panels, 90'), and 5100 (8 panels, 100'). These examples reveal the design flexibility and how the panels and spans could be easily modified to work for crossings of varying distances. Like S580, the Tarkio River pony truss has seven panels, but it is slightly shorter. It is nearly 75' in length, 74'-11 ½" to be exact, as measured between the centers of the bearings (see Photo #40). Each of the seven panels measures 10'-8 ½". The trusses are centered 24'-6" apart and are 9' high (see Photo #8). The members are connected with ¾" and 7/8" diameter rivets. The end posts and upper chords are constructed of two 10"channels with solid cover plates on top, single lacing on the bottom,

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Register as a "rare example of MSHD truss experimentation," while the Tarkio River Bridge was considered possibly eligible as an atypically configured MSHD truss bridge design. Had the Tarkio River Bridge's Baltimore truss been recognized, it most likely would have been ranked higher, perhaps similarly to the McCracken Street Bridge. The McCracken Bridge has two spans, each 100' in length for a total bridge length of 204.0.' As single spans go, the Tarkio River Baltimore truss is 40' longer than the McCracken Street Bridge spans.

and end tie plates. The lower chords consist of two channels with batten plates on top and bottom. Vertical members are four angles connected to a solid central plate. Five panels have diagonal members, each member formed of two angles with batten plates. Four of these five panels feature single diagonal members, while one features a pair of intersecting diagonals. The four panels have single diagonals that slant from the outside upper corner to the inside lower corner, reinforcing the symmetry of the truss and emphasizing the center panel they flank. The center "framed" panel features two angle members that are crossed forming an "X" pattern. The floor system consists of 27" wide flange beams for the end beams and floor beams. Lateral cross-bracing is made of single angles.

The three approach spans at the bridge's north end each consist of four 30" wide flange I-beams that form joists or stringers, 40' long (see Photo #34). These four stringers--two outer stringers and two inner stringers--are supported by floor beams at each end, which in turn rest on the corresponding bents and piers. The four stringers comprising each approach span lie parallel to one another and are uniformly spaced. There are three spaces among the four stringers, thus each stringer is 6'-8" apart (see Plan Sheet 413). The floor beams are formed by channels measuring 12" x 6" and are paired at Bent Nos. 2, 3, and 4.

Lateral braces, situated perpendicularly between the stringers of the approach spans, are formed of angles that measure 3" x 2 ½" x ¼". In many places the stringers and lateral braces form a grid of right angles. Acute and obtuse angles also are formed by the system of stringers and braces in areas juxtapose the skewed floor beams, bents, and piers. Because the alignment is skewed, the position of the lateral braces varies between the floor beams, yet each span has the same number of lateral braces. There are seven lateral braces in both the end span and the two intermediate spans. The end span has two lateral braces between each outer and inner stringer (four braces), whereas there are three lateral braces between the two inner stringers. Where the angles formed by the perpendicular stringer and bracing members are less than or greater than 90 degrees, such as the ends of each span, the distances between the members vary from less than 7" to more than 12'-5". Where the lateral braces form right angles (rectangles) with the stringers, they are spaced at 12'-5" intervals.

All three sections of the bridge's superstructure—the three approach spans at the north end, the main Baltimore truss span at the center of the bridge, and the pony truss span at the south end—share one contiguous deck and uninterrupted guardrail (see Photo #46). With two layers of reinforcing steel, the concrete deck is 9 ½" thick and 23' wide between the curbs. Drainage outlets along the curbs are 3' long. The two horizontal members of the guardrail, an upper rail and lower rail, are formed of 6" channels mounted on 4" I-beam vertical posts along the interior of the panels. For the three approach spans at the north end of the bridge, the guardrails are mounted on I-beam posts supported by trapezoidal knee braces (see Photo #34). At the truss spans, the guardrails are secured to each vertical and diagonal member of the Baltimore and pony trusses they contact (see Photo #29). Additionally, a pair of I-beam posts supports the guardrails between the end posts of the Baltimore and the pony truss at Pier 5 (see Photos #8 and 10). The transition from the bridge guardrail to the highway guardrail is different at both ends of the bridge. At the north end, at Bent 1, the bridge and highway guardrail directly meet near the vertical post supporting the bridge guard rail (see Photo #33). At the south end, at Bent 6, the guardrail terminates differently on the two sides of the bridge. On the west side, the guardrails make a 90-degree bend where they meet the highway guardrails (see Photo #42). On

the east side of the south end, the guardrails flare outward forming a 45-degree angle as they wrap back towards the end post of the pony truss before terminating (see Photo #30).

Some eighty-eight years after the Tarkio River bridge was initially erected and seventy-five years since it was relocated, it remains (2012) a rare example of a Baltimore truss bridge in Missouri. It has experienced minor design alterations since it was adapted for reuse in the 1930s, thus most changes are due to its deteriorating and aging condition which affect its structural integrity. These deficiencies are documented in MoDOT bridge assessments:

> The bridge is structural deficient due to the serious condition (condition rating of 3 out of 10) of the deck. It is also deficient due to width. With an existing width of 22 feet, and with a 32-foot approach roadway and Average Daily Traffic (ADT) of 1860, the width requirement to remove this deficiency would be at least 24 feet. Rehabilitation of the superstructure would address the structural condition, but the bridge would remain functionally obsolete, since widening is not possible for this truss structure type, and the work would not be eligible for federal funding.[66]

Its inherent design, albeit historically significant, is regarded obsolete by today's bridge standards. As a result, the replacement cycle continues as another bridge is erected to ensure service to future generations and continue the ongoing history of the Route 59 Tarkio River crossing.

[66] Memorandum of Agreement for Mitigation of Adverse Effects to Historic Properties (Information to Accompany the Memorandum of Agreement) for the Missouri Safe & Sound Design-Build Contract Project No. J5B0800, executed on July 15, 2009, as housed at the Missouri Department of Transportation, Jefferson City.

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Tarkio River Bridge (Bridge No. G0355R)
Route 59, Atchison County, Missouri

Photographer: Randall Dawdy, Missouri Department of Transportation
Date: March 16, 2011
Location of Negatives: Digital Images Provided to
Missouri State Historic Preservation Office

Photo Index:

#1 of 46. Bridge G0355R. South approach. View to north.

#2 of 46. Bridge G0355R. South approach. View to north.

#3 of 46. Bridge G0355R. Pony truss. View to northwest.

#4 of 46. Bridge G0355R. East side. View to northwest.

#5 of 46. Bridge G0355R. Pony truss detail. View to west.

#6 of 46. Bridge G0355R. Pony truss detail. View to west.

#7 of 46. Bridge G0355R. Pony truss detail. View to west.

#8 of 46. Bridge G0355R. Pony truss. View to northwest.

#9 of 46. Bridge G0355R. Pier 5. View to northwest.

#10 of 46. Bridge G0355R. Details at Pier 5. View to northwest.

#11 of 46. Bridge G0355R. Bearings at Pier 5. View to west.

#12 of 46. Bridge G0355R. Through truss south end. View to west.

#13 of 46. Bridge G0355R. Through truss center panels. View to west.

#14 of 46. Bridge G0355R. Through truss details. View to northwest.

#15 of 46. Bridge G0355R. Details at Pier 4. View to northwest.

#16 of 46. Bridge G0355R. Through truss north end. View to northwest.

#17 of 46. Bridge G0355R. Through truss. View to northwest.

#18 of 46. Bridge G0355R. Through truss. View to northwest.

#19 of 46. Bridge G0355R. Through truss. View to west.

#20 of 46. Bridge G0355R. Through truss. View to west.

#21 of 46. Bridge G0355R. South portal. View to north.

#22 of 46. Bridge G0355R. South portal detail. View to northwest.

#23 of 46. Bridge G0355R. Upper chord detail. View to west.

#24 of 46. Bridge G0355R. Upper chord detail. View to west.

#25 of 46. Bridge G0355R. Diagonal connection. View to west.

#26 of 46. Bridge G0355R. End post detail. View to northwest.

#27 of 46. Bridge G0355R. West truss web. View to northwest.

#28 of 46. Bridge G0355R. Upper struts and laterals. View to north.

#29 of 46. Bridge G0355R. East truss web. View to northeast.

#30 of 46. Bridge G0355R. Guardrail end post. View to northwest.

#31 of 46. Bridge G0355R. West side. View to northeast.

#32 of 46. Bridge G0355R. Through truss. View to northeast.

#33 of 46. Bridge G0355R. Details at Bent 1. View to northeast.

#34 of 46. Bridge G0355R. North approach spans. View to northeast.

#35 of 46. Bridge G0355R. West side. View to southeast.

#36 of 46. Bridge G0355R. Through truss. View to southeast.

#37 of 46. Bridge G0355R. Details at Pier 4. View to southeast.

#38 of 46. Bridge G0355R. Bearing at Pier 4. View to southeast.

#39 of 46. Bridge G0355R. Details at Pier 5. View to southeast.

#40 of 46. Bridge G0355R. South end. View to southeast.

#41 of 46. Bridge G0355R. Pony truss. View to east.

#42 of 46. Bridge G0355R. Details at Bent 6. View to east.

#43 of 46. Bridge G0355R. Bearing at Bent 6. View to east.

#44 of 46. Bridge G0355R. Pier 5. View to south.

#45 of 46. Bridge G0355R. Through truss subdeck. View to south.

#46 of 46. Bridge G0355R. North approach. View to south.

Photographic Methods and Processing:

The archival photographs were taken and processed according to the standards for photographs accompanying NRHP documentation (NPS 2008). Randall Dawdy took the photographs on March 16, 2011 using a digital single lens reflex camera. Images were captured in a raw (nef) format, which was manipulated for light contrast before being converted to a tagged image file format (.tiff) and printed. Images were numbered according to the NRHP Photographic Imaging Policy (NPS 2008) and burned onto compact discs, which were provided to the SHPO along with this report.

Prints were made on Epson Premium Glossy Photo Paper and used Epson Matte Black UltraChrome K3 Ink, both identified as "best" practices by the NRHP photo policy, and which Epson identifies as having an 85-year permanence under glass (NHRP 2009, Epson 2009). Kept in archival conditions the materials will exceed the 75 year permanence standard for the NRHP, which is the standard being used for this project. A copy of the Epson rating is attached.

The .tiff images were burned onto Delkin Archival Gold compact discs, and provided to the SHPO in that format. In addition, a copy of the .tiff file will be maintained by the MODOT Environmental and Historic Preservation Section, and a copy will be provided to the Atchison County Historical Society.

Lightfast Ratings From Wilhelm Imaging Research*

EPSON

Permanence rating for Epson prints framed under glass

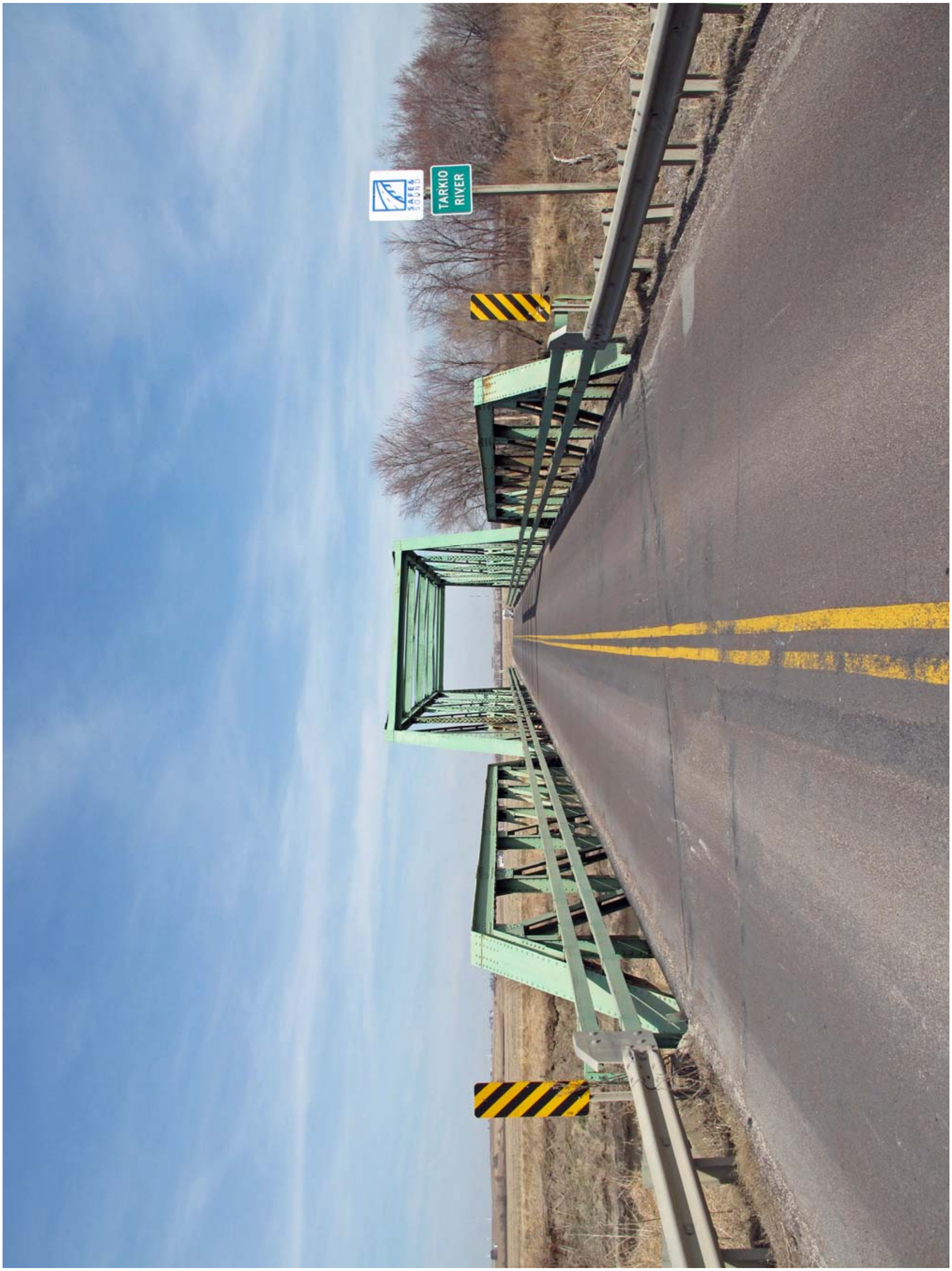
MEDIA	6-Color Photo Dye Inks: Epson Stylus Photo 825/925/960/1280	6-Color Photo Dye Inks: Epson Stylus Photo R200/R300/R320/RX500/RX600	DURABrite® Ink: Epson Stylus C64/C66/C84/C86/CX4600/CX6400/CX6600	PictureMate™ Ink: PictureMate Personal Photo Lab	UltraChrome™ Ink: Epson Stylus Photo 2200	UltraChrome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

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

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

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

#1 of 46. Bridge G0355R. South approach. View to north.



#2 of 46. Bridge G0355R. South approach. View to north.

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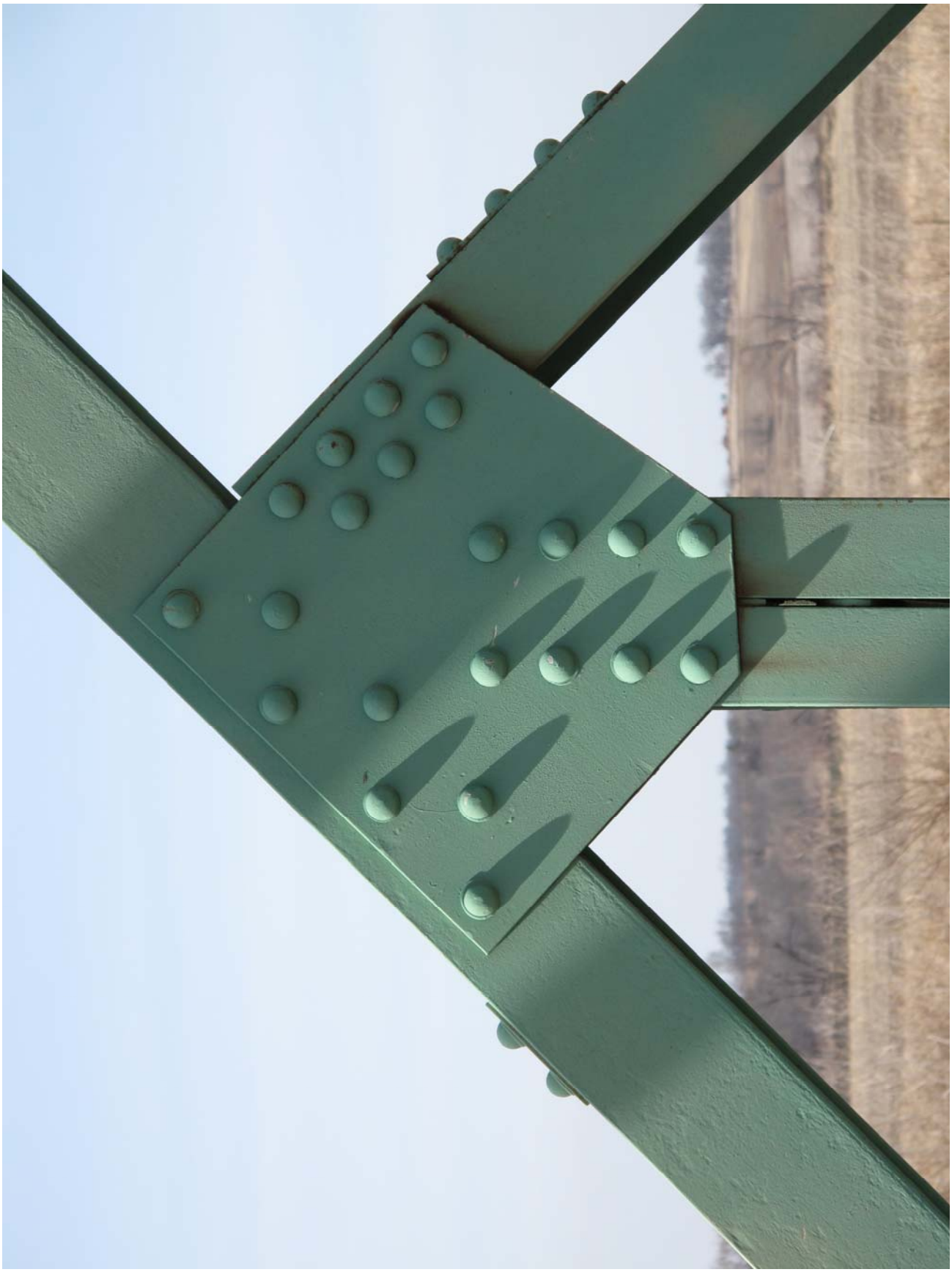

#25 of 46. Bridge G0355R. Diagonal connection. View to west.

#26 of 46. Bridge G0355R. End post detail. View to northwest.

#27 of 46. Bridge G0355R. West truss web. View to northwest.

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#44 of 46. Bridge G0355R. Pier 5. View to south.

#45 of 46. Bridge G0355R. Through truss subdeck. View to south.

#46 of 46. Bridge G0355R. North approach. View to south.

Bridge Plans, Rehabilitations and Standards

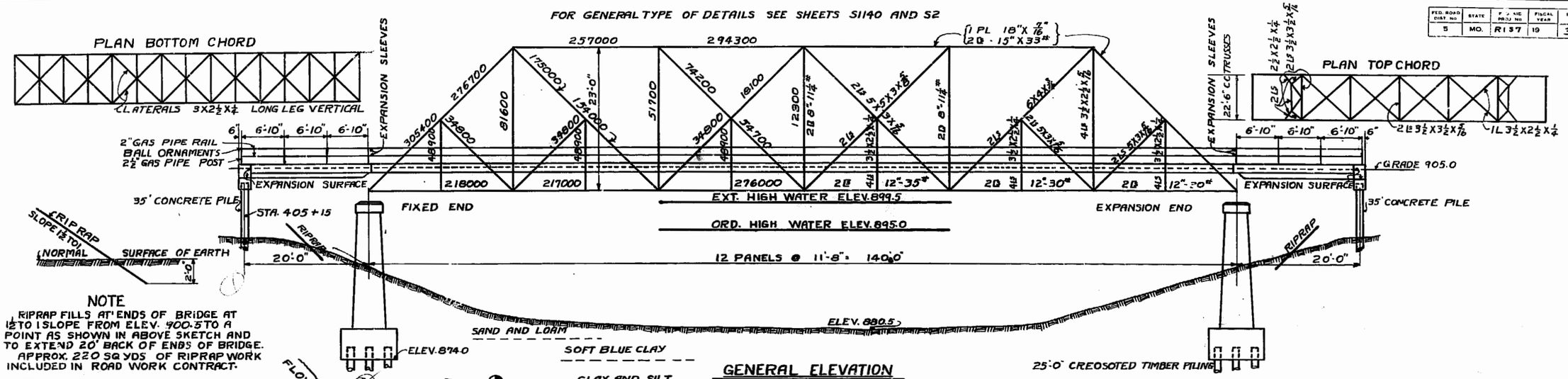
Tarkio River Bridge (Bridge No. G0355R)
Route 59, Atchison County, Missouri

FED. ROAD DIST. NO.	STATE	F. A. NO. PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	MO.	R137	19	31	

FOR GENERAL TYPE OF DETAILS SEE SHEETS S1140 AND S2

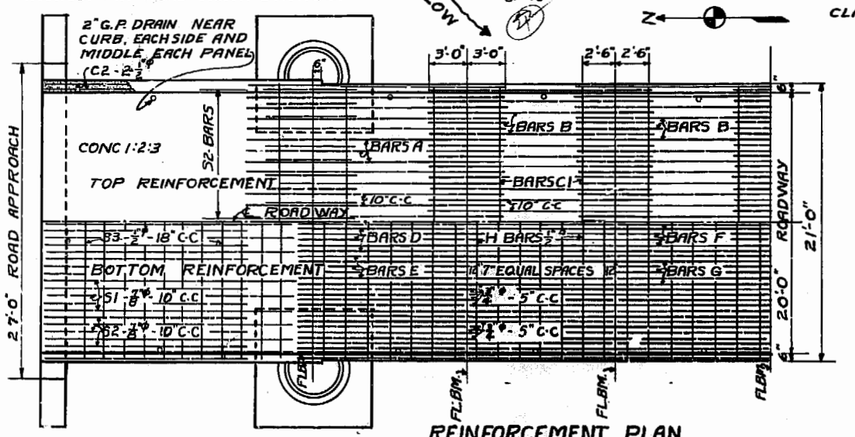
PLAN BOTTOM CHORD

PLAN TOP CHORD

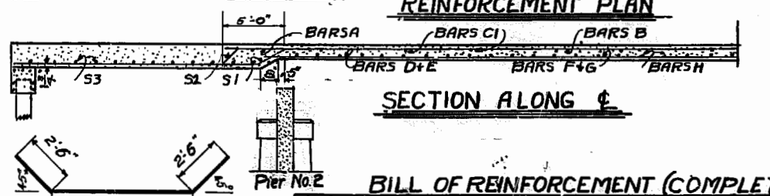


NOTE

RIPRAP FILLS AT ENDS OF BRIDGE AT 1½ TO 1 SLOPE FROM ELEV. 900.5 TO A POINT AS SHOWN IN ABOVE SKETCH AND TO EXTEND 20' BACK OF ENDS OF BRIDGE. APPROX. 220 SQ YDS OF RIPRAP WORK INCLUDED IN ROAD WORK CONTRACT.



REINFORCEMENT PLAN

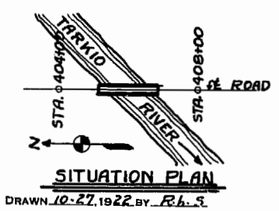


SECTION ALONG ℄

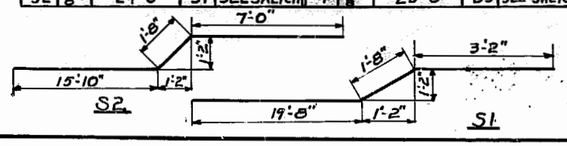
S3

BILL OF REINFORCEMENT (COMPLETE)

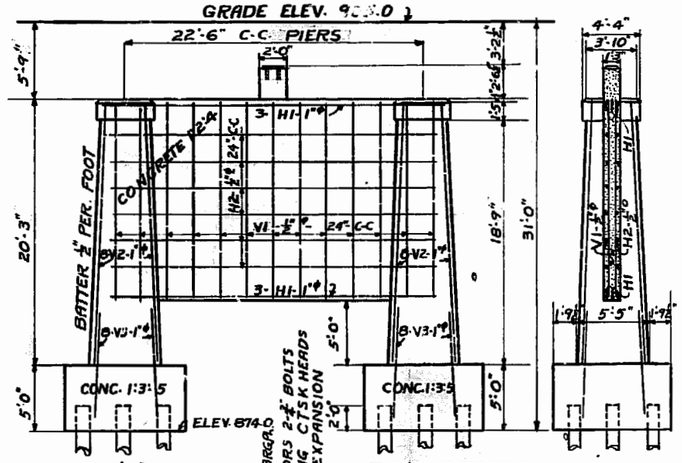
NO	SIZE	LENGTH	MK	REMARKS	NO	SIZE	LENGTH	MK	REMARKS
50	⅜	19'-8"	A	STRAIGHT	28	½	24'-6"	52	SEE SKETCH
250	½	17'-8"	B	"	28	½	22'-6"	53	"
26	½	20'-9"	C1	"	12	1	26'-0"	H1	STRAIGHT
8	½	21'-3"	C2	"	24	½	26'-0"	H2	"
50	⅜	13'-0"	D	"	32	½	15'-0"	V1	"
50	⅜	24'-6"	E	"	32	1	28'-0"	V2	"
100	½	23'-3"	F	"	32	1	8'-0"	V3	"
125	½	23'-3"	G	"	6	⅜	31'-9"	B1	"
96	½	20'-9"	H1	"	4	⅜	22'-0"	B2	"
52	⅜	24'-6"	S1	SEE SKETCH	4	⅜	23'-0"	B3	SEE SKETCH



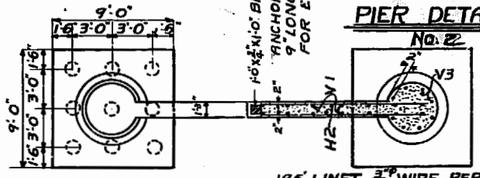
SITUATION PLAN

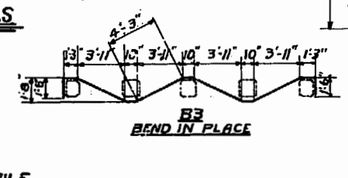


GENERAL ELEVATION



PIER DETAILS





B3 BEND IN PLACE

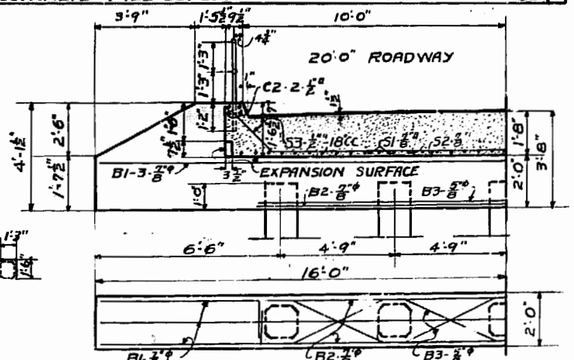
195' LIN FT. ⅞" WIRE PER PILE

CONCRETE PILE

SECTION SLAB ON STEEL SPAN

TABLE OF QUANTITIES

LOCATION	SUPERSTRUCTURE	SLAB + CURB	PILE CAPS	PIERS	TOTAL	
CONCRETE 1:2:3		158.9			158.9	2000 LB. STEEL CASTING
" 1:2:4			11.4	76.0	87.4	
" 1:3:5				60.0	60.0	
REINFORCEMENT		26200	670	4160	31030	
STRUCTURAL STEEL					128000	
LIN. FEET GAS PIPE HAND RAIL					783	
LIN. FEET REINFORCED CONCRETE PILES					350	
LIN FEET CREOSOTED TIMBER PILES					900	
CU. YDS. EXCAVATION.					320	
LIN. FT. CREOSOTED PILE CUT OFF					108	
LIN. FT. CONCRETE PILE CUT OFF					30	



END BENT: HALF PLAN AND ELEVATION

MISSOURI STATE HIGHWAY DEPARTMENT

BRIDGE OVER TARKIO RIVER

STATE ROAD FROM FAIRFAX TO TARKIO

ABOUT 2¾ MILES FROM FAIRFAX.

PROJECT NO. R137 STA. 405+15

ATCHISON COUNTY

SUBMITTED BY Chas. D. Mann BRIDGE ENGINEER

APPROVED BY B. H. Piepmeier STATE HIGHWAY ENGINEER

S1
S2
S1140
G 355

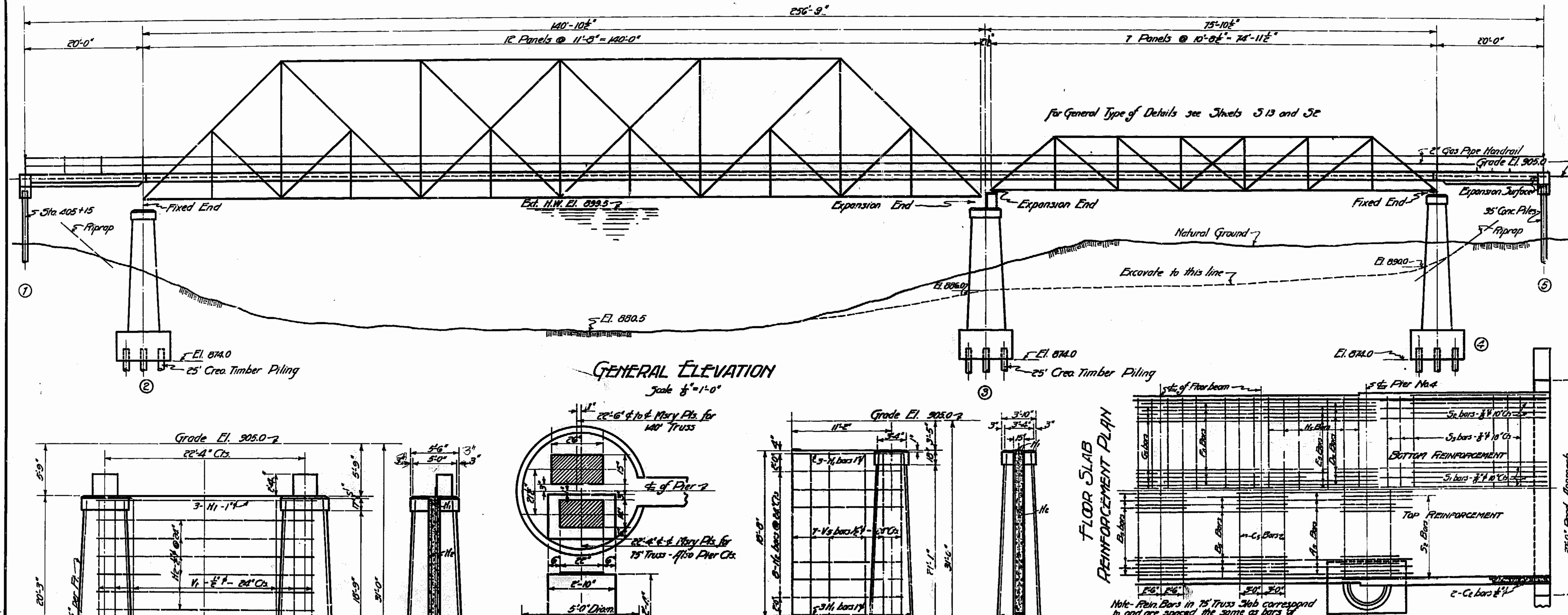
DRAWN 10-27, 1922 BY R.L.S.

CH'K'D. NOV. 1922 BY R.L.T.

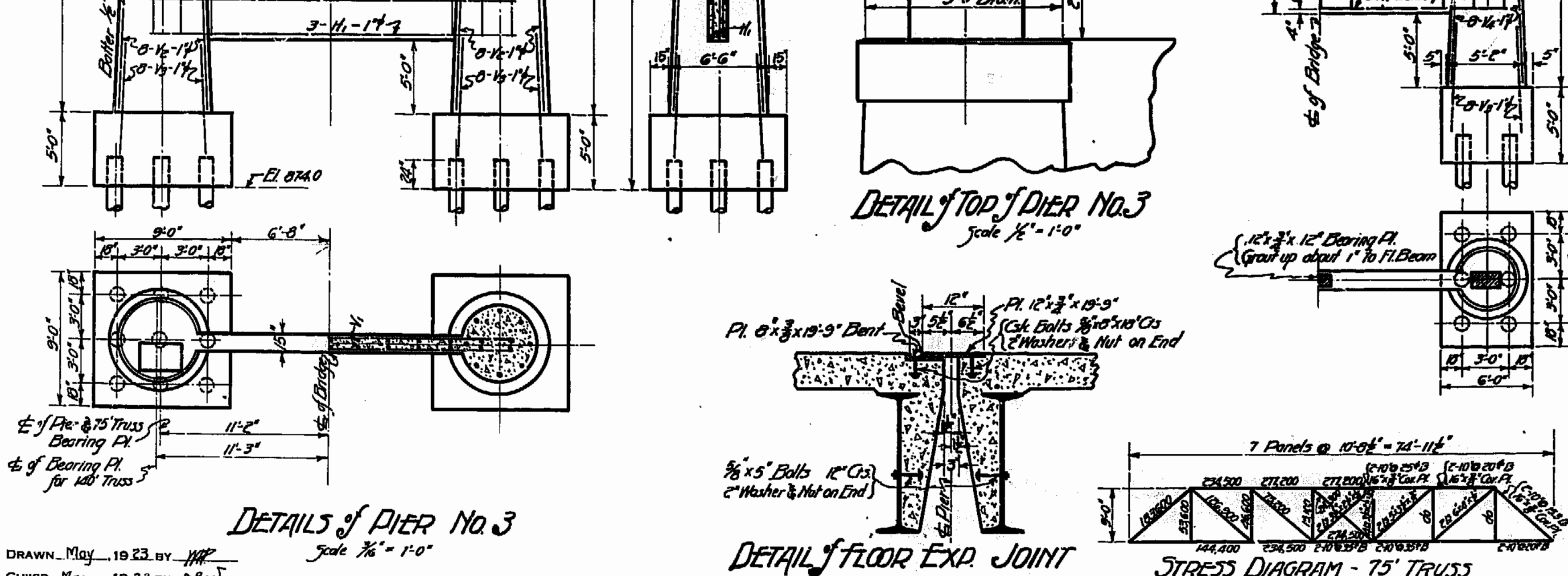
407

File Completed Plans VOID - Repl. with G-355AR

FED. ROAD DIST. No.	STATE	FED. AID PROJ. No.	FISCAL YEAR	SHEET No.	TOTAL SHEETS
5	MO.	RI 57	19		



256'-9"
140'-10½"
75'-10½"
20'-0"
12 Panels @ 11'-8" = 140'-0"
7 Panels @ 10'-8½" = 74'-11½"
20'-0"
For General Type of Details see Sheets S13 and S2
2" Gas Pipe Handrail
Grade El. 905.0
Expansion Surface
35' Conc. Piles
Riprap
Sta. 405+15
Fixed End
Ext. H.W. El. 899.5
Expansion End
Expansion End
Fixed End
Natural Ground
Excavate to this line
El. 890.0
El. 886.0
El. 880.5
El. 874.0
25' Creo. Timber Piling
GENERAL ELEVATION
Scale 1/8" = 1'-0"
Grade El. 905.0
22'-4" Cts.
3-H1-1"
3-H1-1"
V1-½"-24" Cts.
DETAIL of TOP of PIER No. 3
Scale ½" = 1'-0"
22'-6" to ¢ Msry Pls. for 140' Truss
22'-4" ¢-¢ Msry Pls. for 75' Truss - Also Pier Cts.
¢ of Pier
5'-0" Diam.
DETAILS of PIER No. 4
FLOOR SLAB REINFORCEMENT PLAN
Bottom Reinforcement
Top Reinforcement
¢ of Floorbeam
¢ Pier No. 4
25'-0" Road Approach
2-C2 bars ½"
Note - Rein. Bars in 75' Truss Slab correspond to and are spaced the same as bars of corresponding letter on S2.
General Notes on sheet G355 to apply to this sheet also.



DETAILS of PIER No. 3
Scale 3/16" = 1'-0"
¢ of Pier & 75' Truss Bearing Pl.
¢ of Bearing Pl. for 140' Truss
11'-2"
11'-3"
Pl. 8"x⅜"x19'-9" Bent
Pl. 12"x⅜"x19'-9"
Csk. Bolts ⅝"x8"x18" Cts. 2 Washers & Nut on End
⅝"x5" Bolts 12" Cts. 2" Washer & Nut on End
DETAIL of FLOOR EXP. JOINT
12"x⅝"x12" Bearing Pl. Grout up about 1" to Fl. Beam
7 Panels @ 10'-8½" = 74'-11½"
STRESS DIAGRAM - 75' TRUSS

Complete table of Quantities & Rein. Steel

ESTIMATED QUANTITIES				
Location	Superstruct.	Piers	Pile Caps	Totals
Concrete 1:2:3	217.3			217.3 C.Y.
Concrete 1:2:4		128.5	11.4	139.9 C.Y.
Concrete 1:3:5		80.0		80.0 C.Y.
Reinforcing Steel	30,000#	2420#	670#	45,090#
Structural Steel	176,950#			176,950#
Lin. Ft. Gas Pipe Hand Rail				1090
Lin. Ft. Rein. Con. Piles				350
Lin. Ft. Creo. Timber Piles				1200
" " " " " (Cut off)				144
" " Rein. Con. Pile " "				30.
Cu. Yds. Excavation				480

Steel Castings 2000#

BILL OF REINFORCING STEEL									
No.	Size	Length	Mark	Remarks	No.	Size	Length	Mark	Remarks
50	¾"¢	19'-8"	A	Straight	25	¾"¢	33'-6"	F6	Straight
250	¾"¢	17'-8"	B	"	25	¾"¢	33'-6"	G5	"
26	½"¢	20'-9"	C1	"	58	½"¢	20'-9"	H5	"
8	½"¢	21'-3"	C2	"	15	½"¢	20'-6"	J5	"
50	¾"¢	13'-0"	D	"	18	1"¢	26'-0"	H1	"
50	¾"¢	24'-6"	E	"	40	½"¢	23'-6"	H1	"
100	¾"¢	23'-3"	F	"	52	½"¢	15'-0"	V1	"
125	¾"¢	23'-3"	G	"	32	1"¢	20'-0"	V2	"
96	½"¢	20'-9"	H	"	48	1"¢	8'-0"	V3	"
52	⅞"¢	26'-6"	S1	See Sketch	16	1"¢	22'-2"	V4	"
52	⅞"¢	24'-6"	S2	" "	26	½"¢	17'-3"	V5	"
28	½"¢	22'-6"	S3	" "	6	⅞"¢	31'-9"	B1	"
48	¾"¢	15'-5"	A5	Straight	4	⅞"¢	22'-0"	B2	"
120	¾"¢	16'-8"	B5	"	4	⅞"¢	25'-0"	B3	See Sketch
16	½"¢	20'-9"	C5	"					
50	¾"¢	12'-5"	D5	"					
50	¾"¢	23'-10"	E5	"					
25	¾"¢	22'-1"	F5	"					

MISSOURI STATE HIGHWAY DEPARTMENT

BRIDGE OVER TARKIO RIVER

STATE ROAD FROM FAIRFAX TO TARKIO
ABOUT 2¾ MILES FROM FAIRFAX
PROJECT NO. RI 57 STA. 405+15

ATCHISON COUNTY

SUBMITTED BY Charles S. Mann BRIDGE ENGINEER
APPROVED BY B. H. Piepmeier STATE HIGHWAY ENGINEER

Std. S1
Std. S2
Std. S13
Std. S1140
G 355 A

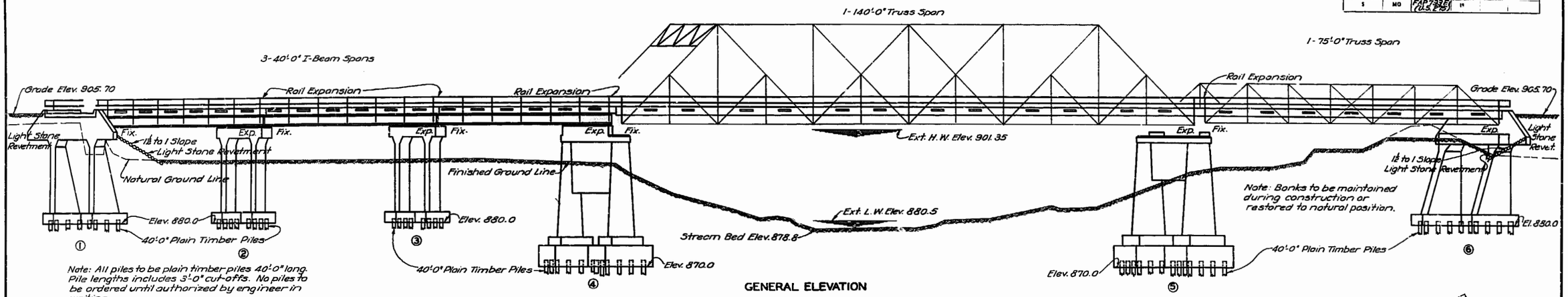
DRAWN May 1923 BY W.A.P.
CH'K'D May 1923 BY A.S.W.J.

408

File Completed Plans (Void) Repl. with G-355AR

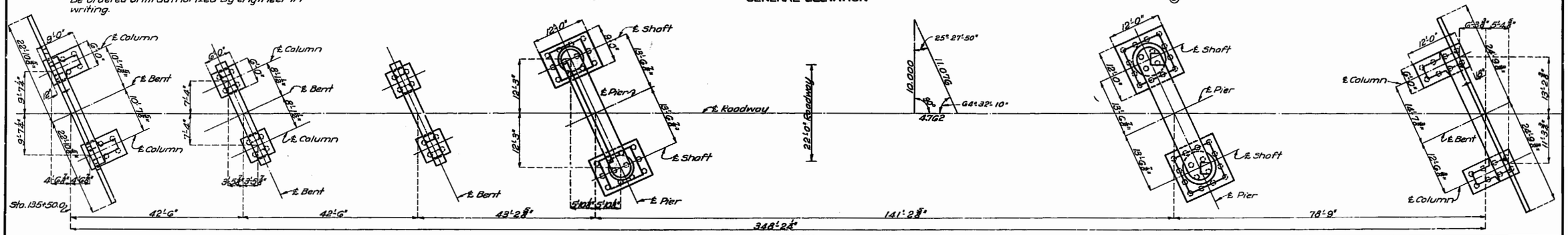
MISSOURI STATE HIGHWAY DEPARTMENT

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	MO	FAP 793E1 (U.S.275)	19		

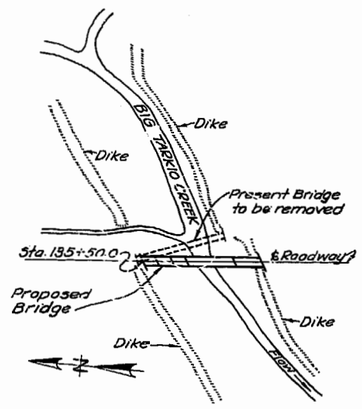


Note: All piles to be plain timber piles 40'-0" long. Pile lengths includes 3'-0" cut-offs. No piles to be ordered until authorized by engineer in writing.

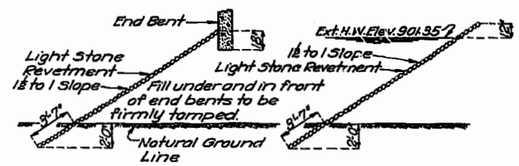
GENERAL ELEVATION



PLAN



LOCATION SKETCH



FRONT OF END BENTS SIDE SLOPES OF FILL

Note: Light stone revetment to be placed on fills at ends of bridge as shown in sketches.
Approximately 240 sq. yds. of light stone revetment work included in road contract.

REVETMENT SKETCHES

Note: Light lines indicate old work.
Heavy lines indicate new work.
Note: This drawing is not to scale.
Follow dimensions.

Drawn June 1936 by H.D.
Traced June 1936 by G.W.
Checked June 1936 by J.K.M.

GENERAL NOTES:

Design Specifications A.A.S.H.O.-1935
Loading H-15 A.A.S.H.O. - Two lanes
Structural Steel Stress 18,000 #/□"
Reinforcing Steel Stress 18,000 #/□"
Concrete Class "A" 1,200 #/□"
Concrete Class "B" 900 #/□"
Concrete in slabs and curbs on truss spans shall be Class "A". All other concrete shall be Class "B".
All concrete shall be proportioned by the weight proportioning method.
Bar supports and spacers will be required for reinforcing steel in superstructure. See Std. C110R.
Exposed edges shall be beveled ¾" where no other bevel is noted.
All Class "A" concrete shall be compacted by vibrating. See Standard Specifications issued November 12, 1935.
Where rubber compound is specified on plans for use in partition or expansion joints, the premoulded compound shall be stitched securely to one face of concrete with copper wire.
Detail shop drawings for all structural steel and cast steel shall be submitted to the State Highway Department in duplicate and shall be approved before material is ordered or work started.
Rivets ⅞" ϕ, holes 15/16" ϕ except in handrail where rivets shall be ¾" ϕ, holes 13/16" ϕ. Field connections for handrail channels shall be ⅝" ϕ button head bolts and for connections of rail to rail posts shall be ⅝" ϕ machine bolts, holes 11/16" ϕ. All other field connections riveted except as noted. Holes for turned bolts shall be subpunched and reamed to a driving fit.
Paint, Shop: none; Field: contact surfaces of bolted field connections one coat of red lead and surfaces inaccessible after erection three coats of red lead. No other paint to be applied by Contractor. Red lead required shall be furnished by the Contractor. Payment for cleaning and painting such surfaces will be included in unit price bid for structural steel.
All piles shall be driven to sustain a load of 20 ton per pile.
Contractor shall verify all dimensions in field before ordering new steel.
Excavation for structure shall be in accordance with Specification 1 of Standard Specifications issued November 12, 1935. Quantities paid for will be computed from Extreme Low Water Elev. 880.5 where existing ground line is below this elevation.
Beam flanges shall be squared up at all points of bearing.
Use pressed shoes and rockers for 140' truss span. For details of shoes and rockers for 75' truss span see Std. 5807.

ESTIMATED QUANTITIES

Item		Substr.	Superstr.	Total
Class 1 Excavation for Structures	Cu. Yds.	700		700
Class 2 Excavation for Structures	Cu. Yds.	420		420
Concrete Class "A"	Cu. Yds.		153.4	153.4
Concrete Class "B"	Cu. Yds.	368.8	76.6	445.4
Fabricated Structural Steel (Truss Spans)	Lbs.		95000	95000
Fabricated Structural Steel (I-Beam Spans)	Lbs.		73500	73500
Cast Steel (Truss Spans)	Lbs.		1520	1520
Cast Steel Bearings (I-Beam Spans)	Lbs.		1580	1580
Reinforcing Steel	Lbs.	16080	68470	84550
Timber Piles	Lin. Ft.	3700		3700
Timber Pile Cut-offs	Lin. Ft.	300		300
Timber Test Piles	Lin. Ft.	100		100

Note: Excavation above Elev. 882.0 will be paid for as Class 1 Excavation for Structures. Excavation below Elev. 882.0 will be paid for as Class 2 Excavation for Structures. Stream banks under span (5-6) shall be excavated to a depth of 3'-0" below bottom of steel, and within the maximum horizontal limits of 4'-0" outside of curb lines, and will be paid for at unit price bid for roadway excavation.

B.M. Elev. 902.73 - Sta. 135+64-12' Lt. Top N. Rivet on N. End Main Span Bridge.

BRIDGE OVER BIG TARKIO CREEK

STATE ROAD FROM TARKIO TO FAIRFAX
ABOUT 3.25 MILES NORTH OF FAIRFAX
PROJECT NO. F AP 793E1(U.S.275) STA. 135+50.0

ATCHISON COUNTY

SUBMITTED BY M.K. Lacy BRIDGE ENGINEER DATE 7/22/36
APPROVED BY T.H. Cutler CHIEF ENGINEER DATE 7/22/36

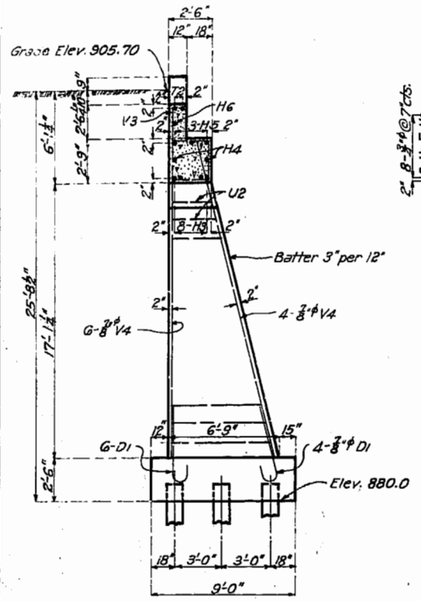
STD. S911
STD. C110R
G-355AR

Sheet No. 1 of 8.

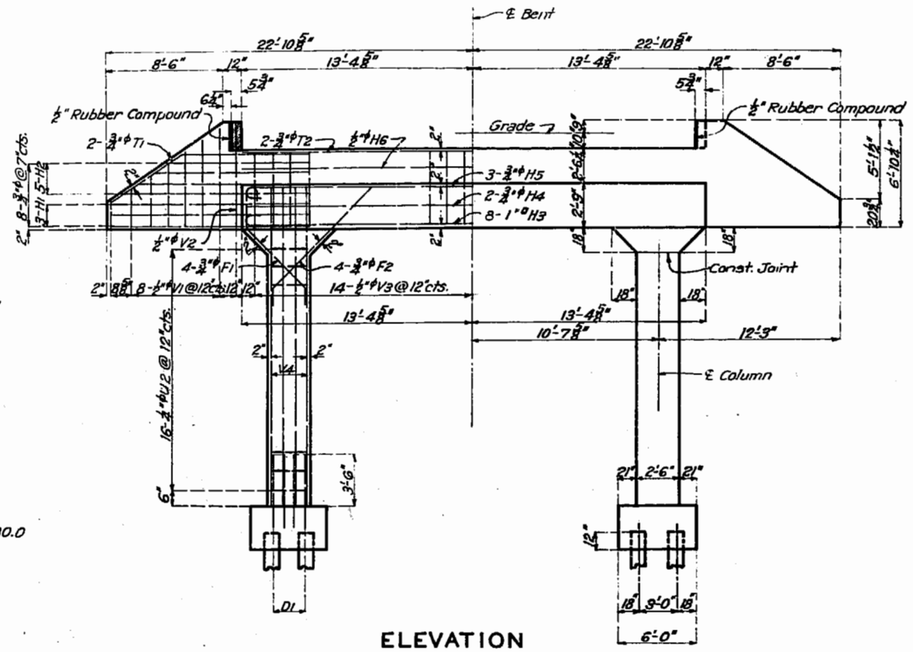
F.A.

MISSOURI STATE HIGHWAY DEPARTMENT

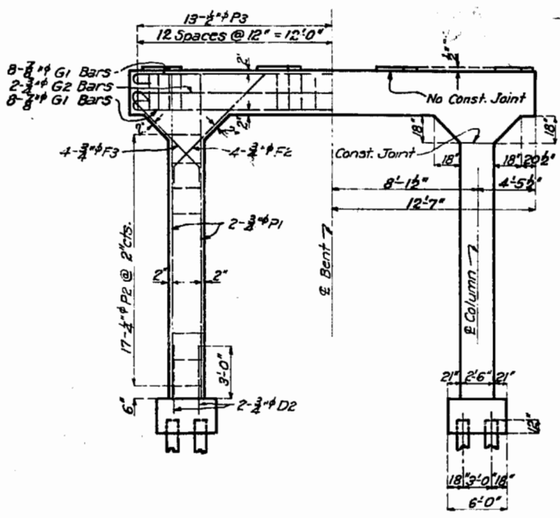
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO	TOTAL SHEETS
5	MO.	FAP 793E (U.S.275)	19		



SECTION AT ℄



ELEVATION



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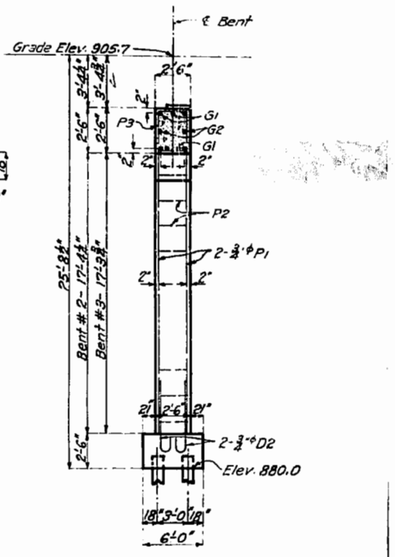

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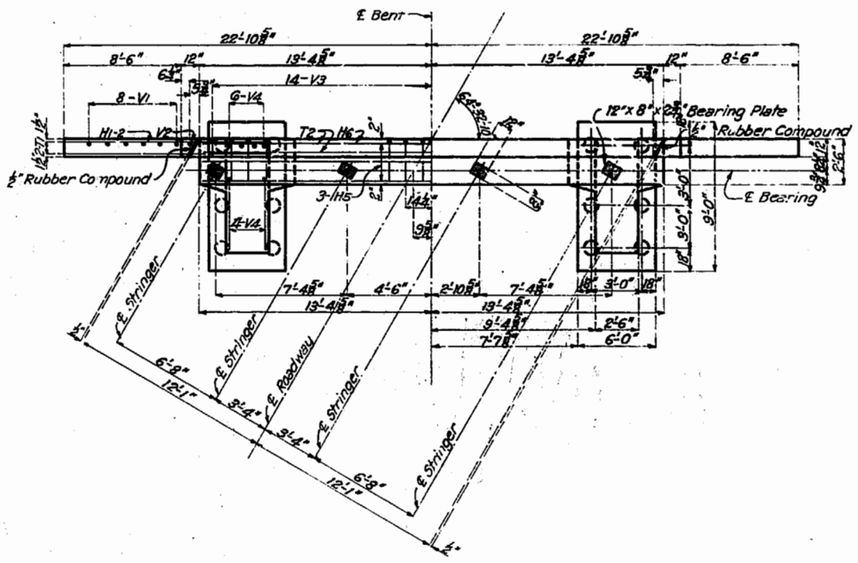
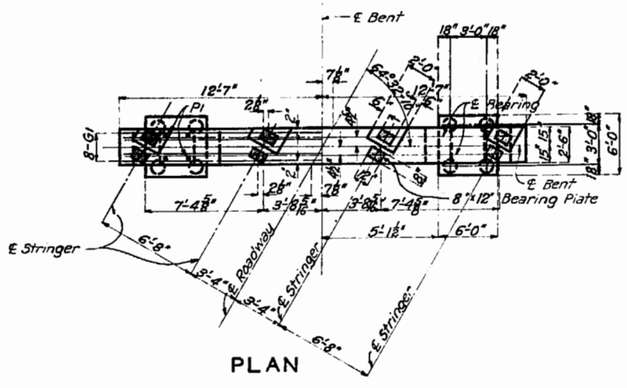


PLAN

DETAILS OF BENT NO. 1



PLAN

DETAILS OF BENTS NO. 2 & 3

BRIDGE OVER BIG TARKIO CREEK

STATE ROAD FROM TARKIO TO FAIRFAX

ABOUT 3.25 MILES NORTH OF FAIRFAX

PROJECT NO. FAP793E(U.S.275) STA. 135+50.0

ATCHISON COUNTY

410

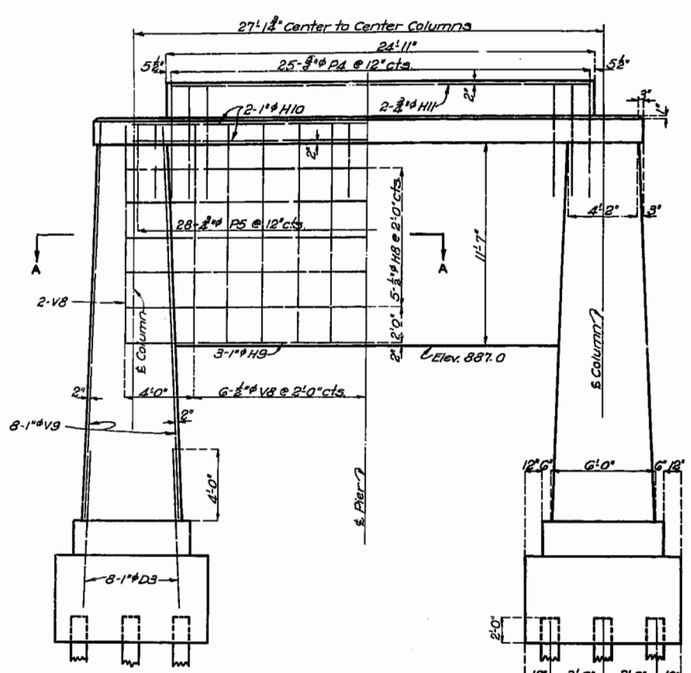
Assembled Aug. 1935 By H.D. - R.J.G.
Checked June 1936 By H.H.m.
Drawn July 1932 By R.J.G.
Checked July 1932 By P.H.S.

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

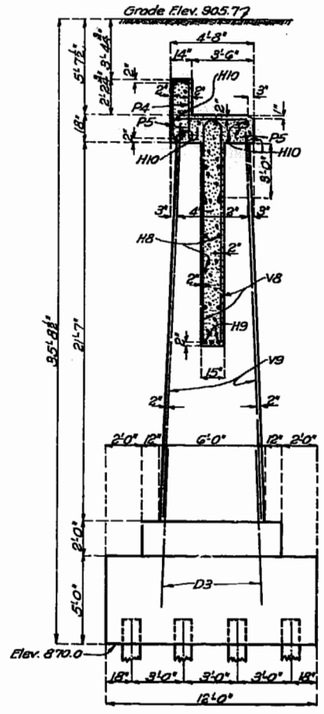
G-355AR

MISSOURI STATE HIGHWAY DEPARTMENT

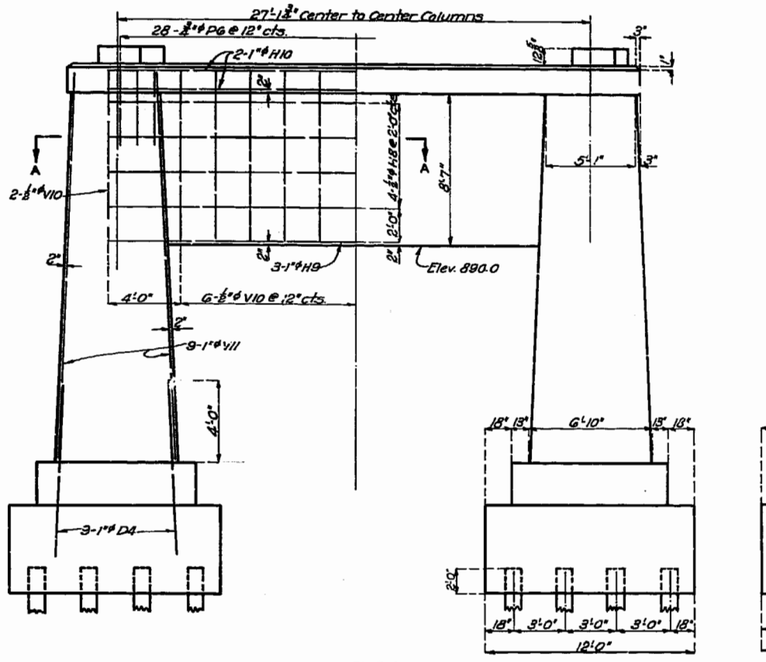
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
3	MO.	FAP 793E (U.S. 275)	19		



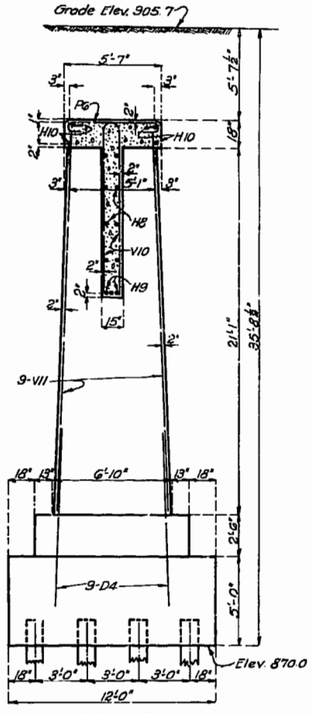
ELEVATION



SECTION AT ℄



ELEVATION



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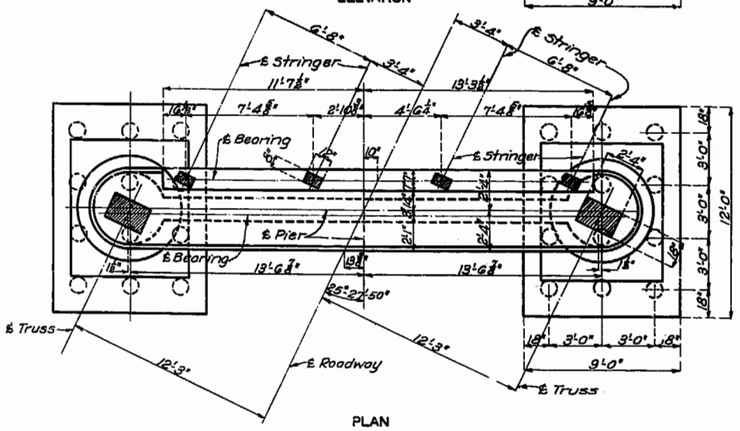
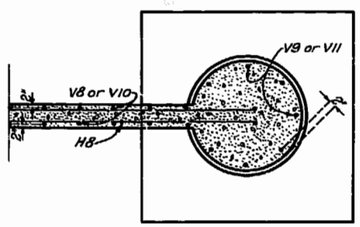
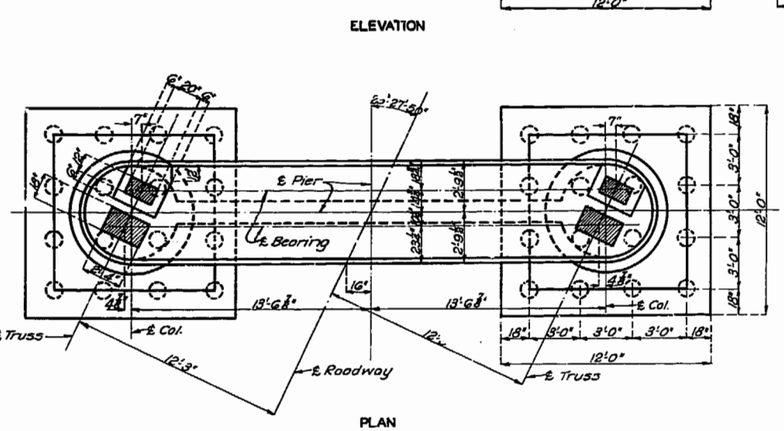


PLAN

DETAILS OF PIER NO. 4

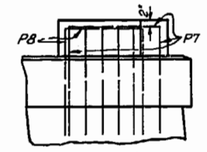


HALF HORIZONTAL SECTION A-A

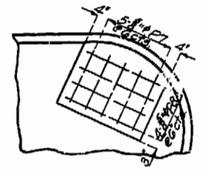


PLAN

DETAILS OF PIER NO. 5



ELEVATION



PLAN SHOWING REINF. FOR BLOCK ON PIER NO. 5

BRIDGE OVER BIG TARKIO CREEK

STATE ROAD FROM TARKIO TO FAIRFAX

ABOUT 3.25 MILES NORTH OF FAIRFAX

PROJECT NO. FAP 793 E1 (U.S. 275) STA. 135 + 50.0

ATCHISON COUNTY

G-355AR

Drawn May 1936 by A.F.K.
Traced June 1936 by G.W.
Checked June 1936 by Hahn

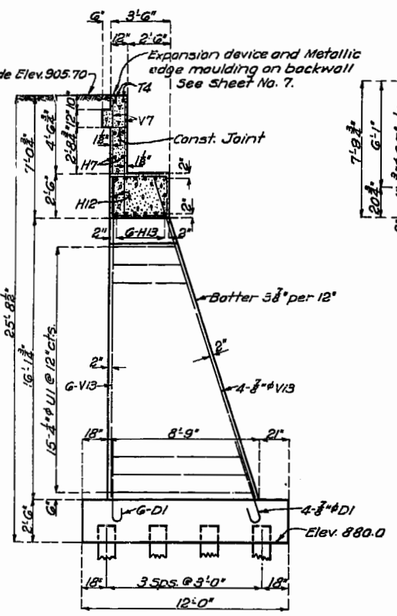
Note: This drawing is not to scale. Follow dimensions.

F.A.

4112

MISSOURI STATE HIGHWAY DEPARTMENT

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	MO.	FAP 793 E (U.S. 275)	19		



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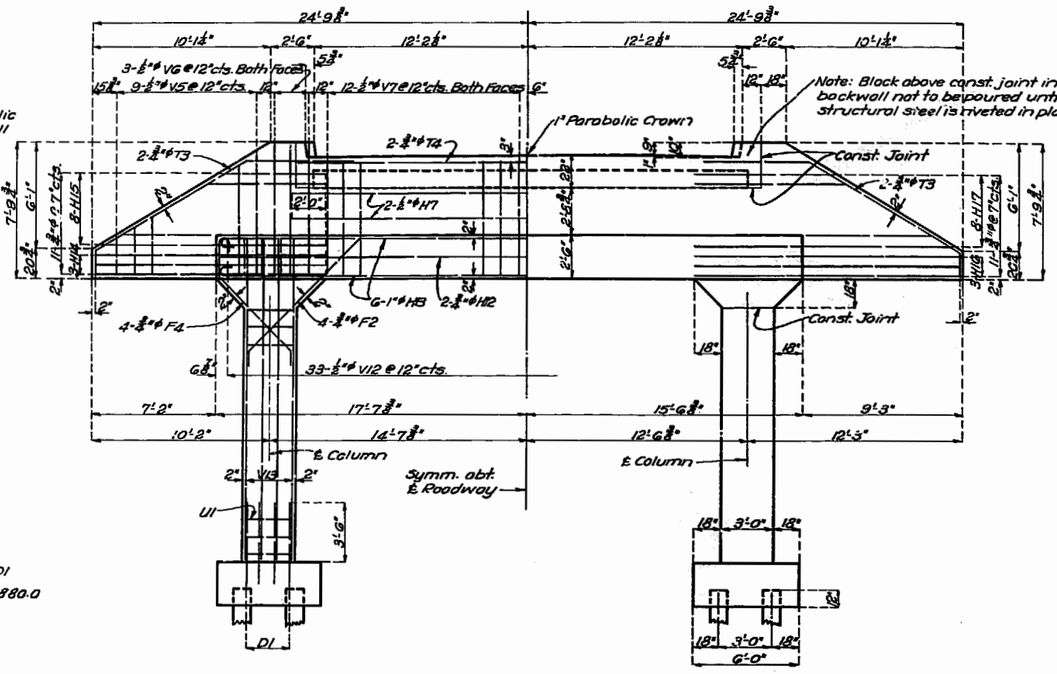
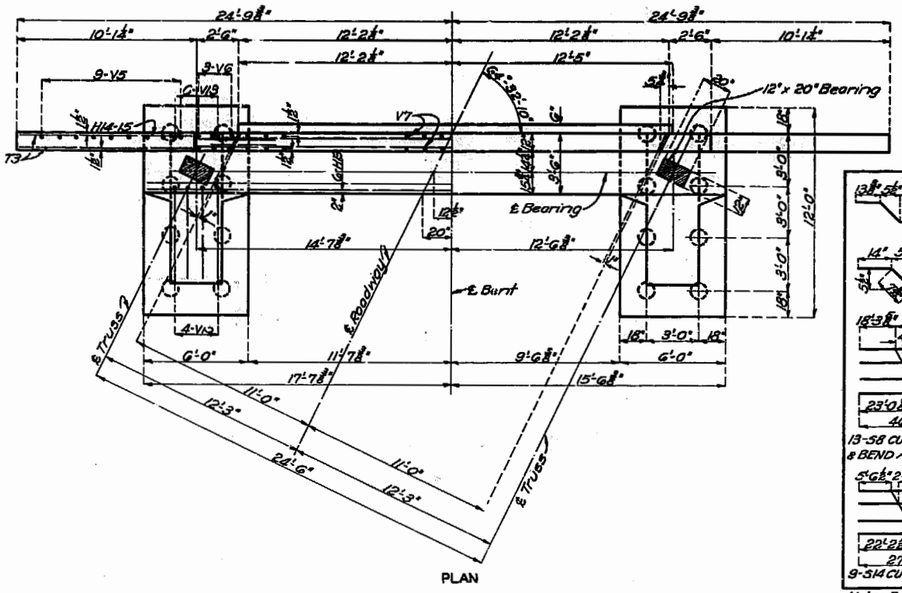


ELEVATION



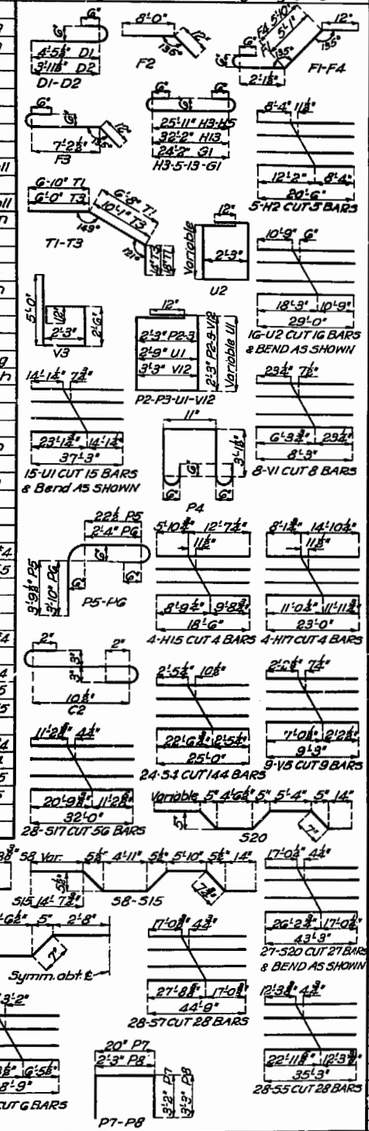
PLAN

DETAILS OF END BENT NO. 6

COMPLETE BILL OF REINFORCING STEEL

No.	Size	Length	Mark	Location
		End Bent No. 1		
20	⅜"ϕ	5'-9"	D1	Footing
8	⅜"ϕ	9'-6"	F1	Haunch
8	⅜"ϕ	9'-0"	F2	"
6	⅜"ϕ	12'-6"	H1	Wing
5	⅜"ϕ	20'-6"	H2	"
8	1"ϕ	28'-6"	H3	Beam
2	⅜"ϕ	26'-6"	H4	"
3	⅜"ϕ	28'-6"	H5	"
1	½"ϕ	24'-6"	H6	Backwall
4	⅜"ϕ	15'-0"	T1	Wing
2	⅜"ϕ	26'-6"	T2	Backwall
16	⅜"ϕ	29'-0"	U2	Column
8	⅜"ϕ	8'-3"	V1	Wing
2	½"ϕ	6'-6"	V2	"
27	½"ϕ	13'-0"	V3	Beam
20	⅜"ϕ	19'-6"	V4	Column
		Int. Bents No. 2 & 3		
16	⅜"ϕ	5'-3"	D2	Footing
16	⅜"ϕ	9'-0"	F2	Haunch
16	⅜"ϕ	9'-6"	F3	"
32	⅜"ϕ	26'-9"	G1	Beam
4	⅜"ϕ	24'-9"	G2	"
16	⅜"ϕ	19'-6"	P1	Column
68	⅜"ϕ	10'-0"	P2	"
50	½"ϕ	10'-0"	P3	Beam
		Piers No. 4 & 5		
16	1"ϕ	9'-3"	D3	Footing #4
18	1"ϕ	9'-9"	D4	" #5
18	½"ϕ	28'-0"	H8	Web
6	1"ϕ	28'-0"	H9	"
8	1"ϕ	27'-0"	H10	Cap
2	⅜"ϕ	24'-6"	H11	Haunch #4
25	⅜"ϕ	9'-5"	P4	"
56	⅜"ϕ	7'-9"	P5	Cap #4
56	⅜"ϕ	8'-3"	P6	" #5
10	⅜"ϕ	8'-0"	P7	Block #5
8	⅜"ϕ	8'-8"	P8	"
26	⅝"ϕ	12'-9"	V8	Web #4
16	1"ϕ	22'-9"	V9	Col. #4
26	½"ϕ	9'-9"	V10	Web #5
18	1"ϕ	22'-3"	V11	Col. #5

Bending Sketches & Cutting Diagrams



No.	Size	Length	Mark	Location
		End Bent No. 6		
20	⅜"ϕ	5'-9"	D1	Footing
8	⅜"ϕ	9'-0"	F2	Haunch
8	⅜"ϕ	10'-3"	F4	"
4	½"ϕ	27'-0"	H7	Backwall
2	⅜"ϕ	32'-9"	H12	Beam
12	1"ϕ	34'-8"	H13	"
3	⅜"ϕ	13'-0"	H14	Wing
4	⅜"ϕ	18'-6"	H15	"
3	⅜"ϕ	15'-9"	H16	"
4	⅜"ϕ	23'-0"	H17	"
4	⅜"ϕ	17'-3"	T3	"
2	⅜"ϕ	26'-0"	T4	Backwall
15	½"ϕ	37'-3"	U1	Column
9	½"ϕ	9'-3"	V5	Wing
12	½"ϕ	7'-6"	V6	"
48	½"ϕ	6'-6"	V7	Backwall
33	½"ϕ	12'-0"	V12	Beam
20	⅜"ϕ	18'-6"	V13	Column
		I-Beam Superstructure		
48	⅝"ϕ	22'-3"	C1	Curb
164	⅜"ϕ	2'-0"	C2	"
448	⅜"ϕ	23'-0"	S1	Slab
378	⅝"ϕ	22'-3"	S2	"
12	½"ϕ	25'-6"	S5	"
144	⅜"ϕ	25'-0"	S4	"
		140' Truss Span		
232	½"ϕ	15"	C3	Curb
32	⅝"ϕ	37'-3"	C5	"
28	⅜"ϕ	35'-9"	S5	Slab
168	⅜"ϕ	38'-0"	S6	"
28	⅜"ϕ	44'-9"	S7	"
13	⅜"ϕ	46'-6"	S8	"
31	½"ϕ	39'-0"	S9	"
13	½"ϕ	34'-3"	S10	"
27	½"ϕ	21'-6"	S11	"
234	⅝"ϕ	22'-9"	S12	"
6	⅝"ϕ	28'-9"	S13	"
9	⅝"ϕ	27'-9"	S14	"
1	⅜"ϕ	28'-6"	S15	"
1	½"ϕ	11'-9"	S16	"
		75' Truss Span		
120	½"ϕ	15"	C3	Curb
24	⅜"ϕ	27'-3"	C4	"
111	⅜"ϕ	22'-9"	S12	Slab
56	⅝"ϕ	32'-0"	S17	"
56	⅝"ϕ	24'-6"	S18	"
56	⅝"ϕ	28'-6"	S19	"
27	¾"ϕ	43'-3"	S20	"
27	⅜"ϕ	41'-0"	S21	"
27	½"ϕ	20'-6"	S22	"
6	⅝"ϕ	27'-0"	S23	"
8	⅝"ϕ	28'-0"	S24	"

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

BRIDGE OVER BIG TARKIO CREEK

STATE ROAD FROM TARKIO TO FAIRFAX

ABOUT 3.25 MILES NORTH OF FAIRFAX

PROJECT NO. FAP 793 E(U.S.275) STA. 135 + 50.0

ATCHISON COUNTY

G-355AR

412

Drawn June 1936 by H.D.
Traced June 1936 by G.W.
Checked June 1936 by H.H.M.

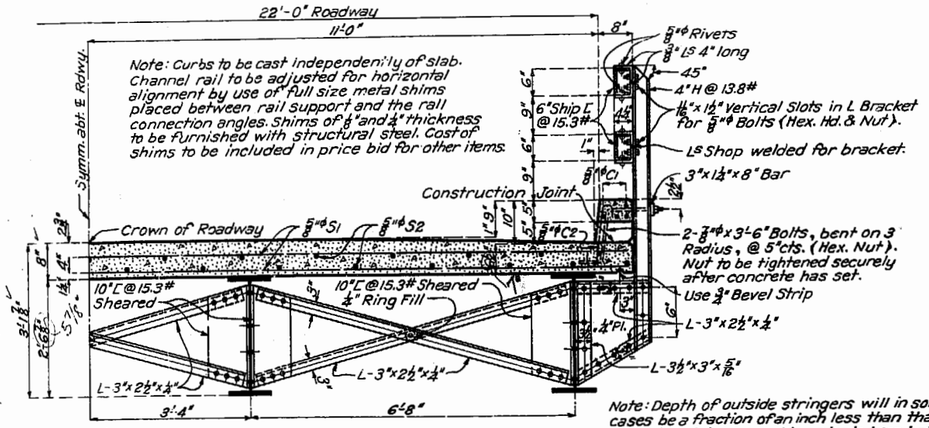
Note: This drawing is not to scale. Follow dimensions.

F.A.

GALLUP-K.C.-MO

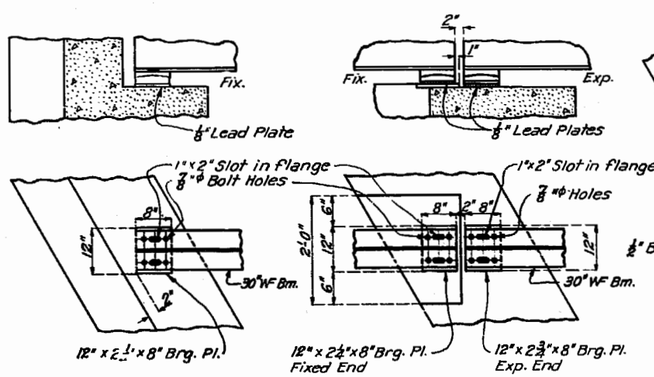
MISSOURI STATE HIGHWAY DEPARTMENT

FED. ROAD DIST. NO.	STATE	F.A. PROJ. NO.	FISCAL YEAR	SHEET NO	TOTAL SHEETS
9	MO.	F.A. 793(E)	19		



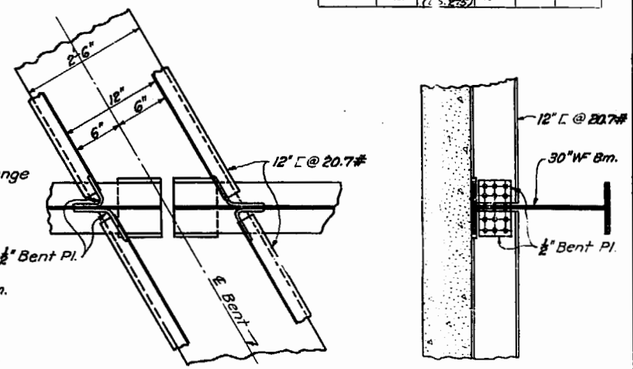
HALF SECTION THRU SPAN

Note: Depth of outside stringers will in some cases be a fraction of an inch less than that of inside stringers and in order to keep bottom of slab horizontal it will be necessary to haunch slab down to top of outside stringers.



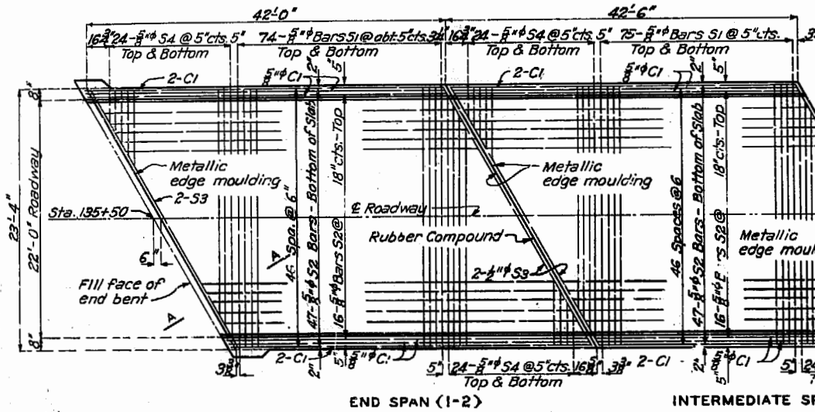
DETAILS OF BEARINGS ON BENT NO. 1

DETAILS OF BEARINGS ON BENTS NO. 2 & 3



Note: Tops of channel separators at ends of span to be flush with bottom of slab.

DETAILS OF END CHANNEL SEPARATORS

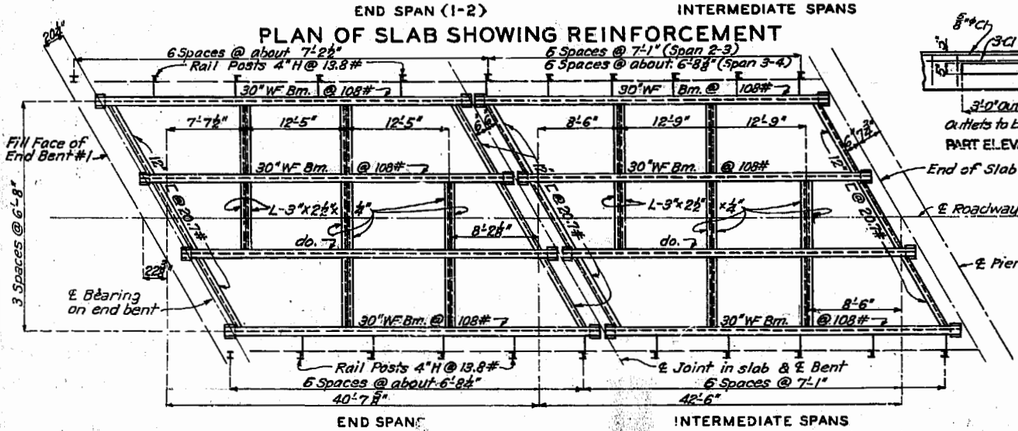


END SPAN (1-2) INTERMEDIATE SPANS

PLAN OF SLAB SHOWING REINFORCEMENT

Note: A mixture of graphite and oil to be applied to surfaces in contact before placing plates in structure. Bearing plates to be either cast steel or gray iron alloy castings.

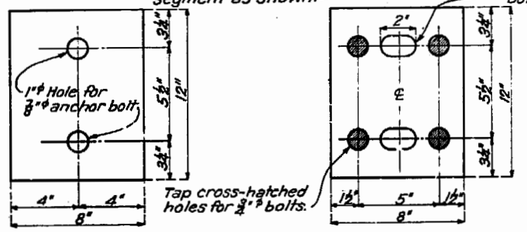
Anchor bolts to be 7/8"ϕ, no heads, Hex. nuts and to extend 10" into concrete. Stud bolts and nuts to be paid for as structural steel.



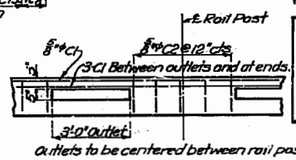
END SPANS INTERMEDIATE SPANS

PLAN OF STRINGERS

END ELEVATION END ELEVATION



PLAN OF BOTTOM PLATES PLAN OF TOP PLATES



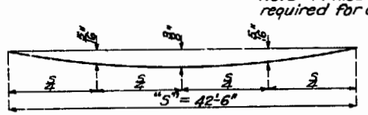
Outlets to be centered between rail posts.

PART ELEVATION OF CURB

Note: Tops of bents to be finished as nearly as possible to within 1/8" of final elevation of bottom of plates. Plates to be seated to proper elevation by inserting soft lead plates between top of bent and bottom of plate. Concrete seat under lead plates to be dressed to a uniform level bearing with carborundum brick. Cost of lead plates to be included in price bid for other items.

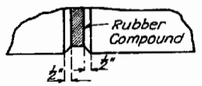
DETAILS OF BEARING PLATES

Note: 4 Fixed and 4 expansion plates required for each span.



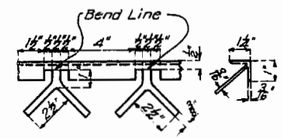
Note: Floor slab to be brought to grade and dead load deflection taken care of by increasing slab thickness. Depth of slab at outside face of curb to be kept uniform and bottom surface of slab warped between curbs and outside beam to obtain required thickness at beam. Payment will be allowed for additional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

DEFLECTION DIAGRAM



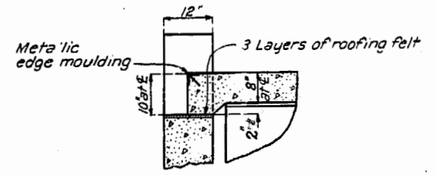
Note: Use bevel as shown for exposed faces of all joints consisting of rubber compound except at top surface of roadway slab. Use metallic edge moulding at top surface of roadway each side of rubber compound joint.

DETAIL OF BEVEL FOR RUBBER COMPOUND JOINTS

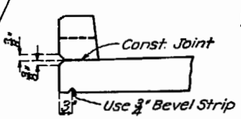


METALLIC EDGE MOULDING

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



SECTION A-A SHOWING SLAB AT END BENT



DETAIL OF BEVEL FOR CONST. JOINT AT CURB

BRIDGE OVER BIG TARKIO CREEK

STATE ROAD FROM TARKIO TO FAIRFAX

ABOUT 3.25 MILES NORTH OF FAIRFAX

PROJECT NO. FAP 793 E1 (U.S. 275) STA 135 + 50.0

ATCHISON COUNTY

FINISHED

Drawn Feb. 1933 By R.J.G.
Traced Feb 1933 By R.J.G. Assembled Aug. 1935 By H.D.-R.J.G.
Checked Feb. 1933 By J.G. Checked June 1936 By J.V.H.m

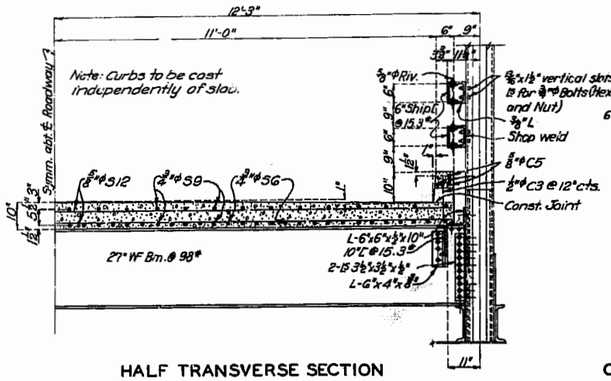
Note: This drawing is not to scale. Follow dimensions.

Sheet No. 5 of 8. F.A.

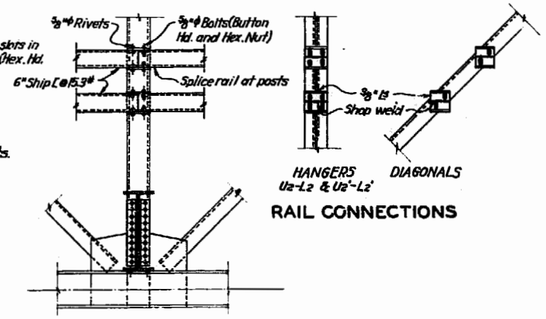
G-355AR

MISSOURI STATE HIGHWAY DEPARTMENT

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	MO.	FAP 793 E (U.S. 275)	19		

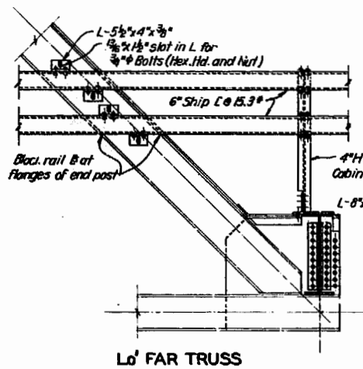


HALF TRANSVERSE SECTION

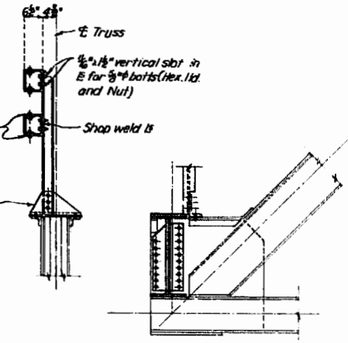


CONNECTIONS TO VERTICALS

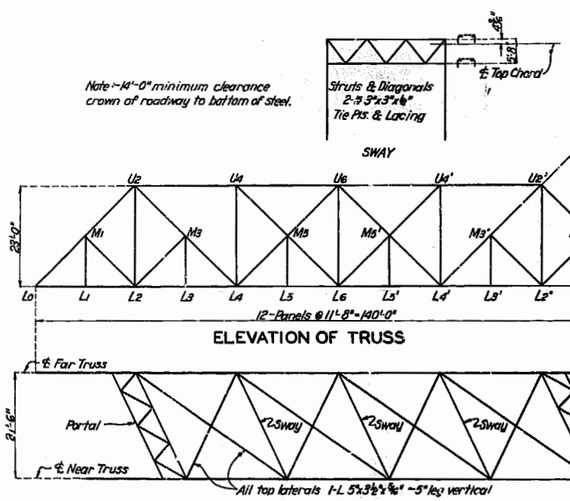
RAIL CONNECTIONS

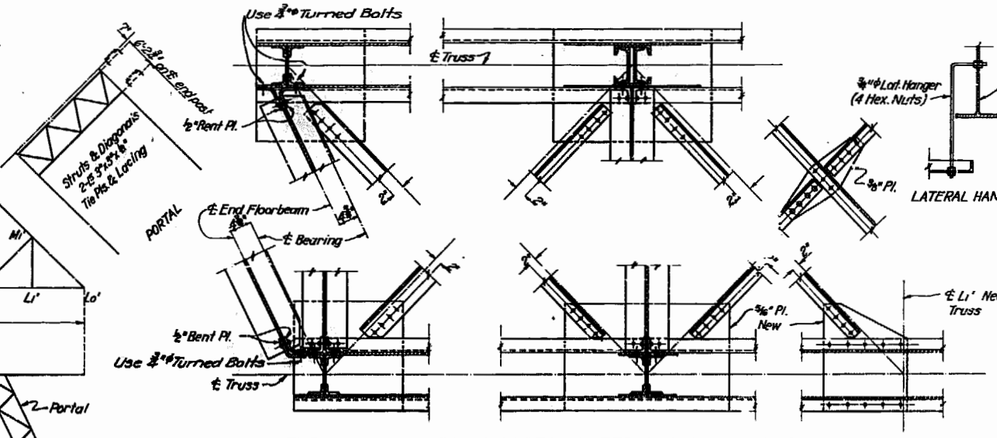


L0' FAR TRUSS

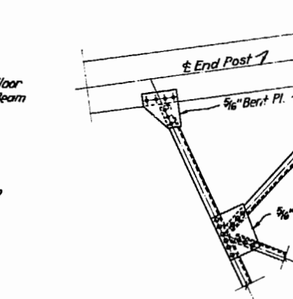


L0 FAR TRUSS

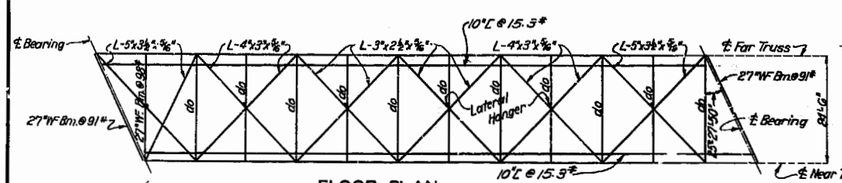




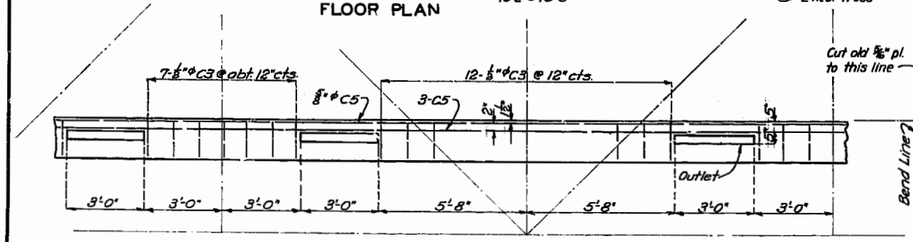
TYPICAL FLOORBEAM & BOTTOM LATERAL CONNECTIONS



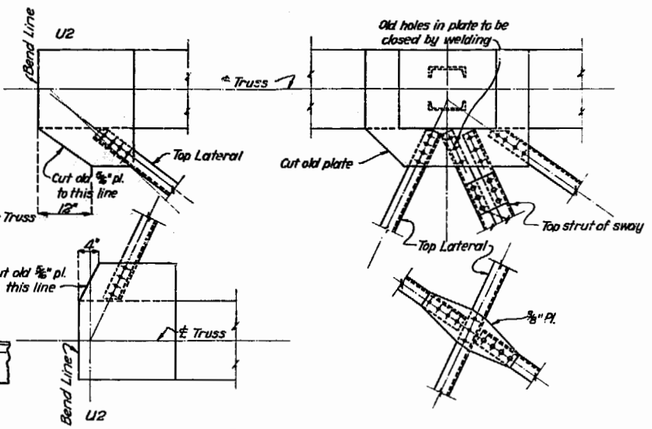
PORTAL CONNECTIONS



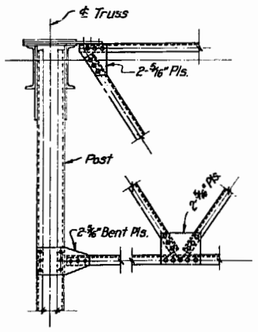
FLOOR PLAN



PART ELEVATION OF CURB



TYPICAL TOP LATERAL CONNECTIONS



SWAY CONNECTIONS

Note: Use present shoes and rockers for 140' Truss Span. Furnish new swedged anchor bolts as follows: 4-1¼"ϕ Anchor bolts 23½" long for fixed end. 4-1¼"ϕ Anchor bolts 2'-3½" long for expansion end.

BRIDGE OVER BIG TARKIO CREEK

STATE ROAD FROM TARKIO TO FAIRFAX

ABOUT 3.25 MILES NORTH OF FAIRFAX

PROJECT NO. FAP 793 E (U.S. 275) STA. 135 + 50.0

ATCHISON COUNTY

G-355AR

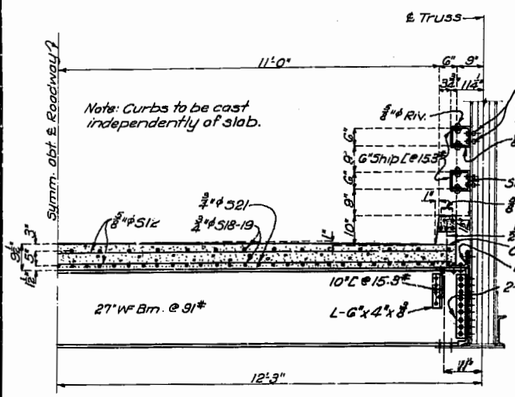
Drawn Aug. 1935 By H.D.
Traced Sept. 1935 By H.E.C.
Checked June 1935 By Hahn

Sheet No. 6 of 8

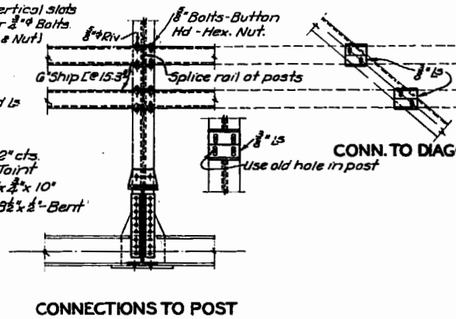
F.A.

MISSOURI STATE HIGHWAY DEPARTMENT

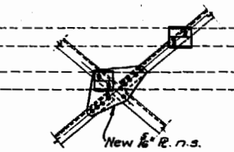
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	MO.	FAP 793E (U.S. 275)	19		



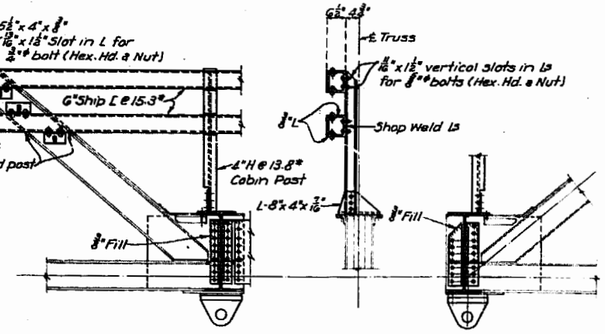
HALF TRANSVERSE SECTION



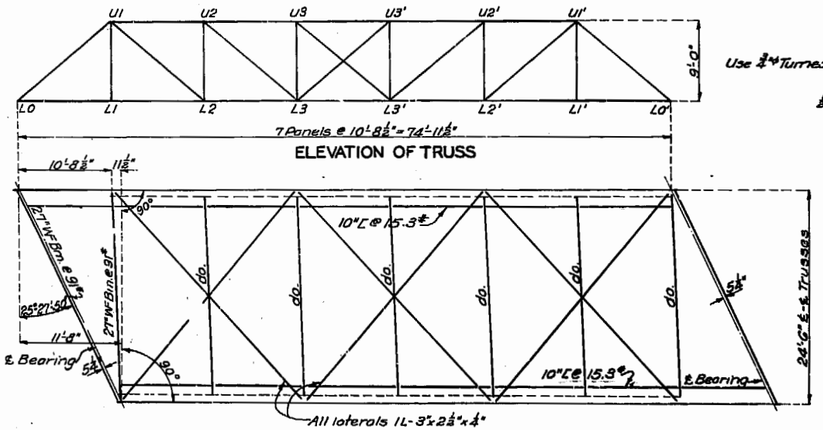
CONNECTIONS TO POST



CONN. IN PANEL L3-L3'

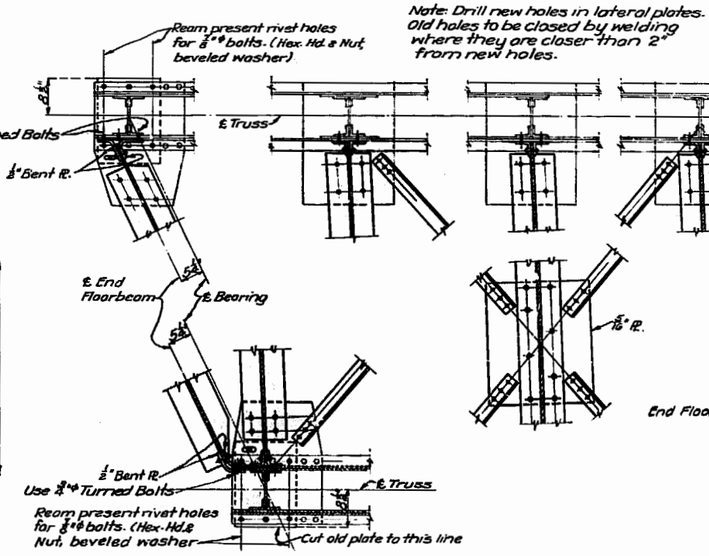


DETAILS AT ENDS OF TRUSS



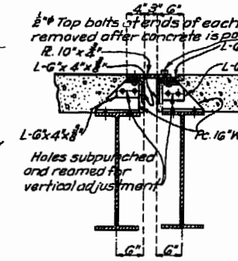
FLOOR PLAN

75' TRUSS SPAN

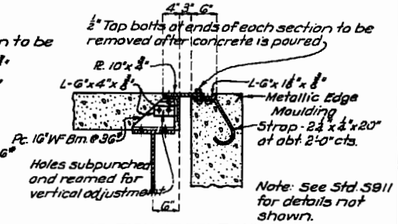


Note: Drill new holes in lateral plates. Old holes to be closed by welding where they are closer than 2" from new holes.

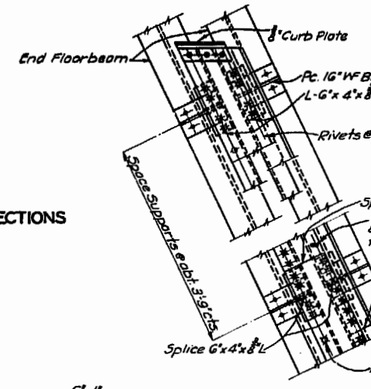
TYPICAL FLOORBEAM AND LATERAL CONNECTIONS



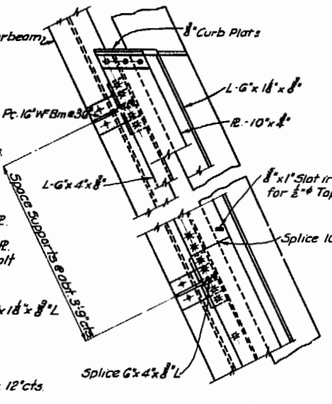
SECTION AT PIER NO. 5



SECTION AT BENT NO. 6

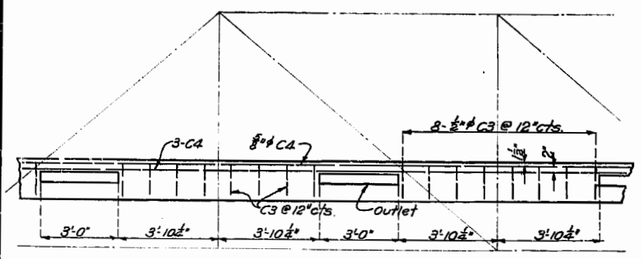


PART PLAN

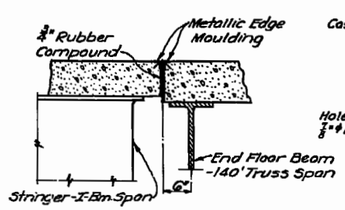


PART PLAN

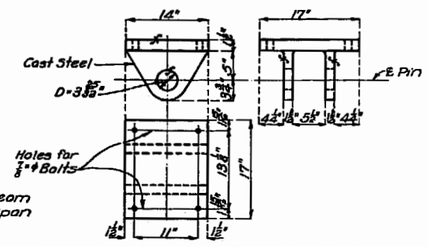
Note: Expansion device to be fabricated in three sections with splices at support as shown above.



PART ELEVATION OF CURB



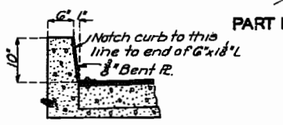
SECTION AT PIER NO. 4



DETAILS OF UPPER BEARING CASTINGS

4 Required

Note: Details of shoes and rockers for 75' span to be as shown on Std. 5807



SECTION AT CURB

BRIDGE OVER BIG TARKIO CREEK

STATE ROAD FROM TARKIO TO FAIRFAX

ABOUT 3.25 MILES NORTH OF FAIRFAX

PROJECT NO. FAP 793E1 (U.S.275) STA. 135+50.0

ATCHISON COUNTY

G-355AR

415

Drawn May 1936 by W.D.
Traced May 1936 by G.W.
Checked June 1936 by J.H.M.

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

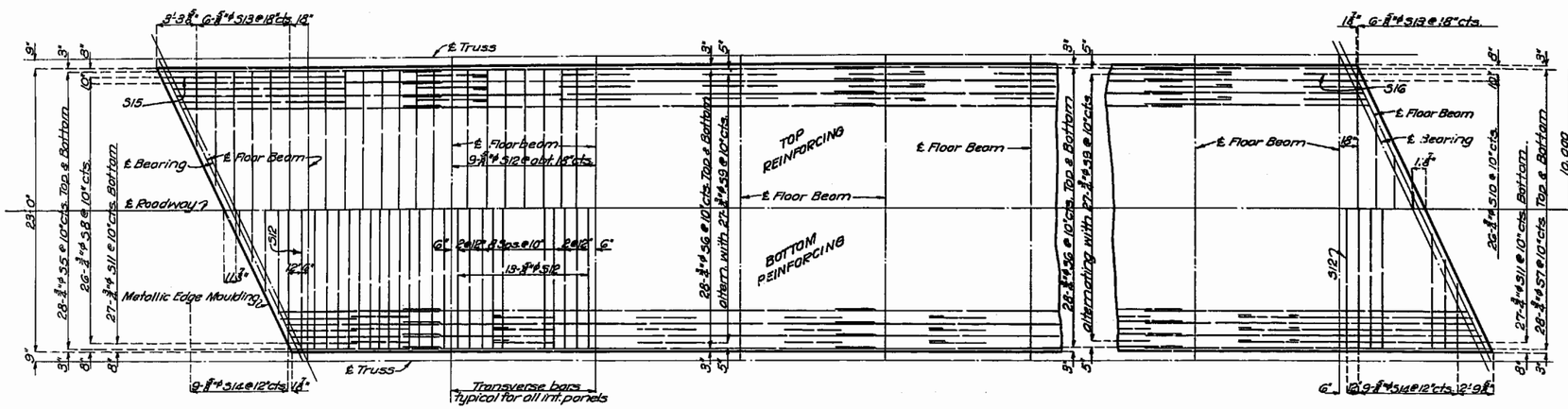
Sheet No. 7 of 8.

F.A.

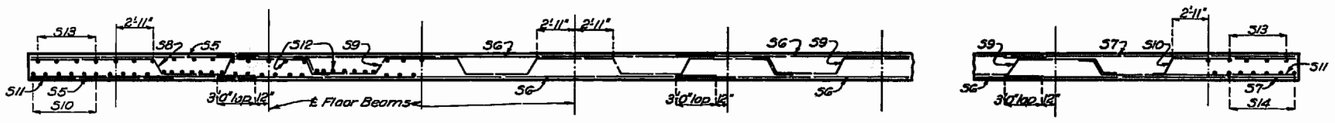
GALLUP-K. C. MO

MISSOURI STATE HIGHWAY DEPARTMENT

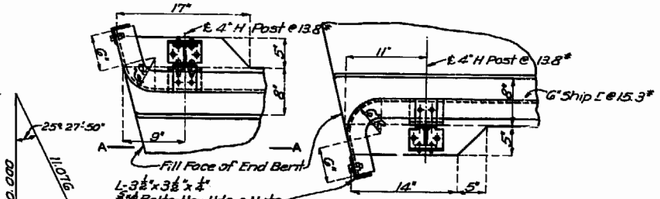
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	MO.	FAP 793E (U.S.275)	19		



PLAN OF SLAB REINFORCING - 140' SPAN

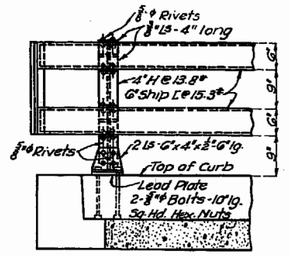


LONGITUDINAL SECTION

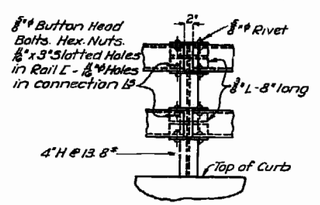


LOCATION OF POSTS AT END BENT NO. 1

Note: Details of rail channels at end as shown above also applies to end at Bent No. 6. Rail post at Bent No. 6 is fastened to cabin of trusses.



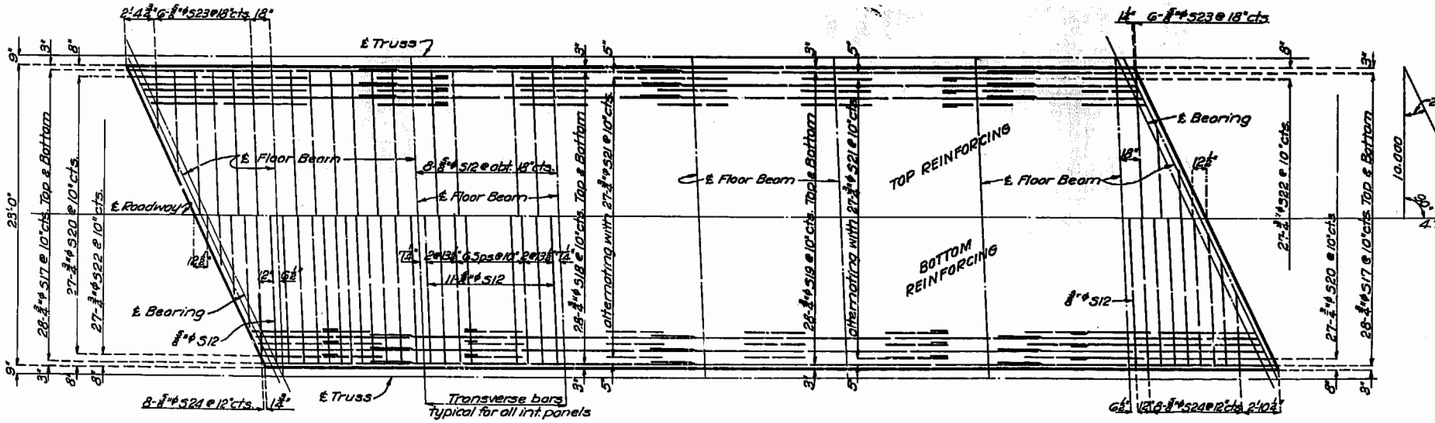
SECTION A-A



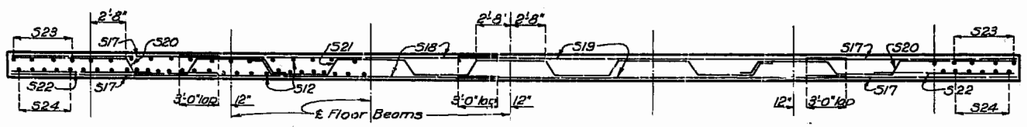
Note: Use similar detail at rail splices. Omit slotted holes and 2" expansion gap.

RAIL EXPANSION JOINT

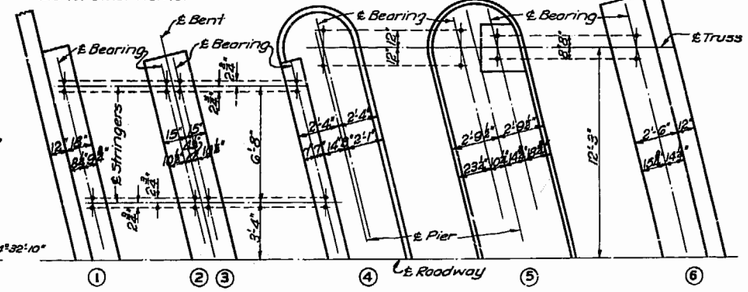
Note: Top of curbs shall be finished to a smooth surface parallel to grade. Not less than one nor more than four soft lead plates of ⅛" thickness shall be used under base angles of each rail post for aligning rail to correct elevation. Plates shall be of same size as leg of base angle and shall be punched ⅞"ϕ on same gages as the base angles. No grouting permissible. Cost of lead plates to be included in price bid for other items.



PLAN OF SLAB REINFORCING - 75' SPAN



LONGITUDINAL SECTION



HALF ANCHOR BOLT PLAN

Note: Bearing areas on bents and piers under and extending 2" beyond edges of bearings shall be built monolithic with bents or piers 8" above plan elevation.

These areas shall be ground with carborundum brick to a horizontal plane surface at plan elevation and shall be adequately protected until lead plates and bearings are in place.

Cost of lead plates shall be included in price bid for structural steel.

Holes for anchor bolts shall be formed in the substructure by placing and setting, with templates, 4"ϕ tapered wells.

BRIDGE OVER BIG TARKIO CREEK

STATE ROAD FROM TARKIO TO FAIRFAX

ABOUT 3.25 MILES NORTH OF FAIRFAX

PROJECT NO. FAP 79 2 E I (U.S. 275) STA. 135+50.0

ATCHISON COUNTY

G-355AR

Drawn: June 1936 by H.D.
Traced June 1936 by G.W.
Checked June 1936 By: J.H.H.m

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

Sheet No. 8 of 8.

F.A.

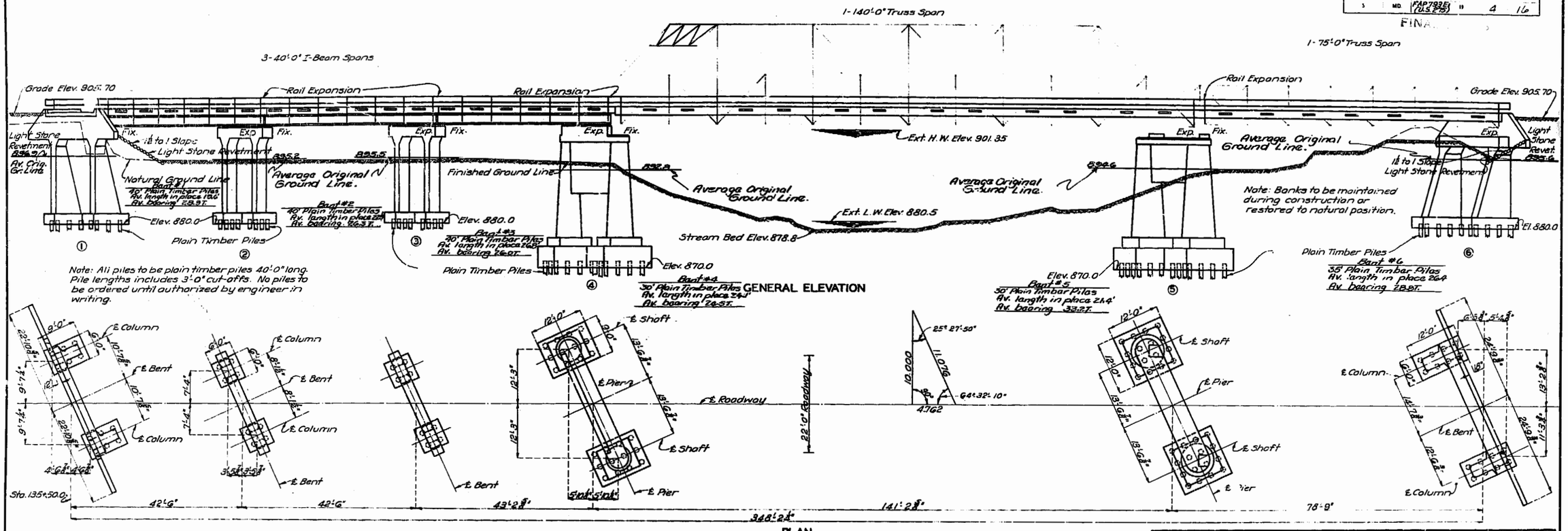
416

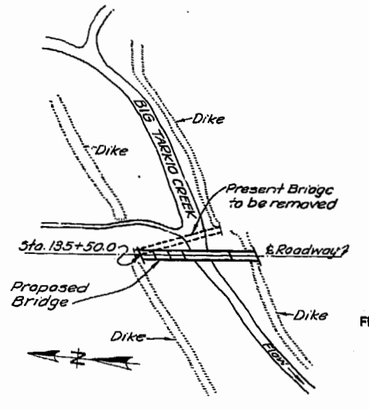
MISSOURI STATE HIGHWAY DEPARTMENT

FINAL PLANS

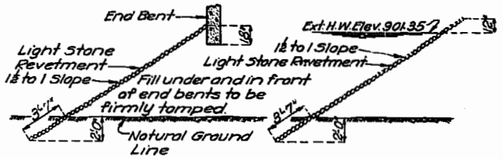
FED. RD. DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	MO.	FAP 793 E (U.S. 275)	19	4	16

FINAL





LOCATION SKETCH



FRONT OF END BENTS SIDE SLOPES OF FILL

Note: Light stone revetment to be placed on fills at ends of bridge as shown in sketches.
Approximately 240 sq. yds. of light stone revetment work included in road contract.

REVETMENT SKETCHES

Note: Light lines indicate old work.
Heavy lines indicate new work.
Note: This drawing is not to scale.
Follow dimensions.

Drawn June 1936 by H.D.
Traced June 1936 by G.W.
Checked June 1936 by J.K.M.

GENERAL NOTES:

Design Specifications A.A.S.H.O.-1935
Loading H-15 A.A.S.H.O. - Two lanes
Structural Steel Stress 18,000 #
Reinforcing Steel Stress 18,000 #
Concrete Class 'A' 1,200 #
Concrete Class 'B' 900 #
Concrete in slabs and curbs on truss spans shall be Class 'A'. All other concrete shall be Class 'B'.
All concrete shall be proportioned by the weight proportioning method.
Bar supports and spacers will be required for reinforcing steel in superstructure. See Std. C110R.
Exposed edges shall be beveled ¾" where no other bevel is noted.
All Class 'A' concrete shall be compacted by vibrating. See Standard Specifications issued November 12, 1935.
Where rubber compound is specified on plans for use in partition or expansion joints, the premoulded compound shall be stitched securely to one face of concrete with copper wire.
Detail shop drawings for all structural steel and cast steel shall be submitted to the State Highway Department in duplicate and shall be approved before material is ordered or work started.
Rivets ¾"ø, holes ⅞"ø except in handrail where rivets shall be ⅝"ø, holes ¹¹⁄₁₆"ø. Field connections for handrail channels shall be ⅝"ø button head bolts and for connections of rail to rail posts shall be ⅝"ø machine bolts, holes ¹¹⁄₁₆"ø. All other field connections riveted except as noted. Holes for turned bolts shall be subpunched and reamed to a driving fit.
Paint; shop none; Field, contact surfaces of bolted field connections one coat of red lead and surfaces inaccessible after erection three coats of red lead. No other paint to be applied by Contractor. Red lead required shall be furnished by the Contractor. Payment for cleaning and painting such surfaces will be included in unit price bid for structural steel.
All piles shall be driven to sustain a load of 20 ton per pile.
Contractor shall verify all dimensions in field before ordering new steel.
Excavation for structure shall be in accordance with Specification 1 of Standard Specifications issued November 12, 1935. Quantities paid for will be computed from Extreme Low Water Elev. 880.5 where existing ground line is below this elevation.
Beam flanges shall be squared up at all points of bearing.
Use present shoes and rockers for 140' truss span. For details of shoes and rockers for 75' truss span see Std. 5807.

QUANTITIES

Item		Substr.	Superstr.	Total
Class 1 Excavation for Structures	Cu. Yds.	829		829
Class 2 Excavation for Structures	Cu. Yds.	420		420
Concrete Class 'A'	Cu. Yds.		153.4	153.4
Concrete Class 'B'	Cu. Yds.	368.8	76.6	445.4
Fabricated Structural Steel (Truss Spans)	Lbs.		98210	98210
Fabricated Structural Steel (I-Beam Spans)	Lbs.		73500	73500
Cast Steel (Truss Spans)	Lbs.		1510	1510
Cast Steel Bearings (I-Beam Spans)	Lbs.		1580	1580
Reinforcing Steel	Lbs.	16680	67870	84550
Timber Piles	Lin. Ft.	2341		2341
Timber Pile Cut-offs	Lin. Ft.	1039		1039
Timber Test Piles	Lin. Ft.	100		100
Class 2 Excavation Below Plan Elev.	Cu. Yd.	6		6

Note: Excavation above Elev. 882.0 will be paid for as Class 1 Excavation for Structures.
Excavation below Elev. 882.0 will be paid for as Class 2 Excavation for Structures.
Stream banks under span (5-6) shall be excavated to a depth of 3'-0" below bottom of steel, and within the maximum horizontal limits of 4'-0" outside of curb lines, and will be paid for at unit price bid for roadway excavation.
Excavation under span (5-6) was removed by bridge contractor and paid for as Class 1 Excavation.

B.M. Elev. 902.30 - ~~Top of Steel at Top N. Rivet on N. End Main Span Bridge.~~
Top of N.W. Cor. of Cap Bent #3.

BRIDGE OVER BIG TARKIO CREEK

STATE ROAD FROM TARKIO TO FAIRFAX
ABOUT 3.25 MILES NORTH OF FAIRFAX
PROJECT NO. F AP 793 E (U.S. 275) STA. 135+50.0

ATCHISON COUNTY

SUBMITTED BY M.R. Lack, BRIDGE ENGINEER, DATE 7/22/36
APPROVED BY T.H. Cutler, CHIEF ENGINEER, DATE 7/22/36

FINAL PLANS

STD. S911
STD. C110R
G-355AR

Sheet No. 1 of 4.

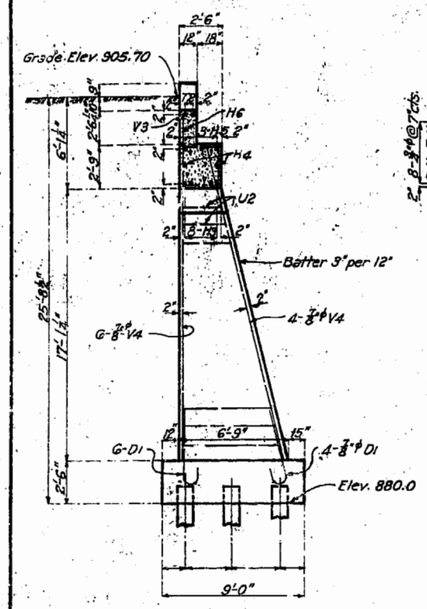
F.A.

MISSOURI STATE HIGHWAY DEPARTMENT

FINAL PLANS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
3	MO.	FAP 793E (U.S.273)	19	3	16

FINAL PLANS



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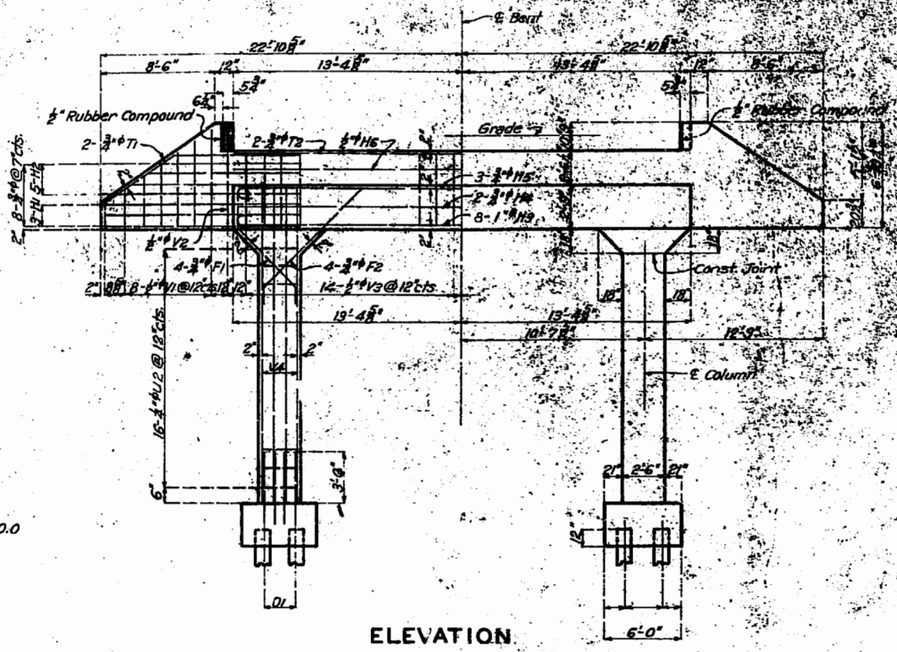
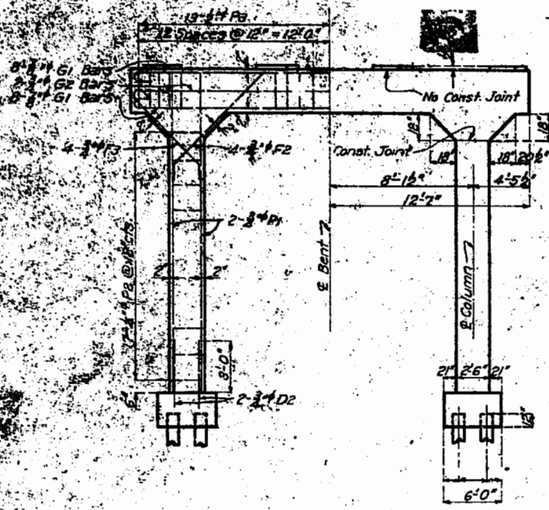


ELEVATION



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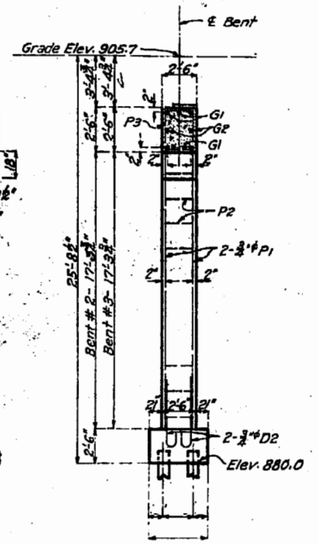

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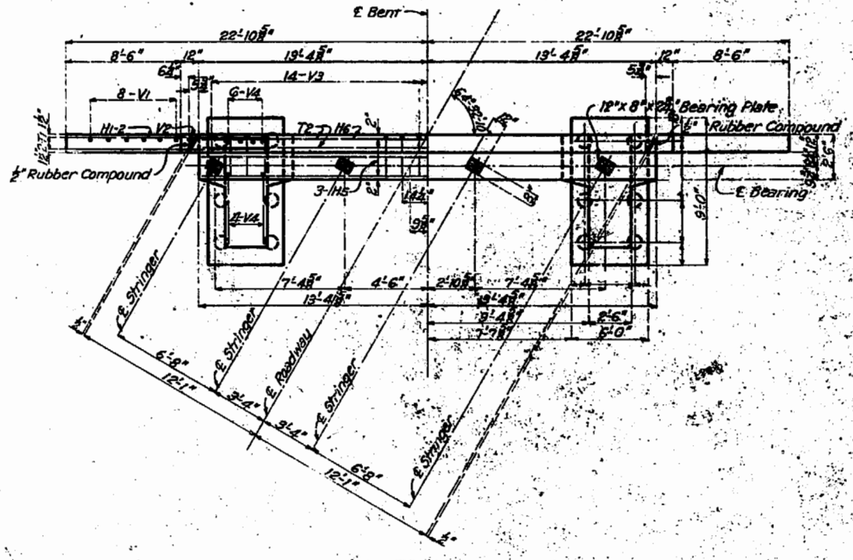
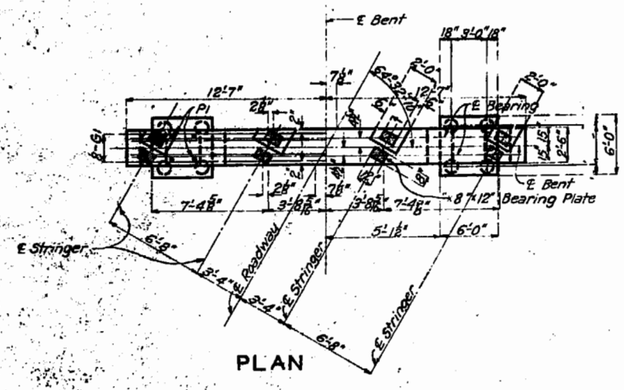


PLAN

DETAILS OF BENT NO. 1



PLAN

DETAILS OF BENTS NO. 2 & 3

BRIDGE OVER BIG TARKIO CREEK

STATE ROAD FROM TARKIO TO FAIRFAX

ABOUT 3.25 MILES NORTH OF FAIRFAX

PROJECT NO. FAP793E(U.S.273) STA. 135+50.0

ATCHISON COUNTY

SUBMITTED BY: DATE: BRIDGE ENGINEER / CHIEF ENGINEER

FINAL PLANS

G-355AR

Assembled Aug. 1935 By H.D. - R.J.G.
Checked June 1936 By Hhm
Drawn July 1932 By R.J.G.
Checked July 1932 By PHS

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

Sheet No. 2 A of 4

E.A.

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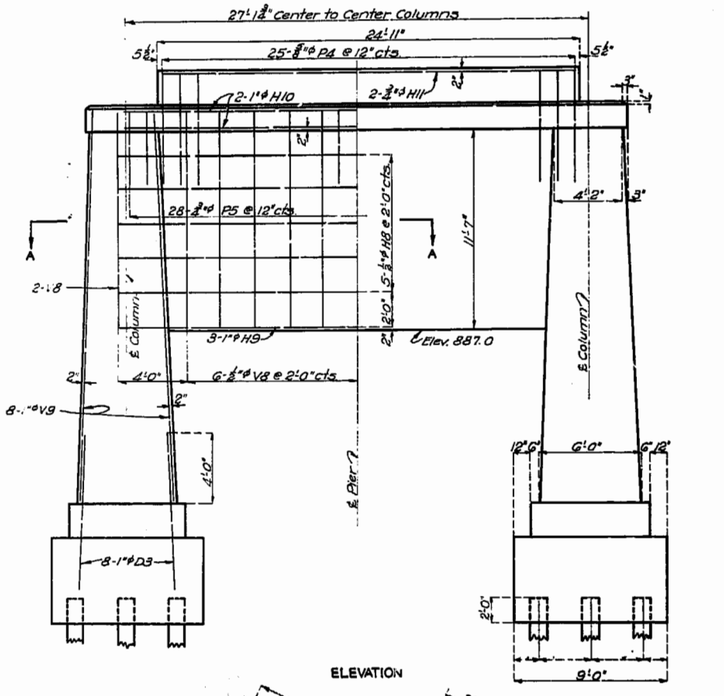
MISSOURI STATE HIGHWAY DEPARTMENT

FINAL PLANS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	MO.	FAP 793 E (U.S. 275)	19	6	16

FINAL PLANS



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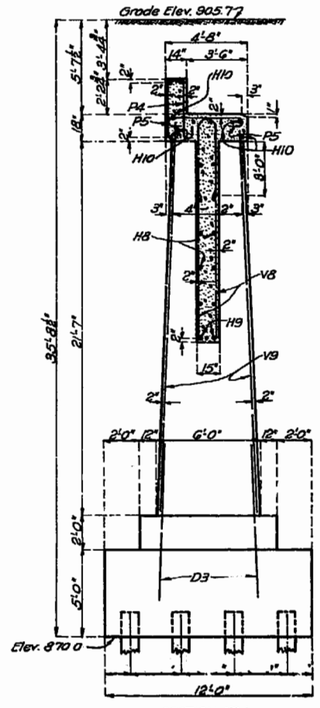
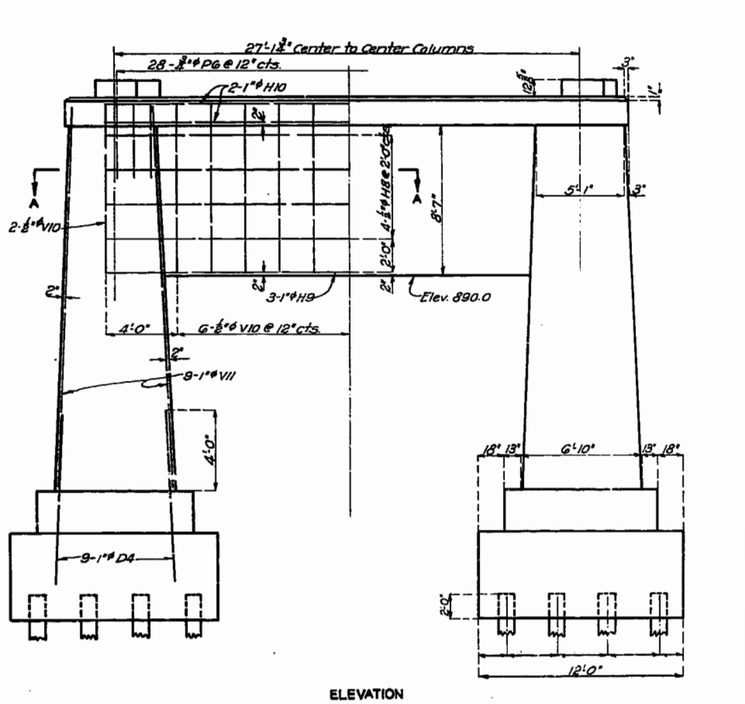


SECTION AT ℄

PLAN

DETAILS OF PIER NO. 4

HALF HORIZONTAL SECTION A-A



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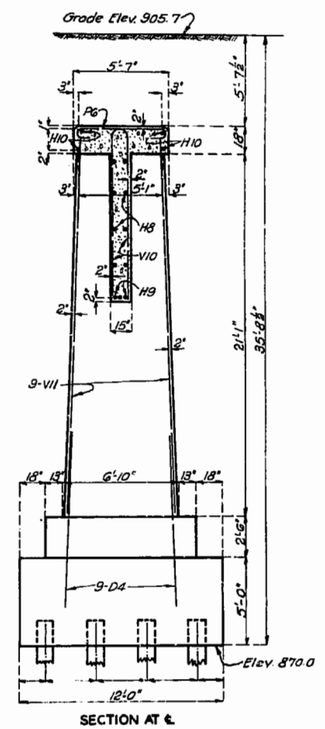

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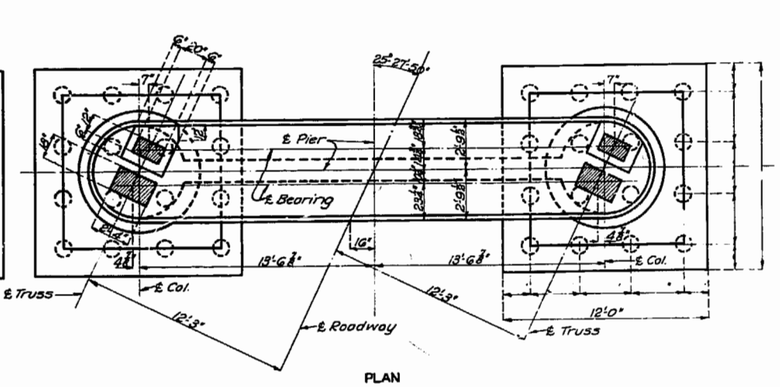
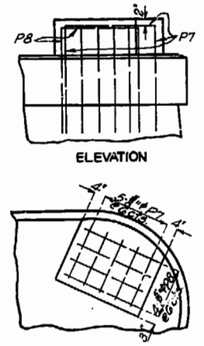


PLAN

DETAILS OF PIER NO. 5



ELEVATION

PLAN SHOWING REINF. FOR BLOCK ON PIER NO. 5

BRIDGE OVER BIG TARKIO CREEK

STATE ROAD FROM TARKIO TO FAIRFAX

ABOUT 3.25 MILES NORTH OF FAIRFAX

PROJECT NO. FAP 793 E1 (U.S. 275) STA. 135+50.0

ATCHISON COUNTY

FINAL PLANS

G-355AR

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Drawn May 1936 by A.F.K.
Traced June 1936 by G.W.
Checked June 1936 by J.Kahn

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

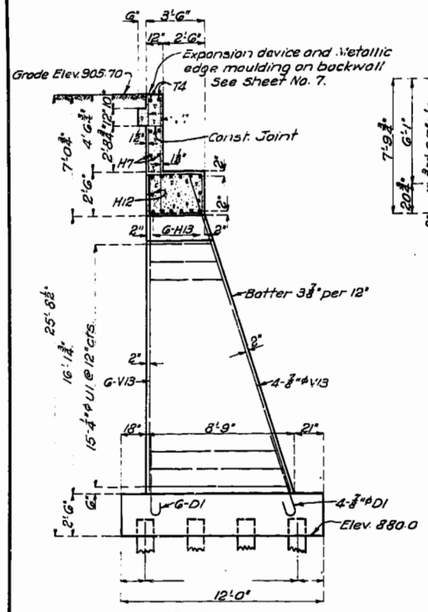
Sheet No. 3 A of 4.

MISSOURI STATE HIGHWAY DEPARTMENT

FINAL PLANS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	MO	FAP 793 G (U.S. 275)	19	7	16

FINAL PLANS



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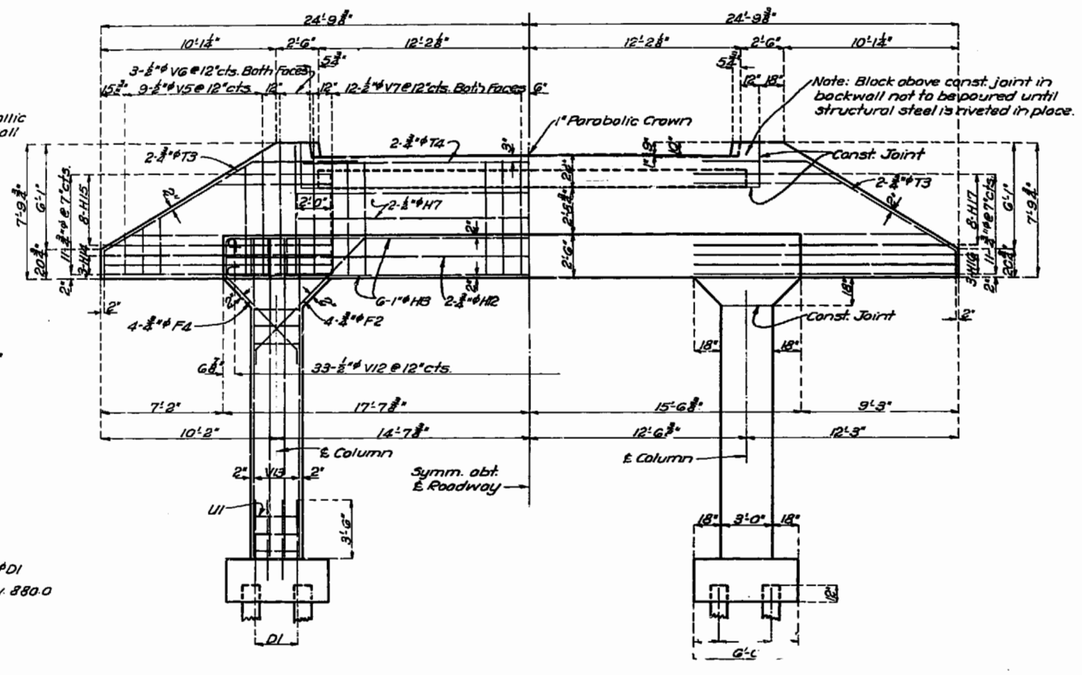

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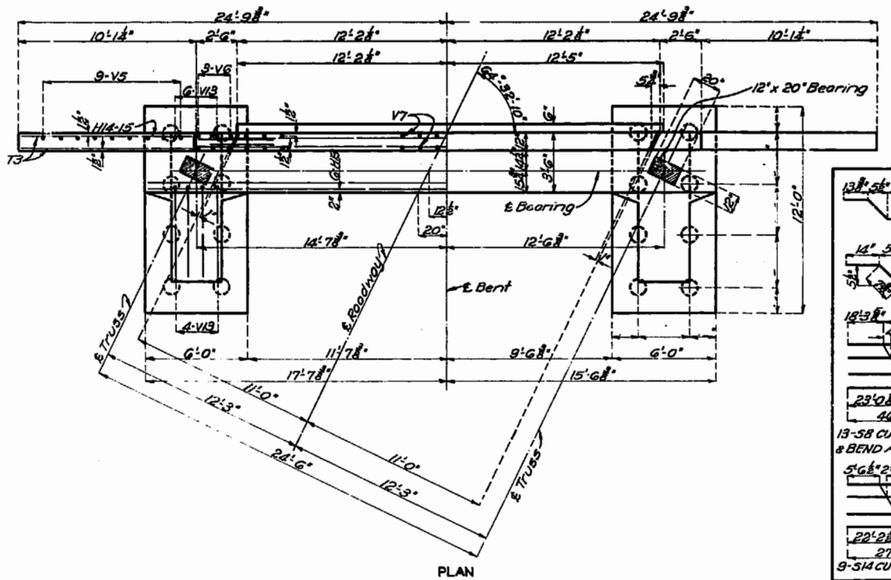


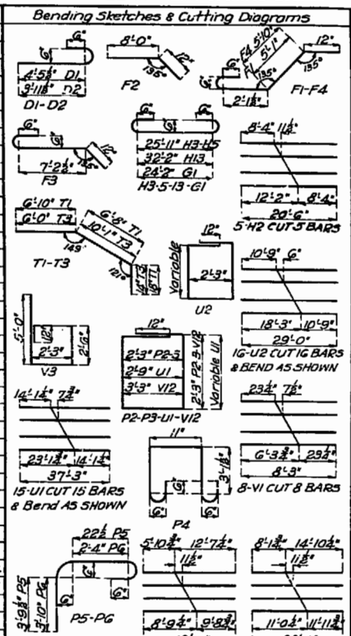
PLAN

DETAILS OF END BENT NO. 6

COMPLETE BILL OF REINFORCING STEEL

No.	Size	Length	Mark	Location
		End Bent No. 1		
20	⅜"ϕ	5'-9"	D1	Footing
8	⅜"ϕ	9'-6"	F1	Haunch
8	⅜"ϕ	9'-0"	F2	"
6	⅜"ϕ	12'-6"	H1	Wing
5	⅜"ϕ	20'-6"	H2	"
8	1"□	28'-6"	H3	Beam
2	½"ϕ	26'-6"	H4	"
3	⅜"ϕ	28'-6"	H5	"
1	½"ϕ	24'-6"	H6	Backwall
4	⅜"ϕ	15'-0"	T1	Wing
2	⅜"ϕ	26'-6"	T2	Backwall
16	½"ϕ	29'-0"	U2	Column
8	½"ϕ	8'-3"	V1	Wing
2	½"ϕ	6'-6"	V2	"
27	½"ϕ	13'-0"	V3	Beam
20	⅜"ϕ	19'-6"	V4	Column
		Int. Bents No. 2 & 3		
16	⅜"ϕ	5'-3"	D2	Footing
16	⅜"ϕ	9'-0"	F2	Haunch
16	⅜"ϕ	9'-6"	F3	"
32	⅜"ϕ	26'-9"	G1	Beam
4	⅜"ϕ	24'-9"	G2	"
16	⅜"ϕ	19'-6"	P1	Column
68	½"ϕ	10'-0"	P2	"
50	½"ϕ	10'-0"	P3	Beam
		Piers No. 4 & 5		
16	1"ϕ	9'-3"	D3	Footing #4
18	1"ϕ	9'-9"	D4	" #5
18	½"ϕ	28'-0"	H8	Web
6	1"ϕ	28'-0"	H9	"
8	1"ϕ	27'-0"	H10	Cap
2	½"ϕ	24'-6"	H11	Haunch #4
25	⅝"ϕ	9'-9"	P4	"
56	⅜"ϕ	7'-9"	F5	Cap #4
56	⅜"ϕ	8'-3"	P6	" #5
10	⅝"ϕ	8'-0"	P7	Block #5
8	⅝"ϕ	8'-8"	P8	"
26	½"ϕ	12'-8"	V8	Web #4
16	1"ϕ	22'-8"	V9	Col. #4
26	½"ϕ	9'-9"	V10	Web #5
18	1"ϕ	22'-3"	V11	Col. #5

Bending Sketches & Cutting Diagrams



Note: Dimensions given are along ℄ of bars and are for computed lengths.
Reinforcing bars ⅜" or over in diameter, which are bent to an angle greater than 90° shall be of structural grade.

No.	Size	Length	Mark	Location
		End Bent No. 6		
20	⅜"ϕ	5'-9"	D1	Footing
8	⅜"ϕ	9'-0"	F2	Haunch
8	⅜"ϕ	10'-3"	F4	"
4	½"ϕ	27'-0"	H7	Backwall
2	⅜"ϕ	32'-9"	H12	Beam
12	1"ϕ	34'-9"	H13	"
4	⅜"ϕ	13'-0"	H14	Wing
4	⅜"ϕ	18'-6"	H15	"
6	⅜"ϕ	15'-3"	H16	"
4	⅜"ϕ	23'-0"	H17	"
4	⅜"ϕ	17'-3"	T3	"
2	⅜"ϕ	26'-0"	T1	Backwall
15	½"ϕ	37'-3"	U1	Column
9	½"ϕ	9'-3"	V5	Wing
12	½"ϕ	7'-6"	V6	"
48	½"ϕ	6'-6"	V7	Backwall
33	½"ϕ	12'-0"	V12	Beam
20	⅜"ϕ	18'-6"	V13	Column
		I-Beam Superstructure		
48	⅜"ϕ	22'-3"	C1	Curb
164	⅜"ϕ	2'-0"	C2	"
448	⅜"ϕ	23'-0"	S1	Slab
378	⅜"ϕ	22'-3"	S2	"
12	½"ϕ	25'-6"	S3	"
144	⅜"ϕ	25'-0"	S4	"
		140' Truss Span		
232	½"ϕ	15"	C3	Curb
32	⅜"ϕ	37'-3"	C5	"
28	⅜"ϕ	35'-3"	S5	Slab
168	⅜"ϕ	38'-0"	S6	"
28	⅜"ϕ	44'-9"	S7	"
13	⅜"ϕ	46'-6"	S8	"
81	½"ϕ	39'-0"	S9	"
13	½"ϕ	34'-3"	S10	"
27	½"ϕ	21'-6"	S11	"
234	⅝"ϕ	22'-9"	S12	"
6	⅝"ϕ	28'-9"	S13	"
9	⅝"ϕ	27'-9"	S14	"
1	⅜"ϕ	28'-6"	S15	"
1	⅜"ϕ	11'-9"	S16	"
		75' Truss Span		
120	½"ϕ	15"	C3	Curb
24	⅜"ϕ	27'-5"	C4	"
111	⅜"ϕ	22'-9"	S12	Slab
56	⅜"ϕ	32'-0"	S17	"
56	½"ϕ	23'-6"	S18	"
56	⅝"ϕ	29'-6"	S19	"
27	⅜"ϕ	43'-3"	S20	"
27	⅜"ϕ	41'-0"	S21	"
27	½"ϕ	20'-6"	S22	"
6	⅝"ϕ	27'-0"	S23	"
8	⅝"ϕ	28'-0"	S24	"

BRIDGE OVER BIG TARKIO CREEK

STATE ROAD FROM TARKIO TO FAIRFAX
ABOUT 3.25 MILES NORTH OF FAIRFAX
PROJECT NO. FAP 793 E1 (U.S.275) STA. 135 + 50.0

ATCHISON COUNTY

FINAL PLANS

G-355AR

Drawn June 1936 by H.D.
Traced June 1936 by G.W.
Checked June 1936 by HHm

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

Sheet No. 4A of 4.

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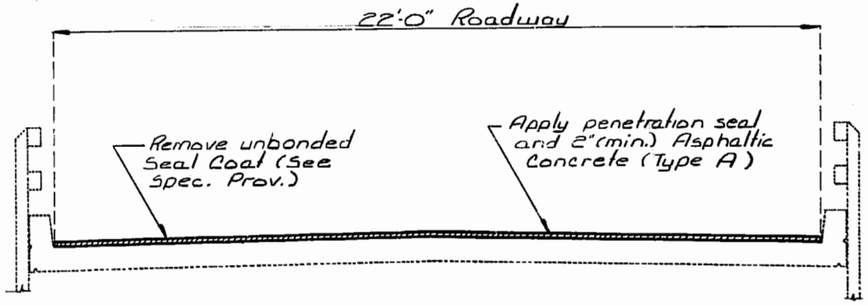
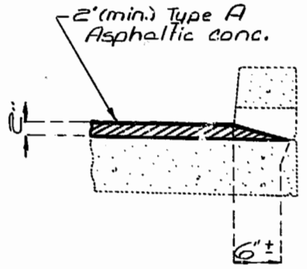
MISSOURI HIGHWAY AND TRANSPORTATION COMMISSION

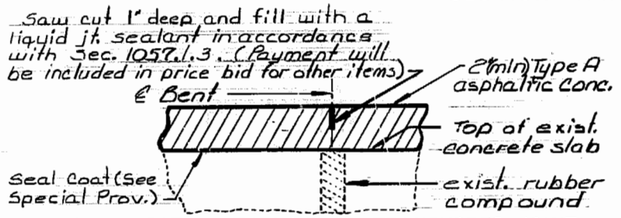
STATE	PROJ NO	SHEET NO.
MO.	1-S-59-401	1
SEC/SUR 3	TWP. 64N RGE. 40W	



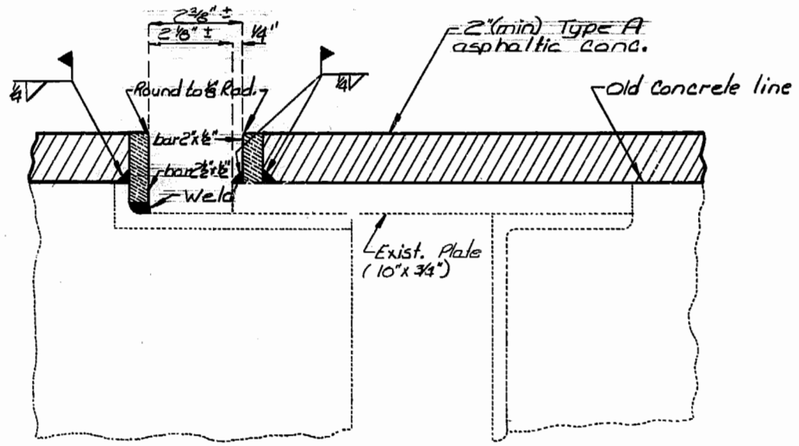
SECTION THRU SLAB



SECTION THRU CURB OUTLET



PART SECTION THRU SLAB TRANSVERSE JOINT
AT BENT NO. 2, NO. 3 & PIER NO. 4



PART SECTION THRU EXPANSION DEVICE
AT PIER NO. 5 & BENT NO. 6
(DAMS AT PLATE TYPE EXPANSION DEVICE)

GENERAL NOTES:

Structural Steel Stress 18,000 #/sq. inch.

Qualification of Welder will be required.

E70. 16, or 18 welding electrodes shall be used.

The bar dams, shall extend full roadway width between curbs, but shall be installed in sections of such lengths to permit at least one way traffic at all times. Before traffic is permitted to cross over sections of dams in place, sufficient bituminous surfacing shall be placed on roadway slab adjacent to both sides of expansion device to prevent any damage to either the steel dams or tires of vehicles.

Steel dams shall conform to crown of roadway.

Steel bars on both sides of expansion joint, for full width of roadway, shall be considered as a steel dam assembly and paid for as one steel bar dam.

Paint: None required.

Outline of old work is indicated by light dashed lines. Heavy lines indicate new work.

One lane of traffic to be maintained during construction. (See Spec. Prov.)

ESTIMATED QUANTITIES		
ITEM		TOTAL
Steel Bar Dam Assembly	each	2
Asphalt Cement (Asphaltic Concrete (60-70 or AC-20) (Type A mix)	Ton	4.7
Mineral Aggregate (Asphaltic Concrete (Type A Mix)	Ton	89
Polymer Modified Asphalt (Seal Coat)	Gal.	300
Cover Aggregate (See Spec. Prov.)	Ton	13

Note: Polymer Modified Asphalt Emulsion Grade CRS-2 Modified shall be applied at a rate of .35 gallon per square yard. Cover Aggregate shall be applied at a rate of .015 tons per square yard.

BRIDGE OVER BIG TARKIO CREEK
STATE ROAD FROM TARKIO TO FAIRFAX
ABOUT 2 MILES NORTH OF FAIRFAX
PROJECT NO. SR-RS-7(3) STA. 135+50
JOB NO. 1-S-59-401 RTE. 59
ATCHISON COUNTY
DATE 9/11/85

STD.
STD.
G-355R

514

DESIGNED AUG. 1985
DETAILED AUG. 1985
CHECKED Aug. 1985

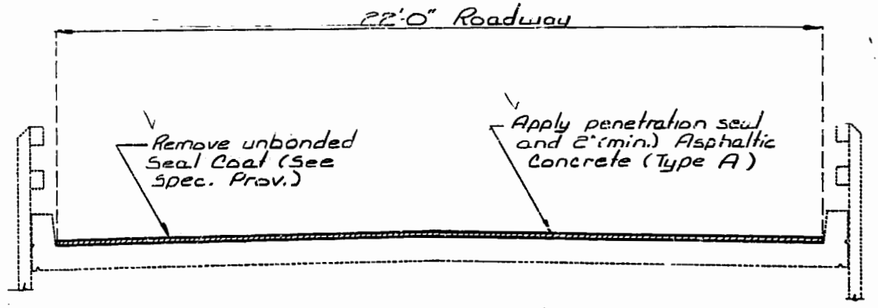
Note: This drawing is not to scale. Follow dimensions.

Sheet No. 1 of 1

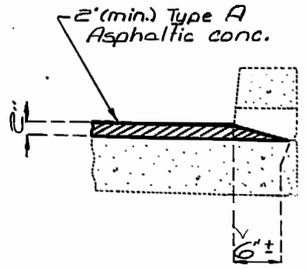
MISSOURI HIGHWAY AND TRANSPORTATION COMMISSION

FINAL PLANS

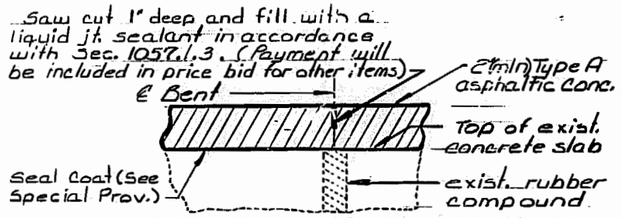
STATE	PROJ NO	SHEET NO
MO	I-S-59-401	1
SEC/SUR 3	TWP 54N RGE 40W	



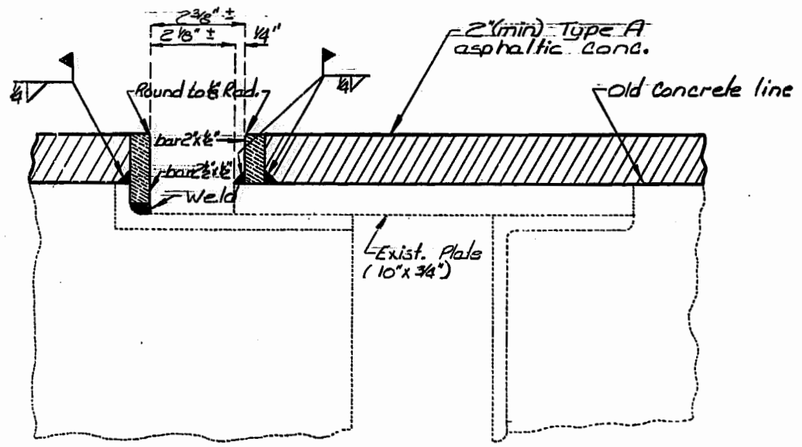
SECTION THRU SLAB



SECTION THRU CURB OUTLET



PART SECTION THRU SLAB TRANSVERSE JOINT AT BENT NO. 2, NO. 3 & PIER NO. 4



PART SECTION THRU EXPANSION DEVICE AT PIER NO. 5 & BENT NO. 6 (DAMS AT PLATE TYPE EXPANSION DEVICE)

GENERAL NOTES:

Structural steel stress 18,000 #/sq. inch.

Qualification of welder will be required.

E70, 16, or 18 welding electrodes shall be used.

The bar dams shall extend full roadway width between curbs but shall be installed in sections of such lengths to permit at least one way traffic at all times. Before traffic is permitted to cross over sections of dams in place, sufficient bituminous surfacing shall be placed on roadway slab adjacent to both sides of expansion device to prevent any damage to either the steel dams or tires of vehicles.

Steel dams shall conform to crown of roadway.

Steel bars on both sides of expansion joint, for full width of roadway, shall be considered as a steel dam assembly and paid for as one steel bar dam.

Paint: None required.

Outline of old work is indicated by light dashed lines. Heavy lines indicate new work.

One lane of traffic to be maintained during construction. (See Spec. Prov.)

FINAL QUANTITIES

ITEM		TOTAL
Steel Bar Dam Assembly	each	2
Asphalt Cement (Asphaltic Concrete (60-70 or AC-20) (Type A mix)	Ton	5.6
Mineral Aggregate (Asphaltic Concrete (Type A Mix)	Ton	93
Polymer Modified Asphalt (Seal Coat)	Gal.	310
Cover Aggregate (See Spec. Prov.)	Ton	13

Note: Polymer Modified Asphalt Emulsion Grade CRS-2 Modified shall be applied at a rate of .35 gallon per square yard.
Cover Aggregate shall be applied at a rate of .015 tons per square yard.

UPDATED BY FROHN 12-9-86, CKD. BY [illegible] 12-9-86

BRIDGE OVER BIG TARKIO CREEK

STATE ROAD FROM TARKIO TO FAIRFAX

ABOUT 2 MILES NORTH OF FAIRFAX

PROJECT NO. I-S-59-401 A&B STA. 135+50

JOB NO. I-S-59-401 RTE. 59

ATCHISON COUNTY

DATE 9/11/85

STD.
STD.
G-355R

DESIGNED AUG. 1985
DETAILED AUG. 1985
CHECKED Aug. 1985

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

Sheet No. 1A of 1

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PORTAL

PEDESTAL - FIXED END
(Cast Steel)

Portal Members $2\frac{1}{2}"\times2\frac{1}{2}"\times\frac{1}{2}"$ Lacing Bars @ 45°
$5"\times\frac{1}{4}"\times12"$ Batten Pls. on $2\frac{1}{2}"\times2\frac{1}{2}"\times\frac{1}{4}"$ ∠s

Crown of Roadway

Close Joint

60° Approx.

14 Panels @ 10'-0" = 140'-0"

Anchor Bolts:
$1\frac{1}{2}"\phi$ Swedged Bolts, 2'-2" Lg.
Hex. Nuts.

Made by V.W.E. July 1920
Checked by S.B.W. July 1920

MISSOURI
STATE HIGHWAY DEPARTMENT
STANDARD HIGH TRUSS
SPAN 140'-0" ROADWAY 18'-0"
JULY 1920

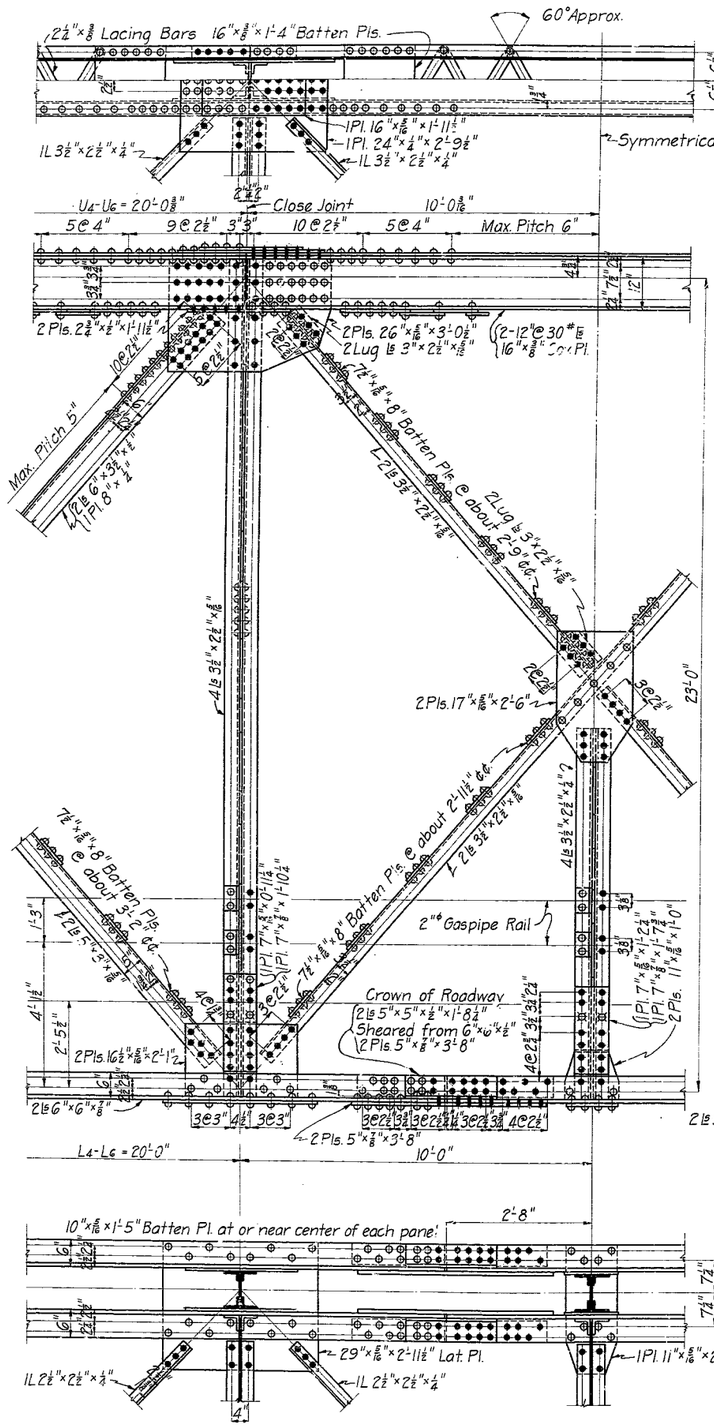
Submitted by Charles D. Mann
Bridge Engineer

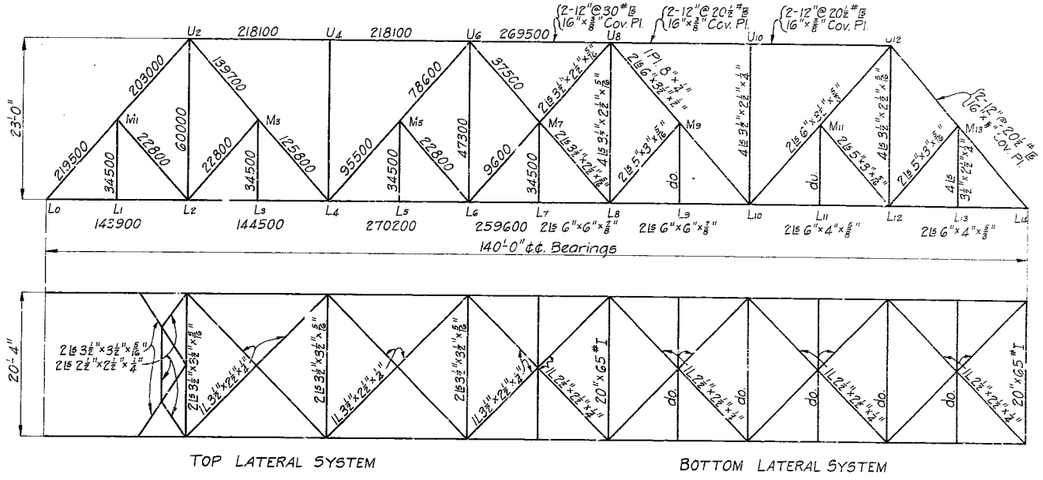
Approved by Alexander W. Graham
State Highway Engineer

Sheet 1 of 2

S1140

1934



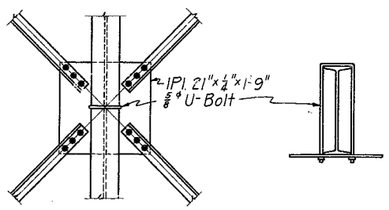


STRESS DIAGRAM

GENERAL NOTES

Live Load: 15 ton tractor with 10 ton trailers, or 70 # per Sq. Ft. of roadway; 20% impact.
Dead Load: Metal as shown plus 10" concrete floor.
Detail shop drawings shall be submitted to the State Highway Department in quadruplicate and shall be approved before steel work is fabricated.
Rivets ⅞" Diam.; holes 13/16" Diam. Field connections riveted throughout.
All metal to be painted one shop coat of red lead and two field coats of an approved brand as per specifications. Field coats to be of different colors.
Steel castings: Specimen tests as provided by the specifications shall be made by the contractor, and a certified statement of the results submitted for the approval of the State Highway Department.

Estimated Weight:
Structural Steel 106100 #
Cast Steel 1800 #



DETAIL AT INTERSECTION OF BOTTOM LATERALS

Made by V.W.F. July 1920
Checked by S.R.W. July 1920

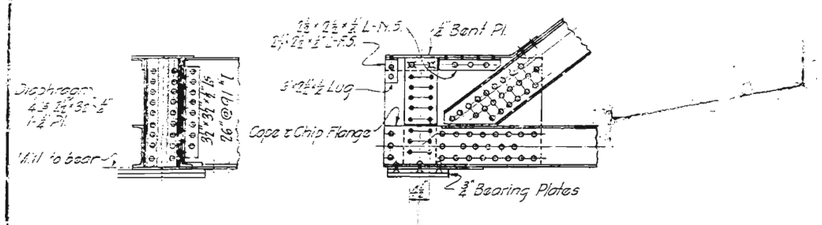
MISSOURI
STATE HIGHWAY DEPARTMENT
STANDARD HIGH TRUSS
SPAN 140'-0" ROADWAY 18'-0"
JULY 1920

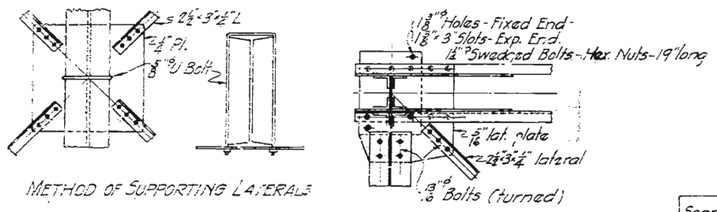
Submitted by Chester D. Mann
Bridge Engineer
Approved by Alexander W. Graham
State Highway Engineer

S1140

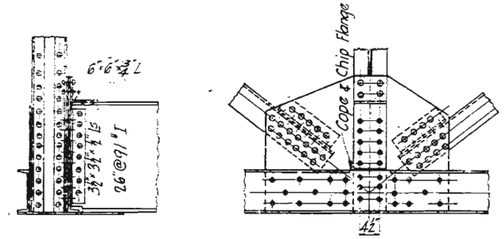
Sheet 2 of 2

488





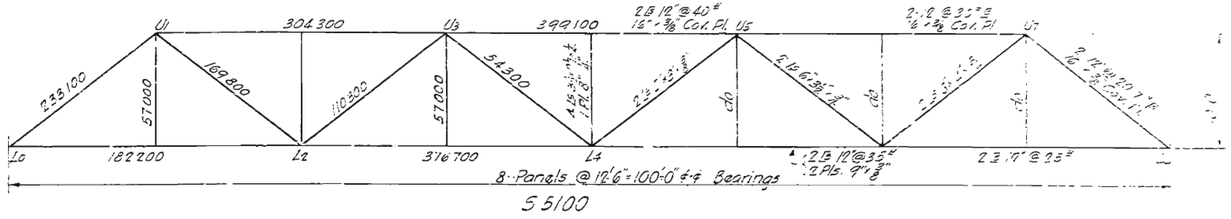
METHOD OF SUPPORTING LATERALS



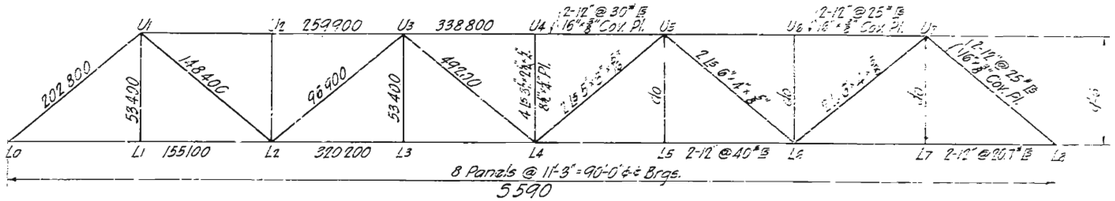
TYPICAL FLOOR BEAM CONNECTIONS

Span	Bearing Pls.	Crown to Mstr.	End Reaction	Wt. of Str. Steel
50'	12"x¾"x1'-6"	3'-4⅝"	90000	23200
60'	12"x¾"x1'-8"	" "	106000	33400
70'	14"x¾"x1'-8"	" "	122000	43700
80'	14"x¾"x1'-10"	" "	138000	54200
90'	15"x¾"x1'-10"	" "	156000	67800
100'	16"x¾"x1'-10"	" "	170000	79500

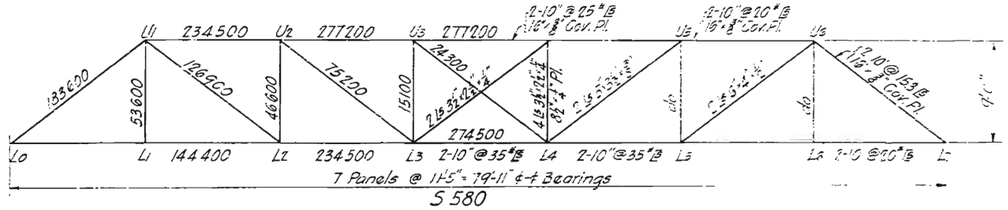
Thickness of bearing plates is finished thickness. Plane contact surfaces at expansion end.
Distance "Crown to Mstr." does not include allowance for grout.
End Reaction is for one truss only and includes live load with impact.



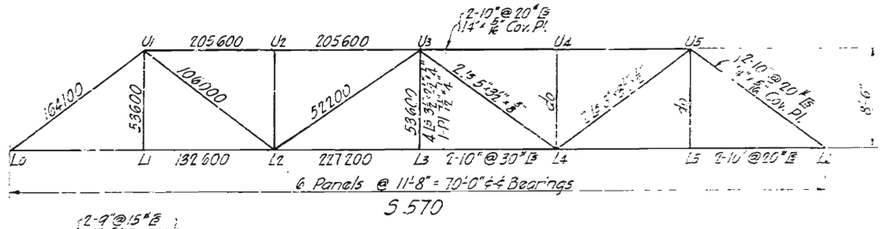
S 5100



S 590

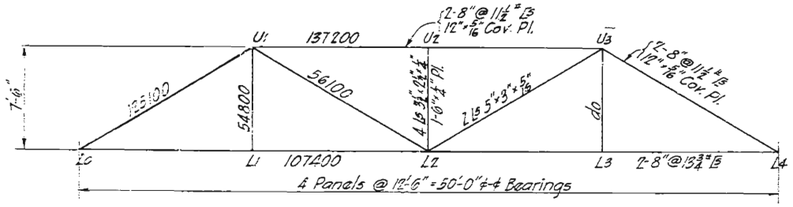


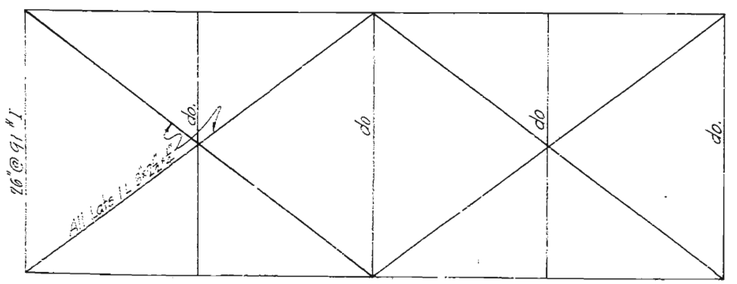
S 580



S 570

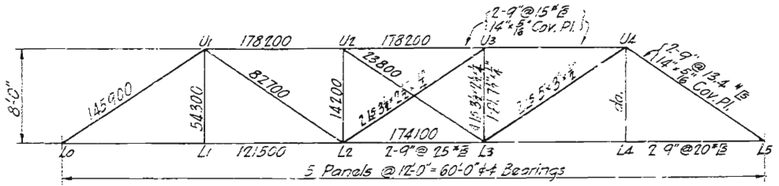
Note: Top Chord, End Post and Web Members laced, Bottom Chord battened

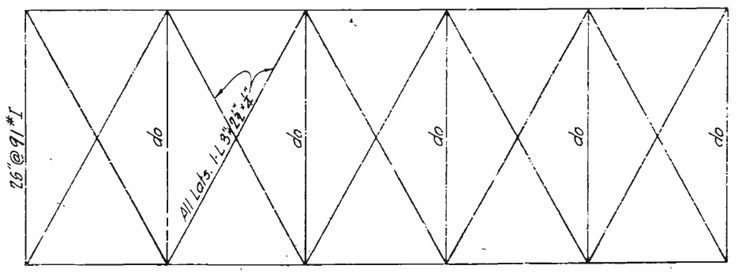




S 550

Use similar arrangement of laterals in all spans of even number of panels.





S 560

Use similar arrangement of laterals in all spans of odd number of panels

MISSOURI
STATE HIGHWAY DEPARTMENT

STRESS DIAGRAMS

STANDARD PONY TRUSSES

CONCRETE FLOOR - WITHOUT JOISTS

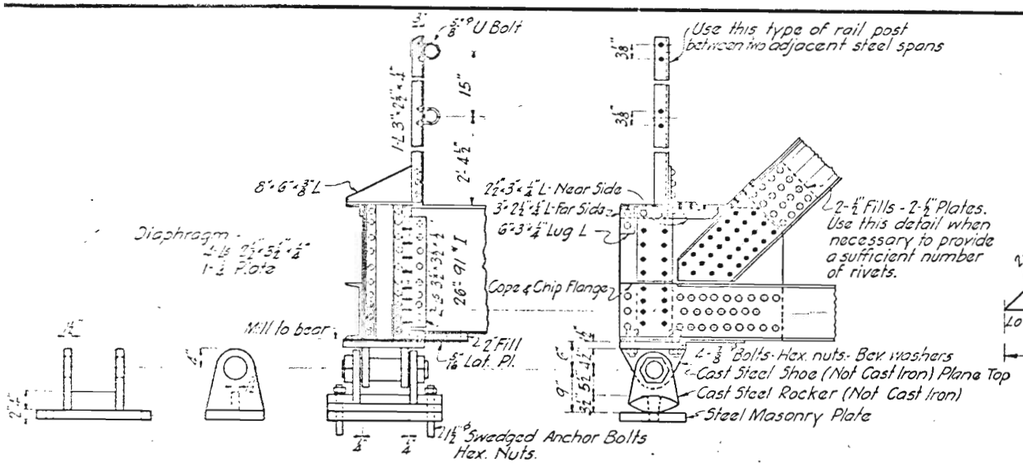
SPANS 50' TO 100' ROADWAY 20'-0"

DEC. 1922

Submitted by: Charles D. Marsh
Bridge Engineer

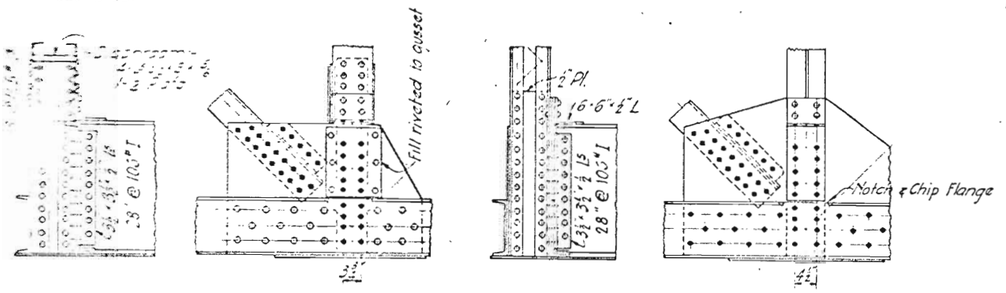
Approved by: [illegible]
Chief Engineer

Drawn Dec. 1922 by J.W.C.
Chkd. Jan 1923 by S.C.F.



PEDESTAL - FIXED END
Cast Steel

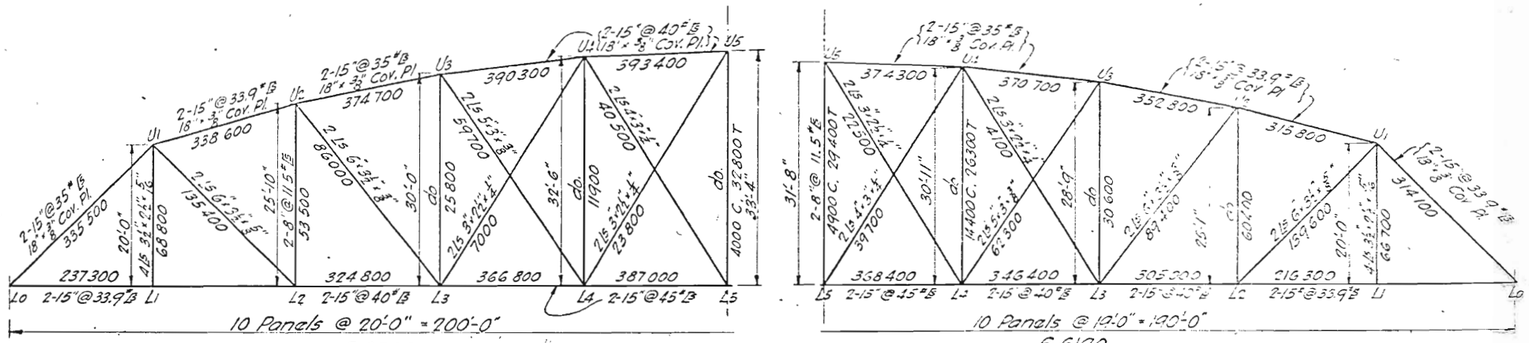
ROCKER - EXPANSION END



TO BE USED WITH CHANNEL VERTS.

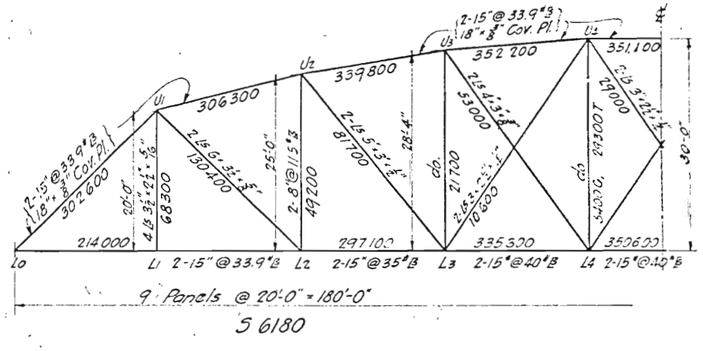
TO BE USED WITH ANGLE VERTS.

FLOOR BEAM CONNS.



5 6200

5 6190



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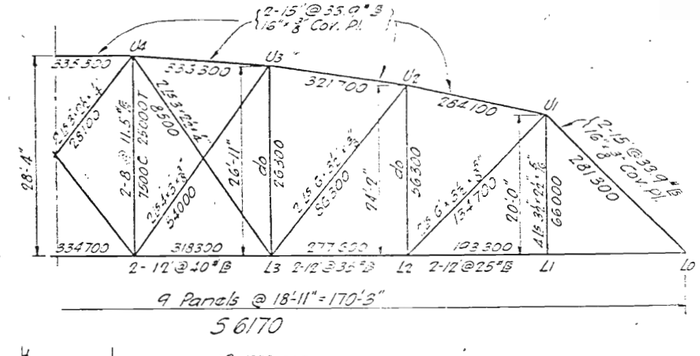

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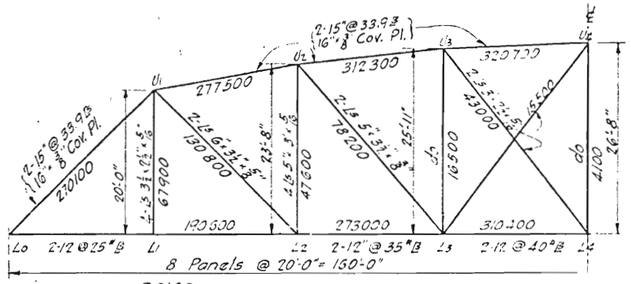

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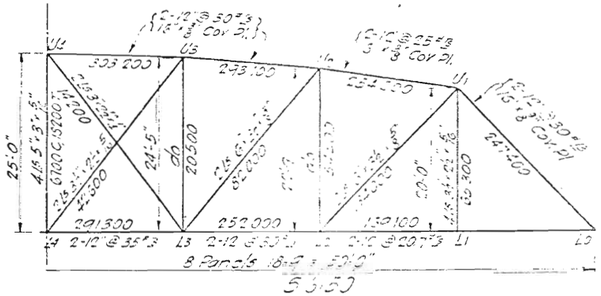

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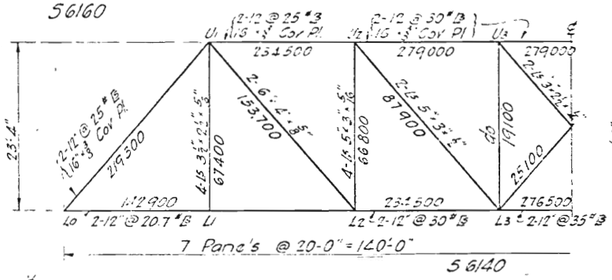

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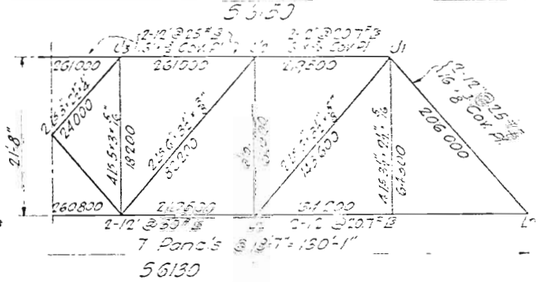

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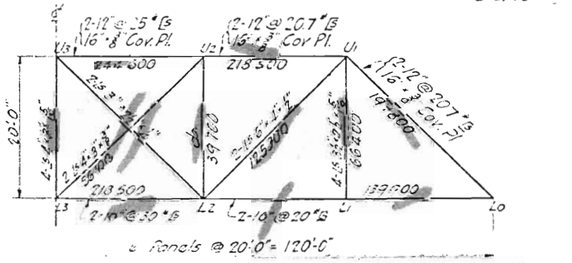
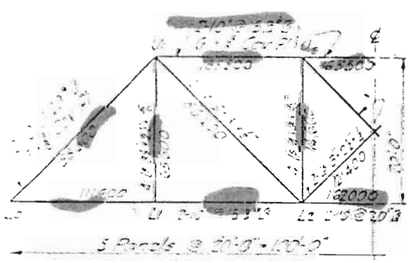


5 6110

5 6120

Note - All compression members laced. Tension members battened except U0-L1 which shall be laced



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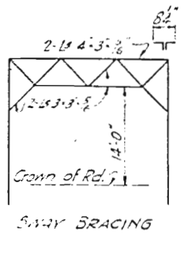

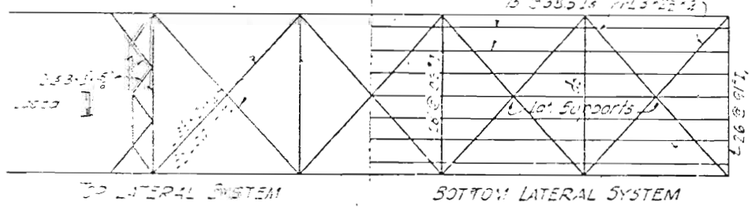

Note - Top and bottom lateral systems, Portals, Sways, Floor Beams and Stringers same for all spans.

Span	Msry. Pl.	Crown to Msry.	End React.	Estimated 1½" Str. Steel	Estimated 1½" Cast Steel	Pin
100	12"×1⅜"×2'-2"	4'-5⅛"	147000	58300	1650	4¼"
110	14"×2"×2'-2"	4'-5⅛"	162000	103000	1750	4½"
120	14"×2"×2'-2"	4'-5⅛"	172500	116600	1750	4⅝"
130	16"×2¼"×2'-2"	4'-5⅛"	185000	137000	1850	4¾"
140	16"×2¼"×2'-2"	4'-5⅛"	198000	150400	1850	4⅞"
150	17"×2½"×2'-2"	4'-5⅛"	147000	134400	1900	5"
160	17"×2½"×2'-2"	4'-5⅛"	220000	175600	1900	5"
170	17"×2½"×2'-2"	4'-5⅛"	230000	195300	1950	5⅛"
180	17"×2½"×2'-4"	4'-5⅛"	240000	206000	1950	5⅛"
190	15"×2½"×2'-4"	4'-5⅛"	254000	228800	1950	5"
200	18"×2½"×2'-4"	4'-5⅛"	264000	241000	1950	5⅛"

Distance "Crown to Msry." does not include allowance for grout.
End Reaction is for one truss only and includes live load with impact.

MISSOURI
STATE HIGHWAY DEPARTMENT
STRESS DIAGRAMS
STANDARD THRU TRUSSES
CONCRETE FLOOR WITH JOISTS
SPANS 100' TO 200' 20'-0" ROADWAY

Submitted by Charles D. Nixon
Bridge Engineer

Approved by C. H. Huston
Chief Engr.

ORIGINAL PLANS - NOT FOR REFERENCE