
Documentation of the Historic Horse Creek Bridge

Bridge No. X0186
Vernon County, Route B
September 2012



Horse Creek Bridge

MoDOT Bridge No. X0186

Vernon County
Route B

Historical and Photographic Documentation

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Submitted to:
State Historic Preservation Office
Jefferson City, Missouri

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

Kevin L. Keith, Director
Missouri Department of Transportation

September 2012

Historic Documentation
Bridge X0186, Horse Creek Bridge

Location: Vernon County, Route B,

Construction Date: 1948

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

Present Use: Highway Bridge, to be removed and replaced

Significance: The Horse Creek Bridge, X0186, is a 10-panel, skewed, steel, polygonal, rigid connected Warren pony truss bridge. The bridge is significant as a late, long-span example of a relatively common Missouri State Highway Department design distinguished because of its polygonal top chord, a variation used by the State Highway Department to conserve material.¹ Approximately 15 bridges of this configuration were constructed in the state in the 1930s and 1940s. Bridge X0186 is one of 8 that remain, and is one of 3 that are skewed.²

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

¹ Fraser, Clayton. "Horse Creek Bridge." *Missouri Historic Bridge Inventory*. Loveland, CO: FRASERdesign, 1996.

² Dawdy, Randall. "Memorandum, Route B, Vernon County, MoDOT Job No. J7S0546, Replacement of Bridge X0186 over Horse Creek." 2011. Historic Preservation Section, Missouri Department of Transportation, Jefferson City, Missouri.

Introduction

The Missouri Department of Transportation is proposing to replace the historic bridge at Horse Creek (number X0186) with a new bridge on the same alignment. The bridge is eligible for listing on the National Register of Historic Places as a relatively rare example of a skewed, polygonal pony truss bridge constructed on the state highway system. The replacement of the bridge will have an adverse effect on the characteristics that make the bridge eligible for listing on the National Register of Historic Places.³ This documentation serves as partial mitigation of the effects of the project on the historic structure.

History of Bridge X0186

Planning for the construction of bridge X0186 began in 1936 when a field check of the site was made. At that time it was determined that an I-beam and truss bridge would be appropriate. The Field Check Memoranda noted that there was no existing bridge in the area. In the early 1930s the State Highway Department had begun designing Warren trusses with polygonal upper chords, which conserved material and made the bridges less expensive to construct.⁴ This is the configuration that would be constructed at Horse Creek.

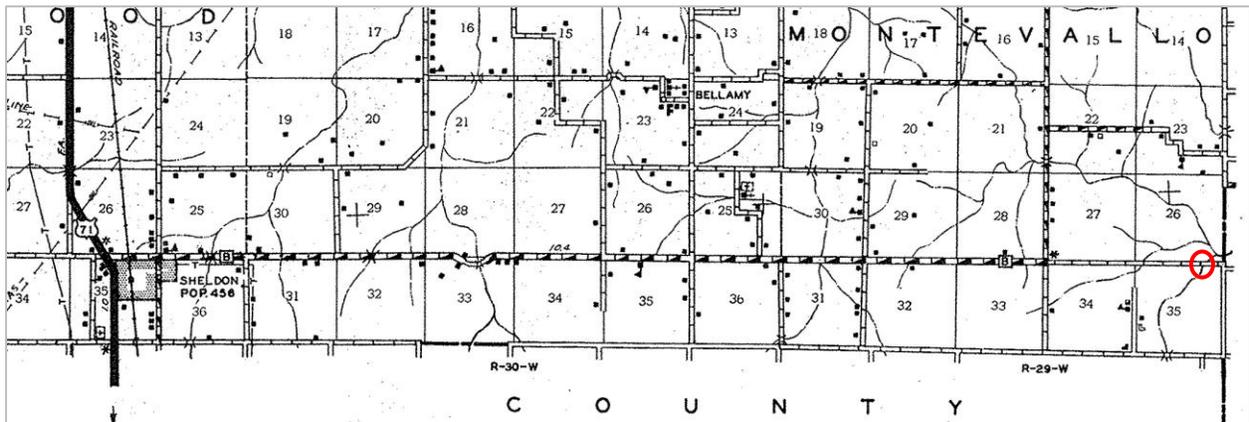


Figure 1: 1940 Vernon County Highway Map with bridge location identified.⁵

In August 1938 borings and soundings of the proposed location were sent to the Bureau of Public Roads for approval.⁶ The project stalled during World War II, with work resuming in 1945. In April a preliminary layout was discussed which included two 41-foot I-beam spans and a 110-foot truss span with a skew of approximately 45 degrees, and concrete bents on rock and two

³ Dawdy, Randall. "Memorandum, Route B Vernon County, MoDOT Job No. J7S0546." 2011. Historic Preservation Section, Missouri Department of Transportation, Jefferson City, Missouri.

⁴ Fraser.

⁵ Missouri State Highway Department. "General Highway Map Vernon County, Missouri." Jefferson City, MO: Missouri State Highway Department, 1940.

⁶ Brown, C. W., Letter to Clifford Shoemaker, 13 July 1945. Correspondence file, bridge X0186. Bridge Division, Missouri Department of Transportation, Jefferson City, Missouri.

dumbbell piers. Notes on the preliminary layout changed the bents to steel pile end bents.⁷ In July preliminary layouts were sent to the Bureau of Public Roads for approval.⁸ The Bureau quickly approved the location of the bridge and planning proceeded.⁹

By October 1945 the preliminary plans for the bridge were completed and sent to the Bureau for review.¹⁰ The Bureau found the plans satisfactory except for concerns about deflection in the skewed end floor beam. They expressed concern that when a live load was on the bridge the deflection could cause the expansion plates to bind and possibly loosen the connections. They suggested a sliding shoe be provided under the center end of the skewed floor beam.¹¹ The State Highway Department quickly made the change to a sliding shoe and the bridge plans were ready.¹²

The project was included in the August 2, 1946 bid call, only one company bid on the project—the Otto W. Knutson company. The bid, at 68,089.15, was more than 10% higher than the engineers estimate for the work of \$59,893.74. The Chief Engineer, C. W. Brown, recommended to the State Highway Commission that the bid be awarded to Knutson, if he was willing to do the work for the engineer’s estimate, with painting to be done by state maintenance forces.¹³

Apparently negotiations with Knutson to do the work for the engineer’s estimates broke down, because the project was included in the December 3, 1947 bid call. At that time the project included 4.1 miles of improvements in Vernon and Cedar Counties with grading and surfacing, a double box culvert on the Wilhite Branch and a bridge over Horse Creek. The project was part of 61.3 miles of improvements included in the bid call with 60 miles of the proposed improvements being on farm-to-market roads.¹⁴

⁷ “Preliminary Layout.” 23 April 1945. Correspondence file, bridge X0186. Bridge Division, Missouri Department of Transportation, Jefferson City, Missouri.

⁸ Brown, C. W., Letter to Clifford Shoemaker, 13 July 1945. Correspondence file, bridge X0186. Bridge Division, Missouri Department of Transportation, Jefferson City, Missouri.

⁹ Shoemaker, Clifford, Letter to C. W. Brown, 17 July 1945. Correspondence file, bridge X0186. Bridge Division, Missouri Department of Transportation, Jefferson City, Missouri.

¹⁰ Brown, C. W., Letter to S. W. O’Brien, 11 October 1945. Correspondence file, bridge X0186. Bridge Division, Missouri Department of Transportation, Jefferson City, Missouri.

¹¹ Shoemaker, Clifford, Letter to C. W. Brown, 22 October 1945. Correspondence file, bridge X0186. Bridge Division, Missouri Department of Transportation, Jefferson City, Missouri.

¹² Brown, C. W., Letter to S. W. O’Brien, 23 October 1945. Correspondence file, bridge X0186. Bridge Division, Missouri Department of Transportation, Jefferson City, Missouri.

¹³ Missouri State Highway Commission. “Minutes of the Special Meeting and the Regular Meeting of the State Highway Commission, held in Jefferson City, Missouri on Monday, August 12, 1946 and Tuesday, August 13, 1946.” pp. 30-31. As held by the Secretary to the Commission, Missouri Department of Transportation, Jefferson City, Missouri.

¹⁴ “Route “B” Among 50 Road Projects.” *The Nevada Herald*, 27 November 1947, p. 1. Microfilm, State Historical Society of Missouri, Columbia, Missouri.

On December 9, 1947 the contract to construct the bridge was awarded to M. E. Gillioz of Monett, Missouri. Gillioz had bid \$69,412.09 for the Vernon County portion of the project and was also awarded the Cedar County portion of the project for an additional \$36,850.05.¹⁵ The contract included grading and surfacing, a double box culvert at the Wilhite Branch and the bridge over Horse Creek. The 4.1 mile road improvements would close a transportation gap between Sheldon and Cedar County Route A.¹⁶

Gillioz received a notice to proceed allowing his company to start work on the bridge on or before February 10, 1948.¹⁷

In January Gillioz requested permission to use a subcontractor for the concrete work on the bridge—the L. B. Mitchell Company of Cassville.¹⁸ The subcontractor was approved and Mitchell's Company was on site and working in the spring. By mid-May work on the pilings was underway with rapid progress made. During the week of May 17-20 eleven piles, all the piles except one, were driven.¹⁹

Work continued throughout the summer and the bridge was completed on November 19, 1948.²⁰ The Sheldon Enterprise predicted a rise in business because of the new road. "For the first time in recent history Sheldon and Jericho Springs are neighbors in fact as well as in mileage" with the two communities being only twenty miles apart and a convenient drive. The paper predicted that Sheldon, located on U. S. Highway 71, would become a commercial shipping point for Jericho Springs. It recommended that Sheldon residents and businesses offer a welcoming hand.²¹

¹⁵ Missouri State Highway Commission. "Minutes of the Special Meeting and the Regular Meeting of the State Highway Commission, held in Jefferson City, Missouri on Monday, December 8, 1947, and Tuesday, December 9, 1947." p. 42. As held by the Secretary to the Commission, Missouri Department of Transportation, Jefferson City, Missouri.

¹⁶ "Contract on Route B Let to Gillioz." *The Sheldon Enterprise*. 19 December 1947, p. 1. Microfilm, State Historical Society of Missouri, Columbia, Missouri.

¹⁷ "Notice to Proceed." 14 January 1948. Construction file, bridge X0156. Bridge Division, Missouri Department of Transportation, Jefferson City, Missouri.

¹⁸ Ellis, J. Russell. Letter to M. E. Gillioz, 20 January 1948. Construction file, bridge X0156. Bridge Division, Missouri Department of Transportation, Jefferson City, Missouri.

¹⁹ "Pile Driving Data." Construction file, bridge X0156. Bridge Division, Missouri Department of Transportation, Jefferson City, Missouri.

²⁰ Corbett, J. J., "Inter-Department Correspondence" to J. R. Ellis, 24 November 1948. Construction file, bridge X0156. Bridge Division, Missouri Department of Transportation, Jefferson City, Missouri.

²¹ "Neighboring Towns Closely Linked by New Road." *The Sheldon Enterprise*. 19 November 1948, p. 1. Microfilm, State Historical Society of Missouri, Columbia, Missouri.

Construction Contractors

M. E. Gillioz—Contractor

M. E. Gillioz of Monett, Missouri constructed the Horse Creek Bridge. The company, headed by Maurice E. Gillioz was active in construction in Missouri and surrounding states between the early 1900s into the 1960s with highway, bridge and building construction.²²

Gillioz' construction company started before 1914 in Pierce City where he successfully bid to build the foundation and floor for St. Mary's Catholic Church. The company grew from small jobs, such as sidewalks, basements, and culverts into larger bridge and road projects. In 1914 he moved the company to Monett where it would remain.²³

Gillioz was a frequent bidder for State Highway Department contracts and constructed many road and bridge projects including major highways and lettered routes.²⁴ Gillioz also constructed many bridges in Missouri, Oklahoma and Kansas including truss and concrete spans.²⁵

The Gillioz Construction Company, as M. E. Gillioz business was commonly known, was one of the region's premiere construction contractors. By 1957 its business with the Missouri State Highway Department amounted to \$31 million. It had more than 100 employees and a payroll of \$228,000.²⁶

Missouri Valley Steel—Fabricator

The Missouri Valley Steel Company incorporated in Leavenworth, Kansas on February 18, 1946. James V. Oliver was the first President, Richard J. Brown, Junior was the Secretary, and John F. Mitchell was the Treasurer. Vice-Presidents and Directors were Russell D. Keeler and Edward L. Hardeman and F. C. Bannon was the sixth Director. The Company started with 450 shares of common stock with a \$100 par value and 500 shares of preferred stock with a \$100 par value. At incorporation 415 shares of the common stock and 445 shares of preferred stock were sold raising \$95,000 in capital for the company.²⁷

²² Austin, David C. "Meramec River Bridge, Bridge No H-996R1, Franklin County Route 40/47, MoDOT Job No. J6P0709." Manuscript, 2000. Historic Preservation Section, Missouri Department of Transportation, Jefferson City, Missouri.

²³ Austin.

²⁴ Missouri State Highway Commission. Minutes. Various dates. As held by Secretary to the Commission, Missouri Department of Transportation, Jefferson City, Missouri. A search conducted of Commission minutes revealed 89 dates with entries for M. E. Gillioz; many were bid awards where Gillioz was awarded multiple jobs. The search should not be considered all inclusive since many of the minutes documents were not made searchable when they were scanned.

²⁵ Bridgehunter. Search results for M. E. Gillioz. Search performed 18 July 2011 at: <http://bridgehunter.com/category/builder/me-gillioz/>. The search revealed 35 bridges attributed to him.

²⁶ Austin.

²⁷ Missouri Valley Steel. "Application of Foreign Corporation for a Certificate of Authority to Transact Business in Missouri." 18 January 1947, charter F9535. Corporations Division, Missouri Secretary of State, Jefferson City, Missouri. Downloaded 13 July 2011 from: <https://www.sos.mo.gov/BusinessEntity/soskb/Filings.asp?467768#>.

The purposes of the company included “design, fabricate, contract for and construct all types of structural work of steel and other materials; to construct, own, lease and operate boats, barges, bridges and other structures; to own and operate a general structural steel shop.”²⁸

Physical Description of Bridge X0186

The Horse Creek Bridge is a 110-foot skewed, ten-panel, steel pony truss; it is a Warren web with verticals and a polygonal top chord. There are 41-foot steel stringer approach spans on both ends of the bridge. It has steel reinforced concrete abutments and piers.

The description below is based on the construction and as built plans and the bridge as it exists in July 2011.²⁹

Piles for the abutments are steel H-beam piles driven to solid rock, shale or cemented gravel, and are not less than the length specified by the bridge plans—2 at 32’, 4 at 33’, 2 at 21’ and 4 at 22’ (combined for both abutments). Piles were to be driven to 30’ below existing ground level.

The abutments (numbers 1 and 4) are a stub abutment with wingwalls. Each abutment is 2’ 6” thick, 4’ high from its base to the bridge seat. The backwall is 23-1/4”. The abutment stem is 35’ 11-1/2” wide and the bridge seat is 32’ 11-1/2” wide with 18” on each side of the bridge seat to the edge of the abutment stem. The wing is 4’6” long on both sides of the abutment and tapers from 7’ 4’ high to 2’ high.

The piers (numbers 2 and 3) have three columns with web walls. Each column has a footing 5’8” square and 4’ deep. Centered on each footing is a column 3’ 8” in diameter. For pier 2 the heights of the columns are 33’ 5-3/8” (left), 33’ 2-1/2” (center) and 32’ 8” (right). For pier 3 the heights of the columns are 36’ 3-1/4” (left), 25’ 3-1/4” (center) and 25’ 5-5/8” (right). A construction joint is located at an elevation of 846 feet above median sea level in each column. The web wall begins above this construction joint. The web wall is 24” thick. The web wall and the columns have a single cap which is 38’ 7” long, 4’ 2” wide and 2’ thick on the truss side and an additional 20-1/4” on the stringer side, forming a bridge seat for the stringer spans.

The stringer spans have plate bearing devices, with expansion plates on both abutments and fixed plates on both piers. The truss span has a rocker bearing device on pier 2 and a fixed pedestal on pier 3.

The stringer spans have five steel I-beam stringers with two sets of intermediate diaphragms, evenly spaced between each pair of stringers. The diaphragms are joined to the stringers by gusset plates and are formed by two angles that are crossed and riveted together at the center meeting point.

²⁸ Ibid.

²⁹ Missouri State Highway Department. “Bridge Over Horse Creek State Road From Sheldon East to Cedar Co. Line, About 12 Miles East of Sheldon, Project No. S-404 (4)(58) Vernon County.” Microfilm, Bridge Division, Missouri Department of Transportation, Jefferson City, Missouri.

The truss has a ten-panel Warren web with a polygonal top chord and verticals. The bottom chord is formed by two angles joined with small plates on the bottom and riveted to the vertical and diagonal members. The end floor beams and floor beams are 24" I-beams. The bottom lateral bracing is formed by four angles that cross at alternate floor beams and are joined by a gusset plate.

The inclined end posts are built members composed of two channels with solid plate on the top surface and small bar lacing on the bottom surface. The hip vertical, diagonals and verticals are 10" I-beams. Each polygonal top chord is formed by four sections of back to back channels with plates riveted to the top and small bar lacing riveted to the bottom in a zigzag pattern. The diagonals and verticals are riveted to the top chord at gusset plates. The top chord peaks at lateral 5 and is symmetrical around that point.

The bridge has a 22' asphalt roadway with concrete curbs. The curbs are 10" above the roadway and 13" wide. There are drains in the truss span; these are 5" high, 4' long and located 12" from the center of the truss verticals.

Guardrails run the length of the bridge on both sides. On the stringer spans the rails are riveted to posts, which are connected to lead plates set in the concrete curb. The posts are short sections of I-beam bevel cut on the top edge. On the truss span the rails are riveted to the vertical and diagonal bridge members. The guardrail is formed of two runs of steel angles. The ends are curved outward and an angle is riveted to the end to form a solid closed end.

Photographic Methods and Processes

The archival photographs accompanying this documentation were taken and processed according to the standards for photographs accompanying National Register of Historic Places (NRHP) documentation.³⁰ Randall Dawdy took photographs on June 28, 2011 using a Canon G10 digital camera. Images were captured in a raw (nef) format, which was manipulated for light contrast before being converted to a tagged image file format (.tiff) and printed. Images were numbered according to the NRHP Photographic Imaging Policy³¹ and burned onto a Delkin Archival Gold compact disc, which was provided to the State Historic Preservation Office along with this report.

Prints were made on Epson Premium Glossy Photo Paper and used Epson Matte Black Ultra Chrome K3 Ink, both identified as "best" practices by the NRHP photo policy, and which Epson identifies as having 85-year permanence under glass.³² Kept in archival conditions the materials

³⁰ National Park Service, "Proposed Updated Photographic Policy National Register of Historic Places." Downloaded 8 June 2008 from: www.nps.gov/history/nr/policyexpansion.html.

³¹ Ibid.

³² Ibid, "Draft of a Proposed New National Register Photographic Imaging Policy." Downloaded 26 March 2009 from: www.nps.gov/history/nr/policyexpansion.html; Epson. "Permanence ratings from Wilhelm Imaging Research." Downloaded 30 April 2009 from www.epson.com/pdf/LightfastCPD_15334R2.pdf.

will exceed the 75 year permanence standard for the NRHP, which is the standard being used for this project.

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

Bibliography

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_____. "General Highway Map Vernon County, Missouri." Jefferson City, MO: Missouri State Highway Department, 1940.

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_____. "Draft of a Proposed New National Register Photographic Imaging Policy." Downloaded 26 March 2009 from: www.nps.gov/history/nr/policyexpansion.html.

Nevada Herald, The. (weekly) Microfilm, State Historical Society of Missouri, Columbia, Missouri.

Sheldon Enterprise, The. (weekly) Microfilm, State Historical Society of Missouri, Columbia, Missouri.

Photo Index and Photo Plates of Archival Photographs

Horse Creek Bridge (Bridge No. X0186)
Route B, Vernon County, Missouri

Photographer: Randall Dawdy, Missouri Department of Transportation

Date: June 28, 2011

Location of Digital Images: Missouri State Historic Preservation Office

Photo Index:

- #1 of 35. Bridge X0186. South guardrail. View to southeast.
- #2 of 35. Bridge X0186. South truss. View to southeast.
- #3 of 35. Bridge X0186. South truss detail. View to south.
- #4 of 35. Bridge X0186. South truss detail. View to south.
- #5 of 35. Bridge X0186. South truss detail. View to south.
- #6 of 35. Bridge X0186. South truss detail. View to southeast.
- #7 of 35. Bridge X0186. South truss detail. View to southeast.
- #8 of 35. Bridge X0186. South truss detail. View to southeast.
- #9 of 35. Bridge X0186. South truss detail. View to southeast.
- #10 of 35. Bridge X0186. South guardrail. View to southwest.
- #11 of 35. Bridge X0186. East approach. View to west.
- #12 of 35. Bridge X0186. East end. View to southwest.
- #13 of 35. Bridge X0186. North truss. View to west.
- #14 of 35. Bridge X0186. West end. View to southwest.
- #15 of 35. Bridge X0186. North side. View to southwest.
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- #17 of 35. Bridge X0186. North profile. View to south.
- #18 of 35. Bridge X0186. North profile. View to south.
- #19 of 35. Bridge X0186. North truss detail. View to south.

- #20 of 35. Bridge X0186. North truss detail. View to south.
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- #23 of 35. Bridge X0186. Pier 2. View to south.
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- #25 of 35. Bridge X0186. West end. View to southeast.
- #26 of 35. Bridge X0186. Detail at Pier 2. View to southeast.
- #27 of 35. Bridge X0186. Subdeck. View to east.
- #28 of 35. Bridge X0186. Pier 3. View to east.
- #29 of 35. Bridge X0186. Lower chord detail. View to northeast.
- #30 of 35. Bridge X0186. Lower chord detail. View to northeast.
- #31 of 35. Bridge X0186. West approach. View to east.
- #32 of 35. Bridge X0186. West approach. View to east.
- #33 of 35. Bridge X0186. South truss. View to east.
- #34 of 35. Bridge X0186. West end. View to northeast.
- #35 of 35. Bridge X0186. South truss. View to northeast.



#1 of 35. Bridge X0186. South guardrail. View to southeast.



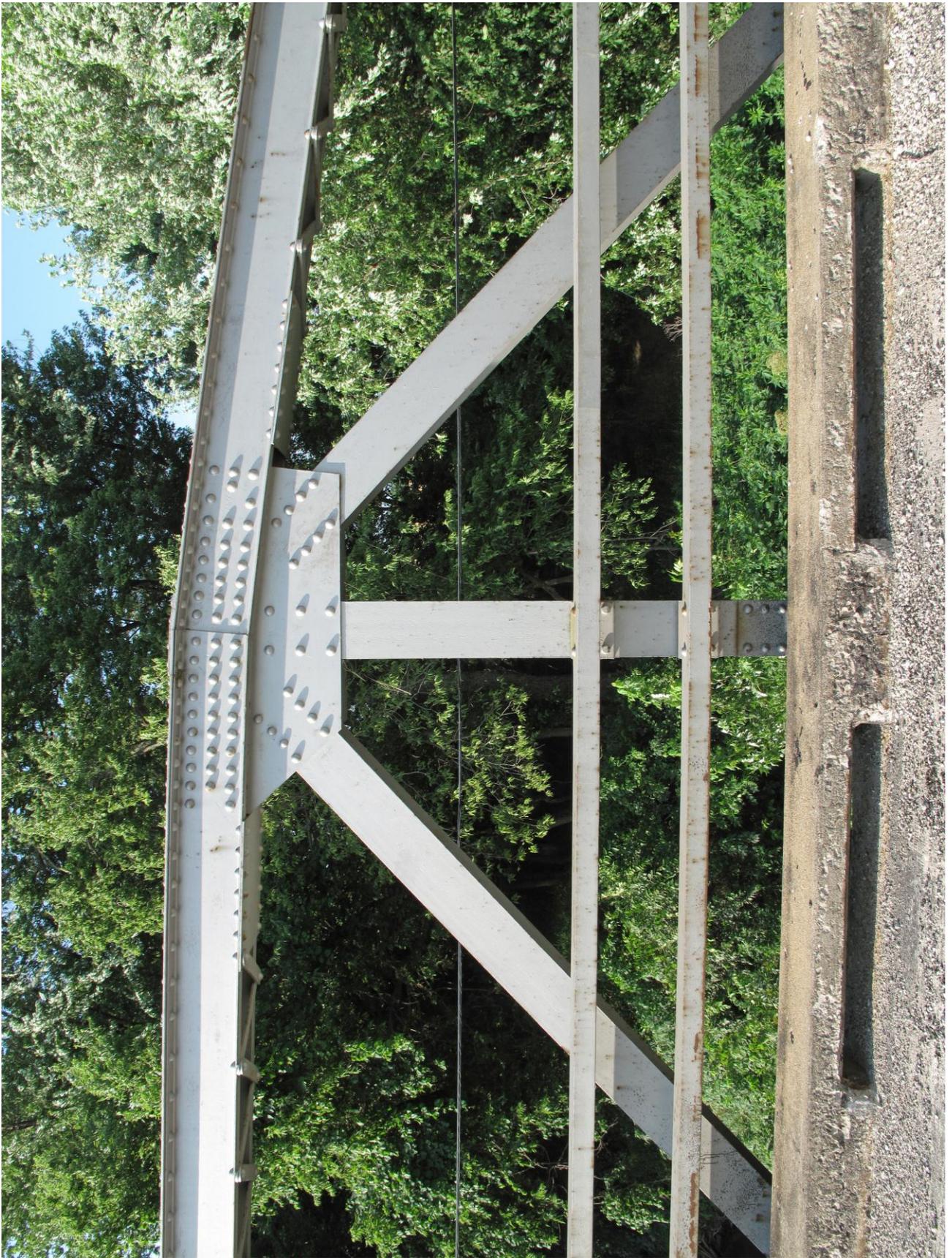
#2 of 35. Bridge X0186. South truss. View to southeast.



#3 of 35. Bridge X0186. South truss detail. View to south.



#4 of 35. Bridge X0186. South truss detail. View to south.



#5 of 35. Bridge X0186. South truss detail. View to south.



#6 of 35. Bridge X0186. South truss detail. View to southeast.



#7 of 35. Bridge X0186. South truss detail. View to southeast.



#8 of 35. Bridge X0186. South truss detail. View to southeast.



#9 of 35. Bridge X0186. South truss detail. View to southeast.



#10 of 35. Bridge X0186. South guardrail. View to southwest.



#11 of 35. Bridge X0186. East approach. View to west.



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#16 of 35. Bridge X0186. North side. View to southwest.



#17 of 35. Bridge X0186. North profile. View to south.



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#23 of 35. Bridge X0186. Pier 2. View to south.



#24 of 35. Bridge X0186. North truss. View to southeast.



#25 of 35. Bridge X0186. West end. View to southeast.



#26 of 35. Bridge X0186. Detail at Pier 2. View to southeast.



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#31 of 35. Bridge X0186. West approach. View to east.



#32 of 35. Bridge X0186. West approach. View to east.



#33 of 35. Bridge X0186. South truss. View to east.



#34 of 35. Bridge X0186. West end. View to northeast.



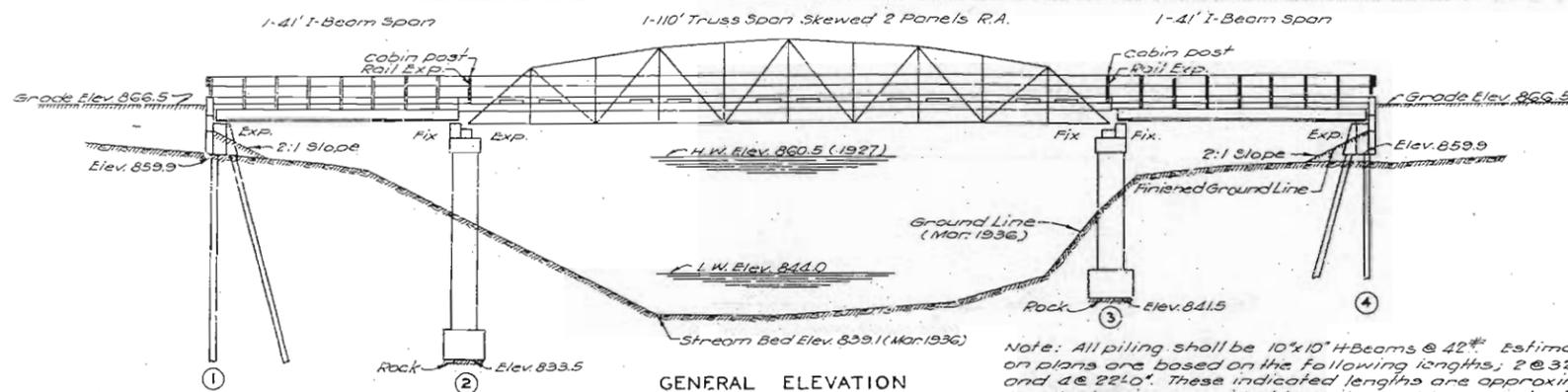
#35 of 35. Bridge X0186. South truss. View to northeast.

Plans for Original Bridge Construction

MISSOURI STATE HIGHWAY DEPARTMENT

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	MO.	5-2022 (2-52)	19		

24



GENERAL ELEVATION

Note: All piling shall be 10"x10" H-Beams @ 42#. Estimated quantities shown on plans are based on the following lengths; 2 @ 32'0", 4 @ 33'0", 2 @ 21'0" and 4 @ 22'0". These indicated lengths are approximate only. Proper lengths to give required bearing and/or penetration will be authorized by the Engineer. See Special Provisions.

All piles shall be driven to practical refusal on or into solid rock, shale or cemented gravel or to not less than the full length authorized and to sustain a load of at least 40 tons per pile. Gravity hammer weighing at least 3000 pounds may be used for driving if desired.

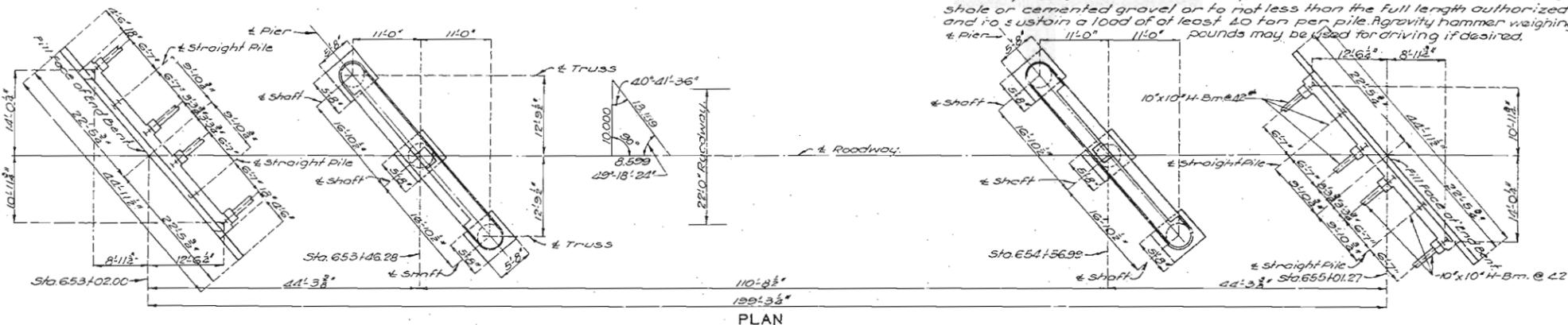
GENERAL NOTES:

Design Specifications A.A.S.H.O.-1921.
 Loading H-10 A.A.S.H.O.
 Structural Steel Stress 12,000 #/sq.
 Reinforcing Steel Stress 18,000 #/sq.
 Concrete Class "B" Stress 1,000 #/sq.
 All concrete shall be Class "B".
 Rivets 3/4" Holes 1/2" unless noted.

Paint: Shop none; Field, contact surfaces of bolted field connections are 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 contractor. Payment for cleaning and painting such surfaces will be included in unit price bid for structural steel.

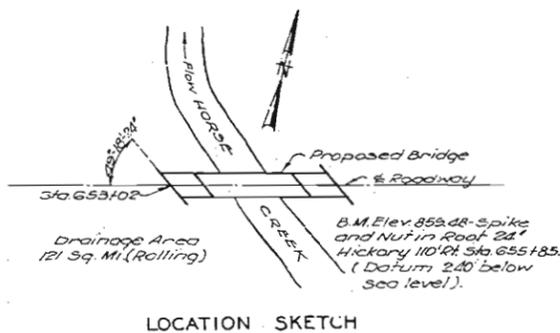
Where joint filler is specified on plans it shall conform with the requirements of section 38-19.11th of the Standard Specifications for Framed Material Filler.

Surfaces of piles on end bents from bottom of concrete caps to 3'-0" below present ground line shall be painted with one coat of an approved brand of emulsified asphalt paint. Payment for excavating ground piles below present ground line and backfilling same, furnishing emulsified asphalt paint and cleaning and painting steel surfaces specified will be included in the unit price bid for other items.



PLAN

COMPLETE BILL OF REINFORCING STEEL			
No.	Size	Length	Mark Location
End Bents No. 1 and 4			
132	3/8"	4'3"	V1 Back wall
4	3/8"	33'0"	H1 " "
4	3/8"	33'0"	H2 " "
16	3/8"	37'9"	H3 Beam
8	3/8"	35'9"	H4 " "
128	3/8"	7'0"	U1 " "
32	3/8"	3'9"	V2 Beam Overlap
20	3/8"	3'3"	U2 Beam
64	3/8"	7'6"	U3 " "
16	3/8"	6'9"	U4 " "
16	3/8"	6'6"	U5 " "
1	3/8"	2'9"	V3 Wing
4	3/8"	4'0"	V4 " "
4	3/8"	5'0"	V5 " "
4	3/8"	6'3"	V6 " "
8	3/8"	7'0"	V7 " "
8	3/8"	8'3"	H5 " "
4	3/8"	7'9"	H6 " "
4	3/8"	6'3"	H7 " "
8	3/8"	20'3"	T1 " "
Piers No. 2 and 3			
48	1"	7'9"	D1 Footing
24	1"	24'3"	P1 Shaft Deriv
24	1"	16'3"	P2 " " " "
4	1"	36'6"	P2 Web
24	3/8"	34'0"	P3 " "
56	3/8"	12'6"	P4 " "
144	3/8"	10'0"	P5 " "
8	3/8"	5'6"	U10 Hunch
6	3/8"	6'0"	U11 " "
Piers No. 2 and 3 (cont.)			
4	3/8"	27'6"	P6 Beam
8	3/8"	33'9"	P7 " "
4	3/8"	37'6"	P8 " "
56	3/8"	7'9"	U6 " "
22	3/8"	2'9"	U7 " "
12	3/8"	7'0"	P9 " "
8	3/8"	7'3"	U8 " "
4	3/8"	6'3"	U9 " "
8	3/8"	22'6"	P10 " "
I-Beam span slab (Superstr.)			
96	3/8"	23'9"	S1 Slab
46	3/8"	26'3"	S2 " "
180	3/8"	22'9"	S3 " "
72	3/8"	28'3"	S4 " "
68	3/8"	28'0"	S5 " "
4	3/8"	31'6"	S6 " "
176	3/8"	2'9"	C1 Curb
12	3/8"	23'3"	C2 " "
12	3/8"	22'9"	C3 " "
Truss (Superstr.)			
408	3/8"	24'6"	S11 Slab
51	3/8"	28'0"	S12 " "
22	3/8"	25'0"	S13 " "
22	3/8"	2'0"	S14 " "
21	3/8"	26'6"	S15 " "
126	3/8"	23'9"	S16 " "
2	3/8"	31'6"	S6 " "
156	3/8"	3'3"	C4 Curb
24	3/8"	30'3"	C5 " "
8	3/8"	4'6"	S17 Slab
8	3/8"	23'0"	S18 " "



LOCATION SKETCH

ESTIMATED QUANTITIES		
Item	Substr.	Superstr. Total
Class 1 Excavation for Structures Cu Yds.	170	170
Class 2 Excavation for Structures Cu Yds.	120	120
Class "B" Concrete Cu Yds.	176.2	176.2
Fabricated Structural Steel (I-Beam Spans) Lbs.	1300	38,000
Fabricated Structural Steel (Trusses) Lbs.		21,000
Cast Steel Lbs.		2060
Reinforcing Steel Lbs.	13,780	21,640
Steel Piles in Place Lin. Ft.	290	290

Note: Excavation for bridge made above Elev. 845.0 will be paid for as Class 1 Excavation for Structures.
 Excavation for bridge made below Elev. 845.0 will be paid for as Class 2 Excavation for Structures.

BRIDGE OVER HORSE CREEK
 STATE ROAD FROM SHELTON EAST TO JEDAR CO. LINE
 ABOUT 12 MILES EAST OF SHELTON
 PROJECT NO. 5-404(4) (5B) STA 653+02
 VERNON COUNTY

DESIGNED BY *V. W. Enselow* DATE 1/8/1946
 APPROVED BY *Chas. Brown* DATE 1/8/1946
CHIEF ENGINEER

Drawn Sept. 1945 by R.W.B.
 Traced Oct. 1945 by H.C.
 Checked Dec. 1945 by R.C.C.

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

Sheet No. 1 of 5

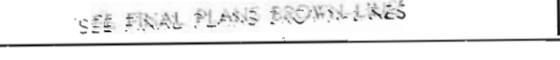
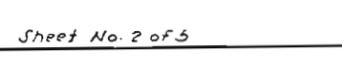
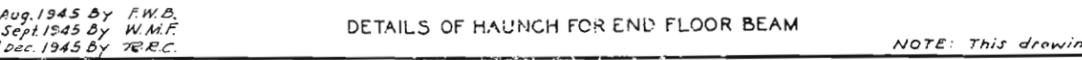
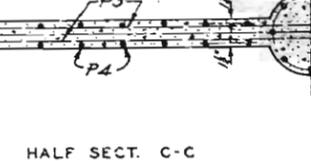
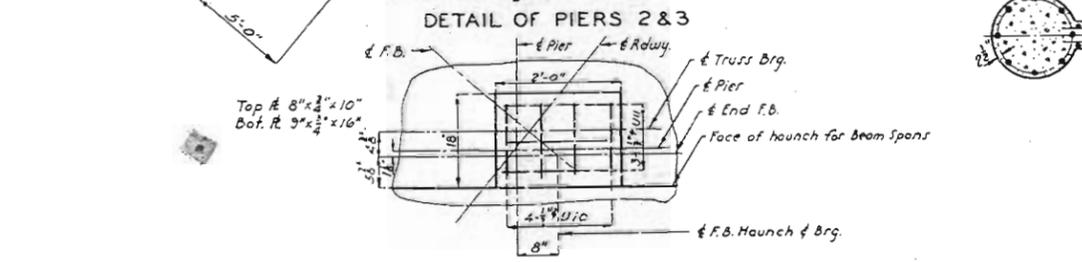
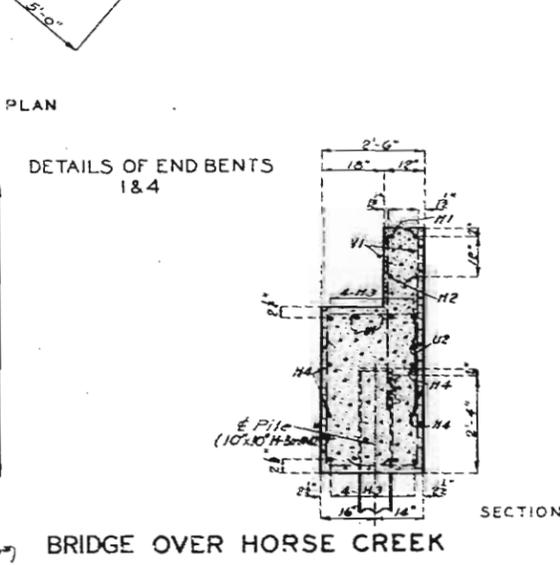
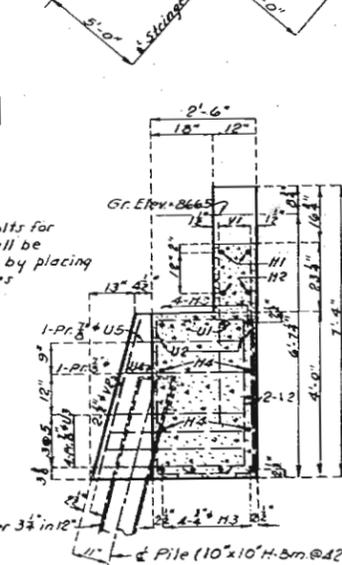
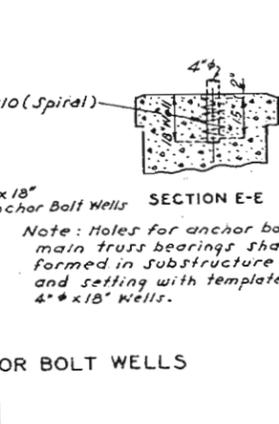
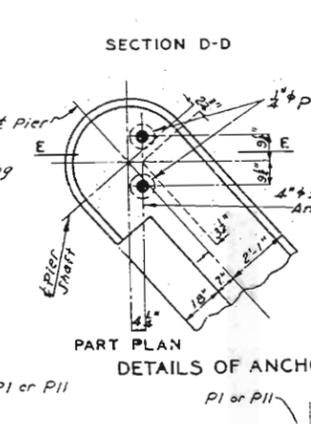
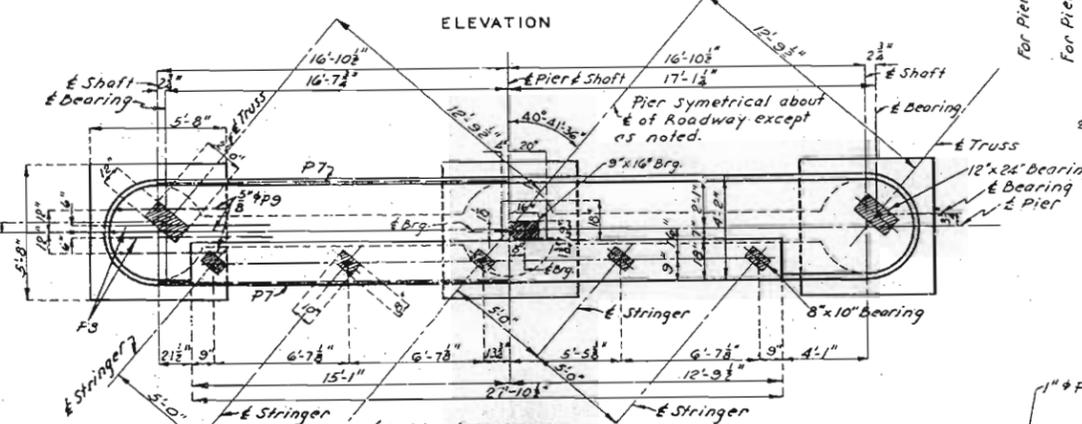
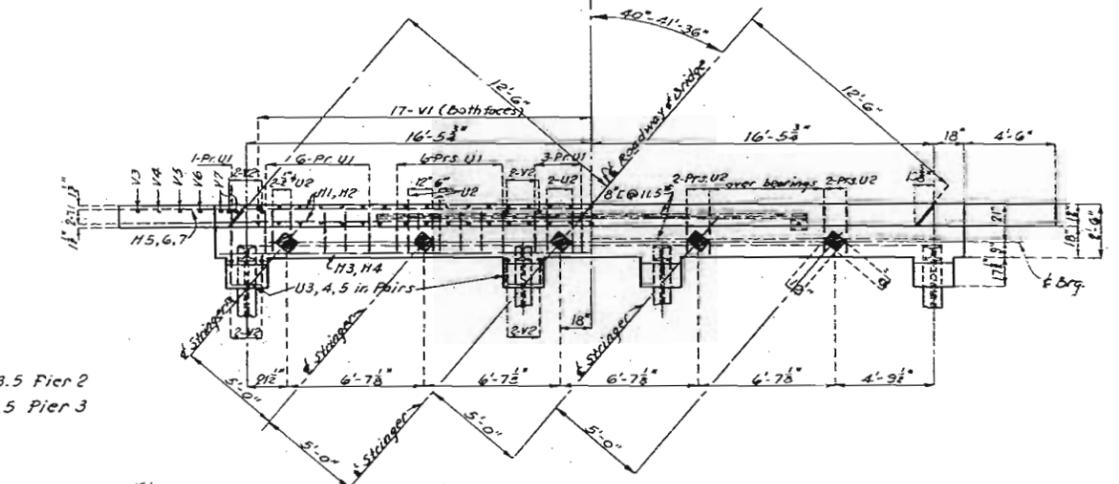
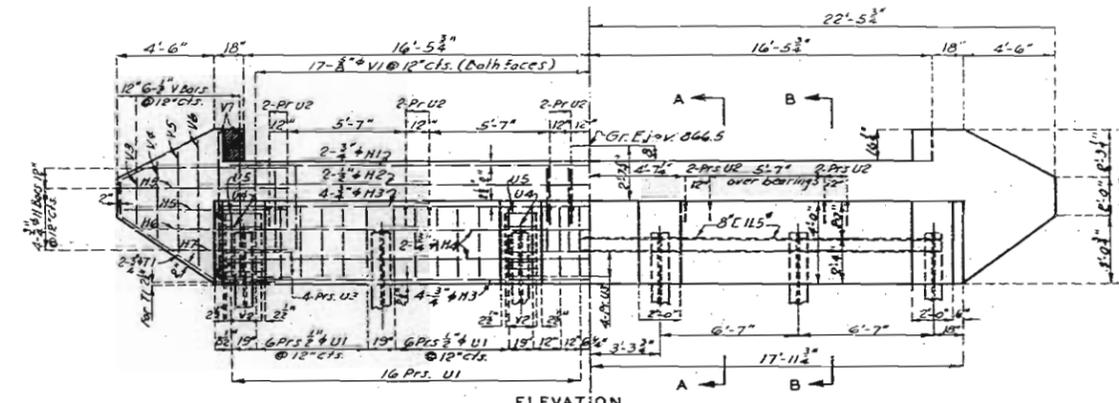
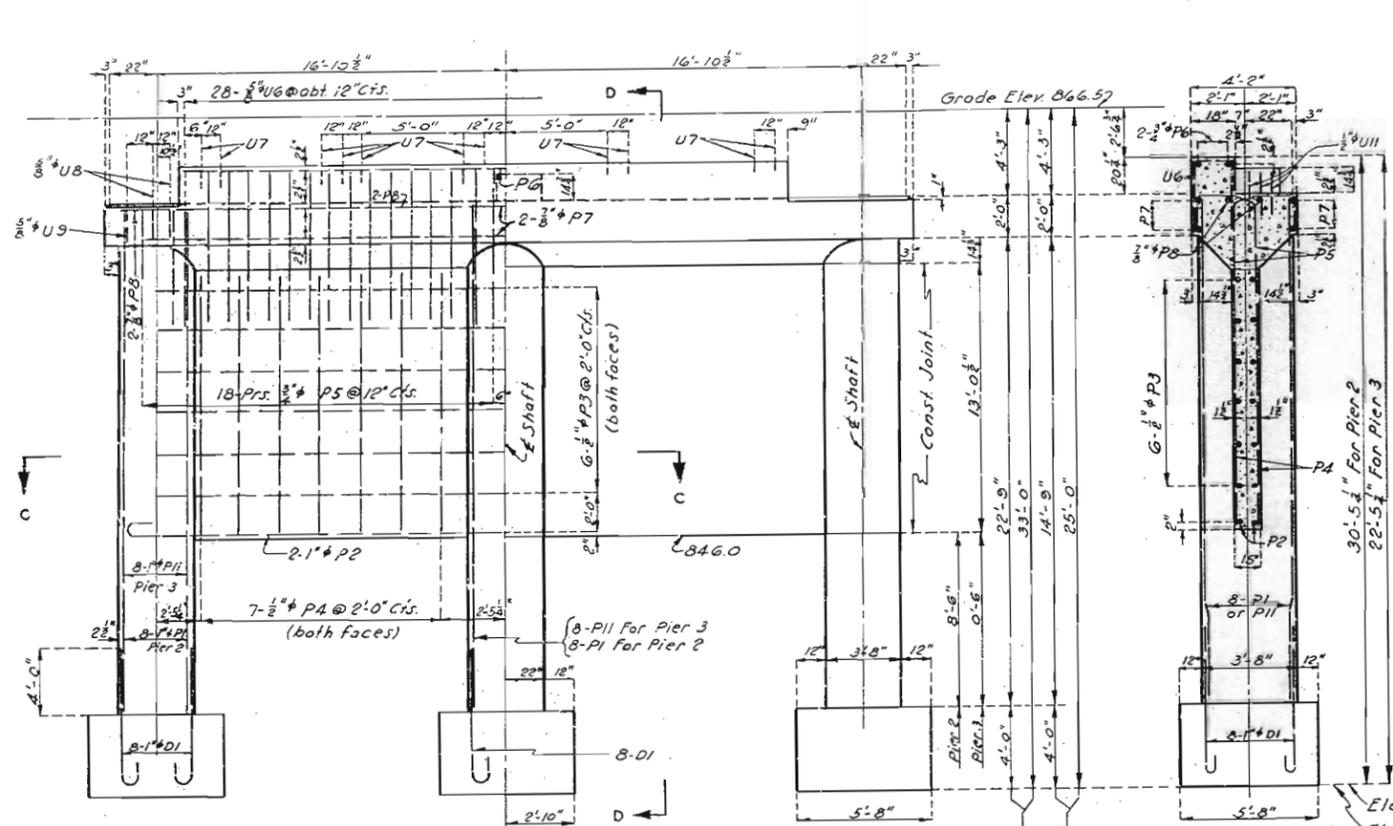
SEE FINAL PLANS BROWN-LINES

STDC-1093
X-186

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MISSOURI STATE HIGHWAY DEPARTMENT

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISC. YEAR	SHEET NO.	TOTAL SHEETS
5	MO.	S-404(4)	1945	19	27



BRIDGE OVER HORSE CREEK
 STATE ROAD FROM SHELDON EAST TO CEDAR CO. LINE
 ABOUT 12 MILES EAST OF SHELDON
 PROJECT NO. S-404(4) (SB) STA 653+02
 VERNON COUNTY

Drawn Aug. 1945 by F.W.B.
 Traced Sept. 1945 by W.M.F.
 Checked Dec. 1945 by T.R.C.

NOTE: This drawing not to scale. Follow Dimensions.

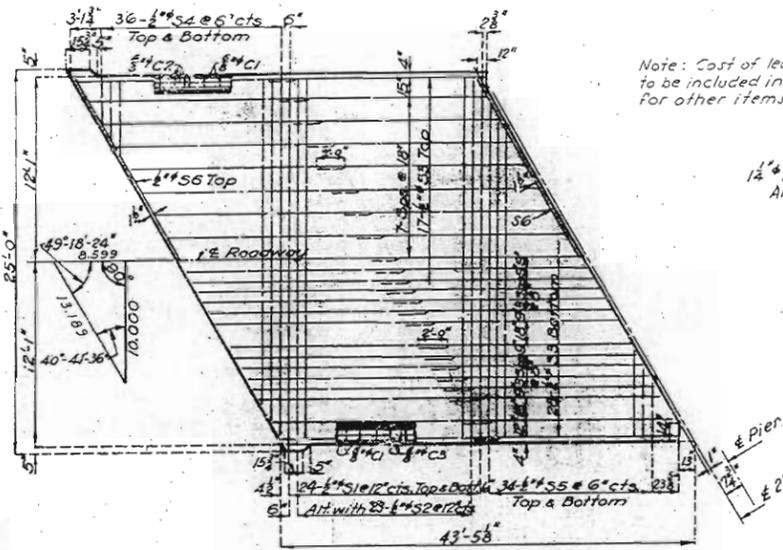
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X-186

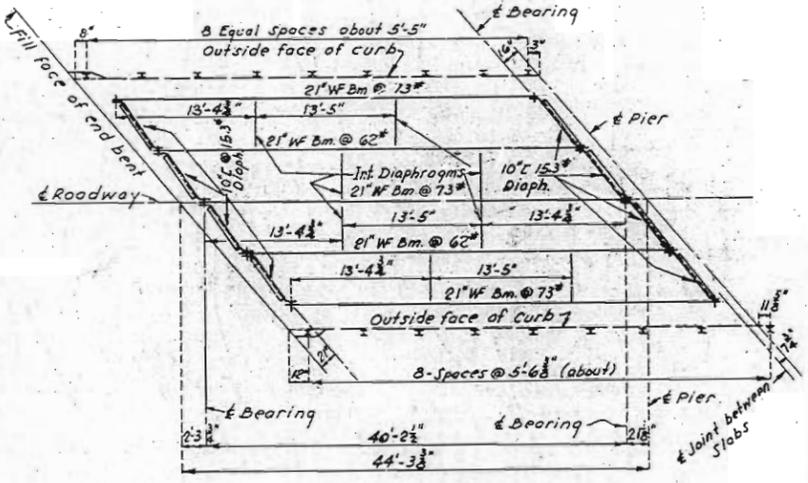
MISSOURI STATE HIGHWAY DEPARTMENT

FED ROAD DIST NO	STATE	FED AID PROJ NO	FISCAL YEAR	SHEET NO	TOTAL SHEETS
1	MO	5-404(4)	1945	3	3

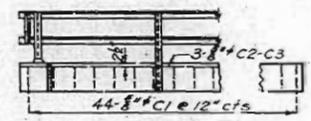
Note: Space dowel bars C1 at approximately 12" centers in curb between outlets and at ends.



SPAN (1-2) (3-4)
PLAN OF SLAB SHOWING REINFORCING



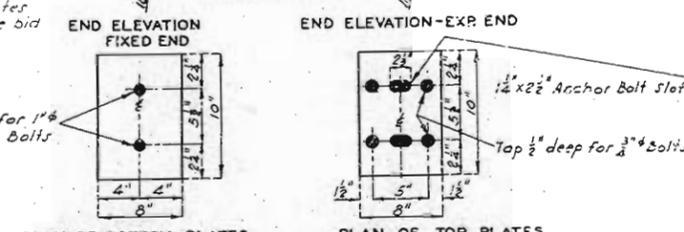
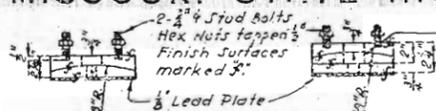
SPAN (1-2) (3-4)
PLAN OF STRUCTURAL STEEL (Approach spans)



END SPANS
TYPICAL CURB DETAILS

Note: Top of curbs under end posts shall be finished to a smooth surface parallel to grade. Not less than one nor more than four soft lead plates of 1/8" thickness shall be used under angles of each end rail post for aligning rail to correct elevation. Plates shall be 8 1/2" x 6" and shall be punched 3/8" on same gauge as the angles. No grouting permitted. Cost of lead plates to be included in price bid for other items.

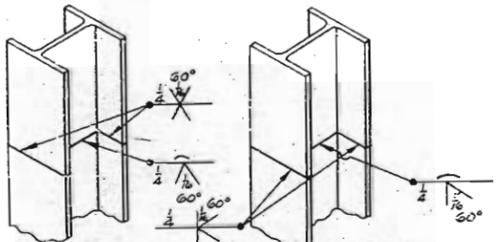
Drawn Traced May 1945 by G.W. Assembled Nov. 1945 by F.W.B.-W.M.F. Checked May 1945 by J.W. Checked Dec. 1945 by R.T.C.



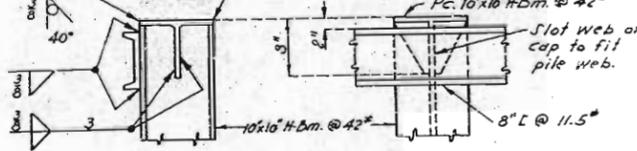
Note: All machine-finished surfaces shall be coated with white lead and tallow before shipment or before being placed in the open. Before erection the white lead and tallow shall be completely removed and the contact surfaces shall be given a heavy coat of graphite and oil. Required: 10 Fixed and 10 Expansion Plates.

DETAILS OF BEARING PLATES

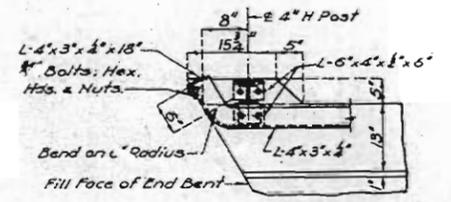
Note: Stud bolts and nuts to be paid for as structural steel. Bearings shall be either gray iron alloy castings or cast steel. Anchor bolts to be 1 1/4" swaged bolts, no heads or nuts and to extend 10" into concrete. Top ends of anchor bolts to be above the top of castings, but not higher than 1/2" below top surface of bottom flange of beam.



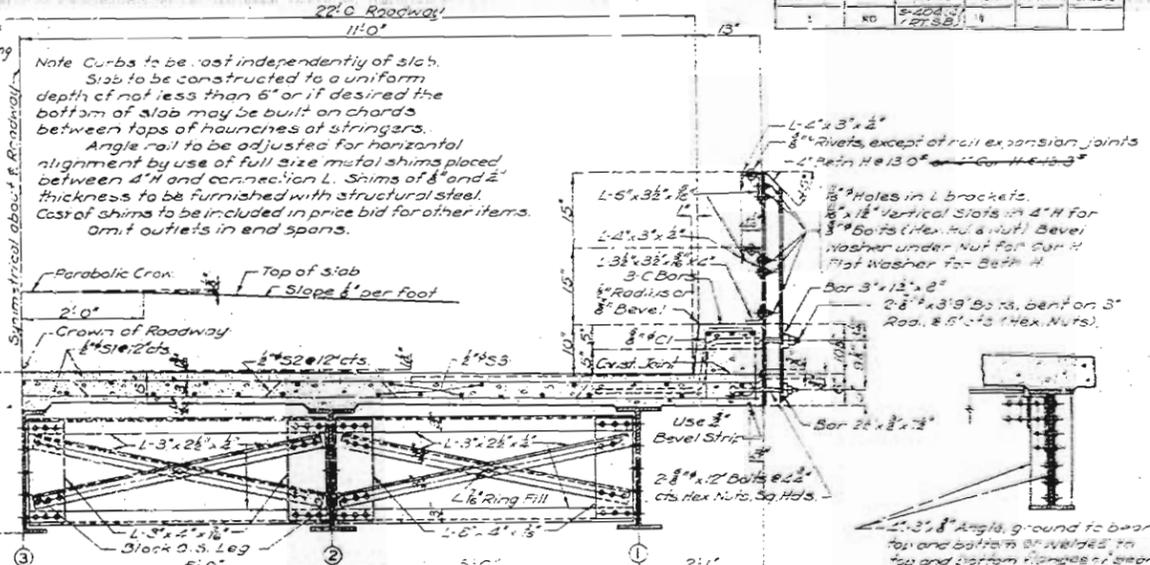
DETAILS OF PILE CAP



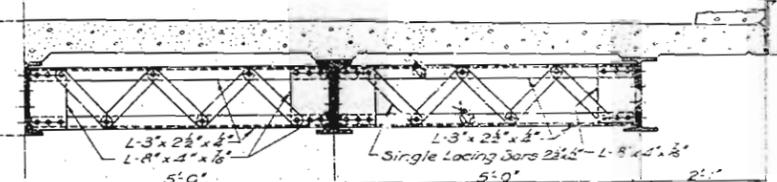
DETAILS OF PILE CAP



LOCATION OF POSTS AT END BENTS



HALF SECTION THRU SPANS REQUIRING 21\", 24\" & 27\" STRINGERS



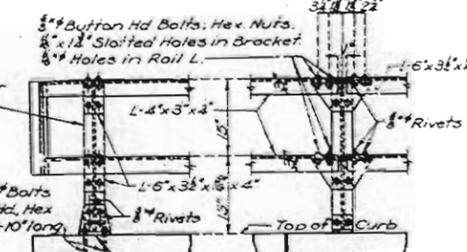
HALF SECTION THRU SPANS REQUIRING 14\", 16\" & 18\" STRINGERS

Note: Slab, curb, rail and post details same as shown in section for 24\" stringers.



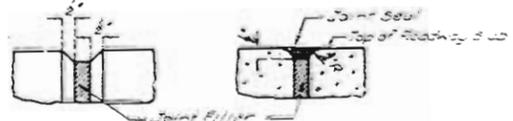
SLAB HAUNCHING DIAGRAM

Note: Slab shall be built parallel to grade and to a minimum thickness of 6\"/>



RAIL AT END BENTS
DETAILS OF RAIL

Note: Use similar detail of rail splices except omit slotted holes and 1\"/>



Note: Use bevel as shown for exposed faces of all filled joints except at top surface of roadway. Use edging tool with 1\"/>

DETAILS OF BEVEL FOR FILLED JOINTS

BRIDGE OVER HORSE CREEK

STATE ROAD FROM SHELDON EAST TO CEDAR CO. LINE ABOUT 12 MILES EAST OF SHELDON
PROJECT NO. S-404(4) (SB) STA. 653+02

VERNON COUNTY

NO CONSTRUCTION CHANGE

X-186

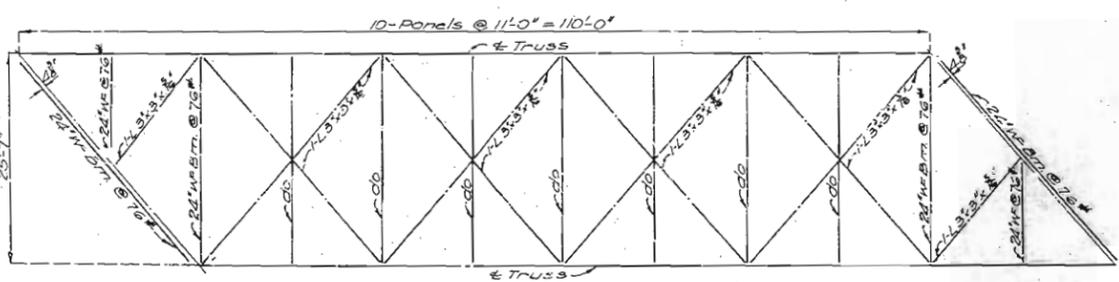
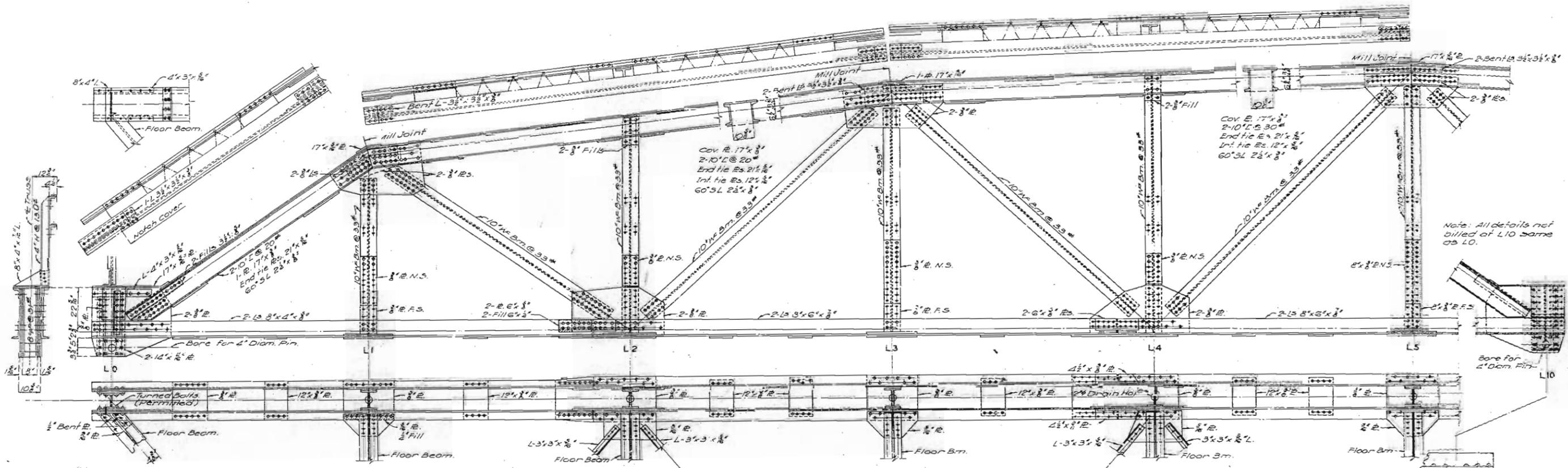
26

251

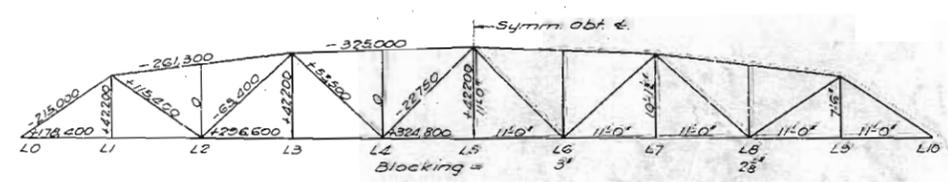
Note: This drawing is not to scale. Follow dimensions.

MISSOURI STATE HIGHWAY DEPARTMENT

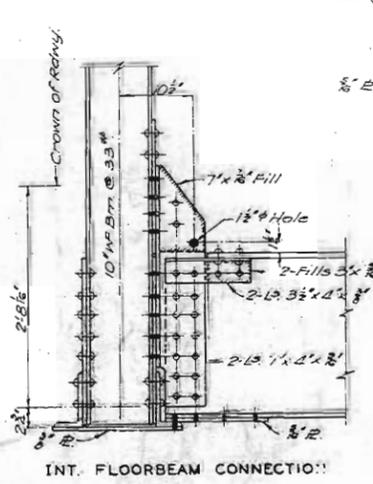
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	MO	S-404 (4)	1945	18	25



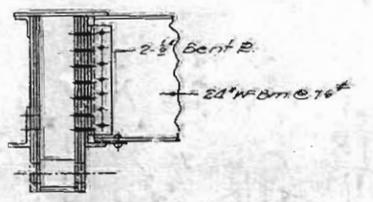
PLAN OF FLOOR STEEL AND LATERALS



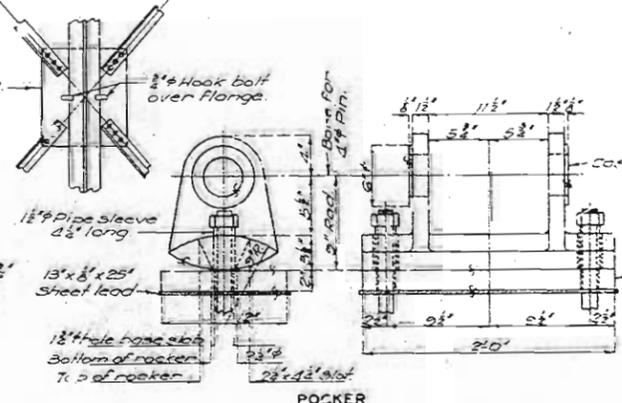
STRESS DIAGRAM AND BLOCKING CAMBER



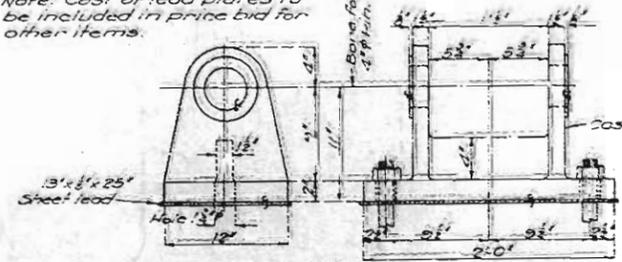
INT. FLOORBEAM CONNECTION



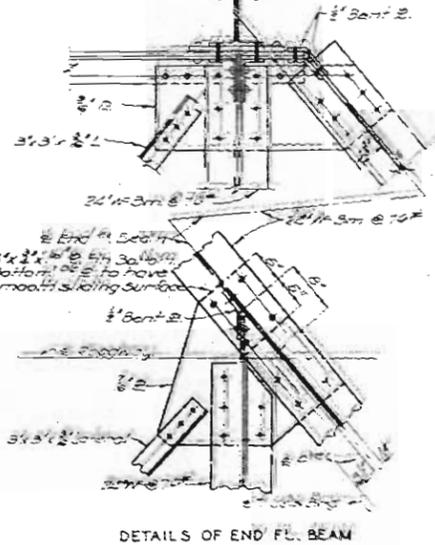
DETAILS OF END FLOOR BM. CONNECTION



POCKER



PEDESTAL



DETAILS OF END FL. BEAM

NOTES:
Rivets 3/4"
Open Holes 3/4"

BRIDGE OVER HORSE CREEK
STATE ROAD FROM SHELDON EAST TO CEDAR CO. LINE
ABOUT 12 MILES EAST OF SHELDON
PROJECT NO. S-404 (4) (5B) STA 653+02
VERNON COUNTY

NO CONSTRUCTION CHANGES

X-186

Drawn Sept. 1945 by F.M.B.
Traced Sept. 1945 by H.C.
Checked Dec. 1945 by R.R.C.

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

28

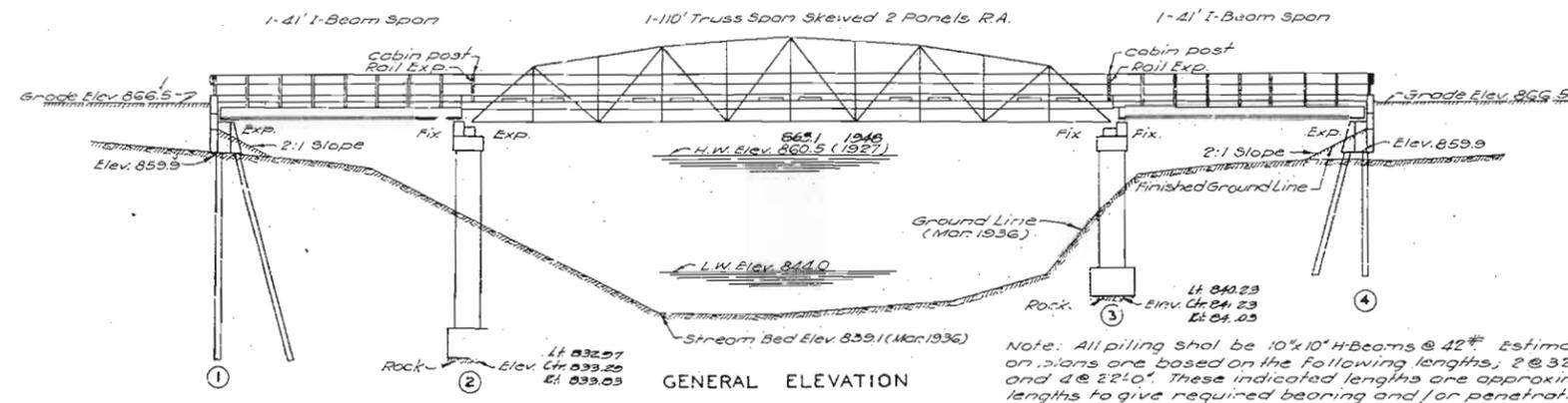
252

MISSOURI STATE HIGHWAY DEPARTMENT

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	MO.	3-262(1) (R. 3.5)	19		

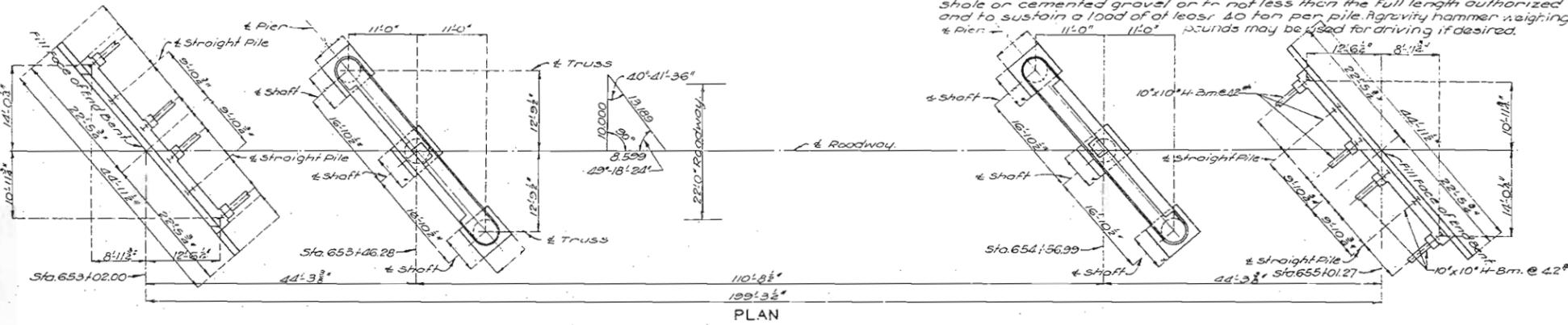
FINAL PLANS

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GENERAL NOTES:
 Design Specifications A.A.S.H.O.-1941.
 Loading H-10 A.A.S.H.O.
 Structural Steel Stress 18,000 #/sq.
 Reinforcing Steel Stress 18,000 #/sq.
 Concrete Class "B" Stress 1,000 #/sq.
 All concrete shall be Class "B".
 Rivets 3/4", Holes 1 1/4" unless noted.
 Paint: Shop and 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 contractor. Payment for cleaning and painting such surfaces will be included in unit price bid for structural steel.
 Where joint filler is specified on plans it shall conform with the requirements of Section 38-15A of the Standard Specifications for Public Works Material Filler.
 Surfaces of piles on end bents from bottom of concrete caps to 3'0" below present ground line shall be painted with one coat of an approved brand of emulsified asphalt paint. Payment for excavating ground piles below present ground line and backfilling same, furnishing emulsified asphalt paint and cleaning and painting steel surfaces specified will be included in the unit price bid for other items.

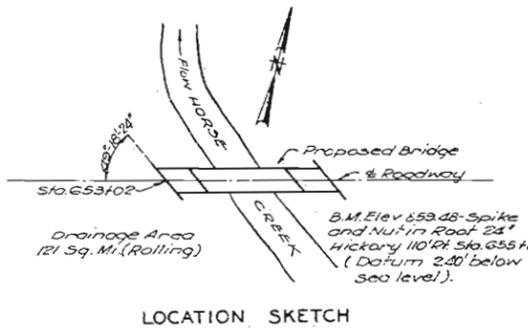
GENERAL NOTES:
 Design Specifications A.A.S.H.O.-1941.
 Loading H-10 A.A.S.H.O.
 Structural Steel Stress 18,000 #/sq.
 Reinforcing Steel Stress 18,000 #/sq.
 Concrete Class "B" Stress 1,000 #/sq.
 All concrete shall be Class "B".
 Rivets 3/4", Holes 1 1/4" unless noted.
 Paint: Shop and field contact 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 contractor. Payment for cleaning and painting such surfaces will be included in unit price bid for structural steel.
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 Surfaces of piles on end bents from bottom of concrete caps to 3'0" below present ground line shall be painted with one coat of an approved brand of emulsified asphalt paint. Payment for excavating ground piles below present ground line and backfilling same, furnishing emulsified asphalt paint and cleaning and painting steel surfaces specified will be included in the unit price bid for other items.



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COMPLETE BILL OF REINFORCING STEEL

No.	Size	Length	Mark	Location
End Bents No. 1 and 4				
132	3/8"	4'3"	V1	Back wall
4	3/8"	33'0"	H1	"
4	3/8"	33'0"	H2	"
16	3/8"	37'9"	H3	Beam
8	3/8"	35'9"	H4	"
128	3/8"	7'0"	U1	"
32	3/8"	3'9"	V2	Beam collar
20	3/8"	3'9"	U2	Beam
64	3/8"	7'6"	U3	"
16	3/8"	6'9"	U4	"
16	3/8"	6'6"	U5	"
4	3/8"	2'9"	V3	Wing
4	3/8"	4'0"	V4	"
4	3/8"	5'0"	V5	"
4	3/8"	6'3"	V6	"
8	3/8"	7'0"	V7	"
8	3/8"	8'3"	H5	"
4	3/8"	7'9"	H6	"
4	3/8"	6'3"	H7	"
8	3/8"	20'3"	T1	"
Piers No. 2 and 3				
48	1"	7'9"	D1	Footing
24	1"	24'3"	P1	Shaft
24	1"	16'3"	P11	"
4	1"	36'6"	P2	Web
24	3/8"	34'0"	P3	"
56	3/8"	12'6"	P4	"
144	3/8"	10'0"	P5	"
8	3/8"	3'6"	U10	Haunch
6	3/8"	6'0"	U11	"
Piers No. 2 and 3 (cont.)				
4	3/8"	27'6"	P6	Beam
8	3/8"	33'9"	P7	"
4	3/8"	37'6"	P8	"
56	3/8"	7'9"	U6	"
22	3/8"	2'3"	U7	"
12	3/8"	7'0"	P9	"
8	3/8"	7'3"	U8	"
4	3/8"	6'3"	U9	"
8	3/8"	22'6"	P10	"
I-Beam Span Slab (Superstr.)				
96	3/8"	23'9"	S1	Slab
46	3/8"	26'3"	S2	"
180	3/8"	22'9"	S3	"
72	3/8"	29'3"	S4	"
68	3/8"	28'0"	S5	"
4	3/8"	3'6"	S6	"
176	3/8"	2'9"	C1	Curb
12	3/8"	23'3"	C2	"
12	3/8"	22'9"	C3	"
Truss (Superstr.)				
208	3/8"	24'0"	S11	Slab
51	3/8"	28'0"	S12	"
22	3/8"	25'0"	S13	"
22	3/8"	27'0"	S14	"
21	3/8"	26'6"	S15	"
126	3/8"	23'9"	S16	"
2	3/8"	31'6"	S6	"
156	3/8"	3'3"	C4	Curb
24	3/8"	30'3"	C5	"
8	3/8"	4'6"	S17	Slab
8	3/8"	23'0"	S18	"



FINAL QUANTITIES			
Item	Substr.	Superstr.	Total
Class 1 Excavation for Structures Cu Yds	195		195
Class 2 Excavation for Structures Cu Yds	127		127
Class "B" concrete Cu Yds	177.4		177.4
Fabricated Structural Steel (I-Beam Spans) Lbs	90750		90750
Fabricated Structural Steel (Trusses) Lbs		91930	91930
Coat steel Lbs		2060	2060
Reinforcing steel Lbs	13780	27610	41390
Steel Piles in place Lin. Ft.	325		325
Class 2 Excavation below Plan Elevation Cu Yds	7.5		7.5
Test Holes Lin. Ft.	20		20

Note: Excavation for bridge made above Elev. 8450 will be paid for as Class 1 Excavation for Structures.
 Excavation for bridge made below Elev. 8450 will be paid for as Class 2 Excavation for Structures.

BRIDGE OVER HORSE CREEK
 STATE ROAD FROM SHELDON EAST TO CEDAR CO. LINE
 ABOUT 12 MILES EAST OF SHELDON
 PROJECT NO. 5-404(4) (35) STA. 653+02
 VERNON COUNTY

DESIGNED BY: J.W. Enslow 1/8/1946
 APPROVED BY: C.W. Brown 1/8/1946

Drawn Sept. 1945 by F.W.B.
 Traced Oct. 1945 by H.C.
 Checked Dec. 1945 by R.R.C.

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

Sheet No. 1A of 2.

STDC-HOR3
X-186

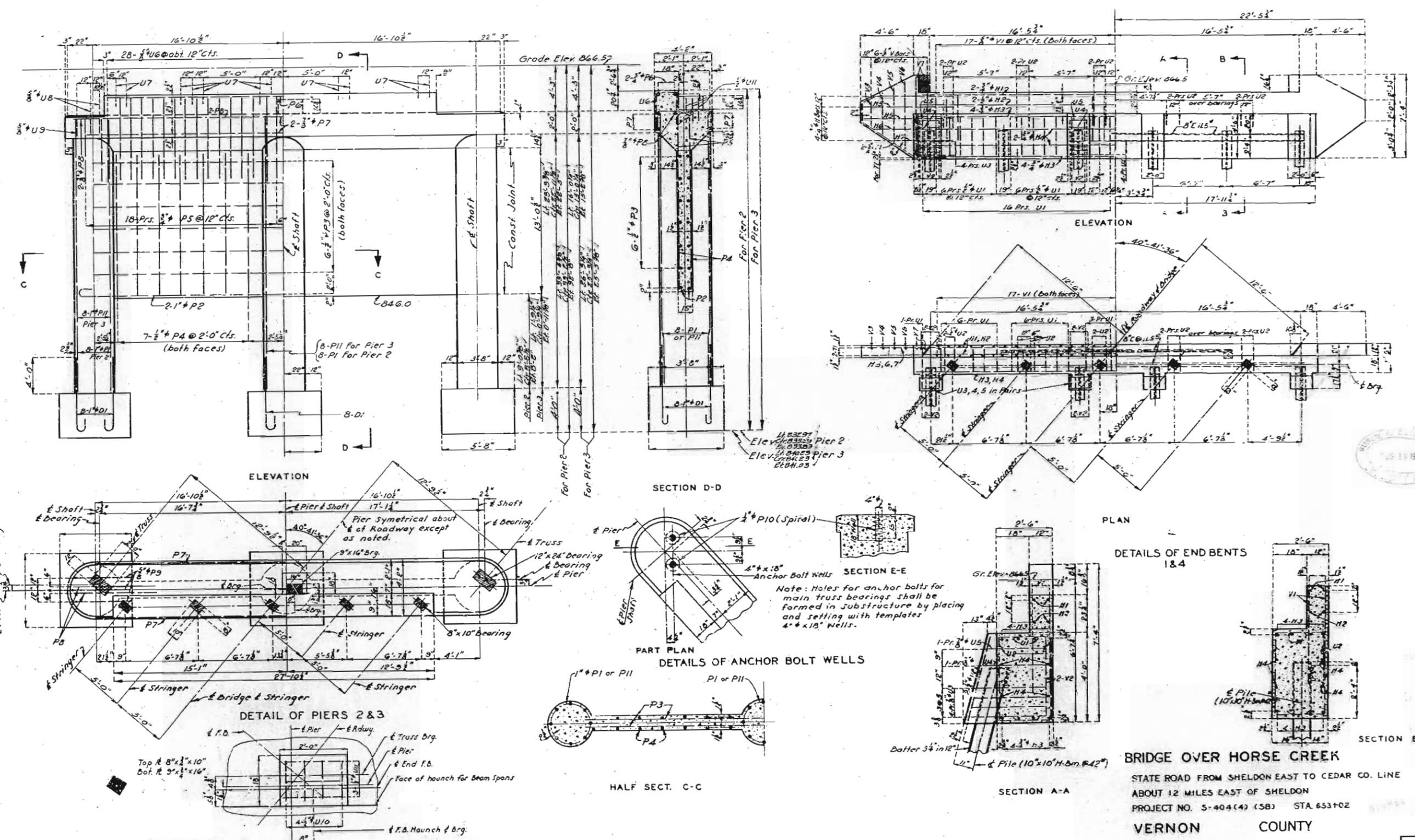
FINAL PLANS

MISSOURI STATE HIGHWAY DEPARTMENT

FED. COMP. DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	MO.	5-404(4)	1945	13	

FINAL PLANS

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Drawn Aug. 1945 By F.W.D.
Traced Sept. 1945 By W.M.F.
Checked Dec. 1945 By T.R.C.

DETAILS OF HAUNCH FOR END FLOOR BEAM

NOTE: This drawing not to scale. Follow Dimensions.

Sheet No. 2A of 2

FINAL PLANS

X-186

BRIDGE OVER HORSE CREEK
STATE ROAD FROM SHELDON EAST TO CEDAR CO. LINE
ABOUT 12 MILES EAST OF SHELDON
PROJECT NO. 5-404(4) (5B) STA 653+02
VERNON COUNTY