Historic and Photographic Documentation of the Historic 102 River Bridge over the 102 River

Bridge No. L0202A
Andrew County, Route E
April 2003

U.S. Department of Transportation
Federal Highway Administration

HISTORIC DOCUMENTATION
BRIDGE L-202A

I. Introduction

Location: Missouri Route E over 102 River, Section 12, Township 59 North, Range 35 West in Andrew County, Missouri.

Construction Dates: 1947-1948

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

Present Use: Highway bridge to be removed and replaced; Projected date of removal in 2004

Significance: Bridge L-202A is an example of a common bridge design modified to fit a particular situation. Warren pony trusses were commonly used by the Missouri State Highway Department in the early twentieth century to span small rivers. Fewer than fifteen Warren truss bridges with polygonal upper chords, however, were built by the Missouri State Highway Department due to their extremely long span length. This design variation proved ideal for the bridge across the 102 River in Andrew County east of Savannah, Missouri. Bridge L-202A was the largest and last polygonal Warren pony truss bridge built by the Missouri State Highway Department, and it is a well-preserved example of a rarely used, unique bridge design.

Historian: Thomas Gubbels, Cultural Resources Section, Design Division, Missouri Department of Transportation, April 2003.

II. History of Bridge L-202A

Ever since its founding in 1841, Savannah has served as the county seat and economic hub of Andrew County. Savannah was selected as the county seat due to its location within three miles of the geographic center of Andrew County. The county seat was originally named Union, Missouri, but its name was changed to Savannah after Savannah, Georgia, at the first meeting of the Andrew County Court. The first county courthouse, a 1½ story wooden structure, opened in November 1841, and unlike most Missouri counties, no central public square was established around the courthouse. Savannah continues to serve as the county seat, and the county government is housed in a brick courthouse built in 1899.[1]

Throughout the nineteenth century, Savannah played a crucial role in Andrew County's economic growth and development, serving as a commercial and manufacturing center. An 1888 county history indicates that Savannah featured a hotel, tannery, earthenware factory, and two mills. These businesses supported Andrew County's diverse agricultural economy. Andrew County farmers grew a variety of crops, including corn, wheat, tobacco, hemp, apples, and grapes. Savannah became a transportation hub for local farmers in 1860 when the Kansas City, St. Joseph, and Council Bluffs Railroad built a line through the county seat. Later, an interurban line was built linking Savannah to St. Joseph, further cementing the town's position as an economic center. By the beginning of the twentieth century, Savannah was a small town that supported a variety of small stores catering to area farmers, including general stores, druggists, butcher shops, and implement dealers.[2]

During the first decades of the twentieth century, responsibility for road and bridge construction in Missouri fell to local governments. Missouri had not provided state aid for the construction of roads or highways since the Civil War, but with the passage of the Centennial Road Law in 1921, the state initiated a program to link its county seats via a system of all-weather roads. The Missouri State Highway Department began to build roads throughout Missouri, but efforts to complete the highway system were temporarily suspended during the Second World War.[3]

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[1] *Andrew County: A Community* (Savannah, MO: Andrew County Historical Society, 1980), 37; Arthur Paul Moser, comp., "A Directory of Towns, Villages, and Hamlets Past and Present of Andrew County, Missouri," downloaded 4 October 2000 from http://198.209.8.166/sheproom/moser/andrewpl.html; *History of Andrew and DeKalb Counties, Missouri* (Chicago: Goodspeed Publishing Company, 1888), 147-148; and Marian Ohman, "Missouri Courthouses: Andrew County," downloaded 3 October 2000 from http://muextension.missouri.edu/xplor/uedivis/ue6001.htm.

[2] *Andrew County: A Community*, 37-39, 118; *History of Andrew and DeKalb Counties*, 159-171; and Russell Miller, David Crampton, and David Austin, "Andrew County: Historic Background," in *Phase II Archeological Testing Job Number 1-I-229-26: Route I-119 Andrew and Buchanan Counties* (Jefferson City, MO: Missouri Highway and Transportation Department, 1984), 94-96.

[3] David Austin, "A History of the Missouri State Highway Department," Unpublished Manuscript, September 2000, 1-3; Missouri Department of Transportation, "History Summary," downloaded 20 February 2002 from http://www.modot.state.mo.us/about/history.htm; and Milton Rafferty, *The Ozarks: Land and Life* (Norman, OK: University of Oklahoma Press, 1980), 108-110.

As Andrew County entered the twentieth century, it was clear that the county needed to improve its road system if it was to maintain a strong agricultural economy. According to a recent county history, Savannah was a small town "composed of small business men and retired farmers" who realized that new roads were needed to replace the random system of gravel and dirt roads that linked area farmers to outside markets.[4] Taxes were collected at the county level, and the money was used to build and maintain farm to market roads. By 1947, the county had constructed approximately 726 miles of roads to serve area farmers and merchants.[5]

Although the Andrew County Court had significantly improved the local road infrastructure during the early twentieth century, state aid was ultimately necessary to link all county residents to an all-weather highway system. In 1941, Missouri Route E, a supplementary road designed to serve farmers who lived in rural Andrew County, was constructed by the Missouri State Highway Department eastward from Savannah to the 102 River. State aid also began to pour into Andrew County after World War II with the passage of the County Aid Road Law. This law allowed the Missouri State Highway Department to directly distribute funds to local county governments for the improvement and maintenance of local farm to market roads. Andrew County received significant funds from this program, and in 1947, the county used state money to improve 44.5 miles of local roads.[6]

When Missouri Route E was built eastward from Savannah in 1941, construction ended as the road reached the bluffs overlooking the 102 River. The 102 River represented a major geographical obstacle that prevented residents of eastern Andrew County from conducting business in their county seat. Instead, many farmers in eastern Andrew County were forced to travel to Maysville, the county seat of DeKalb County, to sell their crops and purchase supplies. Construction of a bridge across the 102 River was thus a top priority for Savannah's business and civic leaders, and many people believed that a new river bridge would help unite Andrew County. In response to local pressure, the Missouri State Highway Department decided to include a bridge over the 102 River in its postwar construction program.[7]

Planning for the construction of a bridge across the 102 River began in the summer of 1945 with a field check of the proposed bridge site. Inspectors from the highway department noted that the channel of the 102 River needed to be widened and the east river bank reinforced with a stone revetment. The inspectors also recommended the construction of a simple Warren pony truss bridge across the river.[8] The Missouri State Highway Department had used Warren

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[4] *Andrew County: A Community*, 38.

[5] "Andrew County Roads Total 823 Miles," *Savannah Reporter*, 28 March 1947, 1.

[6] "Court Selects Roads to Get State Money," *Savannah Reporter*, 24 April 1947, 1; Missouri State Highway Commission, "Plan and Profile of Proposed State Road: Federal Aid Project SE-2," 1941, microfiche copy available from the Design Division, Missouri Department of Transportation General Headquarters, Jefferson City, MO; and Walter Toberman, comp., *State of Missouri Official Manual for the Years Nineteen Fifty-Three and Nineteen Fifty-Four*, (Jefferson City, MO: Missouri Secretary of State, 1954), 659-661.

[7] *Andrew County: A Community*, 172; "Clark & Runquist Engage in Road Work," *Savannah* Reporter, 19 September 1947, 1; and "Plan Celebration for Bridge Opening," *Savannah Reporter*, 15 October 1948, 1.

pony trusses for many of its bridges since the 1920s, and such bridges were common throughout the state. Preliminary plans for the proposed bridge were drawn up in late 1945, and in early 1946, C. W. Brown, Chief Engineer of the Missouri State Highway Department, approved the official design plans for Bridge L-202. Bridge L-202 was based on standard departmental designs for a Warren pony truss bridge, but instead of a standard upper chord, Bridge L-202 featured a polygonal upper chord. The polygonal upper chord design variant was often used by the Missouri State Highway Department during the 1930s to save money by using less material to build the bridge superstructure. However, at 120 feet in length, Bridge L-202 would be the longest polygonal Warren pony truss bridge built by the Missouri State Highway Department, and it was one of the last such bridges built in the state.[9]

Since Bridge L-202 was to be built with partial funding from the federal government, its design had to be approved by the Public Roads Administration. When the plans for Bridge L-202 were submitted to the federal government, a suggestion was made that the Missouri State Highway Department consider redesigning the structure to feature a 160-foot truss span since this was better suited to the wide channel of the 102 River.[10] In response to this request, Chief Engineer C. W. Brown explained that a 120-foot Warren polygonal pony truss was a cheaper alternative that would still effectively span the 102 River:

> We have investigated your alternative layout using a 160 ft. truss and four spans each 41 ft. long and agree that it would be better suited to the channel cross-section. We would, however, prefer using a 41 ft., a 120 ft. truss span, and three each at 61 ft. long. This would permit the use of a low type truss which we prefer to the high type and at the same time span the channel satisfactorily, at slightly less cost. We will assume that this revised layout will meet with your approval and will proceed with the design on this basis unless otherwise notified.[11]

The Public Roads Administration accepted this position, and the highway department received limited federal funds to help pay for the construction of Bridge L-202.[12]

After soliciting bids for the construction of Bridge L-202 from companies located throughout Missouri, the contract for the structure was awarded to a local firm from Savannah, the Clark & Runquist Construction Company. The Clark & Runquist Construction Company was officially incorporated in April 1947 when it filed paperwork with the Missouri Secretary of

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[8]Missouri State Highway Department, "Field Check Memoranda: Andrew County Route E Over 102 River," microfiche copy in "General Correspondence File – Construction Project L-202," Collection 12-0002, Bridge Division, Missouri Department of Transportation General Headquarters, Jefferson City, MO. This collection henceforth cited as the "Bridge File."

[9]Clayton Fraser, "HAER Inventory – 102 River Bridge," in *Missouri Historic Bridge Inventory*, (Loveland, CO: Fraserdesign Inc, 1996), n.p.; and Missouri State Highway Department, "Bridge Over 102 River: L-202," 1946, Bridge File.

[10]Clifford Shoemaker to C. W. Brown, Signed Letter, 24 July 1945, Bridge File.

[11]C. W. Brown to Clifford Shoemaker, Signed Letter, 8 August 1945, Bridge File.

[12]Clifford Shoemaker to C. W. Brown, Signed Letter, 18 December 1945, Bridge File.

State. The Clark & Runquist Construction Company registered as a fictitious corporation, meaning that it was actually a privately held partnership rather than a publicly owned company. Three men, Fred Clark and Victor Runquist of Savannah and William Clark of St. Joseph, Missouri, held ownership of the company equally. The Clark & Runquist Construction Company quickly became extremely active in Andrew County, receiving contracts for a number of county road improvement projects as well as the construction of Bridge L-202. In addition to its construction projects, the Clark & Runquist Construction Company also operated a limestone quarry located northeast of Savannah. The quarry produced lime that was supplied to farmers in Buchanan, Holt, DeKalb, and Andrew Counties under a program sponsored by the Agricultural Adjustment Administration as well as limestone that was used in the company's various construction projects.[13]

Construction of the substructure of the new bridge began in the summer of 1947 and proceeded smoothly. However, inspectors from the Missouri State Highway Department discovered in the spring of 1948 that the Clark & Runquist Construction Company improperly located the footings and columns of Bent No. 1. Bent No. 1 was placed approximately 22 feet farther to the north than was designated on the original bridge plans, possibly endangering the stability of the bridge deck and superstructure. To remedy this situation, the Missouri State Highway Department simply redesigned the bridge slightly, adding additional reinforcing steel to the superstructure. Fortunately, the location error did not require the construction of any additional columns or piers to support the bridge superstructure.[14] Construction proceeded steadily after this problem was resolved, and in November 1948, Bridge L-202A received its final inspection and was opened to the public.[15]

On Sunday, November 15, 1948, a formal celebration was held to celebrate the opening of Bridge L-202A to vehicular traffic. The Savannah Chamber of Commerce, an organization founded in 1947, sponsored the opening program. W. A. Anderson, President of the chamber, offered to host the celebration "to establish a closer and friendlier relationship between the connected areas" within Andrew County.[16] Members of the chamber donated food and supplies to feed the 3,500 people who attended the opening ceremony, and approximately one thousand

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[13]"Clark & Runquist Engage in Road Work," 1; and "Highway Department Reports Road Progress," *Savannah Reporter*, 21 October 1947, 6; and Missouri Secretary of State, "Registration of Fictitious Name: Clark & Runquist Construction Company," 22 April 1947, as held in the Corporations Division, Missouri Secretary of State General Information Center, Jefferson City, MO.

[14]C. W. Brown to L. W. Hoskins, Signed Letter, 15 April 1948, Bridge File. The bridge that was to be built across the 102 River was originally designated Bridge L-202 by the highway department. However, when the problem was discovered with the location of Bent No. 1, a new set of bridge plans was created detailing the necessary corrections. These plans were labeled "Bridge L-202A" instead of "Bridge L-202" to reflect the design change, and when the bridge was completed, it was officially designated Bridge L-202A. See "Bridge Over 102 River: L-202," 1946; and Missouri State Highway Department, "Bridge Over 102 River: L-202A," 1948, Bridge File.

[15]J. J. Corbett to L. M. Hoskins, Signed Letter, 17 November 1948, Bridge File.

[16]W. A. Anderson to Victor Enslow, Signed Letter, 8 November 1948, Bridge File. Anderson invited Enslow, Bridge Engineer for the Missouri State Highway Department, to attend the opening ceremony, but Enslow was unable to attend due to prior commitments. See Victor Ensolw to W. A. Anderson, Signed Letter, 12 November 1948, Bridge File.

pounds of barbecued ham was served to attendees along with baked beans, soda, coffee, and donuts. The primary speaker at the opening ceremony was L. M. Hoskins, a District Engineer from the Missouri State Highway Department. Hoskins was in charge of the department's first district, and he praised the residents of Andrew County for their persistent efforts to improve the local road system. John Hoshor, Mayor of Savannah, cut a yellow ribbon to open the bridge at the end of the ceremony. After all construction expenses were tabulated, Bridge L-202A cost slightly more than $74,000 to build.[17] Construction of this new bridge ultimately proved to be an excellent investment of Missouri's highway funds. Bridge L-202A has functioned in place ever since 1948 without any major renovations or improvements, and it continues to provide a critical link between the rural portions of eastern Andrew County and the county seat.

III. Physical Description of Bridge L-202A

The substructure that supports Bridge L-202A consists of a concrete abutment with wingwalls and a single solid concrete pier. The approach spans leading up to Bridge L-202A are supported by the concrete pier, small concrete end bent, and four steel pile bent piers with concrete caps. The concrete abutment that supports Bridge L-202A is an asymmetrical end bent that features a 3' wide bridge seat approximately 27' 11" long, and wings that are 50' 9" long. The end bent rests on several buried concrete footings measuring from 5' to 7' 9" in length and 2' 6" in thickness. The pier that supports the other end of Bridge L-202A rests on massive concrete footings that are 7' 1½" long and 4' thick. The three solid columns that make up the pier measure 43 11" in height from the bottom of the footings to the top of the pier cap. There is 16' 6" of space between each column, but since this is a closed pier, the space is filled with solid concrete. The end bent and pier are both skewed approximately 38 degrees.

The unique element that distinguishes Bridge L-202A from other bridges in Missouri is its polygonal upper-chord design. The superstructure of the bridge features a Warren pony truss design. The lower chord within each panel consists of two 10' channels linked by batten plates, giving the structure a total length of 120'. The upper chord is composed of two channels featuring cover plates and lacing, and the polygonal upper chord reaches a maximum height of 12'. Verticals and diagonals composed of steel I-beams stabilized by lateral bracing link the upper and lower chords of the Warren truss bridge. The bridge deck is made of reinforced concrete, and the bridge deck is 22' wide to accommodate two lanes of traffic. Standard guardrails composed of two angles line the bridge, and the superstructure rests atop two rocker shoes and two fixed pedestals that link it to the substructure. Less than 15 polygonal Warren truss bridges have been built in Missouri. All were built between 1932 and 1940, and at 120' in length, Bridge L-202A is the longest Warren truss bridge in Missouri to feature a polygonal upper chord.[18]

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[17] *Andrew County: A Community*, 172; "Bridge Opening Program Successful," *Savannah Reporter*, 19 November 1948, 1, 6; "Plan Celebration for Bridge Opening," 1; and "Plans for Bridge Opening Complete," *Savannah Reporter*, 12 November 1948, 1. William Clark and Victor Runquist from the Clark & Runquist Construction Company were present at the celebration commemorating the opening of Bridge L-202A, but Fred Clark was unable to attend due to illness.

[18] Clayton Fraser, *Missouri Historic Bridge Inventory*, (Loveland, CO: Fraserdesign Inc, 1996), 117, 119.

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102 River Bridge
Bridge No. L-202A
Route E, Andrew County, Missouri

Randall Dawdy, Photographer

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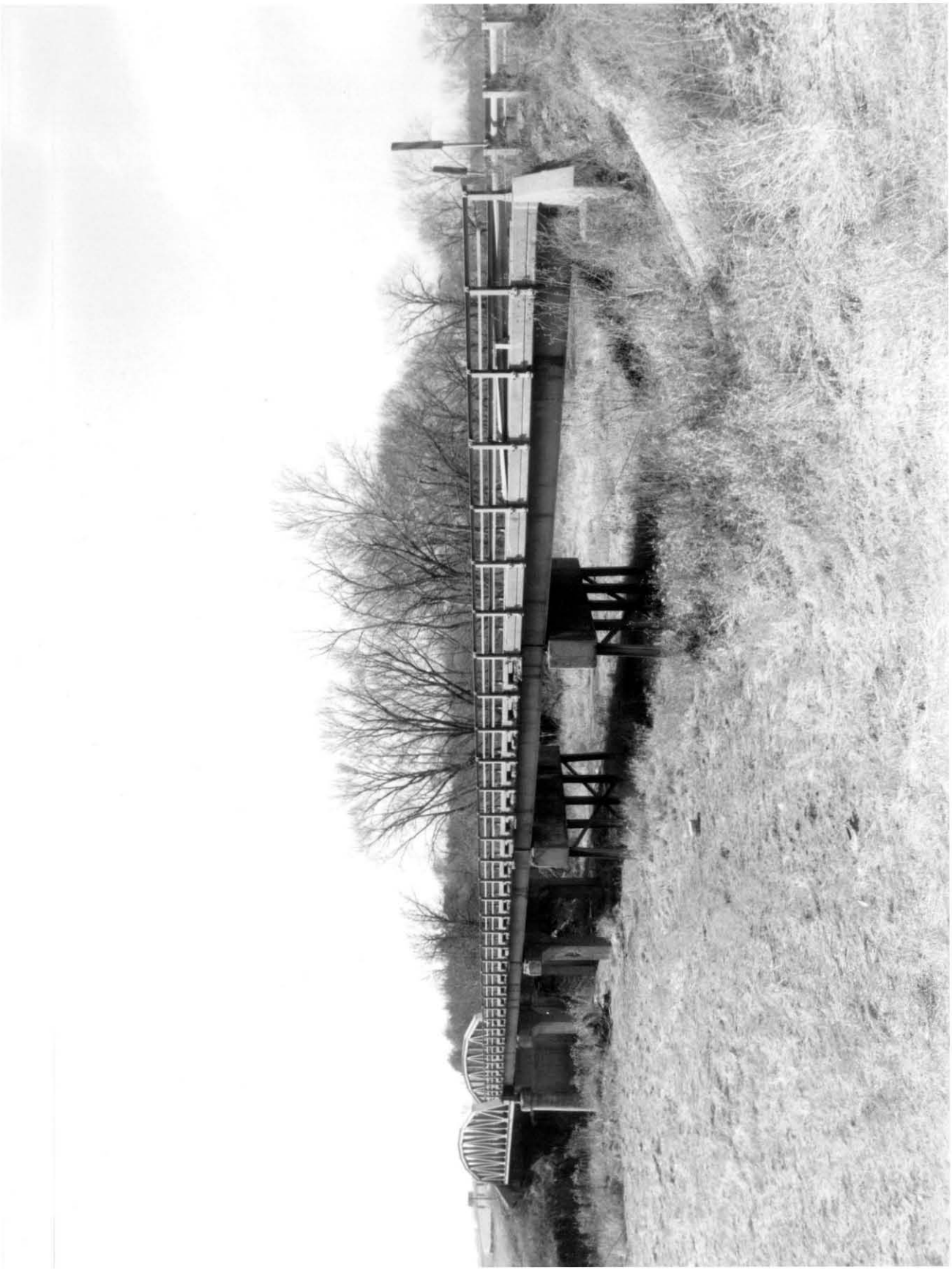
20. Bridge L-202A. Overall view, view to west.

21. Bridge L-202A. Overall view, view to west.

22. Bridge L-202A. Overall view, view to northwest.



#1 of 22: Bridge L-202A. Overall view, view to west.

#2 of 22: Bridge L-202A. Overall view, view to north.

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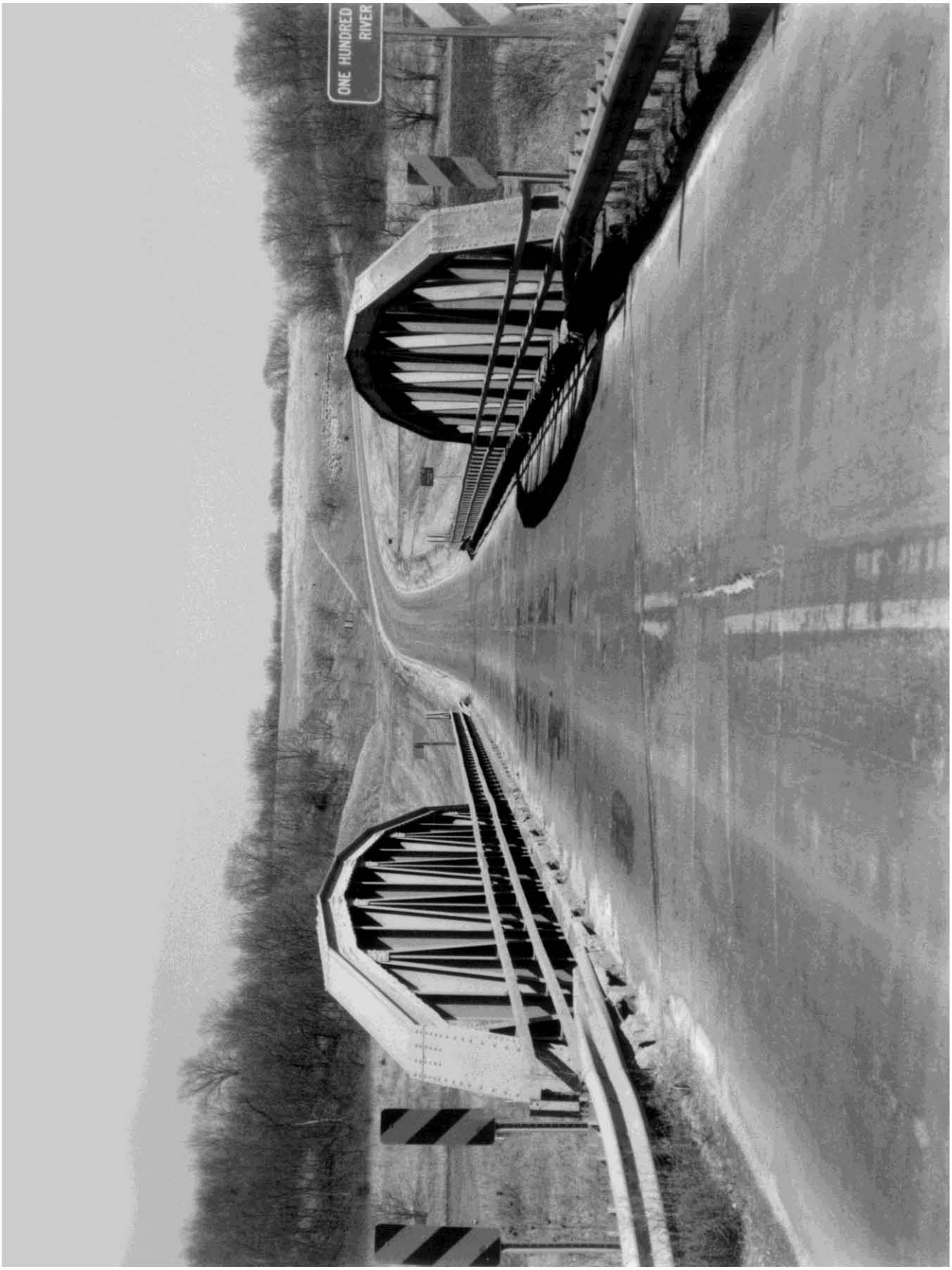

#5 of 22: Bridge L-202A. Approach roadway, view to northeast.

#6 of 22: Bridge L-202A. North half of pony truss and guardrail, view to north.

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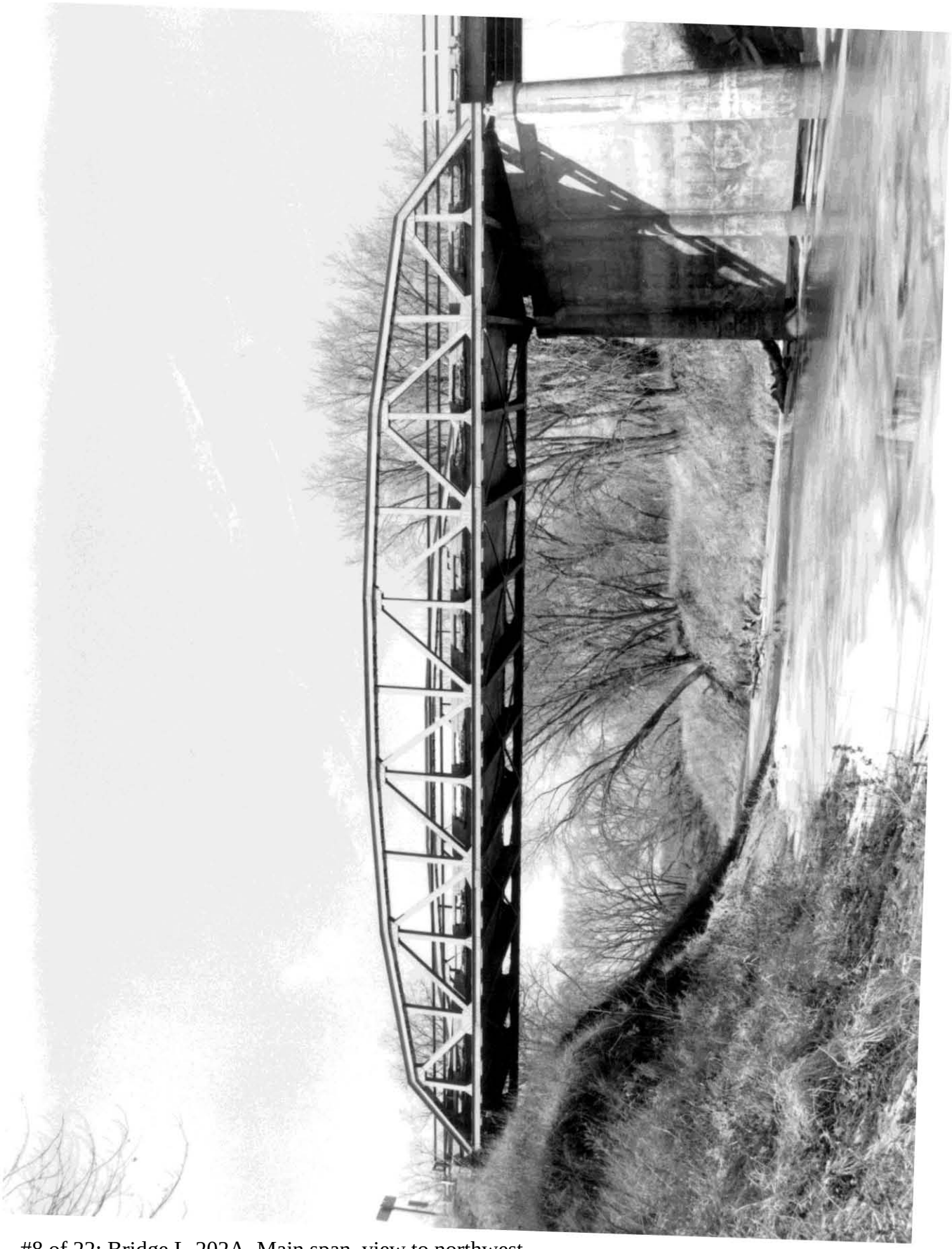

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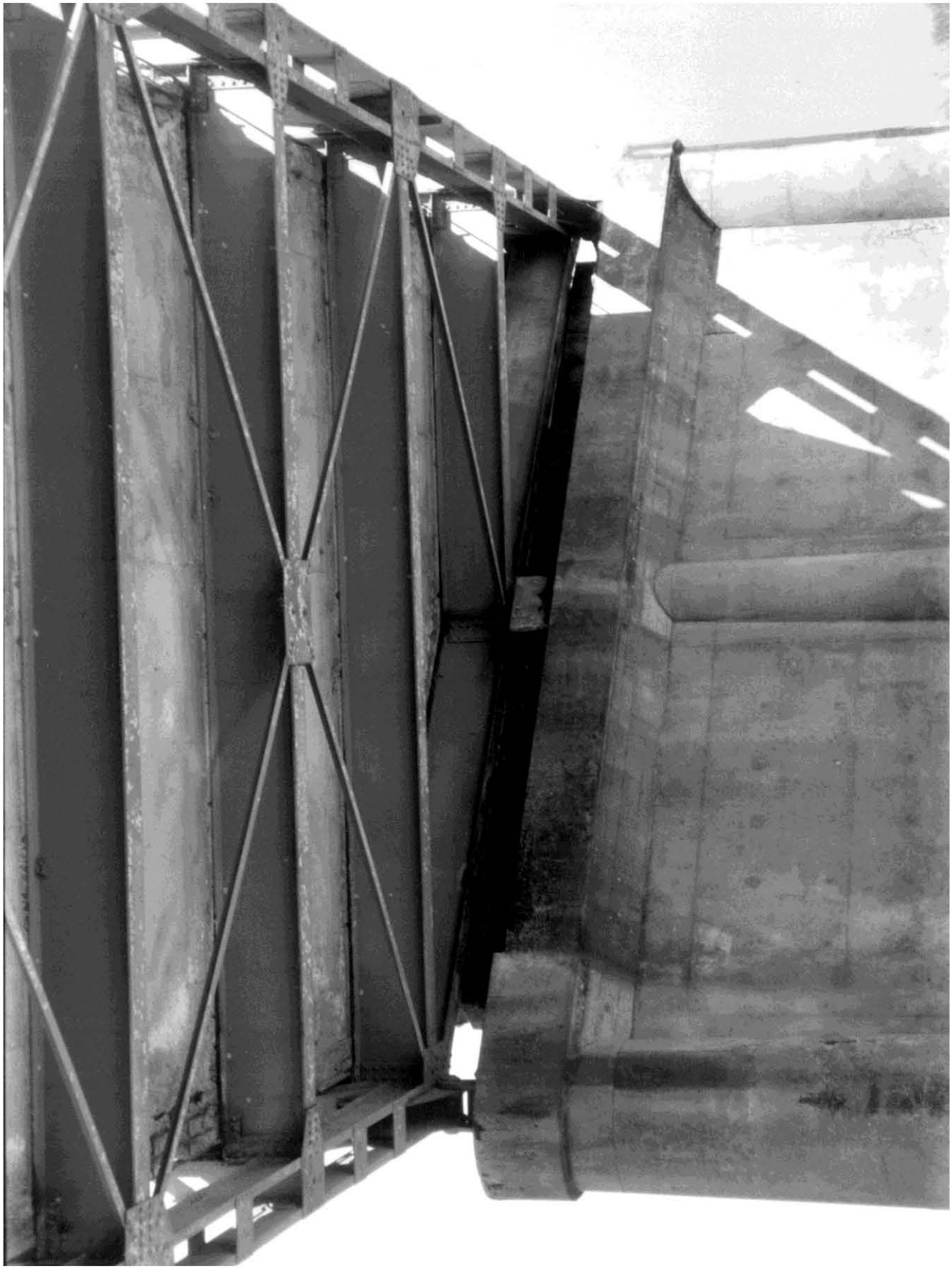
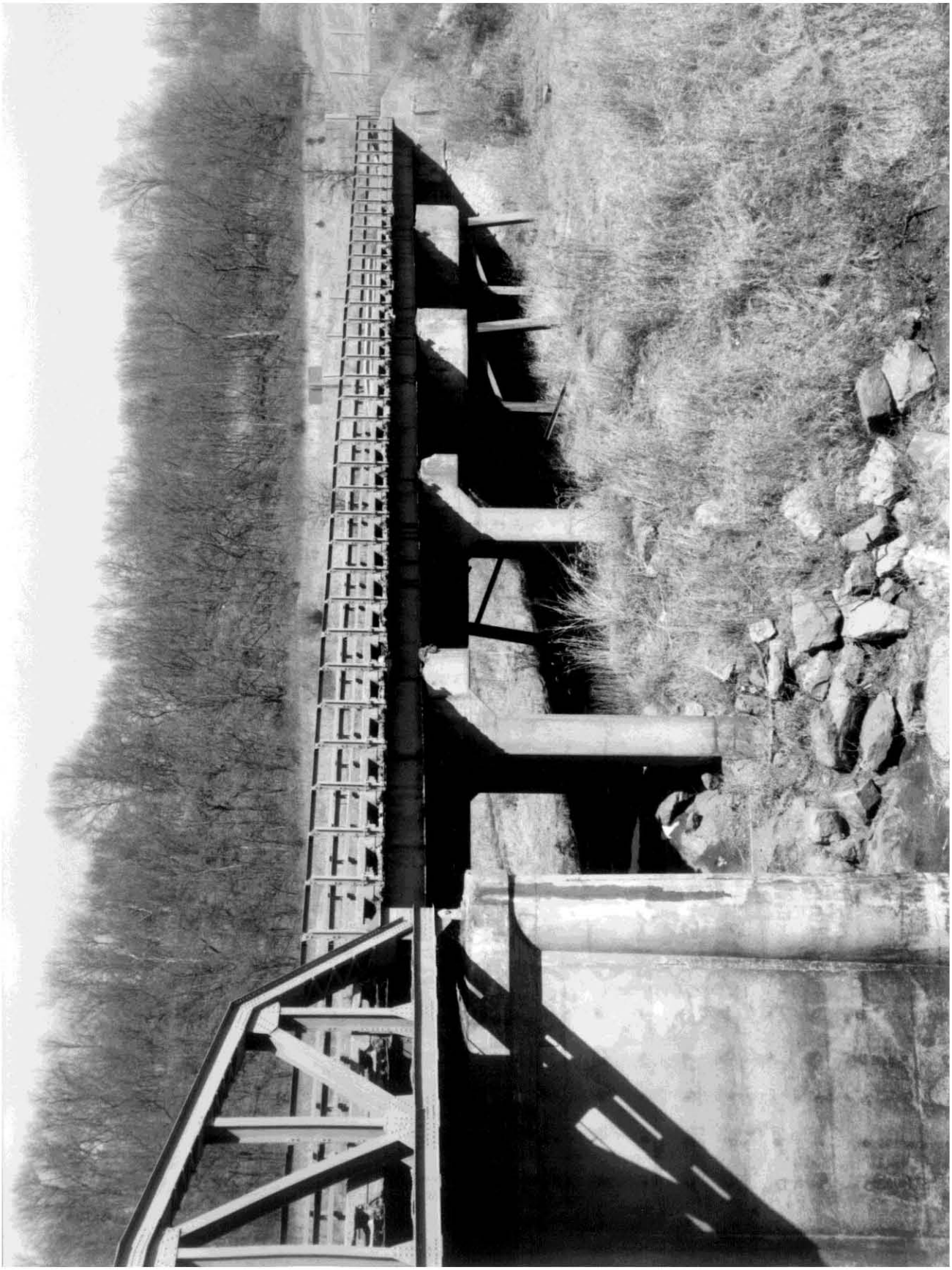


#14 of 22: Bridge L-202A. Subdeck and Dumbbell pier detail, view to northeast.

#15 of 22: Bridge L-202A. Subdeck and Dumbbell pier detail, view to west.



#16 of 22: Bridge L-202A. Approach spans, view to north.

#17 of 22: Bridge L-202A. Subdeck and spill-through pier, view to northeast.

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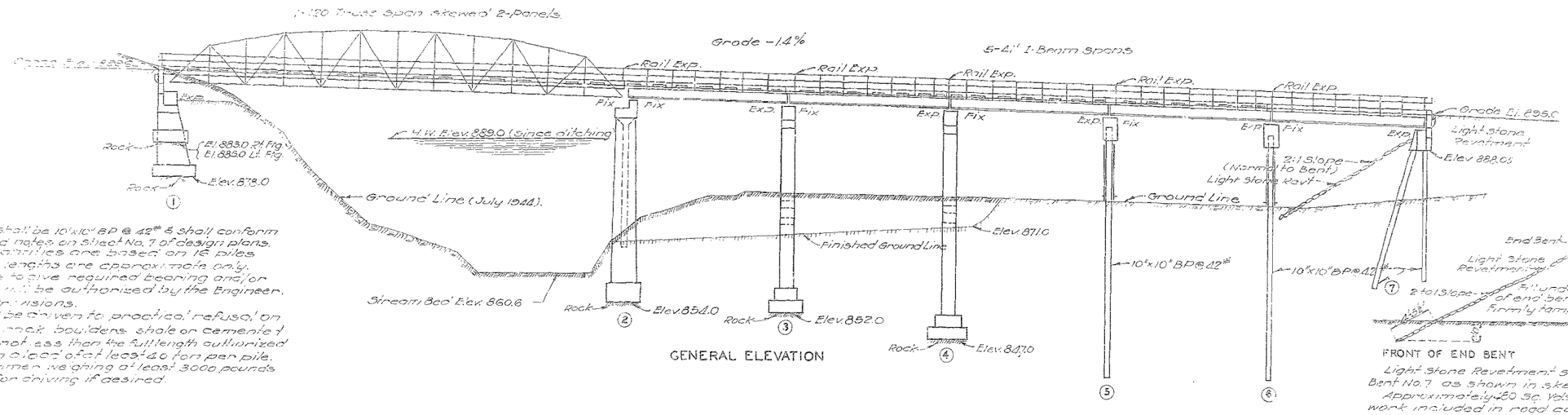
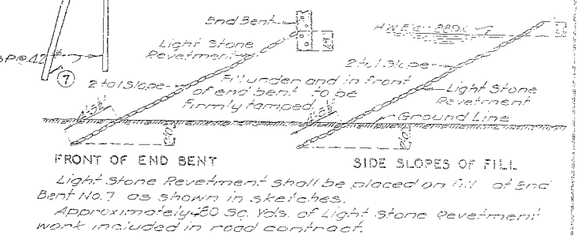
MISSOURI STATE HIGHWAY DEPARTMENT



GENERAL ELEVATION

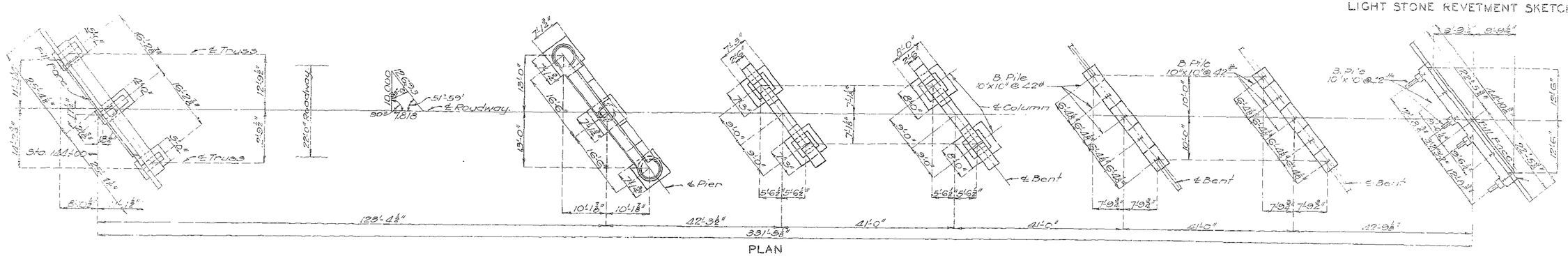
Footing shall be 10"x10" BP @ 42#. B. shall conform with details and notes on sheet No. 7 of design plans. Bar reinforcement quantities are based on 16 piles. Bar lengths are approximate only. These lengths to give required bearing and/or penetration, shall be authorized by the Engineer. See Special Provisions.
Piles shall be driven to practical refusal on or into soil, rock, boulders, shale or cemented gravel, but not less than the full length authorized shall be used. Use a pile of at least 40 ton per pile. A gravity hammer weighing at least 3000 pounds may be used for driving if desired.



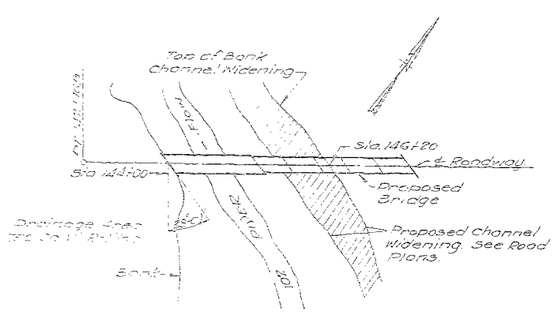
FRONT OF END BENT — SIDE SLOPES OF FILL

Light Stone Revetment shall be placed on fill of End Bent No. 7 as shown in sketches.
Approximately 250 Sq. Yds. of Light Stone Revetment work included in road contract.

LIGHT STONE REVETMENT SKETCHES



PLAN



LOCATION SKETCH

ESTIMATED QUANTITIES			
Item	Substr.	Superstr.	Total
Class 1 Excavation for Structures Cu. Yds.	590		590
Class 2 Excavation for Structures Cu. Yds.	275		275
Class "B" Concrete Cu. Yds.	235.4	194.6	430.0
Fabricated Structural Steel (I-Bm. Spans) Lbs.	4,400	107,220	111,620
Fabricated Structural Steel (Truss Span) Lbs.		107,900	107,900
Cast Steel Lbs.		990	990
Reinforcing Steel Lbs.	21,940	52,180	74,120
Steel Piles in Place Lin. Ft.	768		768
Steel Pile Cut-offs Lin. Ft.	48		48
Gray Iron Alloy Castings Lbs.		2680	2680

Note: Excavation for bridge made above Elev. 861.0 will be paid for as Class 1 Excavation for Structures. Excavation for bridge made below Elev. 861.0 will be paid for as Class 2 Excavation for Structures.

GENERAL NOTES:

Design Specification - A.A.S.H.O. - 1941
Loading H-15 (one lane) - A.A.S.H.O.
Structural steel stress 18,000 #/□"
Reinforcing steel stress 18,000 #/□"
Concrete Class "B" Stress 1,000 #/□"
All concrete shall be Class "B".
Rivets ⅞"ϕ unless noted. Field connections riveted unless noted. Open holes ⅞"ϕ unless noted.
Where joint filler is specified on plans it shall conform with the requirements of Section 38-19 A(1)h of the Standard Specification for Premoulded Material Filler.

Paint: Shop: none. Field: comfort surfaces of bolted field connections one coat of red lead. 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.

Surfaces of piles on end bent No. 7 from bottom of concrete cap to 3'-0" below present ground line shall be painted with one coat of an approved brand of emulsified asphalt paint. Payment for excavation around 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.

B.M. Elev. 897.90 [illegible] U.S.G.S. Datum

BRIDGE OVER 102 RIVER

STATE ROAD FROM SAVANNAH EAST

ABOUT 3.5 MILES EAST OF SAVANNAH

PROJECT NO. S-185 (10) ESD STA. 144+00

ANDREW COUNTY

SUBMITTED BY J. W. Smoker, Bridge Engineer, DATE 6-4-49

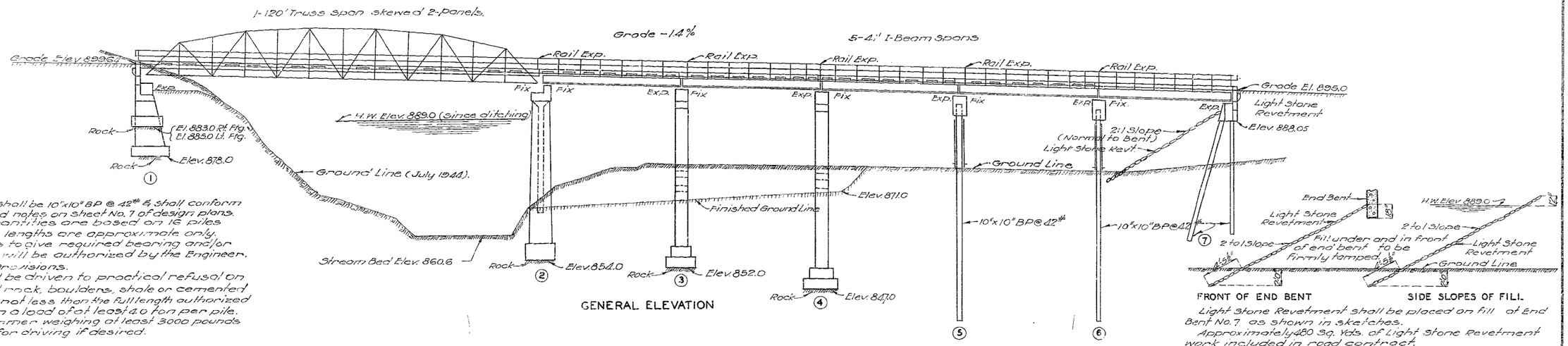
APPROVED BY C. H. Brown, Chief Engineer, DATE 6-4-49

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

Sheet No. 1 of 8

MISSOURI STATE HIGHWAY DEPARTMENT

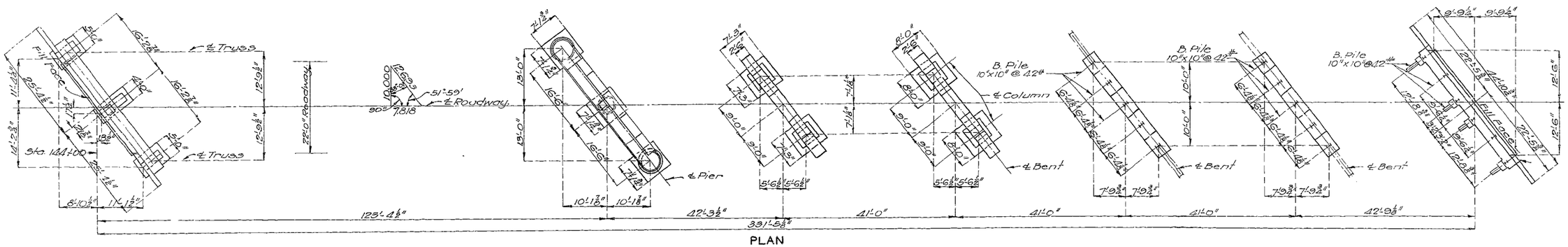
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	MO	(11 152) S-165	19		



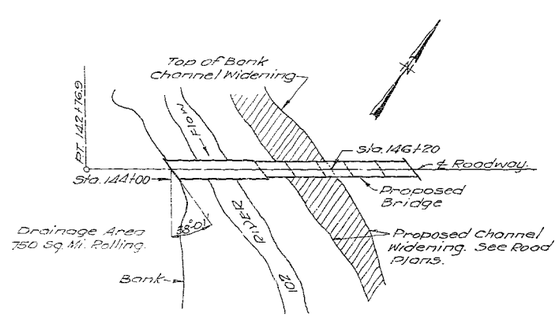
Note: All piling shall be 10"x10" BP @ 42# & shall conform with details and notes on sheet No. 7 of design plans. Estimated quantities are based on 16 piles @ 51'-0". These lengths are approximate only. Proper lengths to give required bearing and/or penetration will be authorized by the Engineer. See Special Provisions.
All piles shall be driven to practical refusal on or into solid rock, boulders, shale or cemented gravel or to not less than the full length authorized and to sustain a load of at least 40 ton per pile. A gravity hammer weighing at least 3000 pounds may be used for driving if desired.

Light Stone Revetment shall be placed on fill at End Bent No. 7 as shown in sketches.
Approximately 480 Sq. Yds. of Light Stone Revetment work included in road contract.

LIGHT STONE REVETMENT SKETCHES



PLAN



LOCATION SKETCH

ESTIMATED QUANTITIES				
Item		Substr.	Superstr.	Total
Class 1 Excavation for Structures	Cu. Yds.	590		590
Class 2 Excavation for Structures	Cu. Yds.	275		275
Class "B" Concrete	Cu. Yds.	295.4	194.6	490.0
Fabricated Structural Steel (I-Bm. Spans)	Lbs.	4,400	107,220	111,620
Fabricated Structural Steel (Truss Span)	Lbs.		107,900	107,900
Cast Steel	Lbs.		990	990
Reinforcing Steel	Lbs.	21,940	52,180	74,120
Steel Piles in Place	Lin. Ft.	768		768
Steel Pile Cut-offs	Lin. Ft.	48		48
Gray Iron Alloy Castings	Lbs.		2680	2680

Note: Excavation for bridge made above Elev. 861.0 will be paid for as Class 1 Excavation for Structures. Excavation for bridge made below Elev. 861.0 will be paid for as Class 2 Excavation for Structures.

GENERAL NOTES:

Design Specification - A.A.S.H.O. - 1941.
Loading H-15 (one lane) - A.A.S.H.O.
Structural steel stress 18,000 #/□"
Reinforcing Steel stress 18,000 #/□"
Concrete Class "B" Stress 1,000 #/□"
All concrete shall be class "B".
Rivets ¾" ⌀ unless noted. Field connections riveted unless noted. Open holes 13/16" ⌀ unless noted.
Where joint filler is specified on plans it shall conform with the requirements of Section 38-19 A(1)h of the Standard Specification for Premoulded Material Filler.
Paint: Shop: none. Field, contact surfaces of bolted field connections one coat of red lead. 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.
Surfaces of piles on end bent No. 7 from bottom of concrete cap to 3'-0" below present ground line shall be painted with one coat of an approved brand of emulsified asphalt paint. Payment for excavation around 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.

B.M. Elev. 897.90 2 Nails in 6" Elm tree 45' Rt. Sta. 144+16
U.S.G.S. Datum

BRIDGE OVER 102 RIVER

STATE ROAD FROM SAVANNAH EAST
ABOUT 3.5 MILES EAST OF SAVANNAH
PROJECT NO S-165 (1) (SE) STA. 144+00
ANDREW COUNTY

SUBMITTED BY J. W. Enslow BRIDGE ENGINEER DATE 6/4/1946
APPROVED BY C. H. Brown CHIEF ENGINEER DATE 6/4/1946

STD. C-110R3
L-202

Drawn Nov. 1945 by F.W.B.
Traced Dec. 1945 by H.C.
Checked Jan. 1946 by J.B.J.

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

Sheet No. 1 of 7.

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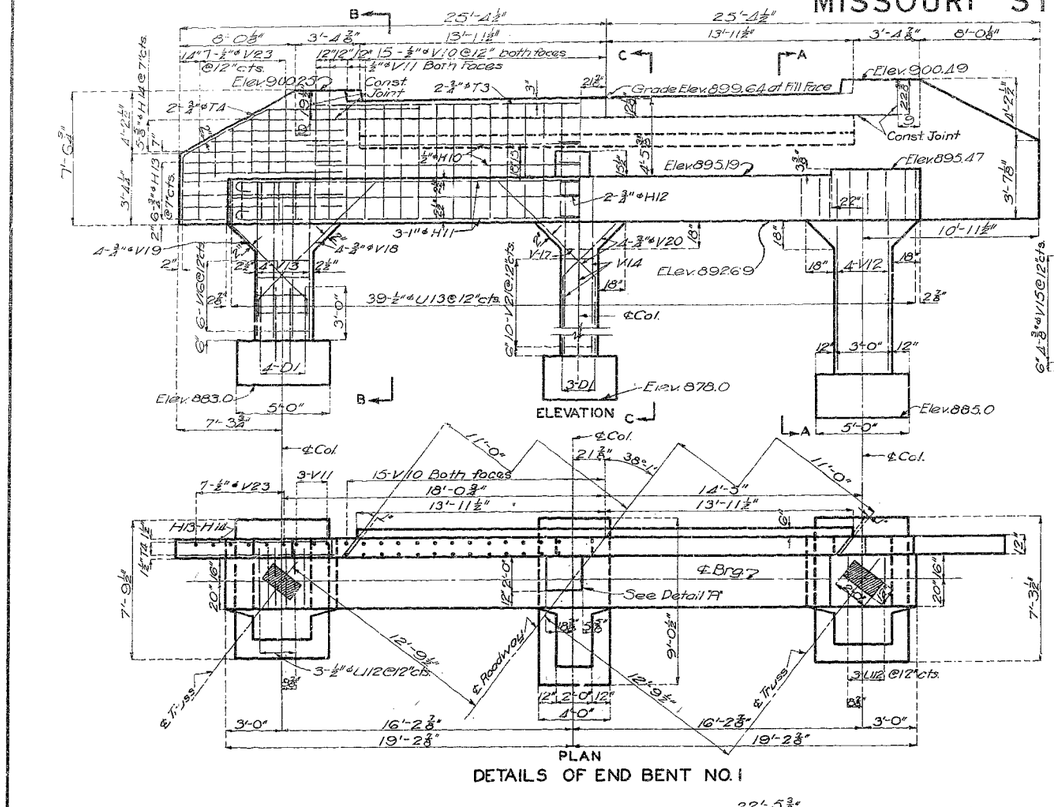
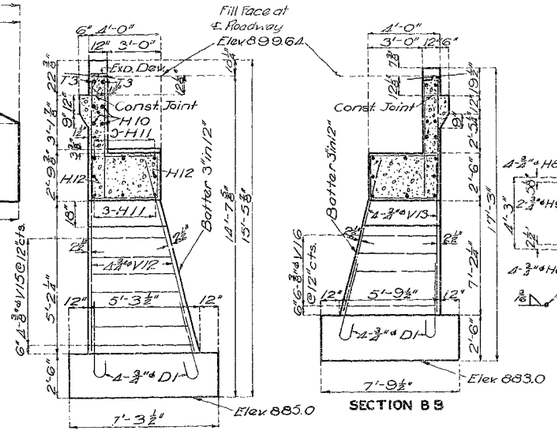
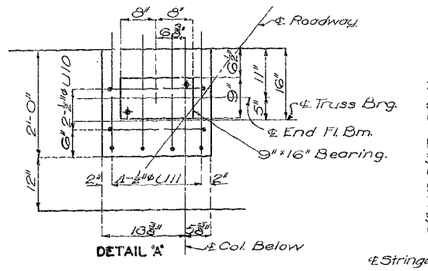
MISSOURI STATE HIGHWAY DEPARTMENT

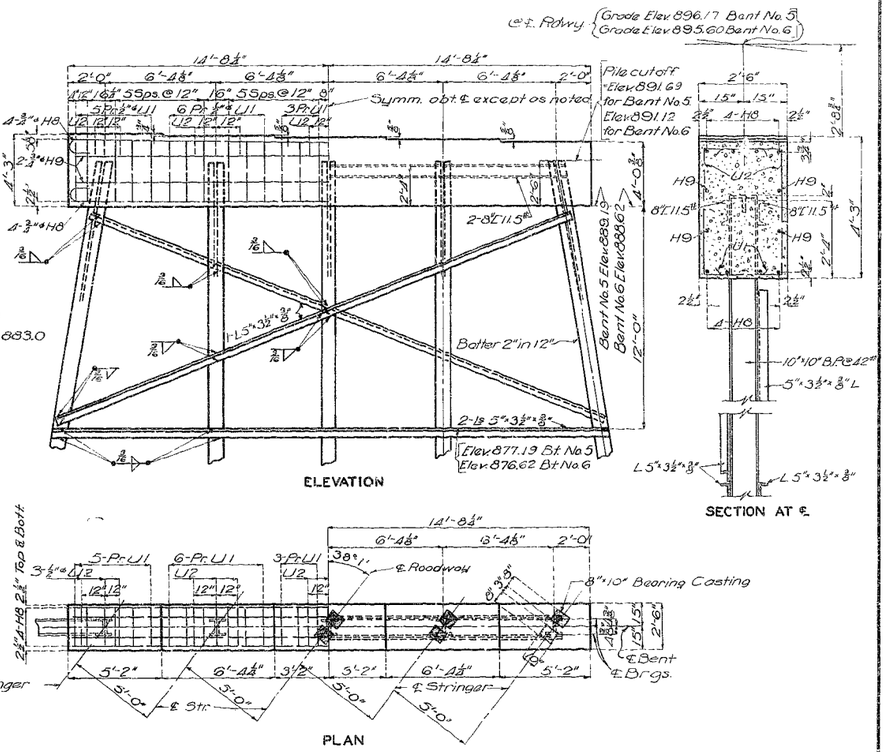
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	MO.	S-165(1)(SE)	19		



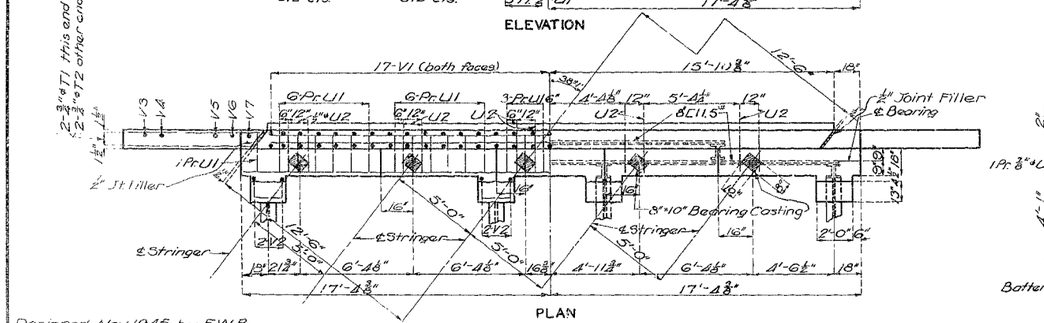
DETAILS OF END BENT NO. 1



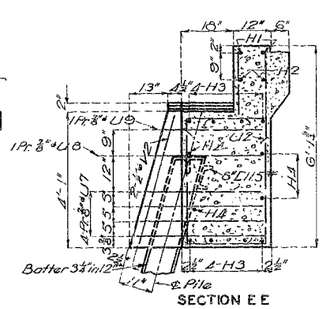


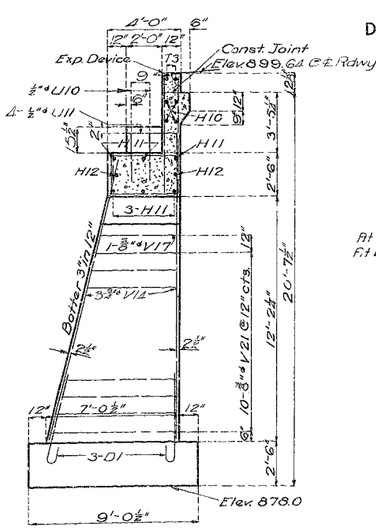


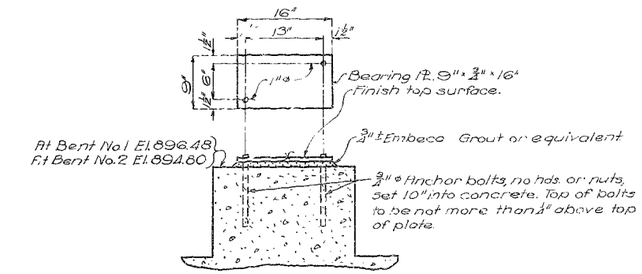
DETAILS OF INTERMEDIATE BENTS NO. 5 & 6



DETAILS OF END BENT NO. 7







Note: Above bearing plate shall be set in contact with bearing plate fastened to bottom of floor beam and grouted in before concrete floor is poured.

DETAIL OF BEARING PLATE FOR END FLOOR BEAM AT BENT NO. 1 AND PIER NO. 2

BRIDGE OVER 102 RIVER

STATE ROAD FROM SAVANNAH EAST

ABOUT 3.5 MILES EAST OF SAVANNAH

PROJECT NO. S-165(1)(SE) STA. 144+00

ANDREW COUNTY

Designed Nov. 1945 by F.W.B.
Drawn Nov. 1945 by F.W.B.
Traced Dec. 1945 by K.R.W.
Checked Jan. 1946 by J.B.J.

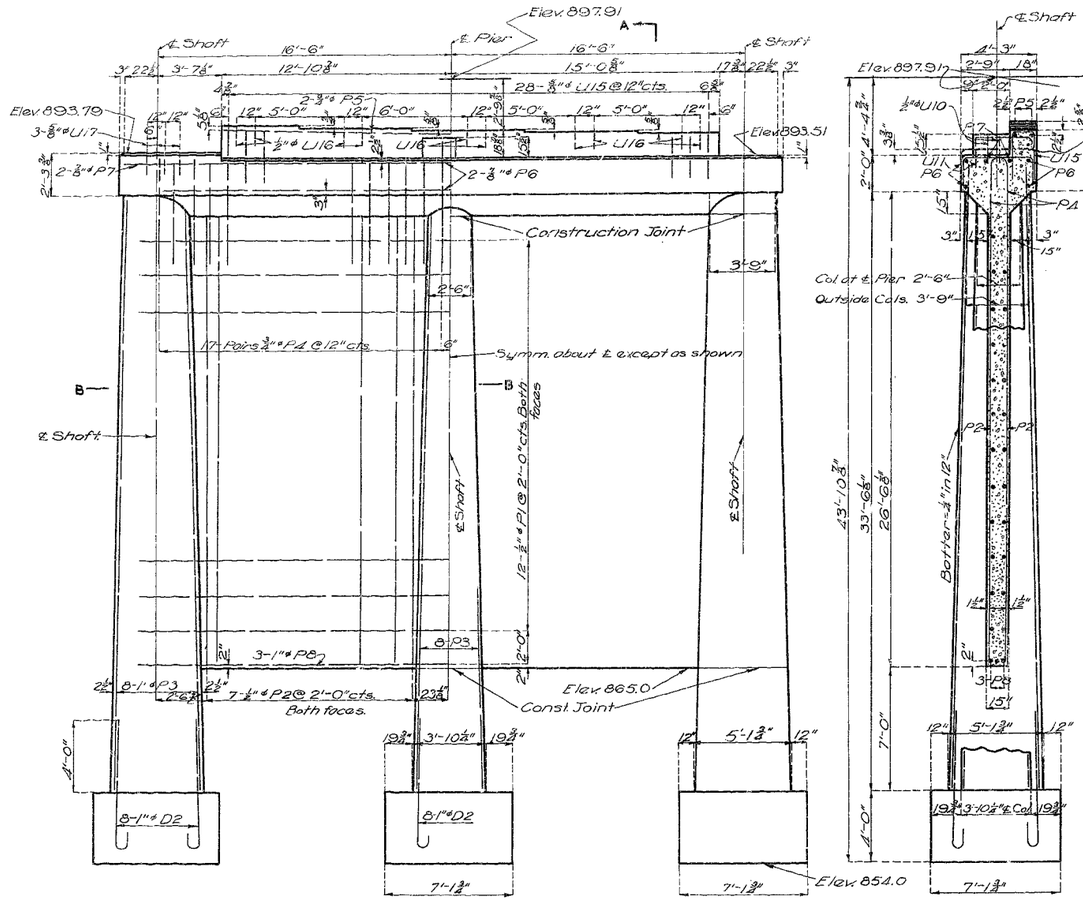
Note: This drawing is not to scale. Follow dimensions.

Sheet No. 2 of 7

L-202

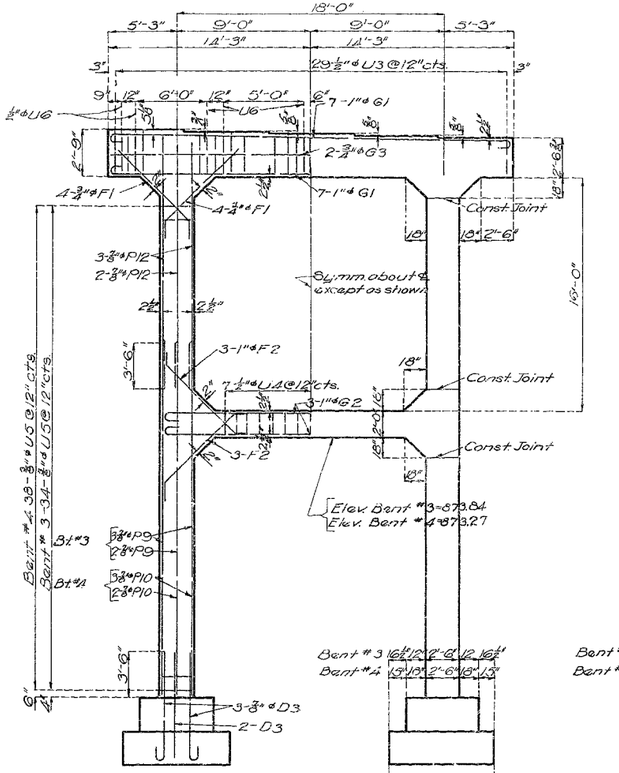
MISSOURI STATE HIGHWAY DEPARTMENT

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	MO.	165 (1)(SE)	19		

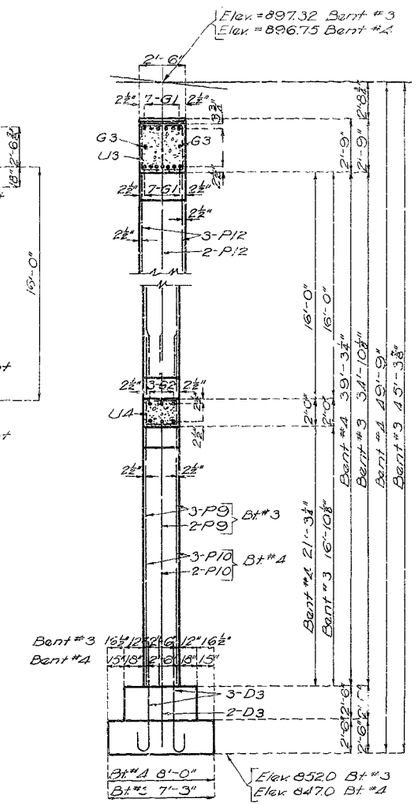


ELEVATION

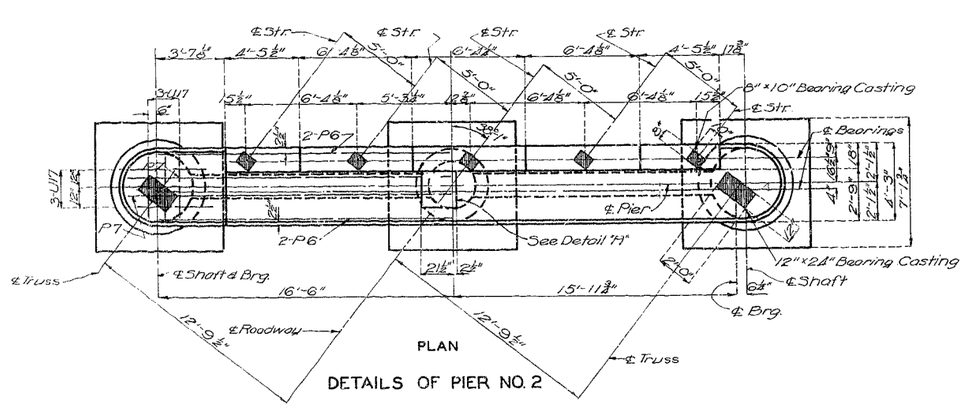
SECTION A-A



ELEVATION

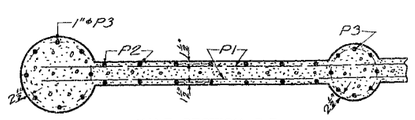


SECTION AT ℄ OF BENT



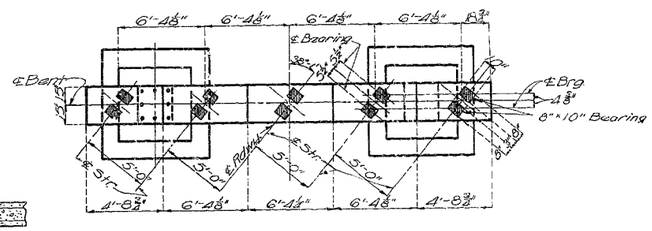
PLAN

DETAILS OF PIER NO. 2



HALF SECTION B B

DETAIL "A"



PLAN

DETAILS OF BENTS NO. 3 & 4

BRIDGE OVER 102 RIVER

STATE ROAD FROM SAVANNAH EAST
ABOUT 3.5 MILES EAST OF SAVANNAH
PROJECT NO S-165(1)(SE) STA. 144+00

ANDREW COUNTY

Designed Nov. 1945 by F.W.B.
Drawn Nov. 1945 by F.W.B.
Traced Nov. 1945 by K.R.W.
Checked Jan. 1946 by J.B.J.

Note: This drawing is not to scale. Follow dimensions

Sheet No. 3 of 7

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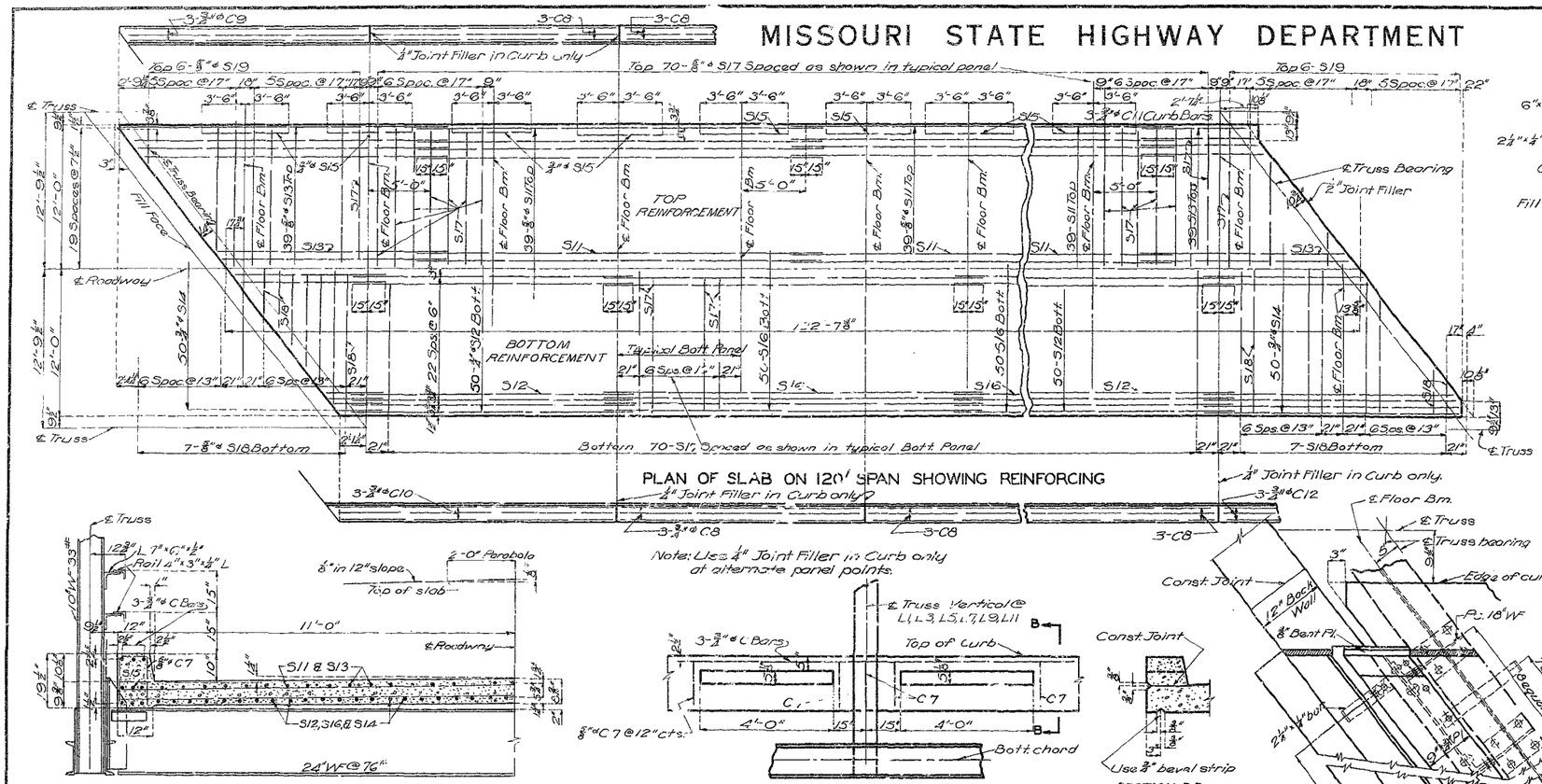
MISSOURI STATE HIGHWAY DEPARTMENT

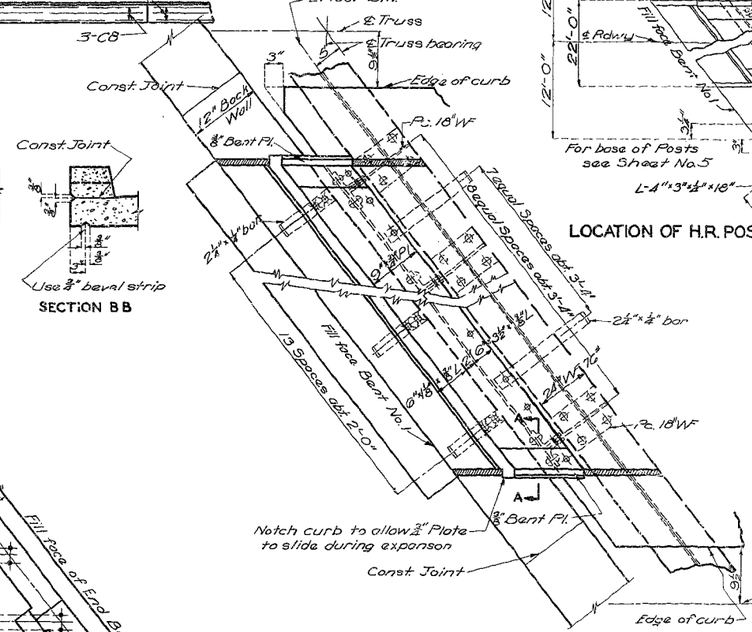
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	MO.	163 (11)(SE)	19		



PLAN OF SLAB ON 120' SPAN SHOWING REINFORCING

HALF SECTION THRU 120' SPAN

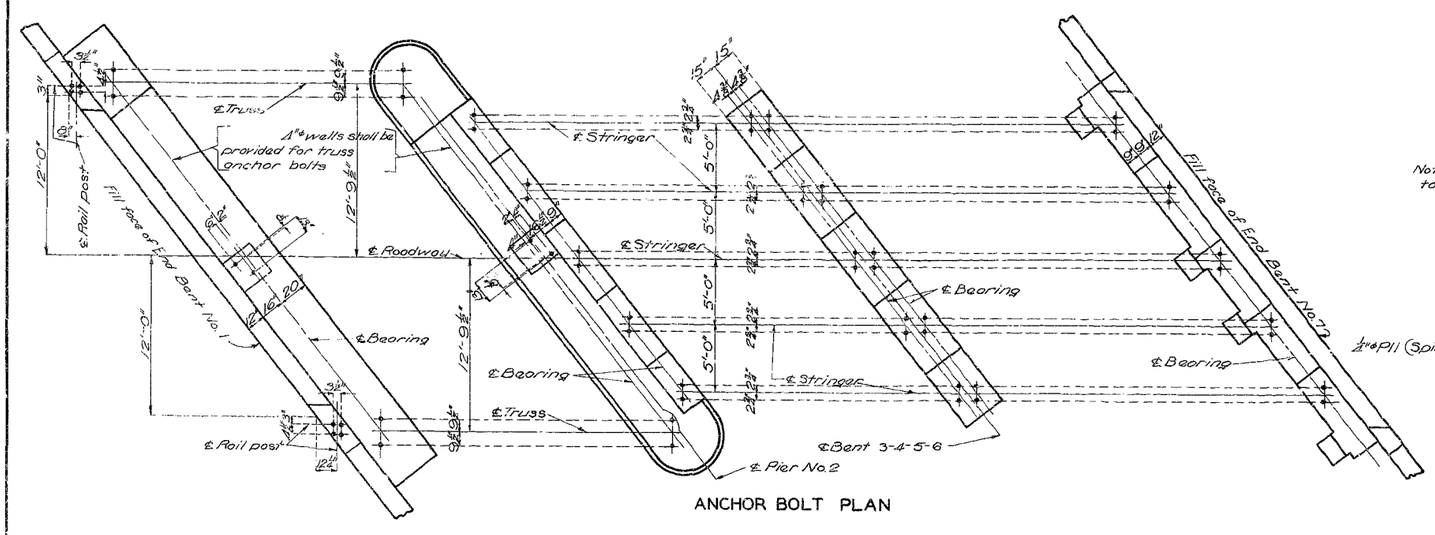
LOCATION OF OUTLETS



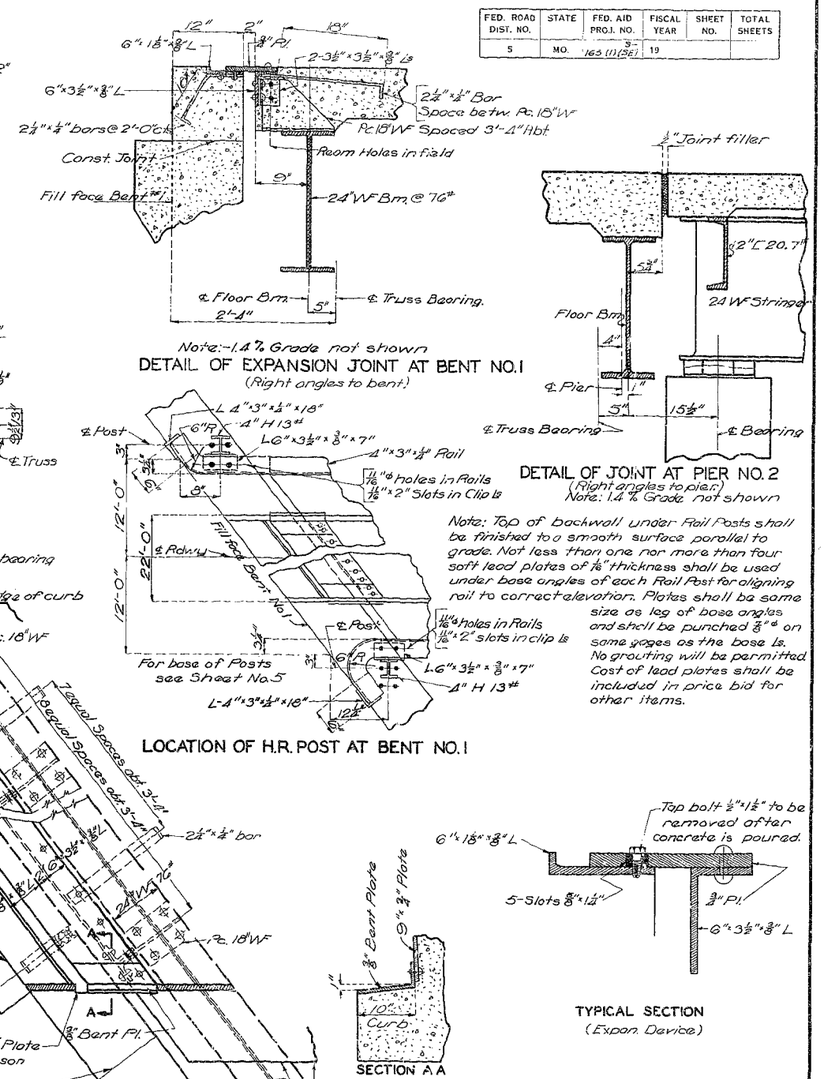
PART PLAN

DETAILS OF EXPANSION DEVICE

Note: ¾" Plate and 6" Angles to conform to crown of roadway.

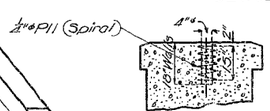


ANCHOR BOLT PLAN



LOCATION OF H.R. POST AT BENT NO. 1

TYPICAL SECTION
(Expan. Device)



DETAIL OF ANCHOR BOLT WELLS

Note: Holes for anchor bolts for main truss bearings shall be formed in substructure by placing and setting with templates 4"ϕ × 18" Walls.

BRIDGE OVER 102 RIVER

STATE ROAD FROM SAVANNAH EAST

ABOUT 3.5 MILES EAST OF SAVANNAH

PROJECT NO. S-165(1) (SE) STA. 144+00

ANDREW COUNTY

Designed Nov. 1945 by F.W.B.
Drawn Nov. 1945 by F.W.B.
Traced Nov. 1945 by K.R.W.
Checked Jan. 1946 by J.B.J.

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

Sheet No. 4 of 7

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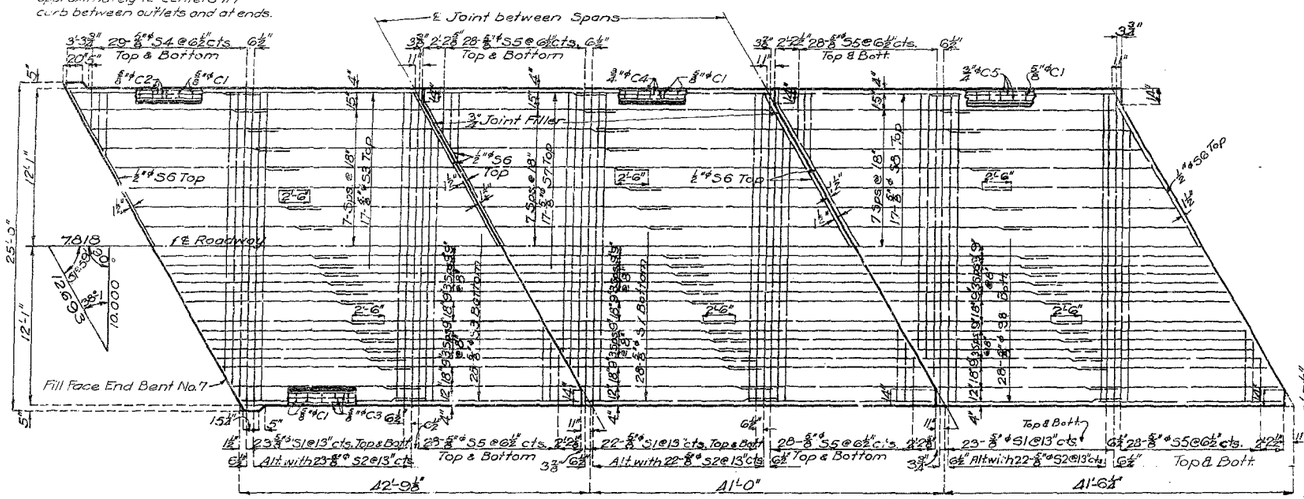
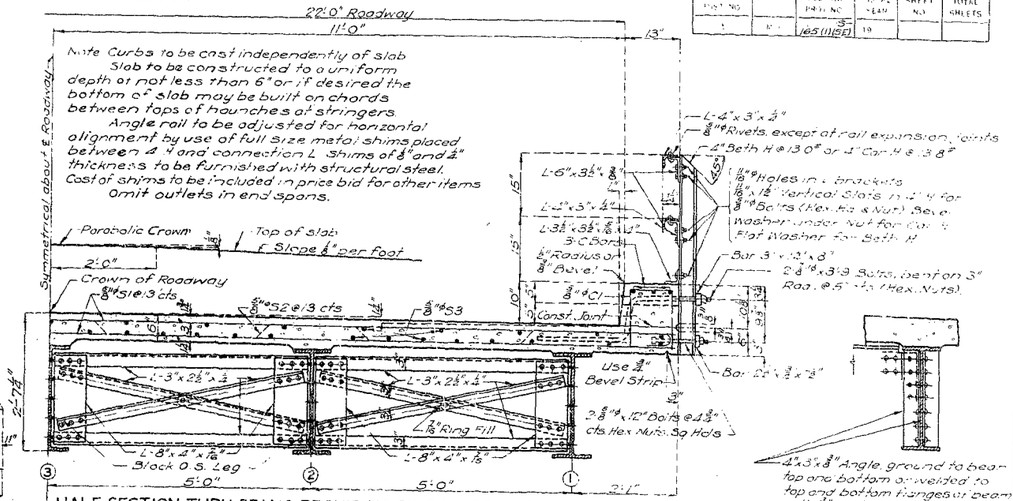
MISSOURI STATE HIGHWAY DEPARTMENT

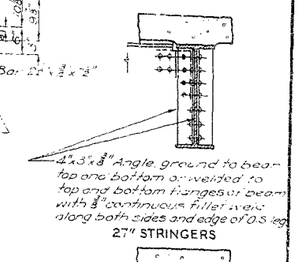
FED ROAD PROJ. NO.	STATE	FED. AID PROJ. NO.	FIG. NO.	SHEET NO.	TOTAL SHEETS
		S-165(1)(SE)	10		



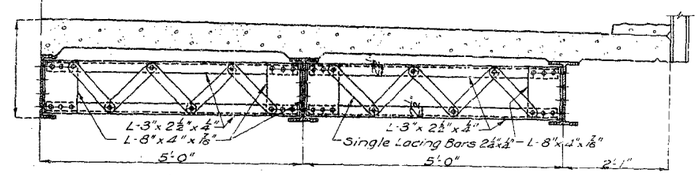
PLAN OF SLAB SHOWING REINFORCING



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



27" STRINGERS

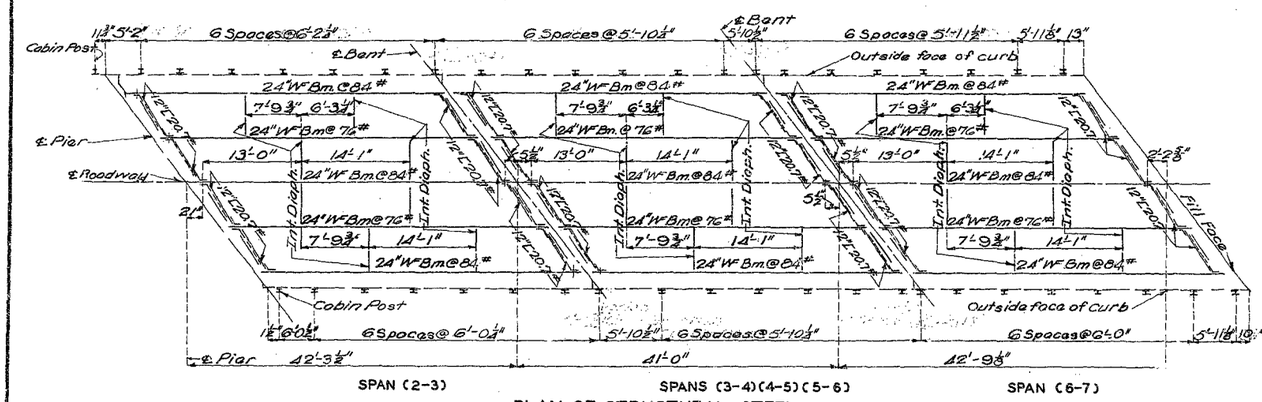


Note: Slab, curb, rail and post details same as shown in section for 24" stringers.

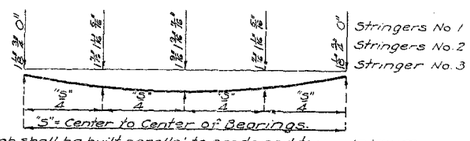
HALF SECTION THRU SPANS REQUIRING 14", 16" & 18" STRINGERS

14", 16", 18", 21" AND 24" STRINGERS

SECTIONS AT ENDS OF SPANS

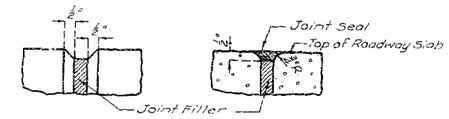


PLAN OF STRUCTURAL STEEL



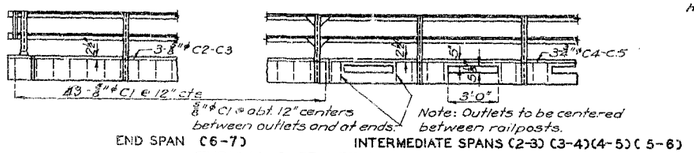
Note: Slab shall be built parallel to grade and to a minimum thickness of 6". Dead load deflection, vertical curve (if any), crown and any difference in depth of stringers shall be taken care of by haunching to stringers by the amounts shown above. This additional concrete is included in "Estimated Quantities".

SLAB HAUNCHING DIAGRAM



Note: Use bevel as shown for exposed faces of all filled joints except of top surface of roadway slab. Use edging tool with 1/4" radius at top surface of roadway slab each side of joint and fill flush with joint seal as shown.

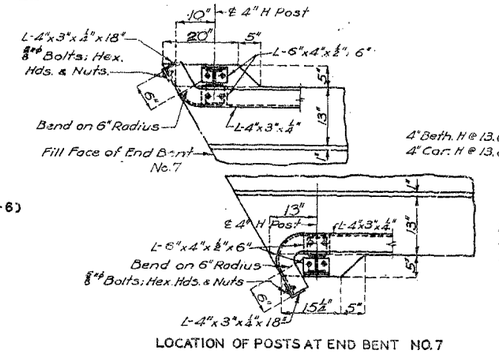
DETAILS OF BEVEL FOR FILLED JOINTS



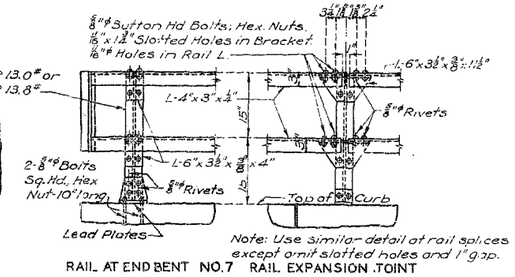
END SPAN (6-7) INTERMEDIATE SPANS (2-3) (3-4)(4-5)(5-6)

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 1/16" thickness shall be used under angles of each end rail post for aligning rail to correct elevation. Plates shall be 8 1/2"x6" and shall be punched 7/8" ø on same gauge as the angles. No grouting permitted. Cost of lead plates to be included in price bid for other items.



LOCATION OF POSTS AT END BENT NO. 7



Note: Use similar detail at rail splices except omit slotted holes and 1" gap.

RAIL AT END BENT NO. 7 RAIL EXPANSION JOINT

DETAILS OF RAIL

BRIDGE OVER 102 RIVER

STATE ROAD FROM SAVANNAH EAST

ABOUT 3.5 MILES EAST OF SAVANNAH

PROJECT NO. S-165(1)(SE) STA 144+00

ANDREW COUNTY

Drawn
Traced May 1945 by G.W. Assembled Nov. 1945 by F.W.B. & K.R.W.
Checked May 1945 by J.B.J. Checked Jan. 1946 by J.B.J.

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

Sheet No. 5 of 7

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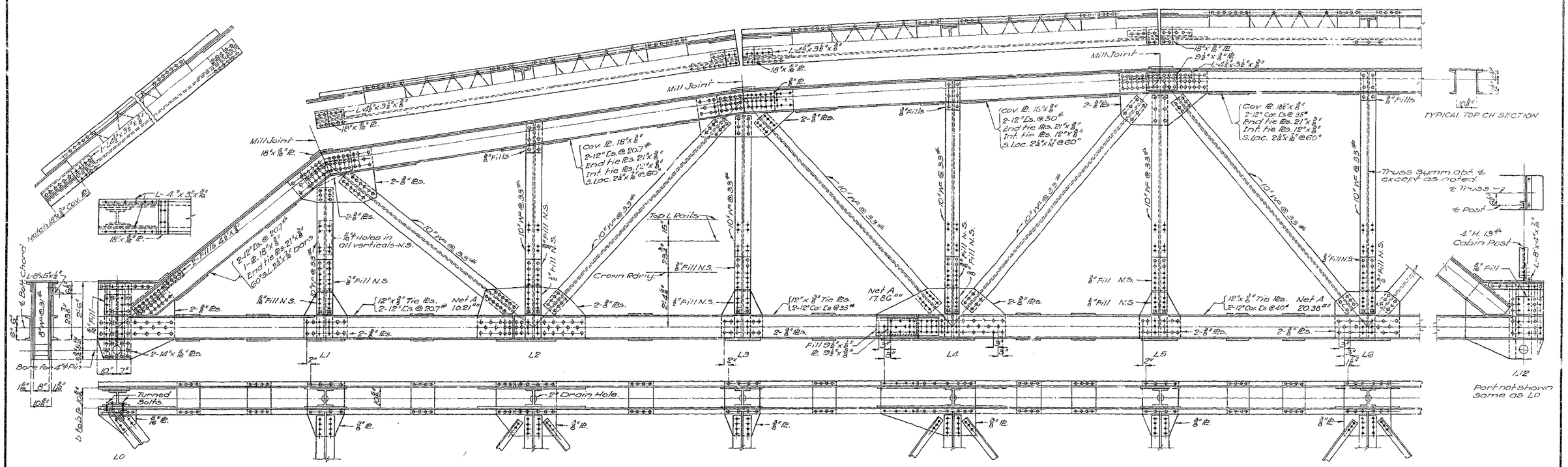
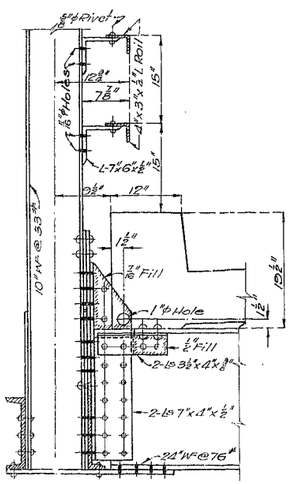
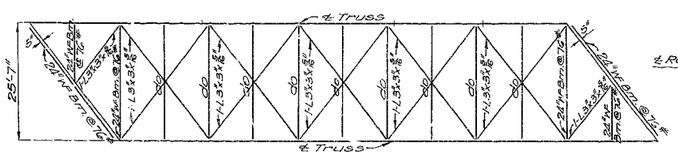
MISSOURI STATE HIGHWAY DEPARTMENT

FED. ROAD DIST. NO	STATE	FED. AID PROJ. NO	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	MO	S-165(1)(SE)	19		

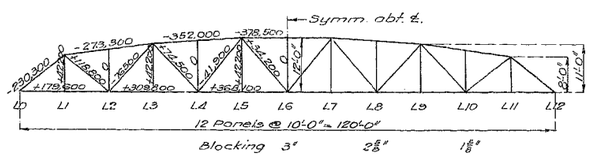




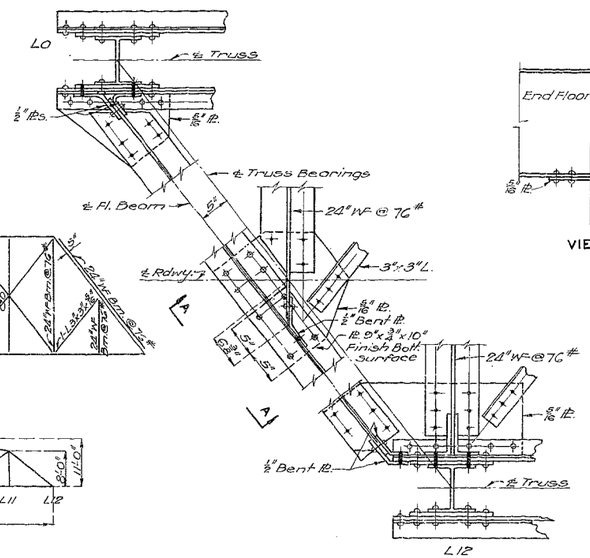
INT. FLOORBEAM CONNECTION



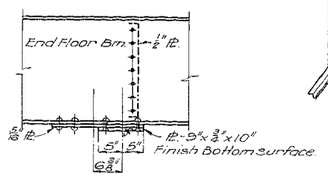
PLAN OF FLOOR STEEL AND LATERALS



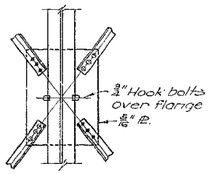
STRESS DIAGRAM AND CAMBER DIAGRAM



DETAILS OF END FLOOR BEAM



VIEW A-A



DETAILS OF 120' TRUSS

Rivets 3/4"φ, Holes 13/16"φ except as noted.

BRIDGE OVER 102 RIVER

STATE ROAD FROM SAVANNAH EAST

ABOUT 3.5 MILES EAST OF SAVANNAH

PROJECT NO. S-165(1)(SE) STA. 144+00

ANDREW COUNTY

Drawn Nov. 1945 by F.W.B.
Traced Dec. 1945 by H.C.
Checked Jan. 1946 by J.B.J.

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

Sheet No. 6 of 7.

L-202

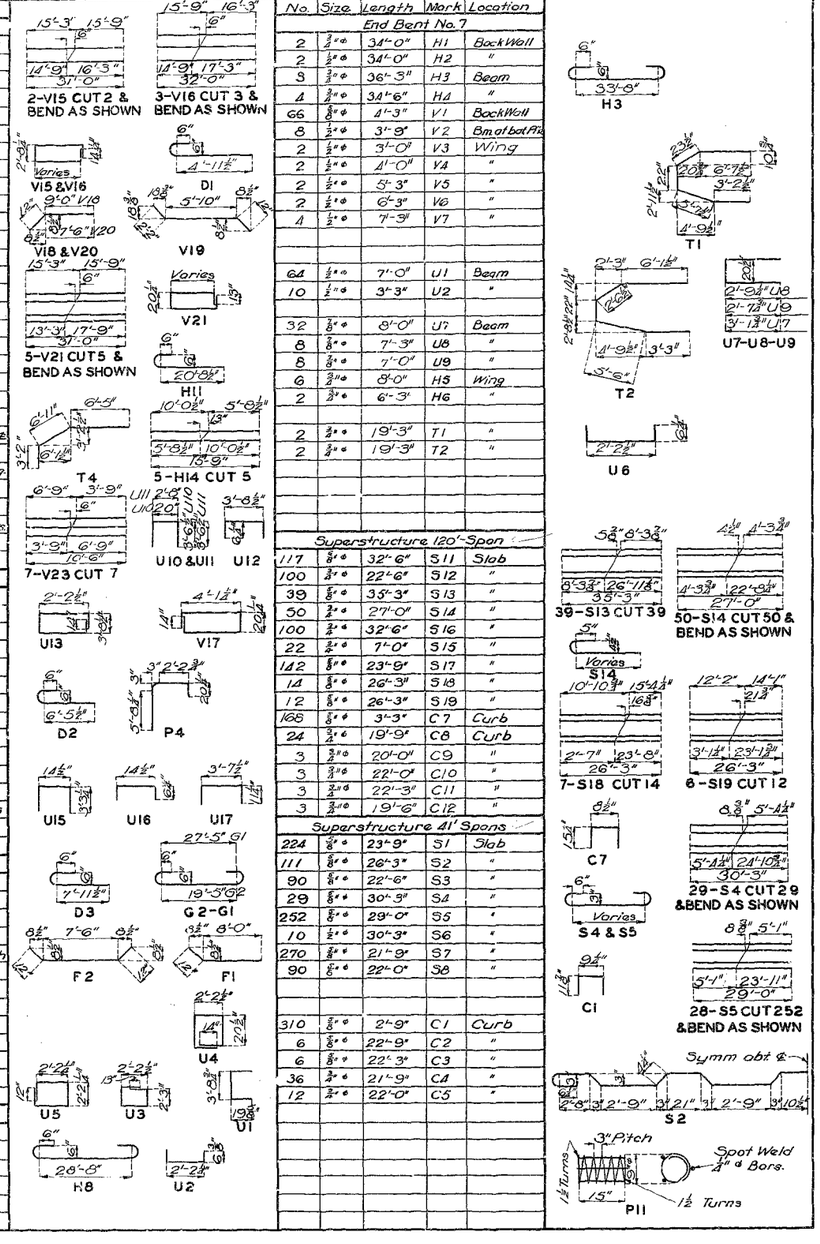
MISSOURI STATE HIGHWAY DEPARTMENT

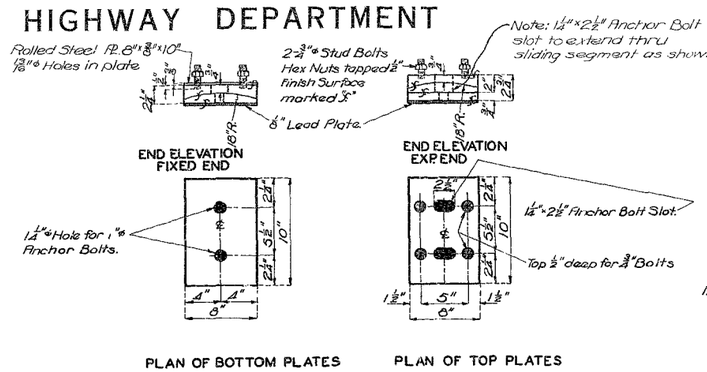
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	MO.	S-165(1)(SE)	19		

COMPLETE BILL OF REINFORCING STEEL

No	Size	Length	Mark	Location
End Bent No.1				
58	1/2"ϕ	6'-3"	V10	Back Wall
12	1/2"ϕ	7'-3"	V11	"
22	3/4"ϕ	6'-3"	D1	Footing
8	3/4"ϕ	7'-6"	V12	Col.
8	3/4"ϕ	9'-6"	V13	Col.
6	3/4"ϕ	14'-6"	V14	Col. at ℄
2	3/8"ϕ	31'-0"	V15	Col.
3	3/8"ϕ	32'-0"	V16	Col.
1	3/8"ϕ	12'-9"	V17	Col. at ℄
8	3/4"ϕ	10'-0"	V18	End Cols.
8	3/4"ϕ	9'-0"	V19	"
8	3/4"ϕ	8'-6"	V20	Col. at ℄
5	3/8"ϕ	31'-0"	V21	"
2	3/4"ϕ	33'-0"	T3	Back Wall
8	1/2"ϕ	18'-0"	H10	B.Wall
12	1"ϕ	22'-0"	H11	Beam
4	3/4"ϕ	20'-6"	H12	"
4	3/4"ϕ	16'-6"	T4	Wing
12	3/4"ϕ	10'-9"	H13	"
5	3/8"ϕ	15'-9"	H14	"
7	1/2"ϕ	10'-6"	V23	"
2	1/2"ϕ	8'-9"	U10	Haunchet ℄
4	1/2"ϕ	8'-9"	U11	"
6	1/2"ϕ	4'-9"	U12	Under Brg.
39	1/2"ϕ	13'-0"	U13	Beam
4	1/2"ϕ	22'-6"	P11	Anc. Bolts
Pier No. 2				
24	1/2"ϕ	33'-3"	P1	Web
28	1/2"ϕ	28'-0"	P2	"
24	1"ϕ	7'-9"	D2	Footing
24	1"ϕ	35'-3"	P3	Shaft
68	3/4"ϕ	10'-0"	P4	Beam
2	3/4"ϕ	27'-9"	P5	Haunch
4	3/4"ϕ	33'-0"	P6	Beam
2	3/4"ϕ	36'-3"	P7	"
28	3/4"ϕ	7'-9"	U15	Haunch
3	1"ϕ	36'-0"	P8	Web
10	1/2"ϕ	2'-3"	U16	Haunch
12	3/4"ϕ	5'-6"	U17	"
4	1/2"ϕ	22'-6"	P11	Anc. Bolts
2	1/2"ϕ	8'-9"	U10	Haunch
4	1/2"ϕ	9'-9"	U11	"
Bents No. 3 & 4				
32	3/8"ϕ	9'-3"	D3	Footing
16	3/8"ϕ	24'-0"	P9	Col. Bt #3
16	3/8"ϕ	26'-3"	P10	Col. Bt #4
12	1"ϕ	22'-0"	G2	Tie Beam
24	1"ϕ	9'-6"	F2	Tie Haunch
26	1/2"ϕ	9'-0"	U4	Tie Beam
32	3/8"ϕ	16'-9"	P12	Col.
144	3/4"ϕ	9'-9"	U5	Col. 3/8"-#3 7/8"-#4
58	1/2"ϕ	10'-0"	U3	Beam
32	3/4"ϕ	9'-0"	F1	"
20	1/2"ϕ	3'-3"	U6	"
28	1"ϕ	30'-0"	G1	"
4	3/4"ϕ	28'-3"	G3	"
Bents No. 5 & 6				
16	3/4"ϕ	31'-3"	H8	Beam
8	3/4"ϕ	29'-0"	H9	"
112	1/2"ϕ	7'-0"	U1	"
30	1/2"ϕ	3'-3"	U2	"

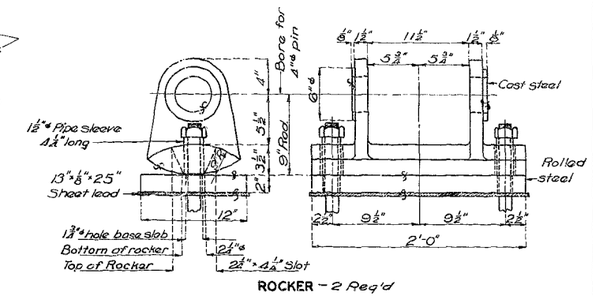
No.	Size	Length	Mark	Location
End Bent No. 7				
2	3/4"ϕ	34'-0"	H1	Back Wall
3	1/2"ϕ	34'-0"	H2	"
3	3/8"ϕ	36'-3"	H3	Beam
4	3/4"ϕ	34'-6"	H4	"
66	3/8"ϕ	4'-3"	V1	Back Wall
8	1/2"ϕ	3'-9"	V2	Bm. at bot. Ft.
2	1/2"ϕ	3'-0"	V3	Wing
2	1/2"ϕ	4'-0"	V4	"
2	1/2"ϕ	5'-3"	V5	"
2	1/2"ϕ	6'-3"	V6	"
4	1/2"ϕ	7'-3"	V7	"
64	1/2"ϕ	7'-0"	U1	Beam
10	1/2"ϕ	3'-3"	U2	"
32	3/8"ϕ	8'-0"	U3	Beam
8	3/8"ϕ	7'-3"	U8	"
8	3/8"ϕ	7'-0"	U9	"
6	3/8"ϕ	8'-0"	H5	Wing
2	3/4"ϕ	6'-3"	H6	"
2	3/4"ϕ	19'-3"	T1	"
2	3/4"ϕ	19'-3"	T2	"
Superstructure 120'-Span				
117	5/8"ϕ	32'-6"	S11	Slab
100	3/8"ϕ	22'-6"	S12	"
39	5/8"ϕ	35'-3"	S13	"
50	3/4"ϕ	27'-0"	S14	"
100	3/4"ϕ	32'-6"	S16	"
22	3/4"ϕ	7'-0"	S15	"
142	5/8"ϕ	23'-9"	S17	"
14	5/8"ϕ	26'-3"	S18	"
12	5/8"ϕ	26'-3"	S19	"
168	5/8"ϕ	3'-3"	C7	Curb
24	3/4"ϕ	19'-9"	C8	Curb
3	3/8"ϕ	20'-0"	C9	"
3	3/8"ϕ	22'-0"	C10	"
3	3/8"ϕ	22'-3"	C11	"
3	3/8"ϕ	19'-6"	C12	"
Superstructure 41' Spans				
224	5/8"ϕ	23'-9"	S1	Slab
111	5/8"ϕ	26'-3"	S2	"
90	5/8"ϕ	22'-6"	S3	"
29	5/8"ϕ	30'-3"	S4	"
252	5/8"ϕ	29'-0"	S5	"
10	5/8"ϕ	30'-3"	S6	"
270	5/8"ϕ	21'-9"	S7	"
90	5/8"ϕ	22'-0"	S8	"
310	5/8"ϕ	2'-9"	C1	Curb
6	5/8"ϕ	22'-9"	C2	"
6	5/8"ϕ	22'-3"	C3	"
36	3/4"ϕ	21'-9"	C4	"
12	3/4"ϕ	22'-0"	C5	"



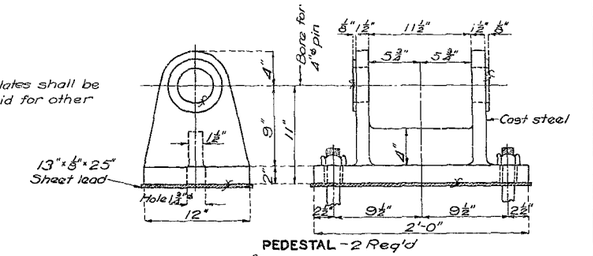


Required: 2.5 Fixed and 2.5 Expansion Plates.
Stud bolts and nuts to be paid for as structural steel. Bearings shall be either gray iron Alloy Castings or cast steel. Anchor bolts to be 1"ϕ swedged bolts, no heads or nuts and to extend 10" into concrete. Top ends of anchor bolts to be above the top of castings, but not higher than 1/4" below top surface of bottom flange of beams.

DETAILS OF BEARING PLATES



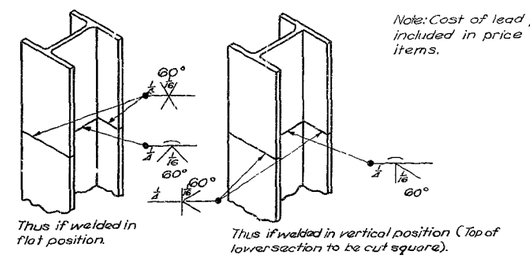
ROCKER – 2 Req'd



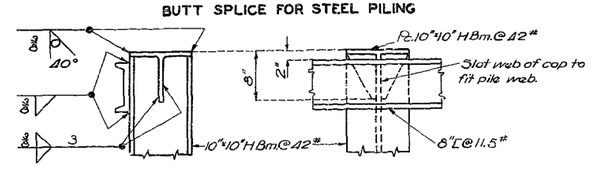
PEDESTAL – 2 Req'd

Note: All fillets 3/4" radius
All anchor bolts 1 1/2"ϕ swedged anchor bolts set 15" into masonry. Supply one Std. 4"ϕ pin with 14 3/4" grip and 2 lomos nuts per shoe.
All anchor bolts, pins, nuts and rolled steel plates to be paid for as Fabricated Steel (Truss Span).

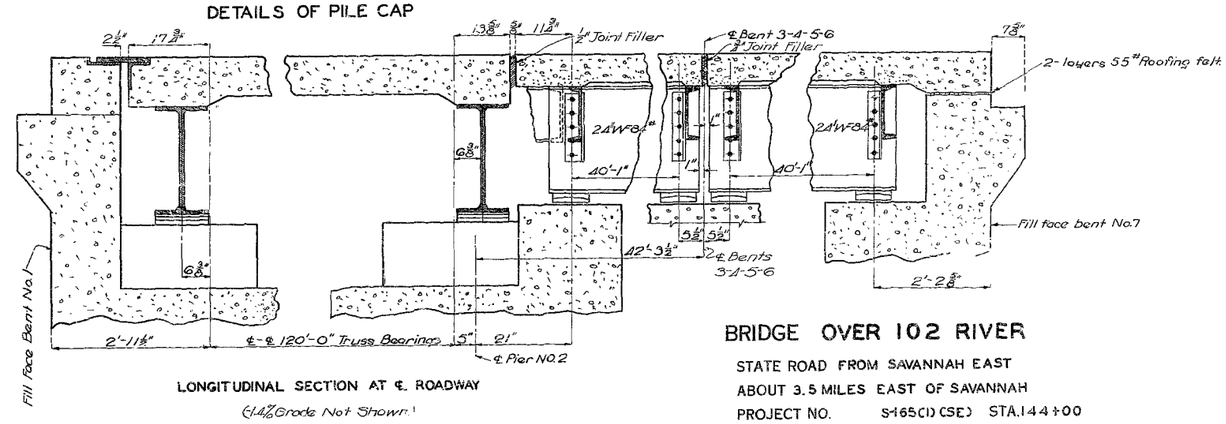
Note: Cost of lead plates shall be included in price bid for other items.



BUTT SPLICE FOR STEEL PILING



DETAILS OF PILE CAP



LONGITUDINAL SECTION AT ℄ ROADWAY

(1.4% Grade Not Shown.)

BRIDGE OVER 102 RIVER

STATE ROAD FROM SAVANNAH EAST
ABOUT 3.5 MILES EAST OF SAVANNAH
PROJECT NO. S-165(1)(SE) STA. 144+00

ANDREW COUNTY

L-202

Drawn Nov. 1945 by F.W.B.
Traced Dec. 1945 by K.R.W.
Checked Jan. 1946 by J.B.J.

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

Sheet No. 7 of 7

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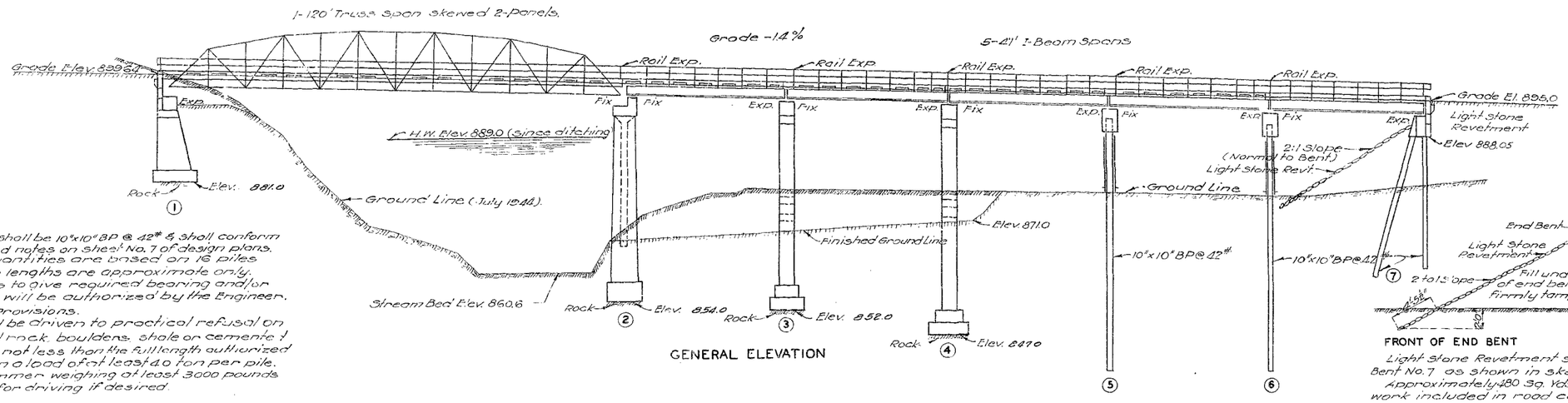
MISSOURI STATE HIGHWAY DEPARTMENT

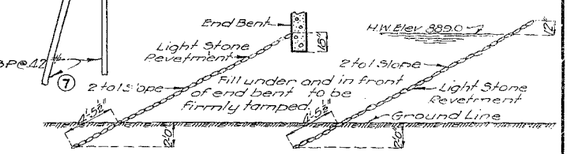
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	MO.	(1) S-165	1947	14	24

FINAL PLANS



GENERAL ELEVATION

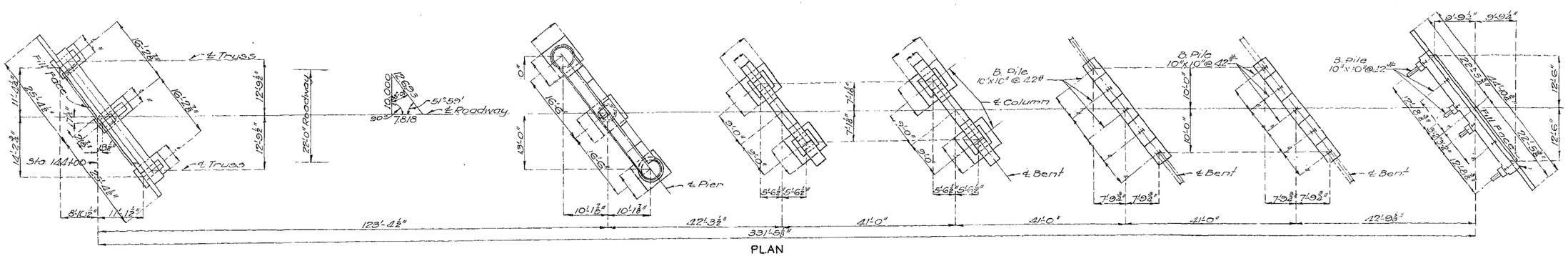
Note: All piling shall be 10"x10" BP @ 42# & shall conform with details and notes on sheet No. 7 of design plans. Estimated quantities are based on 16 piles @ 51'-0". These lengths are approximate only. Proper lengths to give required bearing and/or penetration will be authorized by the Engineer. See Special Provisions.
All piles shall be driven to practical refusal on or into solid rock, boulders, shale or cemented gravel or to not less than the full length authorized and to sustain a load of at least 40 ton per pile. A gravity hammer weighing at least 3000 pounds may be used for driving if desired.



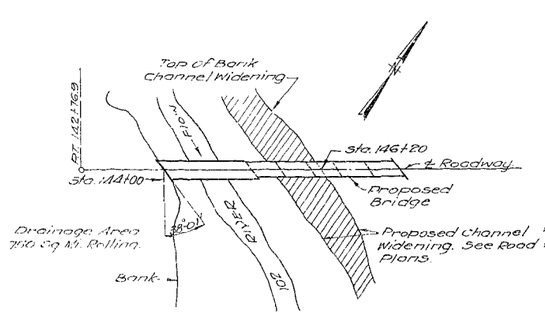
FRONT OF END BENT — SIDE SLOPES OF FILL

Light Stone Revetment shall be placed on fill of End Bent No. 7 as shown in sketches.
Approximately 480 Sq. Yds. of Light Stone Revetment work included in road contract.

LIGHT STONE REVETMENT SKETCHES



PLAN



LOCATION SKETCH

FINAL QUANTITIES

Item		Substr.	Superstr.	Total
Class 1 Excavation for Structures	Cu. Yds.	629		629
Class 2 Excavation for Structures	Cu. Yds.	232		232
Class "B" Concrete	Cu. Yds.	298.5	194.6	493.1
Fabricated Structural Steel (I-Bm. Spans)	Lbs.	4400	106930	111330
Fabricated Structural Steel (Truss Span)	Lbs.		108790	108790
Cast Steel	Lbs.		990	990
Reinforcing Steel	Lbs.	22800	52180	74980
Steel Piles in Place	Lin. Ft.	827		827
Steel Pile Cut-Offs	Lin. Ft.	61		61
Gray Iron Alloy Castings	Lbs.		2680	2680
Contingent Item ~ Foundation Test Holes	(Ft)	69		69
* Contingent Item ~ Extra Work at Bent No. 1		$167.70		$167.70

* Change Order No. 3 Correction.
Note: Excavation for bridge made above Elev. 861.0 will be paid for as Class 1 Excavation for Structures. Excavation for bridge made below Elev. 861.0 will be paid for as Class 2 Excavation for structures.

GENERAL NOTES:

Design Specification - A.A.S.H.O. - 1941.
Loading H-15 (one lane) - A.A.S.H.O.
Structural Steel Stress 18,000 #/□"
Reinforcing Steel Stress 18,000 #/□"
Concrete Class "B" Stress 1,000 #/□"
All concrete shall be class "B"
Rivets ¾"ϕ unless noted. Field connections riveted unless noted. Open holes 13/16"ϕ unless noted.
Where joint filler is specified on plans it shall conform with the requirements of Section 38-19 A(1)h of the Standard Specification for Premoulded Material Filler.
Paint: Shop: none. Field, contact surfaces of bolted field connections one coat of red lead. 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.
Surfaces of piles on end bent No. 7 from bottom of concrete cap to 3'-0" below present ground line shall be painted with one coat of an approved brand of emulsified asphalt paint. Payment for excavation around 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.

BRIDGE OVER 102 RIVER
STATE ROAD FROM SAVANNAH EAST
ABOUT 3.5 MILES EAST OF SAVANNAH
PROJECT NO S-165(1) (SE) STA. 144+00
ANDREW COUNTY

SUBMITTED BY J. W. Enslow BRIDGE ENGINEER DATE 6/4/1946
APPROVED BY C. H. Brown CHIEF ENGINEER DATE 6/4/1946

STD. C-110R3
L-202

Drawn Nov 1945 by F.W.B.
Traced Dec 1945 by H.C.
Checked Jan. 1946 by J.B.J.

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

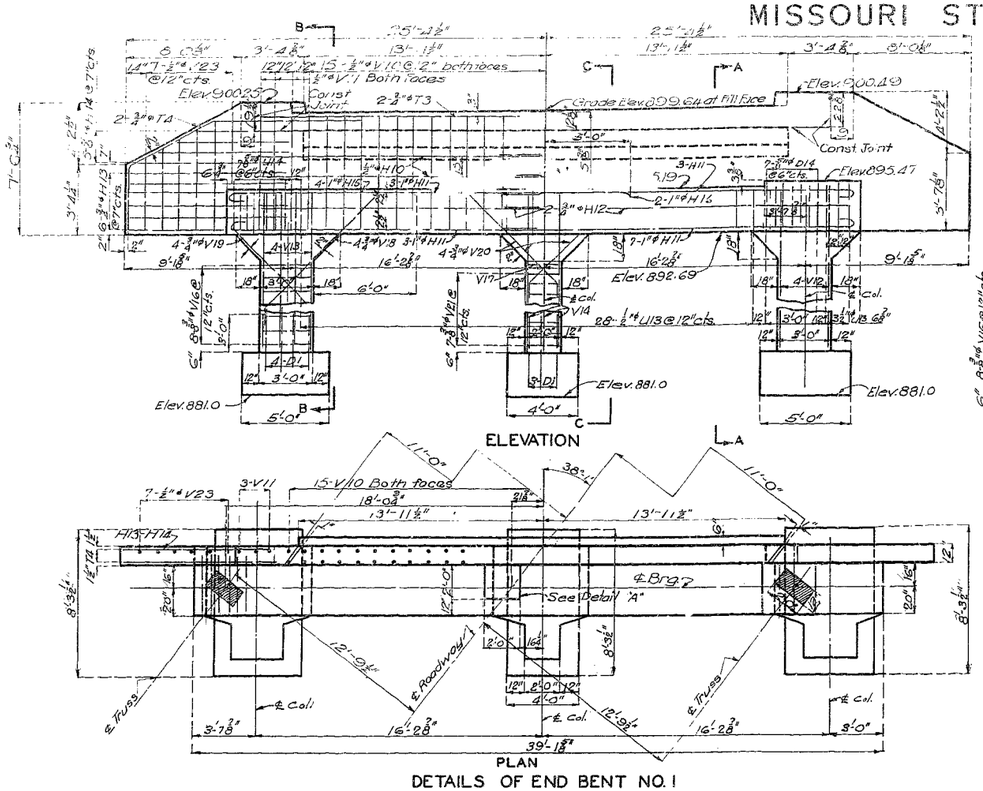
Sheet No. 1A of 2.

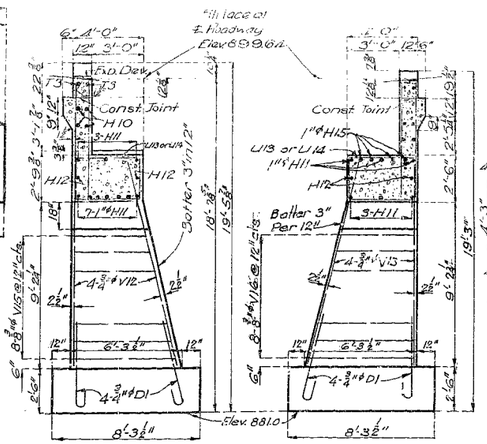
FINAL PLANS

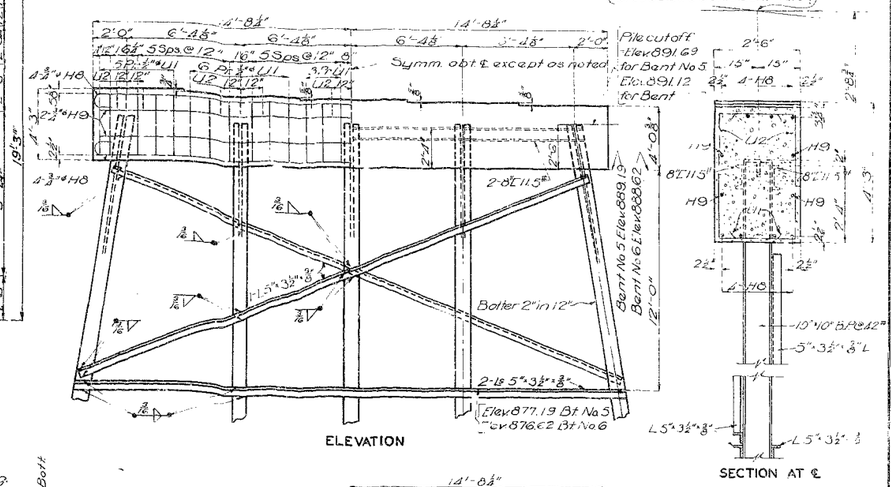
MISSOURI STATE HIGHWAY DEPARTMENT

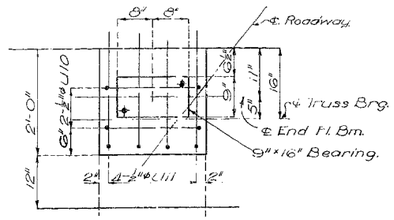
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	MO.	S-165(115E)	19		

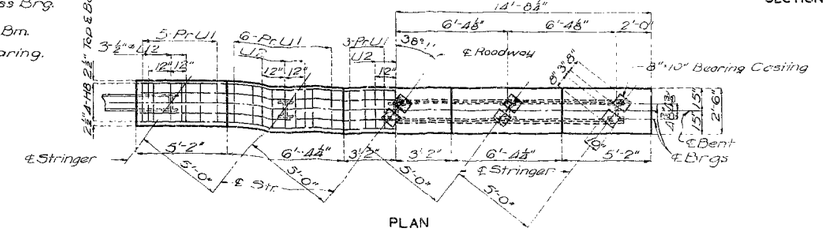
FINAL PLANS

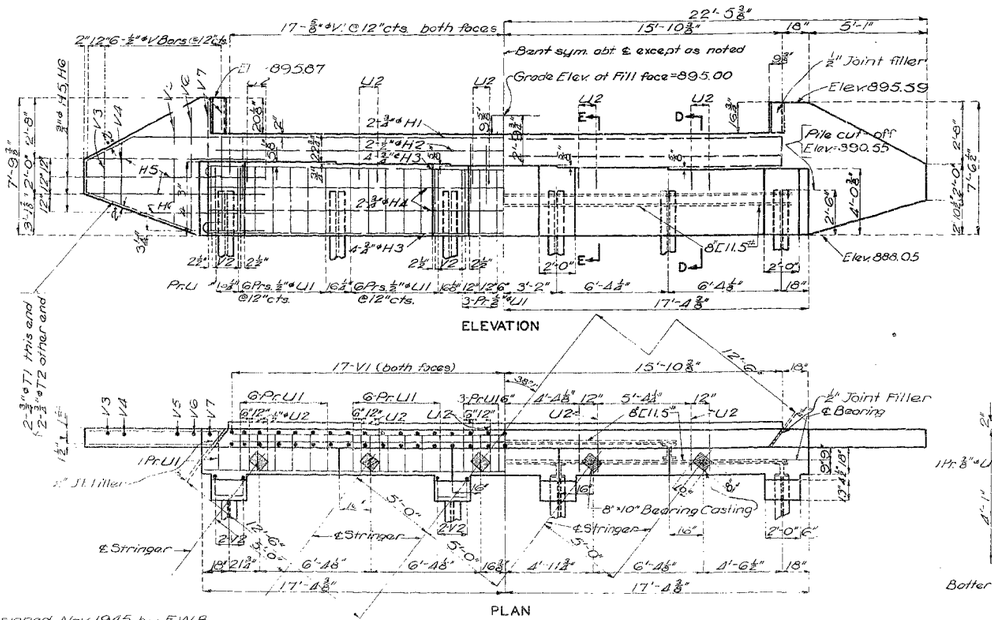


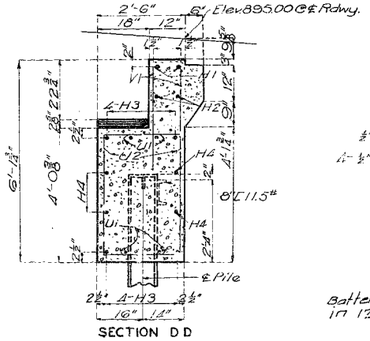


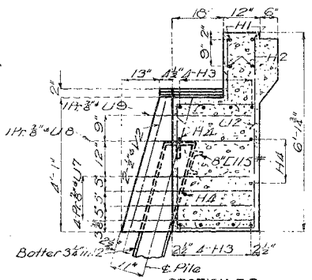


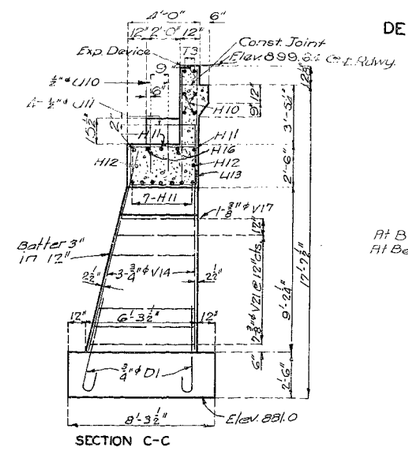


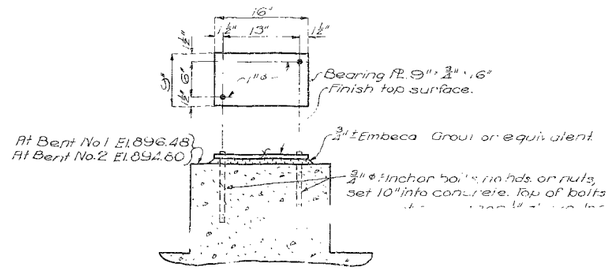












Note: Above bearing plate shall be set in contact with bearing plate fastened to bottom of floor beam and grouted in before concrete floor is poured.

DETAIL OF BEARING PLATE FOR END FLOOR BEAM AT BENT NO.1 AND PIER NO.2

BRIDGE OVER 102 RIVER

STATE ROAD FROM SAVANNAH EAST

ABOUT 3.5 MILES EAST OF SAVANNAH

PROJECT NO S-165(1)(SE) STA. 144+00

ANDREW COUNTY

FINAL PLANS

L 202

Designed Nov. 1945 by F.W.B.
Drawn Nov. 1945 by F.W.B.
Traced Dec. 1945 by K.R.W.
Checked Jan. 1946 by J.B.J.

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

Sheet No. 2A of 2

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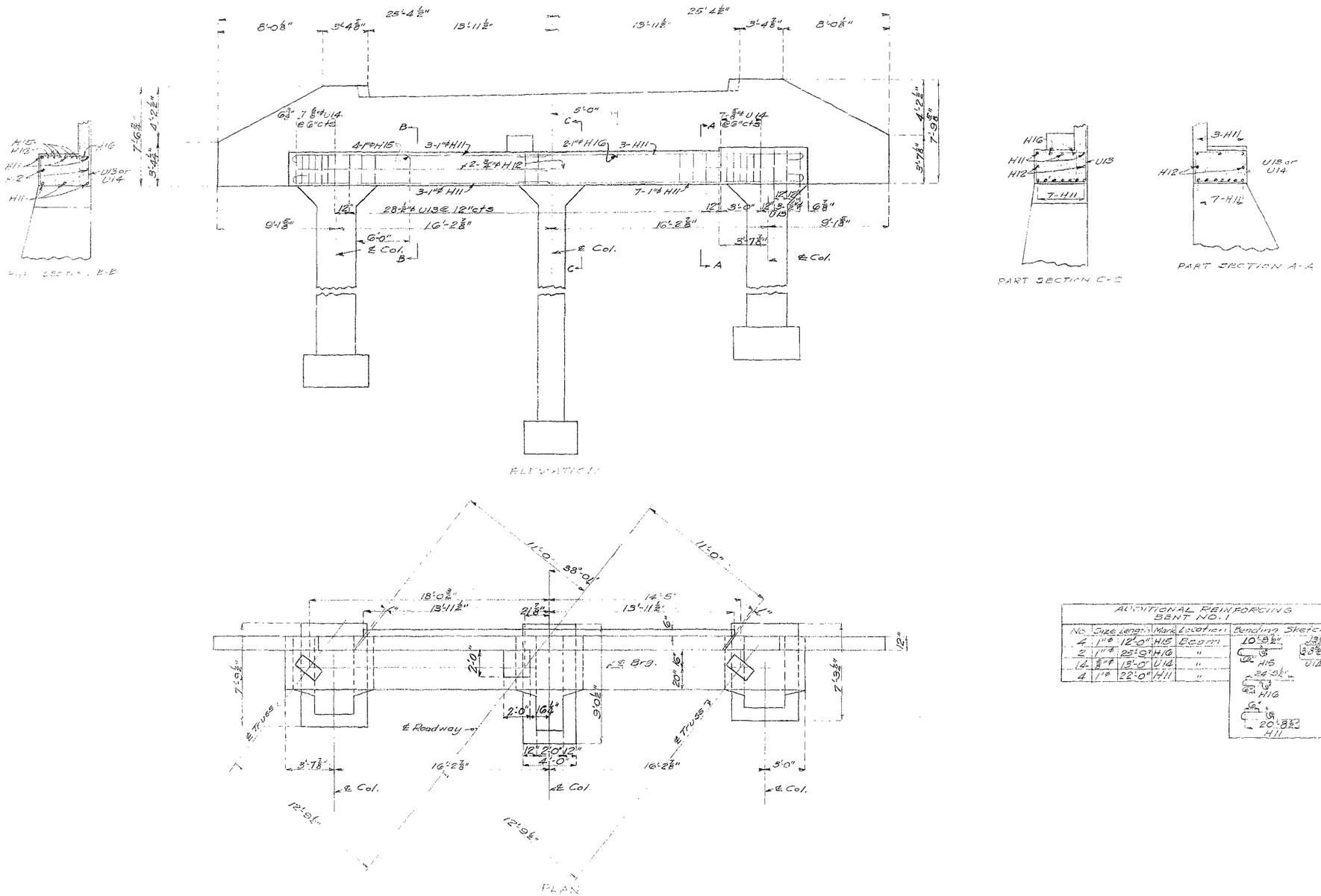

ADDITIONAL REINFORCING BENT NO. 1					
No.	Size	Length	Mark	Location	Bending Sketches
4	1"ϕ	12'-0"	H15	Beam	10'-8½"
2	1"ϕ	25'-9"	H16	"	
14	⅜"ϕ	13'-0"	U14	"	
4	1"ϕ	22'-0"	H11	"	

DETAILS OF BENT NO. 1
See Original Sheet No. 2 of 7
for details not shown.

BRIDGE OVER 100' RIVER
STATE ROAD FROM UVALDAH EAST
[illegible] MILES EAST [illegible]
[illegible]
ANDREW [illegible]

Sheet 2A

L-202A