MISSOURI RIVER BRIDGE

NEBRASKA-IOWA PROJECT I-680-9(190)

DEFINITE PROJECT REPORT

OCTOBER 1968

HARRINGTON AND CORTELYOU
CONSULTING ENGINEERS

MISSOURI RIVER BRIDGE

NEBRASKA-IOWA PROJECT-(680-9(190)

DEFINITE PROJECT REPORT

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October 25, 1968

Nebraska Department of Roads
Lincoln, Nebraska

Iowa Highway Commission
Ames, Iowa

Gentlemen:

The "Definite Project Report" presented herewith provides data for selection of a type of structure for a Missouri River Crossing in North Omaha, Nebraska. The bridge is planned to provide for Westbound traffic on Interstate Route 680 with Eastbound traffic carried by the existing adjacent and parallel Mormon Memorial Bridge. The improvement is designated as Nebraska-Iowa Project I 680-9(190).

The Report is provided in accordance with the terms of an agreement dated 7 March 1967, between Harrington and Cortelyou, the Nebraska Department of Roads and the Iowa State Highway Commission.

The assistance and cooperation by personnel of the States of Nebraska and Iowa and of the Bureau of Public Roads is gratefully acknowledged.

Very truly yours,

HARRINGTON & CORTELYOU

By E. M. Newman
E. M. Newman

EMN:cf

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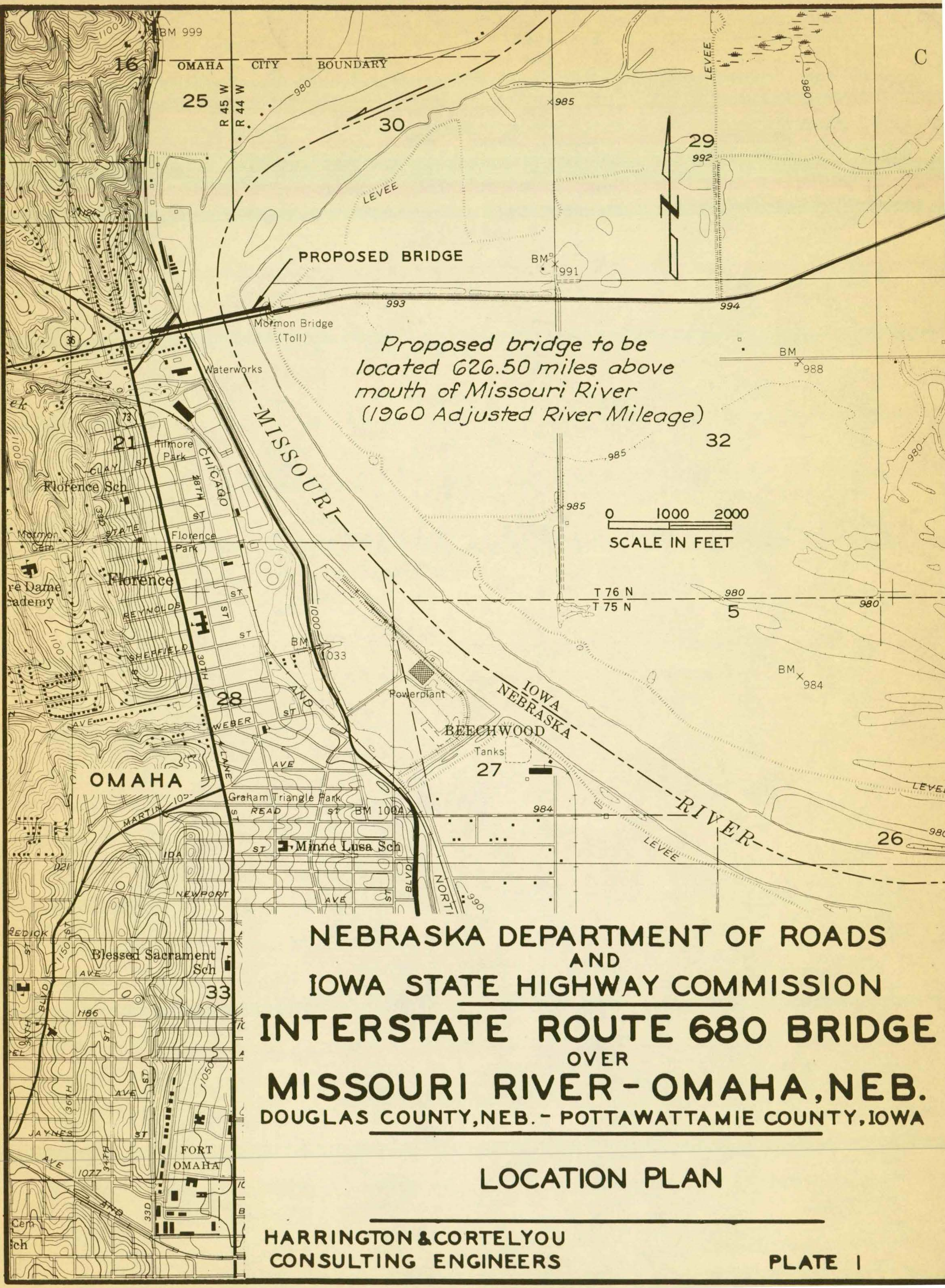


NEBRASKA DEPARTMENT OF ROADS
AND
IOWA STATE HIGHWAY COMMISSION

INTERSTATE ROUTE 680 BRIDGE
OVER
MISSOURI RIVER - OMAHA, NEB.

DOUGLAS COUNTY, NEB. - POTTAWATTAMIE COUNTY, IOWA

LOCATION PLAN

HARRINGTON & CORTELYOU
CONSULTING ENGINEERS

PLATE 1

MISSOURI RIVER BRIDGE

NEBRASKA-IOWA PROJECT I-680-9(190)

DEFINITE PROJECT REPORT

The Mormon Memorial Bridge, owned and operated as a toll facility by the Douglas County, Nebraska, Bridge Commission is located on the center line of McKinley Street in North Omaha extended easterly across the Missouri River. Connections between existing highway routes and general features of the locality which the bridge serves are indicated on Plate I.

It is proposed to construct a second bridge parallel to and 88 feet center to center north from the existing structure, with appropriate approaches to provide for one way traffic on each of the structures. The total facility with such added capacity will become integrated into the interstate route network serving the Omaha-Council Bluffs area specifically as part of Interstate Route 680.

The purpose of the investigations covered by this report is to compare types of structural systems in order to assist in making a selection of the most desirable and economical type for the proposed new bridge. At a conference, attended by representatives of Nebraska Department of Roads, Iowa Highway Commission, Bureau of Public Roads and Harrington and Cortelyou, criteria were developed for preliminary study of the facility. See Appendix I for these criteria. By direction, studies were confined to a "Truss Layout" for the three main river spans, which duplicates the Mormon Bridge truss spans in length, and an alternate "Girder Layout" which substitutes conventional welded girders for the trusses on the same pier locations.

Project limits for both layouts are the same and are determined by the approach lengths required by the girder layout, with its increased roadway elevation over the river, to properly connect with approach grades and alignments established by each state for the proposed connection. Portions of existing roadways will remain in use until tolls are removed and compatibility of such use with grades proposed for eastbound lane were included in the study.

This report explores and provides evaluation of cost differentials developed in the comparative studies of the two types of structural systems on the main river spans. Quantities and application of unit prices to provide comparative estimates for both types of structures include only westbound lane items. Arbitrary limits were established as shown in typical details on accompanying plates and described in the text. Some roadway approach items were omitted where minor or identical for both layouts and did not affect the differential sought in the two plans under study.

Bridge deck features are identical for the two separate systems. A deck width of 38' between combined curb-parapet height of 1'-8" by 1'-4" width and a single tube aluminum railing comprise general roadway dimensions. New piers for the main river spans are located on extended center lines of existing piers 6, 7, 8 and 9. The distance from pier 6 to west abutment is the same for all layouts. For the distance from pier 9 to east abutment, the truss layout is 127' longer and the girder layout is 226' longer than the structural approach on the Mormon Bridge. The following comparison is shown:

	Nebr. Approach Spans	Main River Spans	Iowa Approach Spans	Total Length
Mormon Bridge	485'-4"	951'-6"	475'-8"	1912'-6"
Truss Layout	485'-4"	951'-6"	602'-8"	2039'-6"
Girder Layout	485'-4"	951'-6"	701'-8"	2138'-6"

Pier locations on the Nebraska structural approach unit have been made without regard to present location of River Drive. The street is programmed for relocation on the south side of Mormon Bridge site.

The longer structural approach for proposed truss layout is required to obtain a satisfactory abutment location beyond a water hole caused by floodwaters adjacent to the toe of existing slope, west and north of the east Mormon Bridge abutment. The girder layout approach extends beyond that for the truss layout to cross over the water hole and, in addition, to reduce fill height to about the forty five feet maximum recommended by the Iowa Highway Commission.

This is about fifteen feet more height than the existing fill at Mormon Bridge abutment.

Foundation data from borings and from field records during construction of the Mormon Memorial Bridge were employed to locate bases of proposed new piers. The Boring Record is provided on Plate 10 in Appendix IV.

Clearances required by navigation are slightly less in vertical elevation over the channel than provided by the Mormon Bridge. In the stabilized bank area east of the navigation channel, the Mormon Bridge does not fully comply with clearance requirements revised subsequent to its construction. It is not believed likely that clearances above those furnished by the present structure will be required. Two letters from Corps of Engineers, in response to inquiry, are included in Appendix IV to clarify the requirements. Clearances are shown on Plates 12A & 12B as application drawings for permit to cross the navigable stream.

Estimates have been prepared from layouts and typical drawings referenced and included as part of this report. A detailed estimate of the layout employing trusses for main river spans is included at completion of this text. A similar estimate for the alternate girder layout is provided in Appendix II. The following summary is indicative of the differences:

	Nebraska Approach Roadway	Nebraska Approach Structure	Main River Structure	Iowa Approach Structure	Iowa Approach Roadway	Totals
Girder Layout	$ 52,320	344,025	1,680,280	638,940	287,670	3,003,235
Truss Layout	49,560	333,170	1,767,860	527,735	128,010	2,806,335
Girder Diff.(±)	$ + 2,760	+ 10,855	- 87,580	+111,205	+159,660	+ 196,900

Physical differences in comparative project layouts, of truss and girder systems for the main river spans, are related to vertical difference in grades over the center of main river span unit. Proposed tangent grades intersect at this point at elevation 1048.00 for truss layout and 1060.80 for girder layout. Corresponding roadway elevations at deck level are 1040.50 and 1053.30. The corresponding elevation on Mormon Bridge is 1040.78 which is 0.28 feet above the proposed truss and 12.52 feet below proposed girder layouts.

Horizontal location for bridge and approaches is identical. Limiting grades of 3% maximum from their point of intersection at center of main river spans raise the grades at both abutments for girder layout as shown on accompanying plates. This higher elevation increases costs of roadway and structural elements each side of the main river spans. The modest saving in cost of the girder layout over the truss layout total for the river spans alone is incapable of materially reducing the $284,480 increase in approach costs. The net difference of $196,900 is equal to about seven percent of the total project cost for the truss layout.

Unit prices used to develop costs for the alternate estimates were determined from several sources. Current bid information from both Nebraska and Iowa Highway Departments was provided and used directly where applicable. For items not covered, inquiry from pertinent sources including a review of current and past bids for work of similar scope, provided a guide for establishing prices.

Fabricated structural steel is the largest single item of materials and processes employed. The impact of small variations in unit prices was critical in determining realistic comparisons. In order to obtain the most reliable and current information, three responsible representatives of the construction industry were furnished with complete information on sections, quantities and procedures for the alternate layouts. They responded with a detailed listing of unit prices to assist in establishing a unit price and a differential for the two systems. The unit prices used reflect the best judgment of the organizations in a single unit price covering all the metalwork within the specified divisions of the estimates.

Agreement on prices and differentials from the several sources was reasonably close. The prices were not entirely in accord with expectations for a substantially greater differential in favor of girder material for the main river spans compared to truss material. Thorough review of these costs was made which confirmed the relative differences questioned. It was established that unusually deep girders require procedures in fabrication and erection which decrease the unit price differential and makes invalid the normally held conception of substantial savings.

Prior to selection of the two girder layout proposed as an alternate to the truss layout, numerous comparative designs and estimates for main river spans were made to establish the most economical type. Comparative estimates are provided in Appendix II which indicate that a two girder system is $182,900 less than a four girder alternate.

The difference in elevation between the girder layout and the truss layout resulted in approach roadway design differences. On the Nebraska approach, roadway differences were not significant. In each layout additional right of way will be required to maintain standard back slopes. These areas, shown cross hatched on Plates 7A and 2A, are in addition to property indicated on plans furnished by Nebraska Department of Roads for information and designated for acquisition. The cost of acquiring additional right of way is not included in the estimates.

On the Iowa approach, roadway differences are those relating to difference in elevation of adjacent lanes. For the truss layout, maximum standard slopes will provide adequate space for a special paved ditch on the steeper grades during transition from abutment to level grades. This ditch paving is indicated on typical details but not included in the cost estimate. The edge of this ditch is designated a common point between roadways and quantities for the westbound lane only are included. The remainder would be included with eastbound lane quantities for both layouts.

For the girder layout, provision for retaining the foreslope of the westbound lane between the roadways must be made. Several alternatives were studied based on information available before surveys were furnished to provide actual elevations. The conditions assumed were closely those furnished and the comparisons are valid. Sketches and estimates are included in Appendix II. A retaining wall located at the shoulder line provided a comparative cost of $411,900. A retaining wall located in the foreslope is estimated to cost $262,500. Further efforts to reduce the cost resulted in investigation of bin type retaining walls and the comparative cost on the same basis as for retaining walls is estimated at $148,300. The difference resulted in selection of the bin type retaining wall for this application and it is shown on typical approach drawing included in Appendix II. Only westbound lane quantities are included with the retaining wall layouts and are divided at the common point between lanes as previously indicated.

It is anticipated that roadway signing will be included in the project final plans but the cost of this item is not included in the comparative estimates. Lighting on the Nebraska approach roadway and across the structure to the east abutment, only, is provided similarly in each of the comparative estimates. Engineering costs are not included in any estimate total. A percentage for contingencies has not been added directly to totals of accompanying estimates as an indication of total project cost. Roadway estimates are properly comparable but not complete where eastbound lane quantities are excluded. Rip-rap quantities are not included but affects both plans in about the same amount. Similar toe dimensions and blanket depth would be employed. The height of such protection for Corps of Engineers 100 year flood frequency elevation of 989.00 is an element relating to selection of final flood plain grades covered finally by Iowa Highway Commission plans for the roadway approach.

It is possible to determine comparative construction costs for that portion of the project between and including the abutments. These are summarized as follows:

	Truss Layout	Girder Layout
Estimated Cost - - - -	$ 2,628,765	2,663,245
Contingencies (Add 10%)	262,875	266,325
Total - - - - - -	$ 2,891,640	2,929,570

Selection of the Truss Layout for the preferred project type is influenced by the difference in estimated cost of the two structural systems and by a preference for symmetry of appearance.

ESTIMATE

TRUSS LAYOUT

NEBRASKA ROADWAY

Paving (8" Reinforced)	2570	Sq.Yd.	@	$ 7.00	$17,990.
Armor Coat (Aggregate)	27	Tons	@	12.00	325.
Asphaltic Concrete	150	Tons	@	15.00	2,250.
Asphalt Treated Base (Shoulders)	590	Tons	@	7.00	4,130.
Granular Base	930	Tons	@	4.50	4,185.
Asphalt Applications	1300	Gals	@	0.20	260.
Embankment	5200	Cu.Yds.	@	1.10	5,720.
Excavation (Excess-Disposal)	7000	Cu.Yds.	@	1.00	7,000.
Top Soil	900	Cu.Yds.	@	3.00	2,700.
Lighting	Lump Sum				5,000.

Total Nebraska Roadway - - - - - - - - - - $49,560.

NEBRASKA APPROACH STRUCTURE

Substructure

Concrete	405	Cu.Yds.	@	$75.00	$30,375.
Reinforcing Steel	66000	Lbs.	@	0.15	9,900.
Excavation	540	Cu.Yds.	@	8.00	4,320.
Steel Piles (10BP42)	5600	Lin.Ft.	@	7.00	39,200.

Total Substructure - - - - - - - - - - - - $83,795.

(Cont. Nebraska App. Struct.) (Trusses)

Superstructure

Concrete Deck	700	Cu.Yd.	@	$90.00	$63,000.
Reinforcing Steel	168000	Lbs.	@	.15	25,200.
Fabricated Structural Steel	570000	Lbs.	@	0.255	145,350.
Drains (C.I. Type C. Basin)	10	Each	@	500.00	5,000.
Railing (one tube H. S. Alum.)	975	Lin.Ft.	@	7.00	6,825.
Lighting	Lump Sum				4,000.

Total Superstructure - - - - - - - - - - - - - - $249,375.

MAIN RIVER SPANS - (TRUSSES)

Substructure

Concrete in Bases	1730	Cu.Yds.	@	$70.00	$121,100.
Concrete in Shafts	2870	Cu.Yds.	@	80.00	229,600.
Reinforcing Steel	92000	Lbs.	@	.15	13,800.
Excavation	4340	Cu.Yds.	@	15.00	65,100.
Steel Piles (10BP42)	2360	Lin.Ft.	@	9.00	21,240.
Cofferdams for Piers 6-7-8-9	Lump Sum				165,000.

Total Substructure - - - - - - - - - - - - - - $615,840.

Superstructure

Concrete Deck	1130	Cu.Yds.	@	$90.00	$101,700.
Reinforcing Steel	270000	Lbs.	@	0.15	40,500.
Fabricated Structural Steel	2,888,000	Lbs.	@	0.34	981,920.
Drains (4"x8" Tube Type)	72	Each	@	50.00	3,600.
Railing (one tube H.S. Alum.)	1900	Lin.Ft.	@	7.00	13,300.
Lighting (Br.Roadway)	Lump Sum				6,000.
Lighting (Navigation)	Lump Sum				5,000.

Total Superstructure - - - - - - - - - - - - - $1,152,020.

(Cont.-Trusses)

IOWA APPROACH STRUCTURE

Substructure

Concrete	1635	Cu.Yds.	@	$75.00	$122,625.
Reinforcing Steel	46000	Lbs.	@	.15	6,900.
Excavation	2520	Cu.Yds.	@	8.00	20,160.
Steel Piles (10BP42)	585	Lin.Ft.	@	7.00	4,095.
Cofferdams for Piers 10-11-12-13	Lump Sum				85,000.

Total Substructure - - - - - - - - - - - - - - $238,780.

Superstructure

Concrete Deck	710	Cu.Yds.	@	$90.00	$ 63,900.
Reinforcing Steel	170000	Lbs.	@	.15	25,500.
Fabricated Structural Steel	710000	Lbs.	@	0.255	181,050.
Drains (C.I.-Catch Basin Type)	12	Each	@	500.00	6,000.
Railing (one tube H.S. Alum.)	1215	Lin.Ft.	@	7.00	8,505.
Lighting (Br.Roadway)	Lump Sum				4,000.

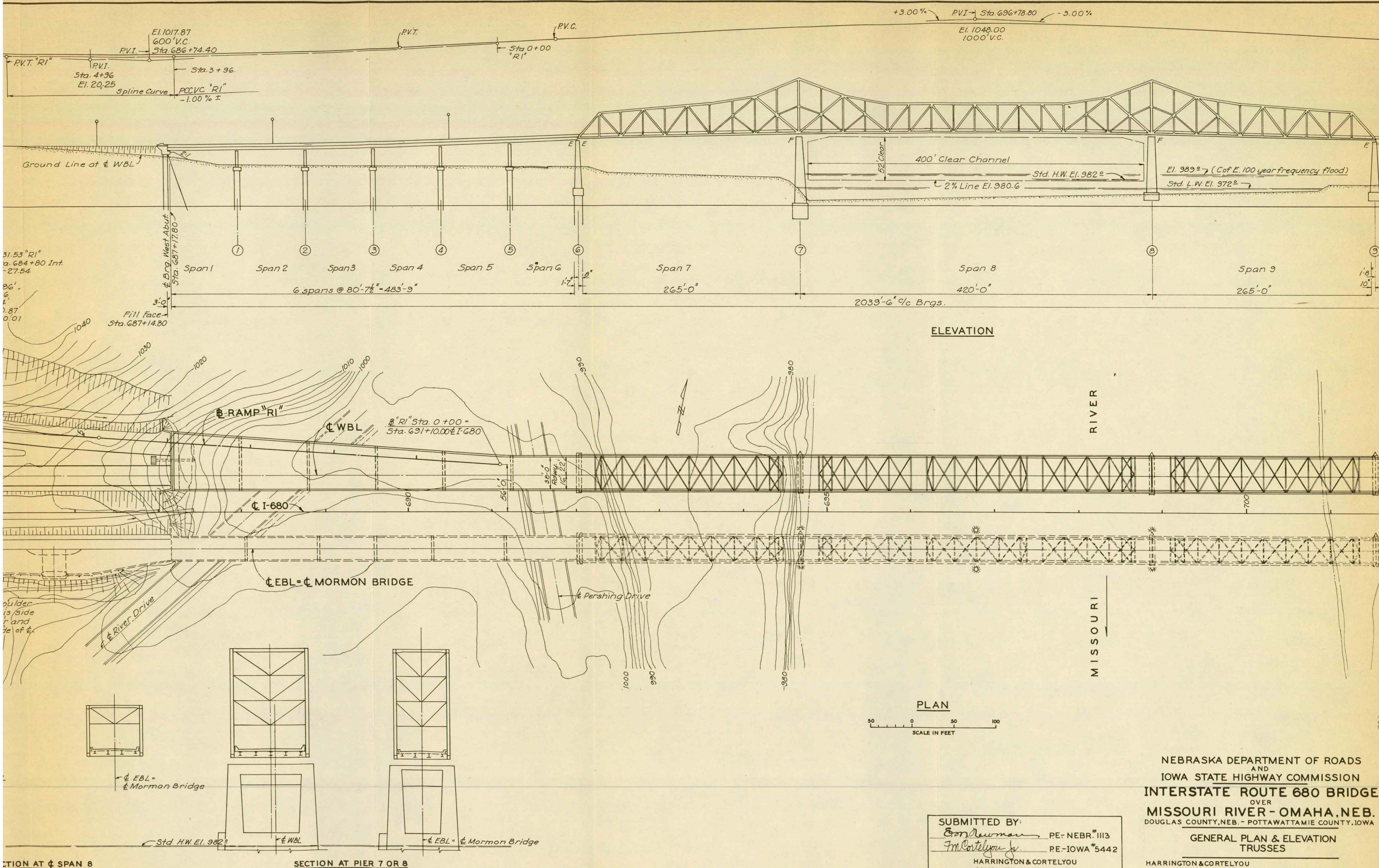
Total Superstructure - - - - - - - - - - - - - $288,955.

IOWA ROADWAY

Paving	4250	Sq.Yds.	@	$ 7.00	$ 29,750.
Armor Coat Aggregate(3/4")	28	Tons		12.00	336.
Asphalt Treated Base (Shoulders)	1520	Tons	@	7.00	10,640.
Granular Sub-base	1660	Tons	@	4.50	7,470.
Crushed Stone(Shoulders)	380	Tons	@	4.00	1,520.
Asphalt Applications	1720	Gals.	@	0.20	344.
Guard Rail	1460	Lin.Ft.	@	5.00	7,300.
Guard Rail Anchor Sections	2	Each	@	150.00	300.
Right of Way Fencing	1660	Lin.Ft.	@	0.50	830.
Compacted Embankment	63200	Cu.Yds.	@	1.10	69,520.

Total Iowa Roadway - - - - - - - - - - - - - - $128,010.

Project Total - $2,806,335.



NEBRASKA DEPARTMENT OF ROADS
AND
IOWA STATE HIGHWAY COMMISSION

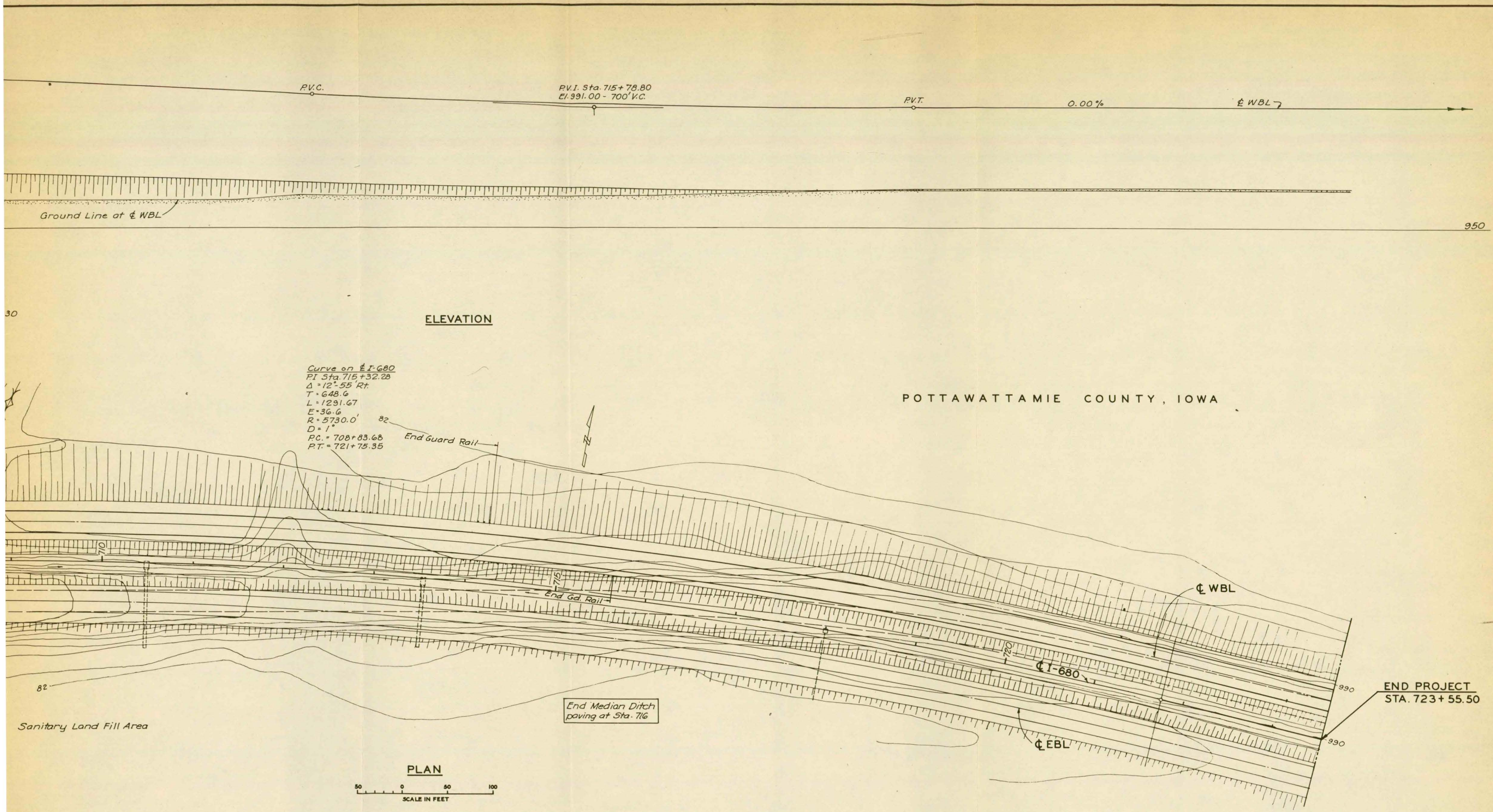
INTERSTATE ROUTE 680 BRIDGE
OVER
MISSOURI RIVER - OMAHA, NEB.

DOUGLAS COUNTY, NEB. - POTTAWATTAMIE COUNTY, IOWA

GENERAL PLAN & ELEVATION
TRUSSES

SUBMITTED BY:
E. M. Newman P.E.- NEBR. #1113
F. M. Cortelyou Jr. P.E.- IOWA #5442
HARRINGTON & CORTELYOU
CONSULTING ENGINEERS

HARRINGTON & CORTELYOU
CONSULTING ENGINEERS - OCTOBER 1968 PLATE 2A

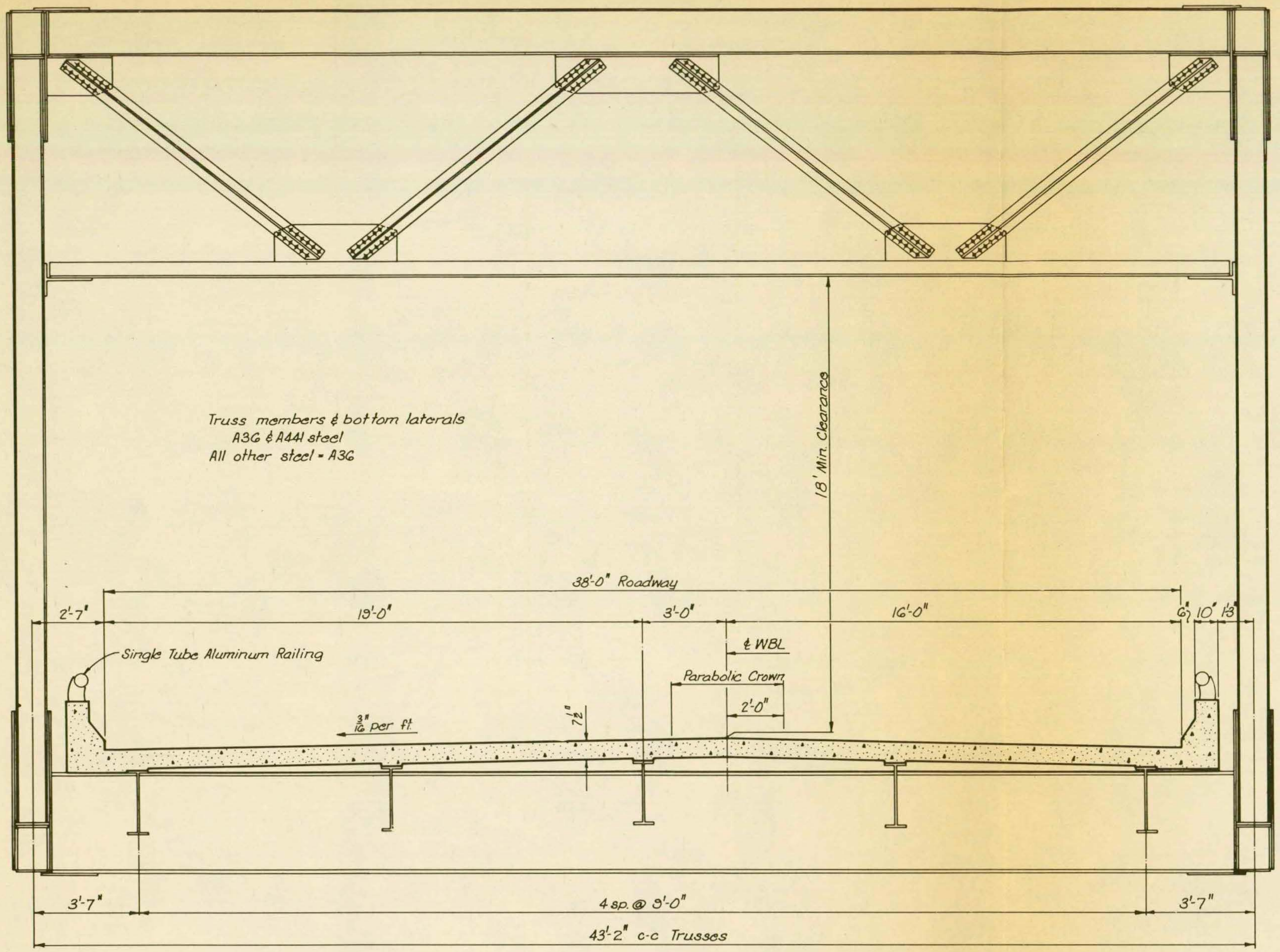


NEBRASKA DEPARTMENT OF ROADS
AND
IOWA STATE HIGHWAY COMMISSION

INTERSTATE ROUTE 680 BRIDGE
OVER
MISSOURI RIVER - OMAHA, NEB.
DOUGLAS COUNTY, NEB. - POTTAWATTAMIE COUNTY, IOWA

GENERAL PLAN & ELEVATION
TRUSSES

HARRINGTON & CORTELYOU
CONSULTING ENGINEERS - OCTOBER 1968 PLATE 2B



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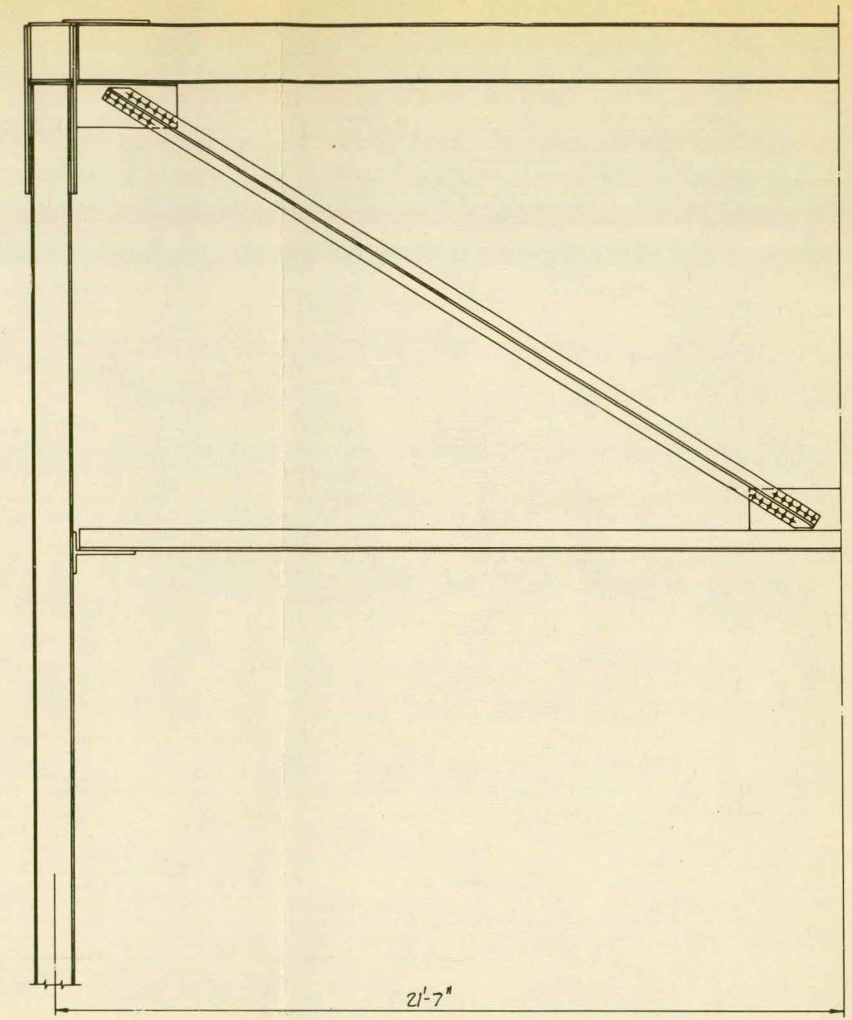
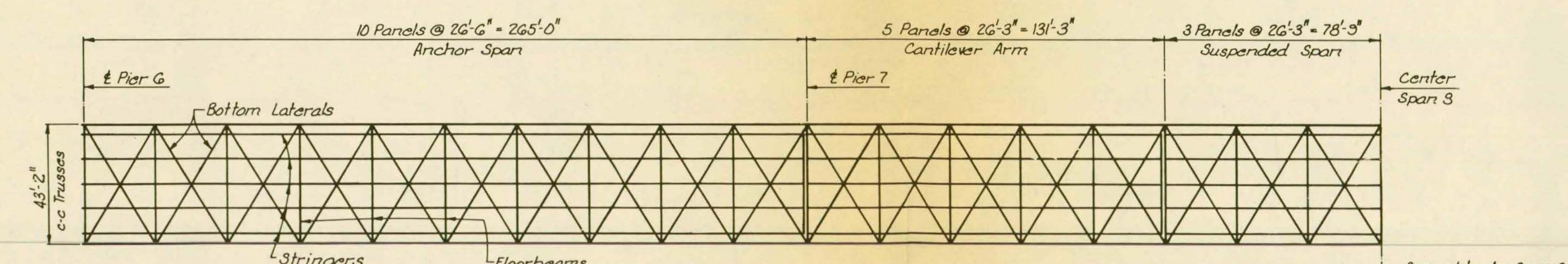


SWAY FRAMES



FRAMING PLAN

0 30 60
SCALE IN FEET

NEBRASKA DEPARTMENT OF ROADS
AND
IOWA STATE HIGHWAY COMMISSION

INTERSTATE ROUTE 680 BRIDGE
OVER
MISSOURI RIVER - OMAHA, NEB.
DOUGLAS COUNTY, NEB. - POTTAWATTAMIE COUNTY, IOWA

TRUSSES-RIVER SPANS

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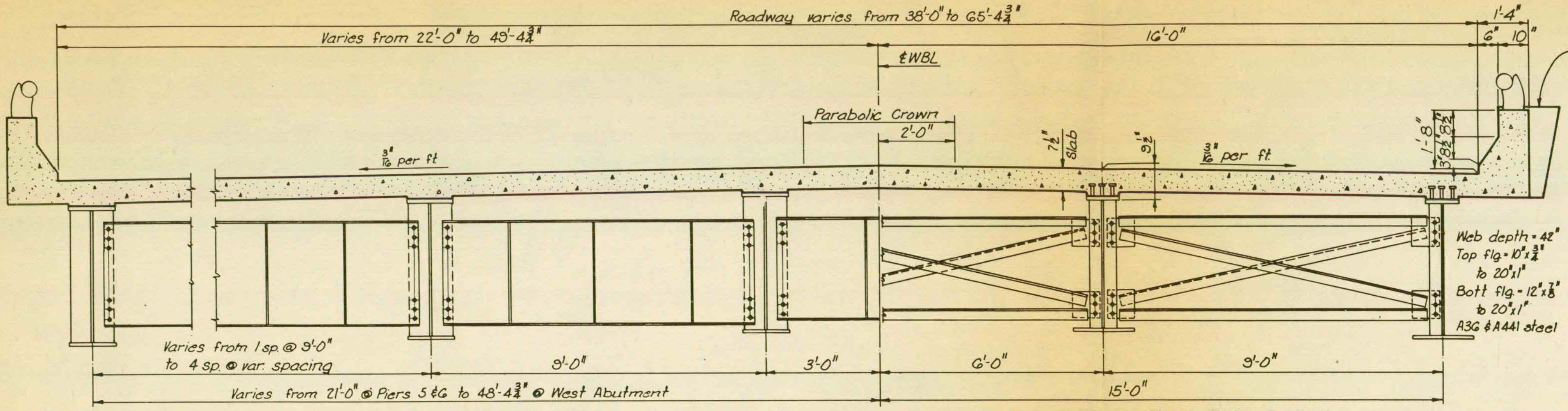
CONSULTING ENGINEERS - OCTOBER 1968 PLATE 3

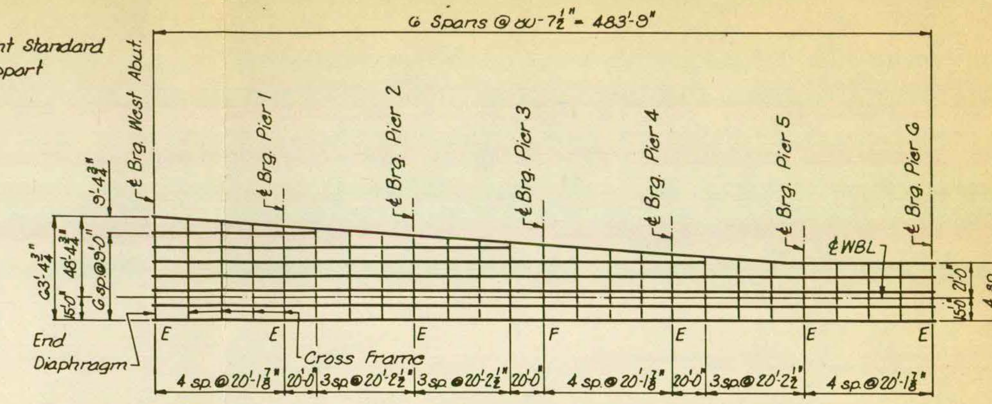


HALF SECTION AT PIERS

HALF SECTION AT CENTER OF SPAN

NEBRASKA APPROACH SPANS — TRUSS LAYOUT OR GIRDER LAYOUT

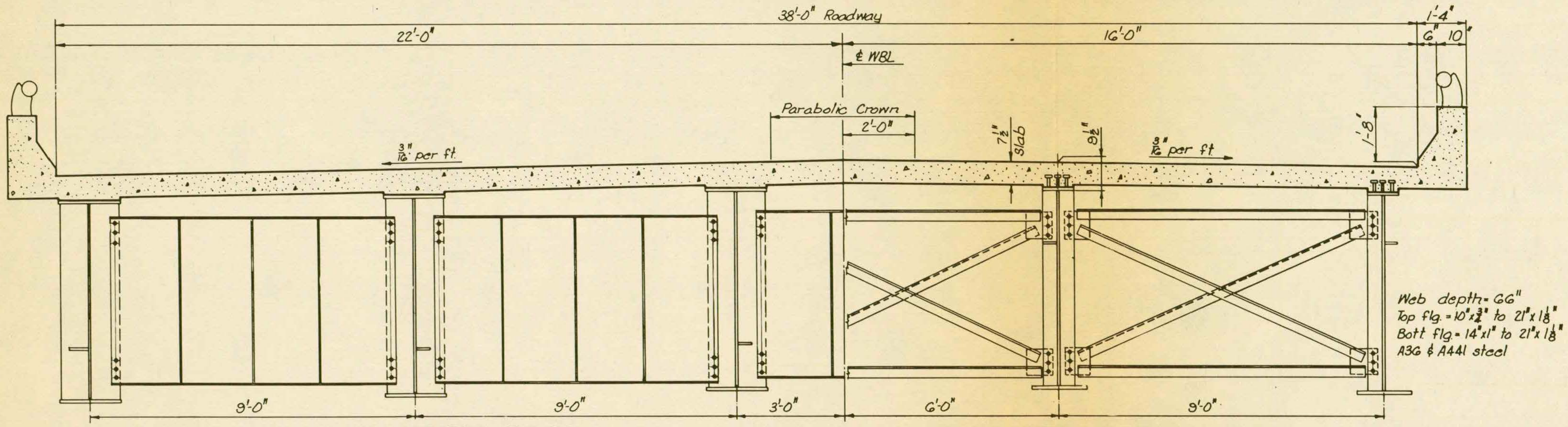
SCALE IN FEET



FRAMING PLAN

NEBRASKA APPROACH SPANS - TRUSS OR GIRDER LAYOUT

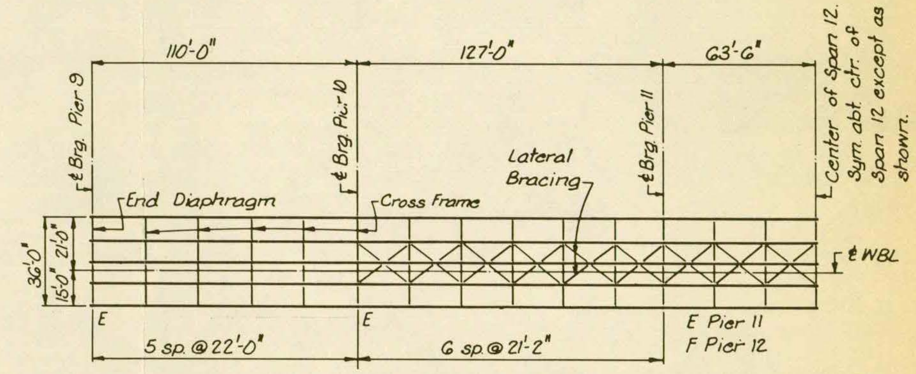
SCALE IN FEET



HALF SECTION AT PIERS

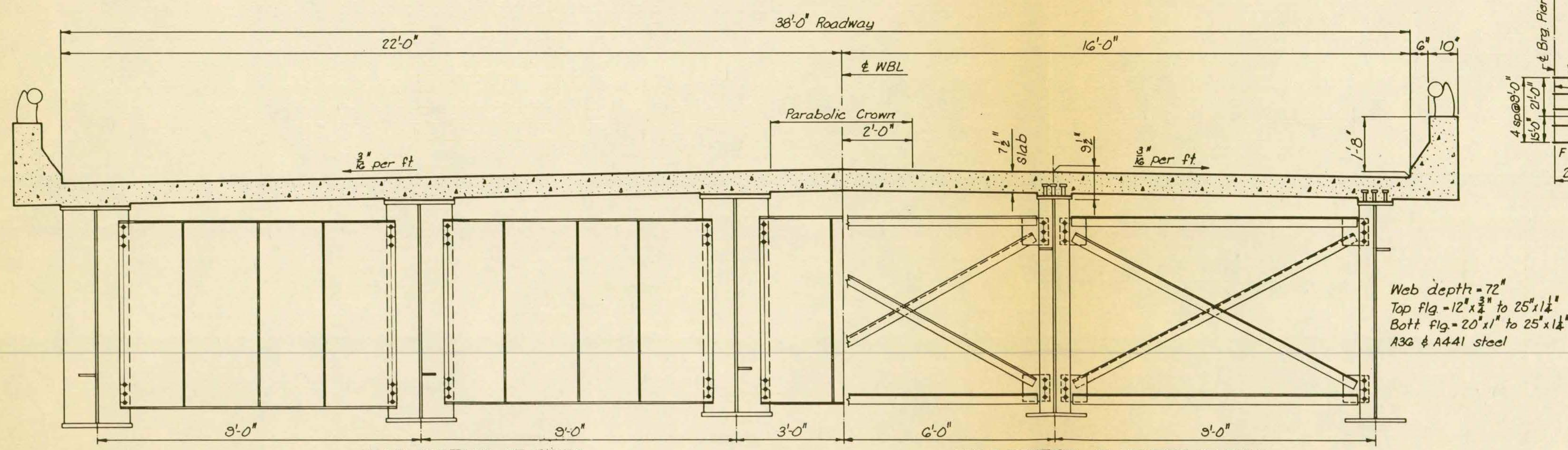
HALF SECTION AT CENTER OF SPAN

IOWA APPROACH SPANS — TRUSS LAYOUT



FRAMING PLAN

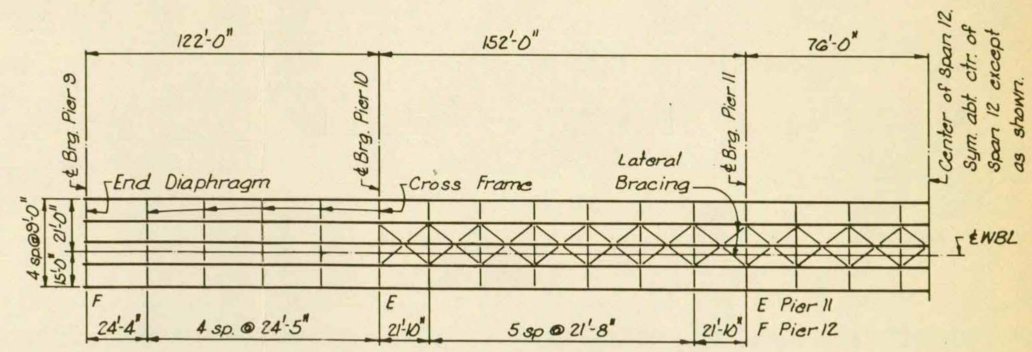
IOWA APPROACH SPANS - TRUSS LAYOUT



HALF SECTION AT PIERS

HALF SECTION AT CENTER OF SPAN

IOWA APPROACH SPANS — GIRDER LAYOUT



FRAMING PLAN

IOWA APPROACH SPANS - GIRDER LAYOUT

SCALE IN FEET

NEBRASKA DEPARTMENT OF ROADS
AND
IOWA STATE HIGHWAY COMMISSION

INTERSTATE ROUTE 680 BRIDGE
OVER
MISSOURI RIVER - OMAHA, NEB.
DOUGLAS COUNTY, NEB. - POTTAWATTAMIE COUNTY, IOWA

APPROACH SPANS
NEBRASKA - IOWA

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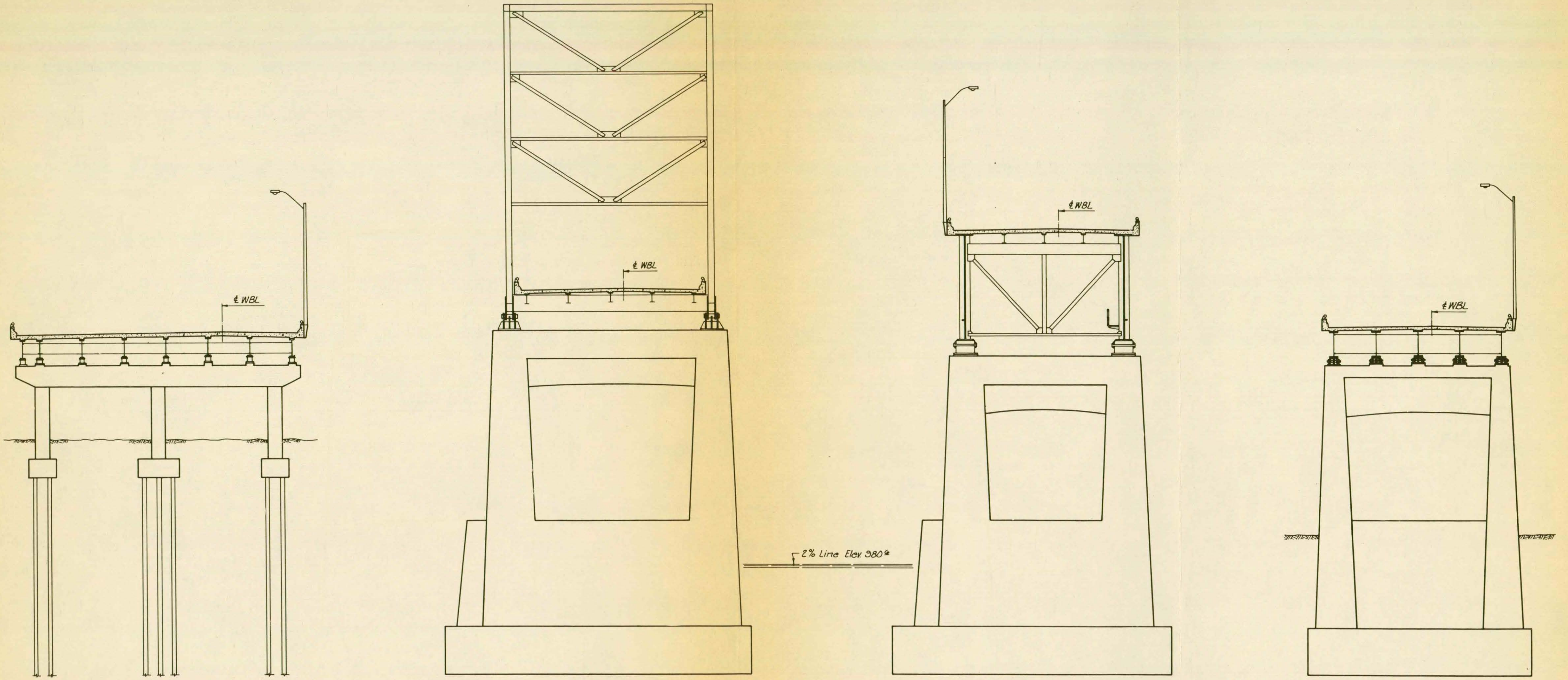

NEBRASKA APPROACH SPANS

Pier for truss layout shown; piers for girder layout are similar.

MAIN SPANS
TRUSS LAYOUT

0 10 20 30
SCALE IN FEET

MAIN SPANS
GIRDER LAYOUT

IOWA APPROACH SPANS

Pier for truss layout shown; piers for girder layout are similar.

NEBRASKA DEPARTMENT OF ROADS
AND
IOWA STATE HIGHWAY COMMISSION

INTERSTATE ROUTE 680 BRIDGE
OVER
MISSOURI RIVER - OMAHA, NEB.
DOUGLAS COUNTY, NEB. - POTTAWATTAMIE COUNTY, IOWA

TYPICAL PIERS

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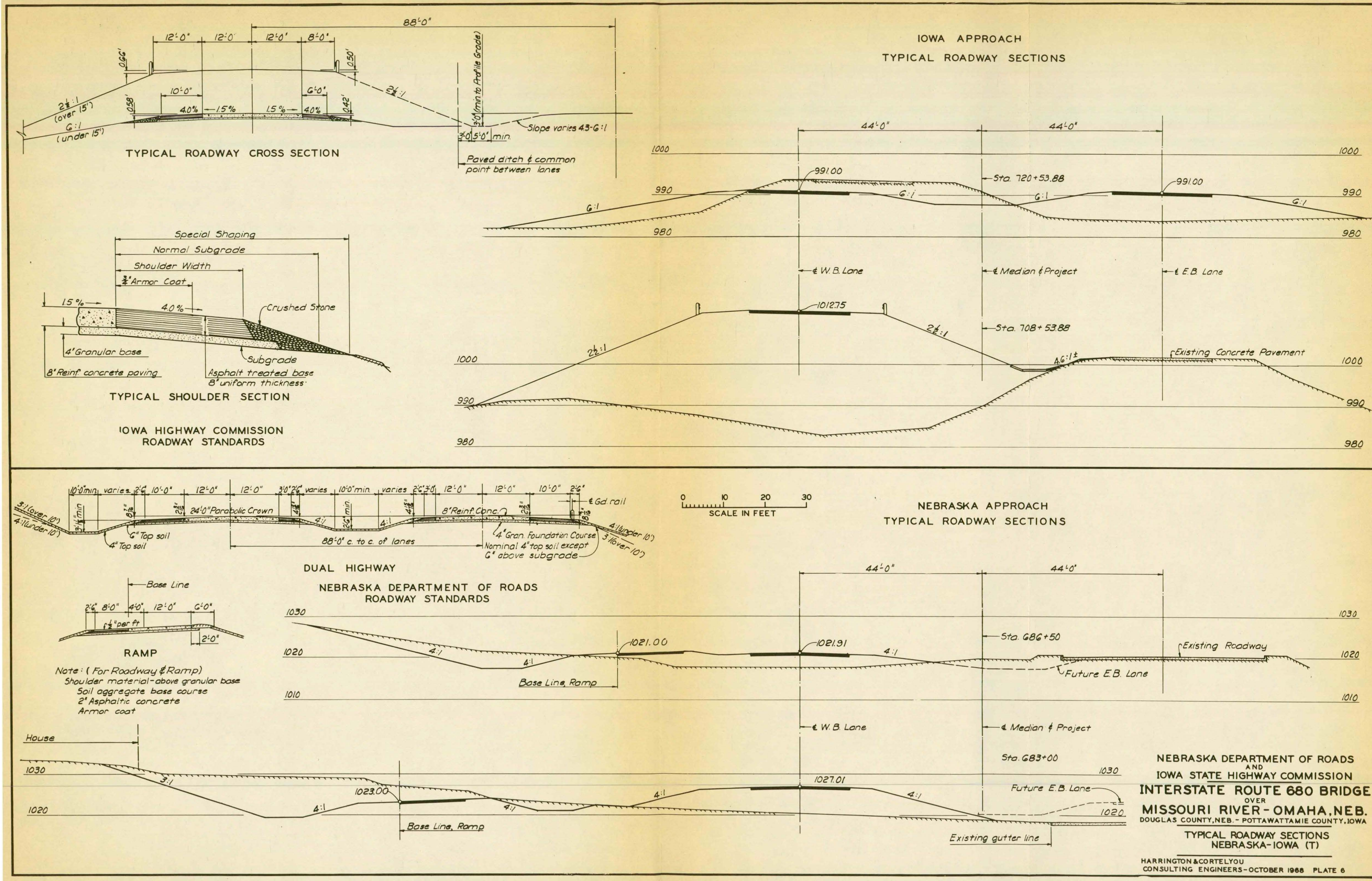


NEBRASKA DEPARTMENT OF ROADS
AND
IOWA STATE HIGHWAY COMMISSION

INTERSTATE ROUTE 680 BRIDGE
OVER
MISSOURI RIVER - OMAHA, NEB.
DOUGLAS COUNTY, NEB. - POTTAWATTAMIE COUNTY, IOWA

TYPICAL ROADWAY SECTIONS
NEBRASKA-IOWA (T)

HARRINGTON & CORTELYOU
CONSULTING ENGINEERS - OCTOBER 1968 PLATE 6

APPENDIX I

OUTLINE OF DESIGN CRITERIA

MISSOURI RIVER BRIDGE

NORTH OMAHA, NEBRASKA

INTERSTATE ROUTE 680

BY STATES OF NEBRASKA AND IOWA

OUTLINE OF DESIGN CRITERIA FOR PRELIMINARY STUDY

A. GENERAL.

1. Purpose of Study. The preliminary study is for the purpose of developing economical layouts and comparative detailed cost estimates for two types of bridge structures to establish the recommended type for final design. One type is to include a three span truss type superstructure unit essentially duplicating the Mormon Bridge layout, and the other type is to have plate girder spans in place of the truss spans.

2. Purpose of Outline. The purpose of this outline is to establish data and criteria on which the study is to be based.

3. Scope of Study. For the purpose of developing comparative cost estimates to establish the most economical type of structure, the same length of project will be used for each type. Since the girder layout will require the highest grade line to cross the navigation channel, the end limits for this study will be where the girder layout grade intersects the controlling approach grades established by each State. Estimates will include cost of roadway as well as bridge items within the common limits of study.

4. Report. Results of the studies will be published in a Definite Project Report, including permit application drawings for the Corps of Engineers, as covered in the Agreement.

B. LAYOUT.

1. Alignment. Centerline of proposed bridge is to be on a tangent line located 88' upstream and parallel to centerline of Mormon Bridge. Beyond ends of bridge, alignment of approaches to end of project study is to fit or be transitioned into centerline of West Bound Lane as established by each State. This study will not include any investigations or studies of approach geometrics or grades other than to make ties as above, but if this

study reveals the desirability of revising any geometric approach layouts of the States, same will be reported to them.

2. Bridge Layout. Preliminary discussion at the Omaha District Office, Corps of Engineers, established that new piers flanking the channel opening, and the east end pier of the 3 span unit crossing the channel, can be on the extended centerlines of Mormon Bridge Piers 7, 8 and 9 respectively. (Also see Item C, CLEARANCES). Unless there are appreciable savings to do otherwise, it is considered desirable to locate the balance of the new piers in the river as nearly as possible on the extended centerlines of the Mormon Bridge piers. The East Abutment (Iowa side) will be located so that fill height at the abutment does not exceed the maximum established by the Iowa design of their approach embankment.

C. CLEARANCES FOR NAVIGATION.

1. General. Clearance requirements pertaining to the river crossing are given in letter of 7 January 1966 to the Iowa State Highway Commission from Mr. Otto, Omaha District Office, Corps of Engineers (copy included as Appendix A). Discussion with Mr. Edwards, Assistant Chief of Operations Division, Omaha District Office, on January 11, 1966, resulted in interpretation of above clearance requirements as outlined below.

2. Vertical. Minimum of 52 feet above the 2% line within a stabilized channel width of 700 feet extending easterly from the channel face of Mormon Bridge Pier 7, except that a new pier opposite Mormon Bridge Pier 9 and eastward thereof the clearance need not exceed that presently provided by the Mormon Bridge; and except for an allowable infringement at the face of each channel pier.

3. Horizontal. Minimum of 400 feet face to face of main channel piers which will be on extended centerlines of Mormon Bridge Piers 7 and 8.

4. Water Elevations. As furnished by Corps of Engineers letter above, 2% Line = Elev. 980.6, Standard High Water = Elev. 982.0, and Standard Low Water = 972.0, all Mean Sea Level Datum.

D. CLEARANCES FOR STREETS UNDER BRIDGE.

1. Vertical. Minimum of 14.5 feet over roadway width between gutter lines. (This includes a 6 inch allowance for resurfacing).

2. Horizontal. Minimum of 6 feet from gutter line to face of pier or abutment. Where there is an existing sidewalk,

face of substructure unit will be no closer to roadway than back edge of sidewalk.

E. GEOMETRIC STANDARDS.

1. "A Policy on Geometric Design of Rural Highways" by the A.A.S.H.O. 1965.

2. "A Policy on Arterial Highways in Urban Areas" by the A.A.S.H.O. 1957.

3. "Geometric Design Standards for the National System of Interstate and Defense Highways," revised and adopted by the A.A.S.H.O., July 12, 1956, and as further revised on April 12, 1963, October 24, 1963, May 15, 1965, and October 15, 1966.

4. Grades. Grades shall not exceed 3% maximum on bridge and approaches thereto. P.V.I. for vertical curve on bridge will be at centerline of main channel (400' opening) to make the main 3 span superstructure unit symmetrical - unless there is a compelling reason to shift P.V.I. for better tie to approach grades established by the States.

5. Design Speed. The basic design speed for west bound lane is 60 M.P.H. for Nebraska approach and on bridge, 70 M.P.H. in Iowa.

F. SPECIFICATIONS.

1. AASHO Standard Specifications for Highway Bridges, 1965 Edition, is the basis for design of the structures covered by this report. (Some criteria Items herein are an interpretation as to use of Specification requirements). The Standard Specifications and approved interim Specifications, current when final design is started, will be used as directed.

2. The current construction specifications of Nebraska will be used where applicable for such things as bid items for the cost estimates, method of measuring quantities, standard types of roadway construction and appurtenances therefor, etc.

G. LOADING.

1. HS20-44 with alternate military loading.

2. 20 p.s.f. future wearing surface.

3. Provision will be made for 1/2" monolithic wearing surface.

H. SUPERSTRUCTURE.

1. Roadway Cross Section (a through c are from Nebraska letter of November 20, 1967, and modified by October 7, 1968, letter for the curb and parapet cross section). (Drawing No. B68-a dated March, 1968).

(a) 38'-0" width, face to face of curbs.

(b) Combined parapet and curb section (New Jersey type), 1'-8" over-all height with 10" parapet width.

(c) Aluminum railing on parapet, single tube, 9" minimum height.

(d) Cross-slopes at 3/16" per foot downward from C/L of roadway with 4' parabolic rounding at center.

(e) 4"x1'-6" tube drains on gutter line, extending slightly below bottom of slab for trusses at 30 ft. spacing. For girder, use 100 ft. spacing with grating and catch basin downspout extended below bottom of flange. Omit over streets and sidewalks.

2. Deck Slab.

(a) Concrete: $f'_c = 3{,}500$ p.s.i.

$n = 10$

(b) Reinf. Steel: Intermediate or hard grade, shall meet requirements of intermediate grade for bends. $f_s = 20{,}000$ p.s.i.

(c) Minimum thickness of slab 7-1/2". 2" clearance to top steel. 1" clearance to bottom steel.

(d) Transverse slab reinforcing will be alternate straight and crankshaft bars. Distribution steel will be on top of bottom bars and below top bars.

(e) Transverse dead load distribution. Assume simple spans between girders and apply all slab, curb, parapet, rail, & F.W.S. outside of exterior girder directly to the exterior girder with no uplift on interior girder. This applies to both composite and non-composite construction, and for longitudinal beams, stringers or girders.

(f) Truck wheel will be 1' from curb for slab design and 2' from curb for design of supporting members.

(g) Concrete haunches at least 1/2" high shall be used on top of plate girders based on maximum thickness of flange plates to care for deviations in camber and fabrication. For rolled beam spans and truss span stringers, 1/4" minimum concrete haunch shall be used above top flange.

3. Plate Girder and Rolled Beam Spans.

(a) Material: For this report, girders will be designed for ASTM A-441 steel where economical. Balance of material will be ASTM A-36 steel. Final design may employ other currently approved alloy steels where economical and as may be directed.

(b) Composite Construction: Composite construction will not be used for spans over 200' or for girders with floor beam and stringer cross section. Composite construction will be used for other girder and beam spans. Composite action will be used only in the positive moment area. Stud type shear connectors will be specified.

(c) Fabrication: All girders shall be shop welded and field bolted with high strength bolts.

(d) Stiffeners:

(1) Bearing stiffeners shall be plates in pairs welded with full penetration welds to compression flange and ground to bear on tension flange.

(2) Intermediate stiffeners will be placed only on inside of exterior girders and may be on one side or staggered on interior girders.

(3) Longitudinal stiffeners shall be single plates welded to the outside face of the web.

(e) Web.

(1) Minimum thickness of web will be 5/16" for floorbeams, 3/8" minimum for any longitudinal girders.

(2) Haunches to increase the depth of girders over the piers when required will be parabolic and extend to approximately the 0.25 pt. of interior spans. Haunches shall be symm. about C/L of pier.

(f) Flanges:

A min. flange width of 0.15 D with a min. flange size of 10"x3/4" will be used. Top flange shall be not less than 40% of the bottom flange. Preferred width to thickness ratio shall be 18 or less.

(g) Continuity:

All plate girder or beam span units will be continuous.

4. Truss Spans.

(a) Material. For this report, truss members will be designed for ASTM-A441 steel where economical. Balance of material will be ASTM A-36 steel. Final design may employ other currently approved alloy steels where economical and as may be directed.

(b) A cantilever type truss arrangement similar to the Mormon Bridge will be used.

(c) Shop fabrication will be with welding and field erection with high strength bolts. Chord diaphrams, flared ends of bracing and some details of secondary members may be shop welded.

(d) Perforated plates for truss members will be used.

(e) Minimum vertical clearance from crown of roadway to low steel of portals and sway frames will be 18.0 feet.

(f) The truss members will be outside of the parapets so that minimum horizontal clearance to the truss will be 17'-7" from C/L of roadway on left side.

5. Service Access:

(a) Ladders on each outside face of the structure will be provided for access to the pier top navigation lights.

(b) For access to the mid-channel navigation lights on the girder span, a ladder will be provided outside each face of the deck extending to a platform at bottom flange level. For the truss span, similar ladders will extend to a platform on top of the bottom chords. Access walkways will be provided between each pair of girders of the main river spans.

6. Jacking: No special provisions will be made for jacking except at Iowa Abutment.

7. Deflection and camber.

(a) Girders and trusses shall be cambered to compensate for dead load deflections and vertical curvature.

(b) Max. allow. LL+I defl. = 1/1000.

8. <u>Shoes</u>: Galvanized welded steel rockers and fixed shoes will be used.

9. <u>Expansion hinges in girders</u>. Link type or rocker type hinges will be provided off of piers - if practical.

10. <u>Lighting</u>:

(a) Lighting will be provided for entire project.

(b) Navigation lighting will be provided in accordance with U. S. Coast Guard regulations.

11. <u>Utilities and Signing</u>: No provisions will be made for utilities or signing.

12. <u>Fatigue</u>:

(a) Allowable fatigue stresses will not be applied in designing for DL+ wind load.

(b) No attachments will be welded to the flanges of beams or girders except stud shear connectors.

(c) Cover plates on beams will not be used. Welded girders or heavier beams will be used instead of beams with cover plates.

(d) For any point investigated in a continuous span, determine whether truck or lane loading produces the maximum moment, regardless of sign, and use same type of loading to find the minimum moment. DO NOT use lane loading (100,000 cycles) for moment of one sign and truck loading (500,000 cycles) for moment of the other sign.

(e) Shop web splices for plates of equal thickness shall meet all the requirements for "Base Metal" fatigue stresses.

(f) The field splices and ends of composite sections will be located at approximately the points of zero dead load moment.

(g) To clarify Table 1.7.3A, use 500,000 cycles when maximum moment is determined by a truck and 100,000 cycles when the maximum moment is determined by lane loading.

I. SUBSTRUCTURE.

1. General Design.

(a) Concrete:- f'_c = 3,500 p.s.i.,

n = 10

(b) Reinf. Steel: Intermediate or hard grade, shall meet requirement of intermediate grade for bends. f_s = 20,000 p.s.i.

(c) Piles: For pile footings, steel bearing piles will be used with an allowable design load for point bearing based on 12,000 p.s.i. stress except use 9,000 p.s.i. for piles in Iowa abutment. No "drag load" will be used for point bearing piles.

2. Piers.

(a) In general, piers will be the same type as were used for the Mormon Bridge. For the first pier on the Nebraska bank (west end pier of 3 span unit over main channel, opposite Mormon Bridge Pier 6) and all piers eastward thereof, piers will be a two-column type on a common base with solid web above base to Elev. 990 and with the columns tied by a cap beam. Other piers on the Nebraska side will be two column piers on separate footings with columns connected by a cap beam. Depending upon the location of the Iowa abutment, the latter type possibly may be used near the east end of the bridge.

(b) Foundation conditions will be assumed to be the same as those of the Mormon Bridge. Four piers will be founded on rock. These will be the two main channel piers and the next two adjacent piers on the Iowa side. The remaining piers will be founded on steel bearing piles.

(c) An ice load of 400 p.s.i. on the projected area for a 12" thickness of ice will be used. The point of application will be halfway between E.H.W. Elev. 989.0 and S.L.W. Elev. 972.0 = Elev. 980.5.

(d) For rock footings the maximum allowable footing pressure will be 15,000 p.s.f. without buoyancy. There shall be no uplift with full buoyancy for a water elevation of 980.5.

(e) Pile footings below Elev. 980.5 will be designed for buoyancy to that elevation. No uplift will be allowed on piles.

(f) Reinforcing steel in pile footings will be located above the top of the piles.

3. Abutments.

(a) Nebraska abutment will be stub or closed pedestal type on steel bearing piles. Factors influencing choice will include abutment location to best suit span arrangement, widening effect of bridge roadway due to Ramp R1, and difference in grade elevations for East Bound and West Bound lanes.

(b) The Iowa abutment type will depend upon the distance it is located from the river as determined by Iowa soils and embankment studies. The east abutment of the Mormon Bridge is a two-pedestal type on pile footings with base Elev. 970.0 which was about 14 feet below natural ground surface at time of construction. If the new abutment is at the same general location where it can be subjected to high water flow of appreciable depth, a pedestal type abutment should be considered. If the abutment is located well to the east of the Mormon Abutment, a stub type could be used with possibly an upstream protective dike.

(c) 5' minimum width of berm will be provided in front of open-type abutments.

(d) End slope of 1 vertical on 2 horizontal will be used for the Nebraska abutment. End slope for Iowa abutment will depend on results of Iowa soils study.

(e) Type of wings-Nebraska standards.

Use same wings for Iowa and Nebraska abutments.

J. APPROACHES.

1. For estimating quantities and costs of the bridge approaches within the project study limits herein defined, construction standards set up by each State will be used for items such as paving, shoulder treatment or surfacing, guardrail, etc., and the normal unit prices for estimating used by the States will be applied to such construction items.

NOTE: Conference on April 19, 1967, established the foregoing criteria. (Revisions - Nebraska Department of Roads letters November 20, 1967, and September 27, 1968).

APPENDIX II

ALTERNATE GIRDER LAYOUT

COMPARISON-ROADWAY WIDTHS

APPENDIX II

ESTIMATE

2 GIRDER LAYOUT

NEBRASKA ROADWAY

Paving (8" Reinf.)	2570	Sq.Yds.	@	$ 7.00	$17,990.
Armor Coat Aggregate	27	Tons	@	12.00	325.
Asphaltic Concrete	148	Tons	@	15.00	2,220.
Asphalt Treated Base (Shoulders)	590	Tons	@	7.00	4,130.
Granular Base	930	Tons	@	4.50	4,185.
Asphalt Applications	1300	Gals.	@	0.20	260.
Guard Rail	300	Lin.Ft.	@	5.00	1,500.
Embankment	12600	Cu.Yds.	@	1.10	13,860.
Top Soil	950	Cu.Yds.	@	3.00	2,850.
Lighting	Lump Sum				5,000.

Total Nebraska Approach - - - - - - - - - - - - $52,320.

NEBRASKA APPROACH STRUCTURE

Substructure

Concrete	505	Cu.Yds.	@	$75.00	$37,875.
Reinforcing Steel	83000	Lbs.	@	.15	12,450.
Excavation	540	Cu.Yds.	@	8.00	4,320.
Steel Piles (10BP42)	5715	Lin.Ft.	@	7.00	40,005.

Total Substructure - - - - - - - - - - - - - $94,650.

(Cont. Nebr. App. Struct.)(Girders)

SUPERSTRUCTURE

Concrete Deck	700	Cu.Yds.	@	$90.00	$63,000.
Reinforcing Steel	168000	Lbs.	@	.15	25,200.
Fabricated Structural Steel	570000	Lbs.	@	0.255	145,350.
Drains (C.I. Catch Basin Type)	10	Each	@	500.00	5,000.
Railing (one tube H.S. Alum.)	975	Lin.Ft.	@	7.00	6,825.
Lighting (Bridge Roadway)	Lump Sum				4,000.

Total Superstructure - - - - - - - - - - - $249,375.

MAIN RIVER SPANS - 2 GIRDERS

Substructure

Concrete in Bases	1615	Cu.Yds.	@	$70.00	$113,050.
Concrete in Shafts	2450	Cu.Yds.	@	80.00	196,000.
Reinforcing Steel	75000	Lbs.	@	.15	11,250.
Excavation	4130	Cu.Yds.	@	15.00	61,950.
Steel Piles (10BP42)	2360	Lin.Ft.	@	9.00	21,240.
Cofferdams for Piers 6-7-8-9	Lump Sum				165,000.

Total Substructure - - - - - - - - - - - - $568,490.

Superstructure

Concrete Deck	1150	Cu.Yds.	@	$90.00	$103,500.
Reinforcing Steel	276000	Lbs.	@	.15	41,400.
Fabricated Structural Steel	2823000	Lbs.	@	0.33	931,590.
Drains (Cast Iron-Catch Basin Type)	22	Each	@	500.00	11,000.
Railing (one tube H.S. Alum.)	1900	Lin.Ft.	@	7.00	13,300.
Lighting Bridge Roadway	Lump Sum				6,000.
Navigation Lighting	Lump Sum				5,000.

Total Superstructure - - - - - - - - - - - $1,111,790.

APPENDIX II (Continued)

IOWA APPROACH STRUCTURE (Cont.Girders)

Substructure

Concrete	2020	Cu.Yds.	@ $75.00	$151,500.	
Reinforcing Steel	55000	Lbs.	@ 0.15	8,250.	
Excavation	3230	Cu.Yds.	@ 8.00	25,840.	
Steel Piles (10BP42)	660	Lin.Ft.	@ 7.00	4,620.	
Cofferdams for Piers 10-11-12-13	Lump Sum			85,000.	
Total Substructure - - - - - - - - - - - -					$275,210.

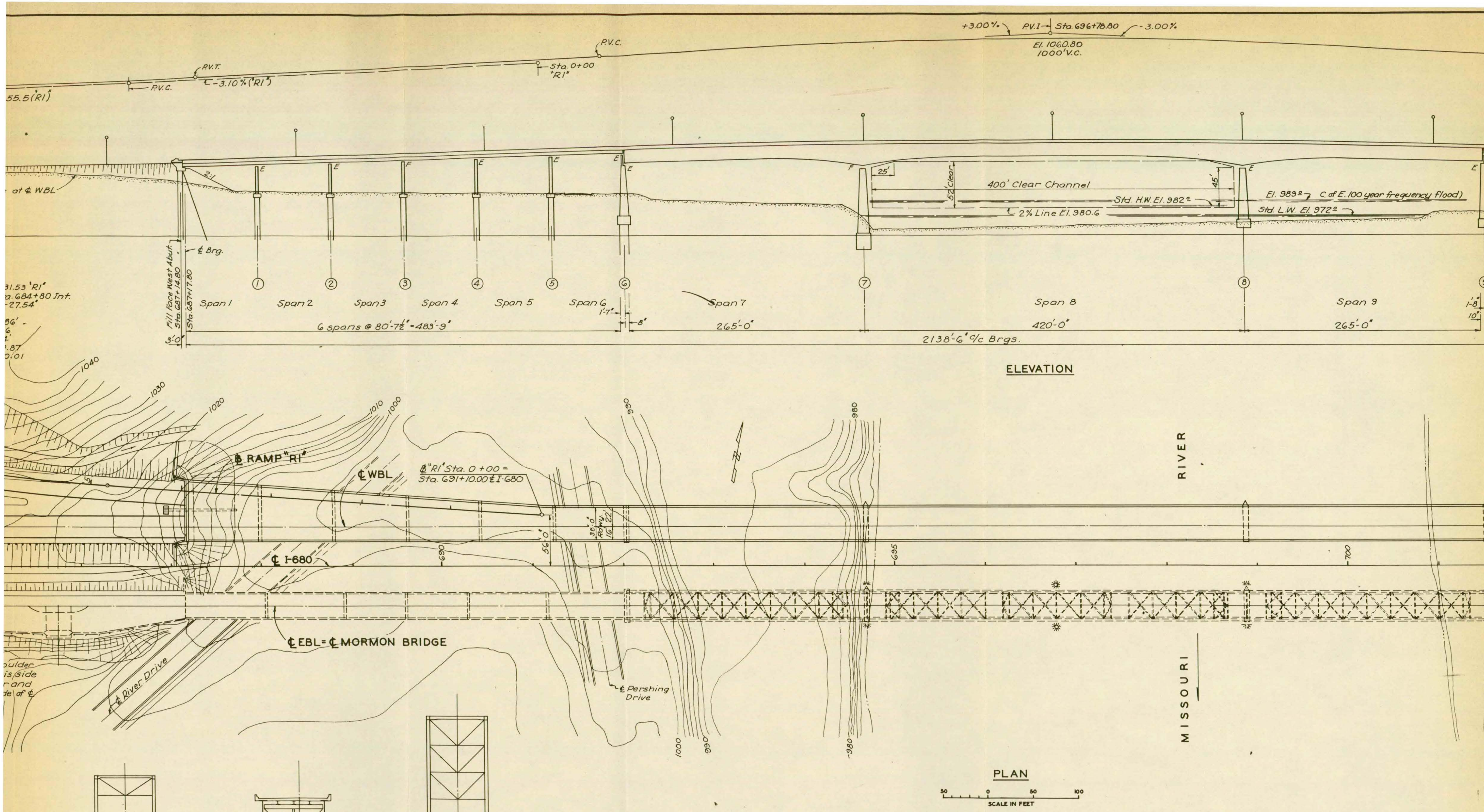
Superstructure

Concrete Deck	830	Cu.Yds.	@ $90.00	$ 74,700.	
Reinforcing Steel	198000	Lbs.	@ .15	29,700.	
Fabricated Structural Steel	935000	Lbs.	@ 0.255	238,425.	
Drains (Cast Iron-Catch Basin Type)	14	Each	@ 500.00	7,000.	
Railing (One tube H. S. Alum.)	1415	Lin.Ft.	@ 7.00	9,905.	
Lighting (Bridge Raodway)	Lump Sum			4,000.	
Total Superstructure - - - - - - - - - - -					$363,730.

IOWA ROADWAY

Paving (8" Reinforced)	3990	Sq.Yds.	@ $ 7.00	$27,930.	
Armor Coat Aggregate	27	Tons	@ 12.00	324.	
Asphalt Treated Base	1425	Tons	@ 7.00	9,975.	
Granular Sub Base	1618	Tons	@ 4.50	7,281.	
Crushed Stone (Shoulders)	250	Tons	@ 4.00	1,000.	
Asphalt Applications	1675	Gals.	@ 0.20	335.	
Guard Rail (Includes Posts at 6.25')	2240	Lin.Ft.	@ 5.00	11,200.	
Guard Rail Anchor Sections	2	Each	@ 150.00	300.	
Right of Way Fence	1600	Lin.Ft.	@ 0.50	800.	
Compacted Embankment	95000	Cu.Yds.	@ 1.10	104,500.	
Bin Type Retaining Wall 16' to 19'(Asbestos bonded)	1240	Sq.Yds.	@ 70.00	86,800.	
(Asbestos bonded) 4' to 16'	325	Sq.Yds.	@ 55.00	17,875.	
Flume (1/2 Round 24" Conc. Pipe & Risers)	900	Lin.Ft.	@ 6.00	5,400.	
8" Perforated Metal Pipe	900	Lin.Ft.	@ 3.00	2,700.	
Compacted Backfill	7500	Cu.Yds.	@ 1.50	11,250.	
Total Iowa Roadway - - - - - - - - - - - -					$287,670

Total Project - $3,003,235.

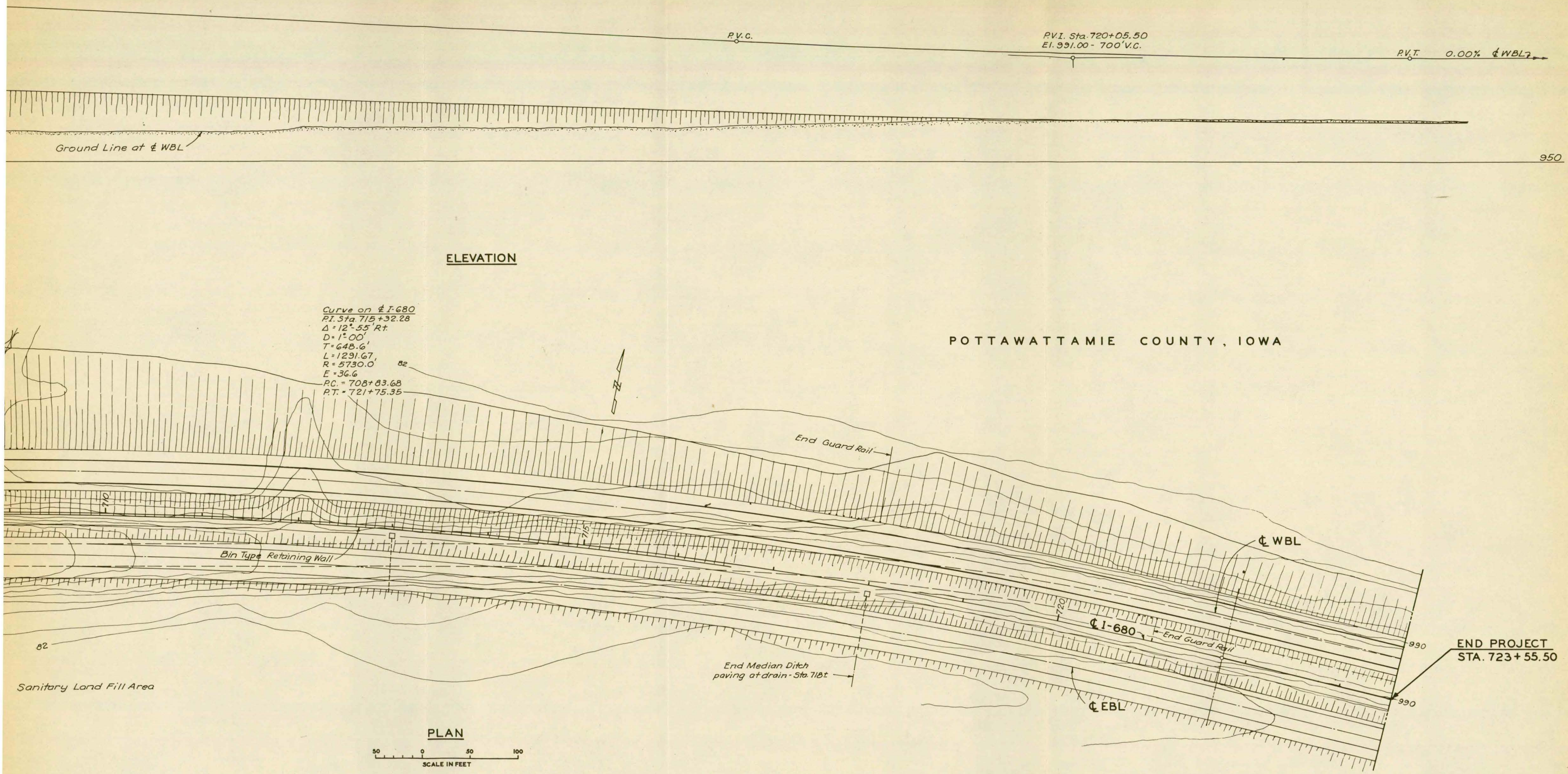


NEBRASKA DEPARTMENT OF ROADS
AND
IOWA STATE HIGHWAY COMMISSION

INTERSTATE ROUTE 680 BRIDGE
OVER
MISSOURI RIVER - OMAHA, NEB.
DOUGLAS COUNTY, NEB. - POTTAWATTAMIE COUNTY, IOWA

GENERAL PLAN & ELEVATION
GIRDERS

HARRINGTON & CORTELYOU
CONSULTING ENGINEERS - OCTOBER 1968 PLATE 7A



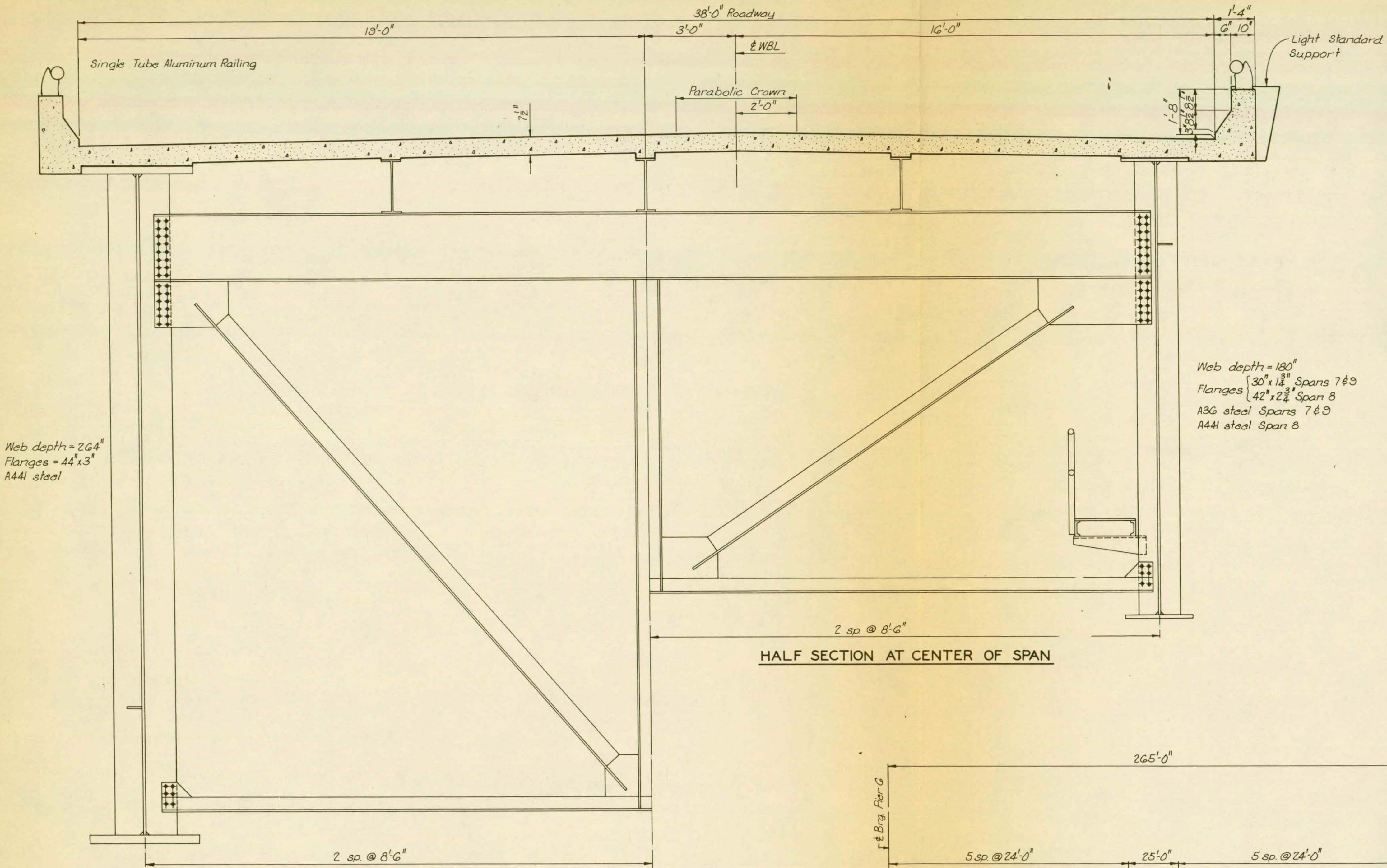
NEBRASKA DEPARTMENT OF ROADS
AND
IOWA STATE HIGHWAY COMMISSION

INTERSTATE ROUTE 680 BRIDGE
OVER
MISSOURI RIVER - OMAHA, NEB.

DOUGLAS COUNTY, NEB. - POTTAWATTAMIE COUNTY, IOWA

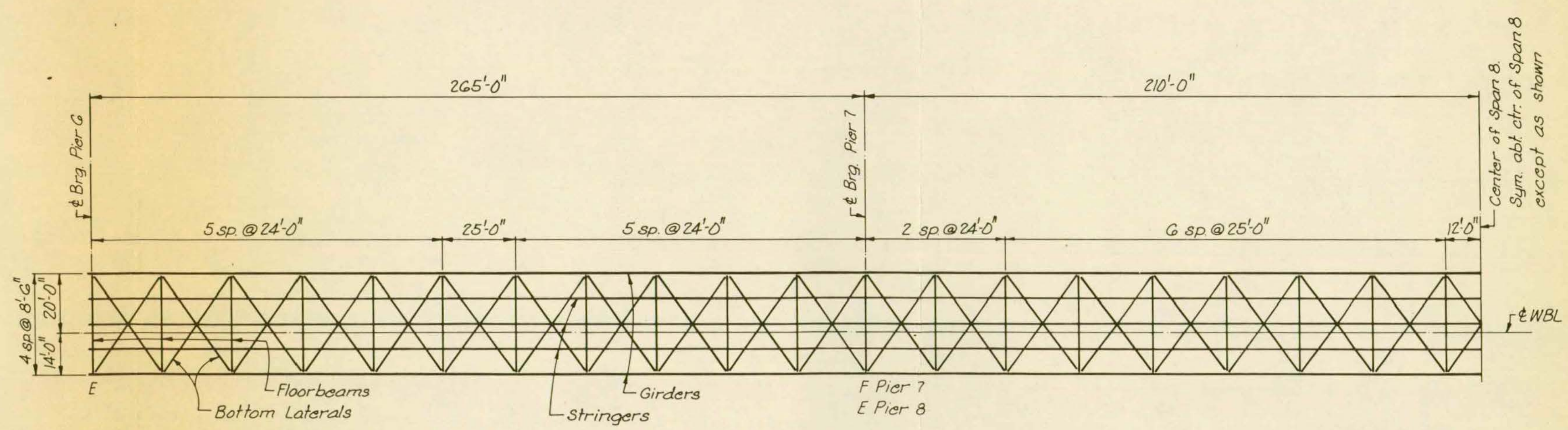
GENERAL PLAN & ELEVATION
GIRDERS

HARRINGTON & CORTELYOU
CONSULTING ENGINEERS - OCTOBER 1968 PLATE 7B



HALF SECTION AT CENTER OF SPAN

HALF SECTION AT PIERS



FRAMING PLAN

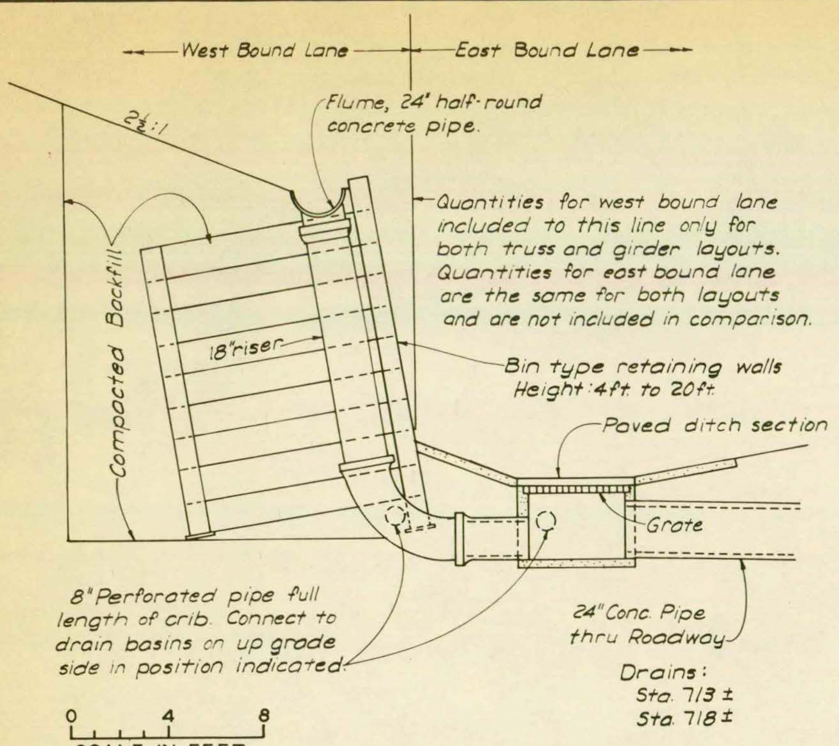
30 0 30
SCALE IN FEET

NEBRASKA DEPARTMENT OF ROADS
AND
IOWA STATE HIGHWAY COMMISSION

INTERSTATE ROUTE 680 BRIDGE
OVER
MISSOURI RIVER - OMAHA, NEB.
DOUGLAS COUNTY, NEB. - POTTAWATTAMIE COUNTY, IOWA

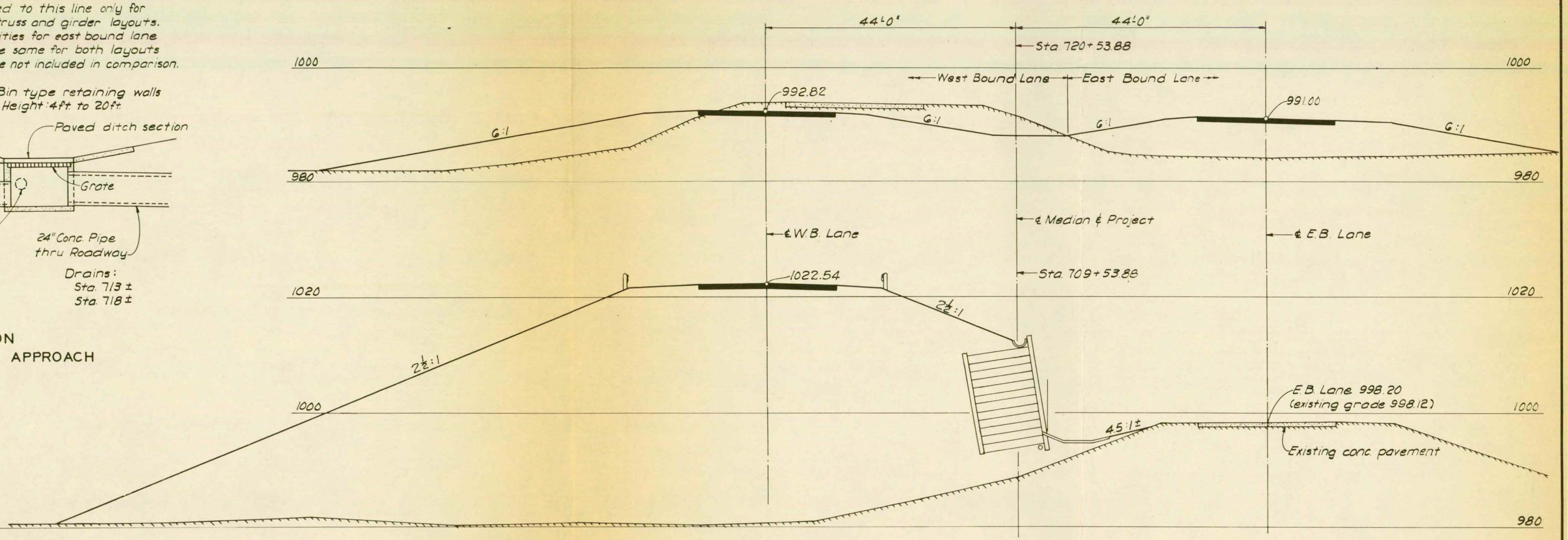
GIRDERS-RIVER SPANS

HARRINGTON & CORTELYOU
CONSULTING ENGINEERS - OCTOBER 1968 PLATE 8

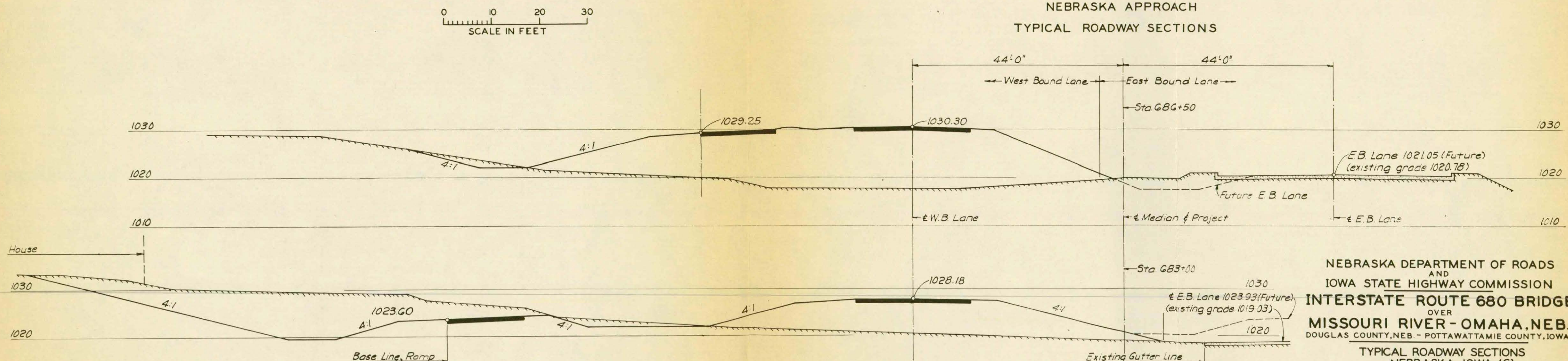


TYPICAL SECTION
PROPOSED DRAINS - IOWA APPROACH

IOWA APPROACH
TYPICAL ROADWAY SECTIONS



NEBRASKA APPROACH
TYPICAL ROADWAY SECTIONS



NEBRASKA DEPARTMENT OF ROADS
AND
IOWA STATE HIGHWAY COMMISSION
INTERSTATE ROUTE 680 BRIDGE
OVER
MISSOURI RIVER - OMAHA, NEB.
DOUGLAS COUNTY, NEB. - POTTAWATTAMIE COUNTY, IOWA
TYPICAL ROADWAY SECTIONS
NEBRASKA-IOWA (G)

HARRINGTON & CORTELYOU
CONSULTING ENGINEERS - OCTOBER 1968 PLATE 9

APPENDIX II (Continued)

Cost comparison of 2 girder and 4 girder superstructures for the three main spans. Drains, railing, and lighting are not included since they are the same for either cross section. Approach costs are affected by girder depth differences and are included in comparison.

2 Girder Superstructure with Floor System

Concrete	960	Cu.Yds.	@	$90.00	$86,400.
Reinforcing Steel	231000	Lbs.	@	.15	34,650.
Fabricated Structural Steel					
A441 - 1,779,000)					
A36 - 653,000)					
Shoes 40,000)					
	2472000	Lbs.	@	.33	815,760.
Estimated additional cost for increased approach quantities					31,000.

Total (2 Girders) - - - - - - - - - - - - - - - - $ 967,810.

4 Girder Superstructure

Concrete	955	Cu.Yds.	@	$90.00	$85,950.
Reinforcing Steel	230000	Lbs.	@	.15	34,500.
Fabricated Structural Steel					
A441-1,951,000)					
A36 -1,131,000)					
Shoes 40,000)	3122000	Lbs.	@	.33	1,030,260.

Total (4 Girders) - - - - - - - - - - - - - - - -$1,150,710.

Difference in favor of 2 Girder Superstructure = $ 182,900.

NOTE: Comparative girder estimates are based on roadway width of 30 feet. The comparisons are valid for 38 feet width.

Comparative Cost Estimate

Bin Type Wall (Sta. 707 to 715+75)

Armco bin-type Wall (Asbestos bonded)						
	20' high	1222	S.Y.	@	$73.00	$89,206
	16' "	167	S.Y.	@	65.00	10,855
	12' "	133	S.Y.	@	55.00	7,315
	6' "	93	S.Y.	@	55.00	5,115
Open concrete flume		875	L.F.	@	5.00	4,375
8" Perforated metal pipe (asbestos bonded)		875	L.F.	@	3.00	2,625
Formed Steel Beam rail & posts		900	L.F.	@	5.00	4,500
Compacted backfill		8000	C.Y.	@	1.50	12,000
Compacted Embankment		11190	C.Y.	@	1.10	12,309
(See Plate 9 for Bin Details)						$148,300

Comparative Cost Estimate

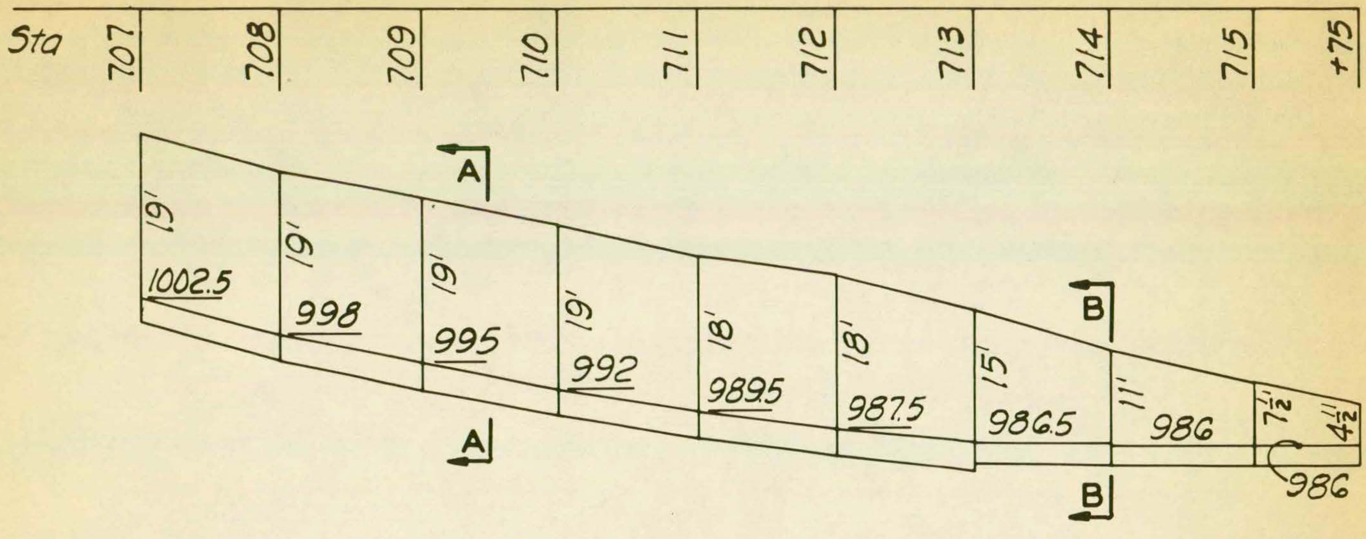
Concrete Wall in Foreslope (Sta. 707 to 715+75)

Class A Concrete	1410	C.Y.	@	$90.00	$126,900
Reinf. Steel	127000	Lbs.	@	.15	19,050
Piling	12500	L.F.	@	7.00	87,500
Open Concrete flume	875	L.F.	@	5.00	4,375
Formed Steel Beam rail & posts	900	L.F.	@	5.00	4,500
Compacted backfill	2300	C.Y.	@	1.50	3,450
Compacted embankment	15205	C.Y.	@	1.10	16,725
					$262,500

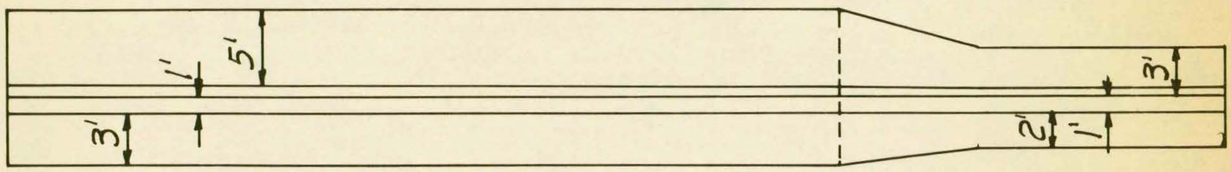
Comparative Cost Estimate

Concrete Wall @ Shoulder Line (Sta. 707 to 716)

Class A Concrete	2580	C.Y.	@	$90.00	$232,200
Reinf. Steel	232000	Lbs.	@	.15	34,800
Piling	19600	L.F.	@	7.00	137,200
Single tube aluminum rail	900	L.F.	@	7.00	6,300
Compacted embankment	(-3540)	C.Y.	@	1.10	(-3,894)
Compacted backfill	3529	C.Y.	@	1.50	5,294
					$411,900

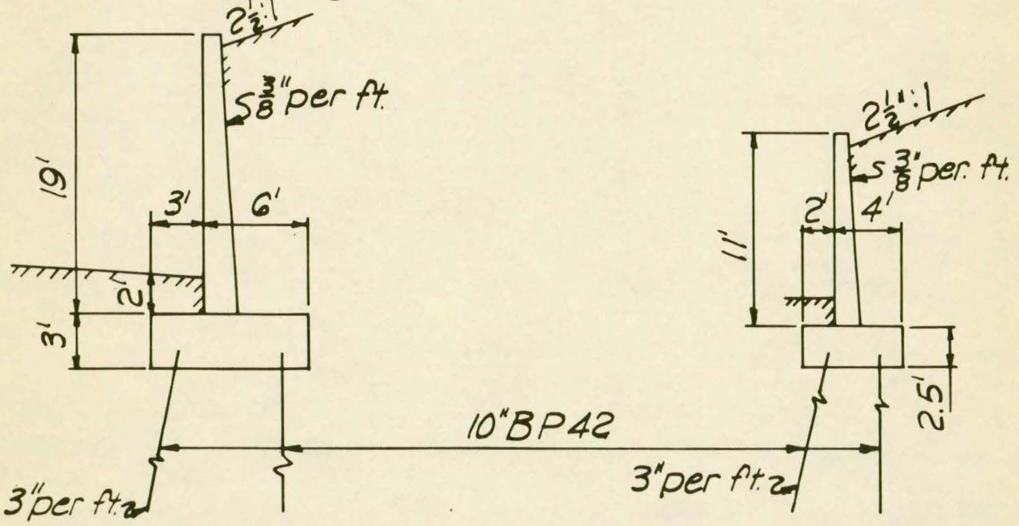


ELEVATION



PLAN

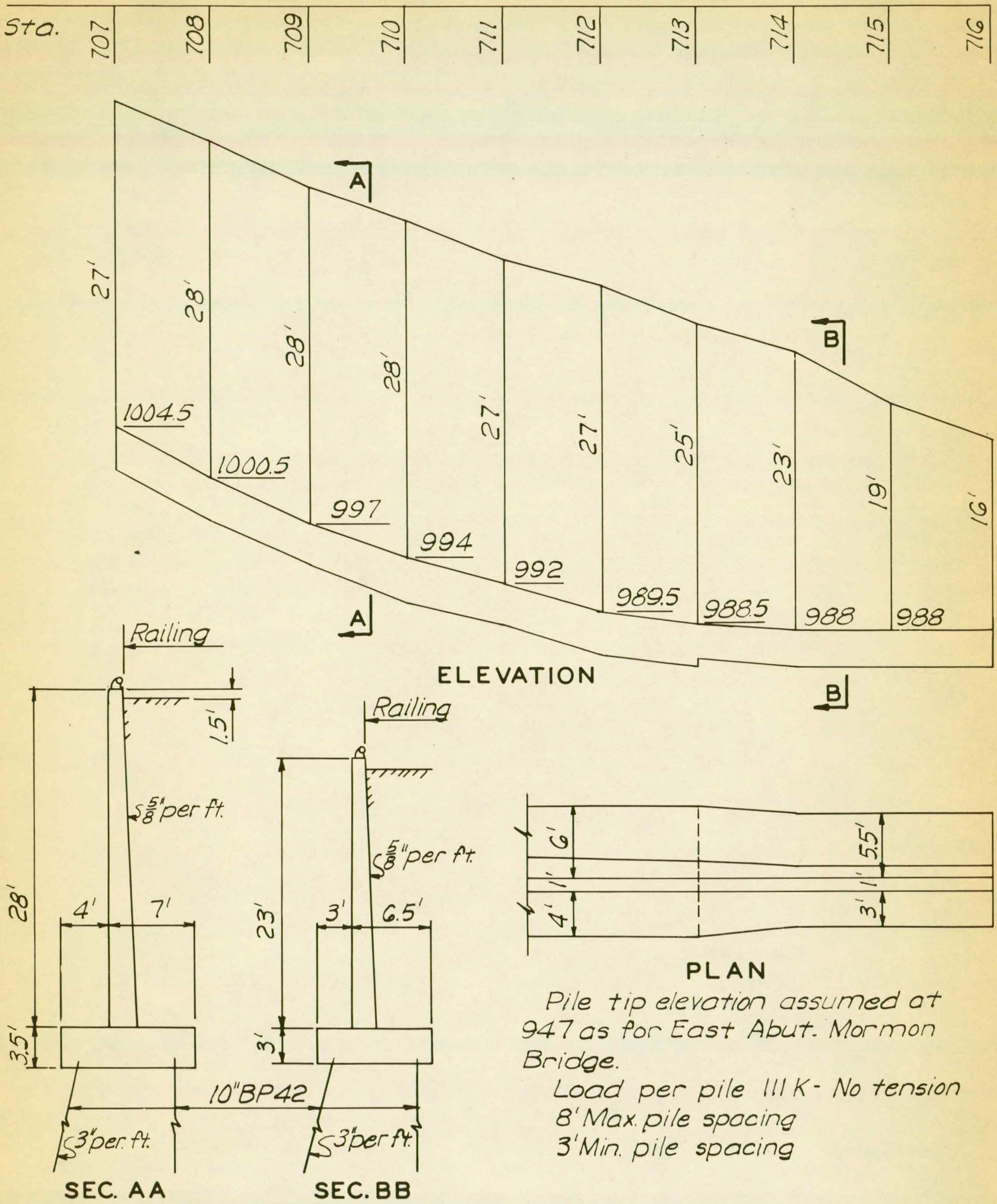
Pile tip elevation assumed at 947 as for East Abut. Mormon Bridge.
Load per pile 111 K- No tension.
8' Max. pile spacing. 3' Min. pile spacing.



SEC. AA

SEC. BB

RETAINING WALL IN FORESLOPE



RETAINING WALL AT SHOULDER

COMPARISON - ROADWAY WIDTHS

By letter dated November 20, 1967, from Nebraska Department of Highways, instructions were received to expand the Definite Project Report Study to provide a roadway width of 38 feet on the structure. The original authorization specified a roadway width of 30 feet. Work had been completed for preliminary submission of the report.

Redesign of the main river spans for added width increased depths of both truss and girder layouts. Revision of grades for underclearance requirements affected grades for both roadway and approach structural elements. Seven completed drawings were revised and reused as part of this report. Four drawings were unchanged and four new drawings were made.

Detailed estimates for the 30 ft. roadway width are not included in this report. A summary of unit totals is tabulated as a comparison with similar units of the 38 ft. roadway as information in the following table:

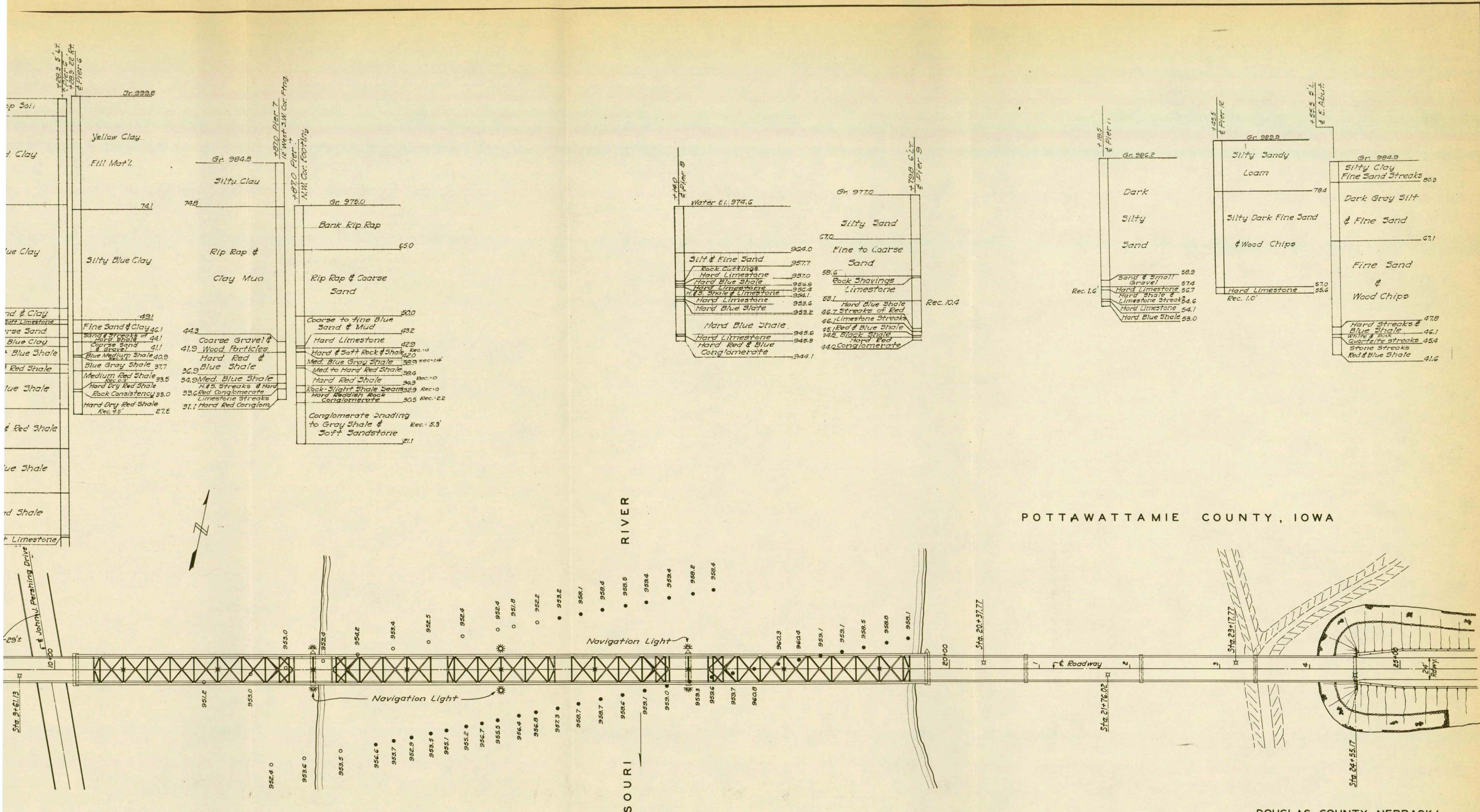
COMPARISON - ROADWAY WIDTHS

	30 FT. ROADWAY		38 FT. ROADWAY	
	Trusses	Girders	Trusses	Girders
NEBR. ROADWAY	$48,360.	$51,300.	$49,560.	$52,320.
NEBR. APPR.STRUCT.				
Substructure	71,030.	79,970.	83,795.	94,650.
Superstructure	215,790.	215,790.	249,375.	249,375.
RIVER SPANS				
Substructure	548,090.	504,990.	615,840.	568,490.
Superstructure	962,210.	966,610.	1,152,020.	1,111,790.
IOWA APPR.STRUCT.				
Substructure	194,155.	228,945.	238,780.	275,210.
Superstructure	239,845.	300,955.	288,955.	363,730.
IOWA ROADWAY	120,600.	266,500.	128,010.	287,670.
TOTALS - - - - - -	$2,400,080.	2,615,060.	2,806,335.	3,003.235.

DIFFERENCE - - - - - - - $214,980. - - - - - - - - $196,900.

APPENDIX III

MORMON MEMORIAL BRIDGE DATA



PLAN

GENERAL NOTES

Specifications for Design : A.A.S.H.O. 1949.

Live Loading : H20-S16-44.

Datum : Elevations shown refer to U.S.C.&G.S. "Mean Sea Level" datum.

Roadway Lighting: Fixtures indicated by ¤. Locate on bridge as shown on Plan and on Omaha Approach as shown on Sh. No. A1.

Soundings: On Plan, • indicates sounding elevation at which rock was encountered, and ○ indicates elevation to which sounding was taken without encountering rock. This sounding information obtained from Corps of Engineers, U.S. Army.

DOUGLAS COUNTY NEBRASKA
NORTH OMAHA BRIDGE COMMISSION

MISSOURI RIVER BRIDGE

OMAHA, NEBRASKA

BORINGS

HARRINGTON AND CORTELYOU
KANSAS CITY, MO.
CONSULTING ENGINEERS

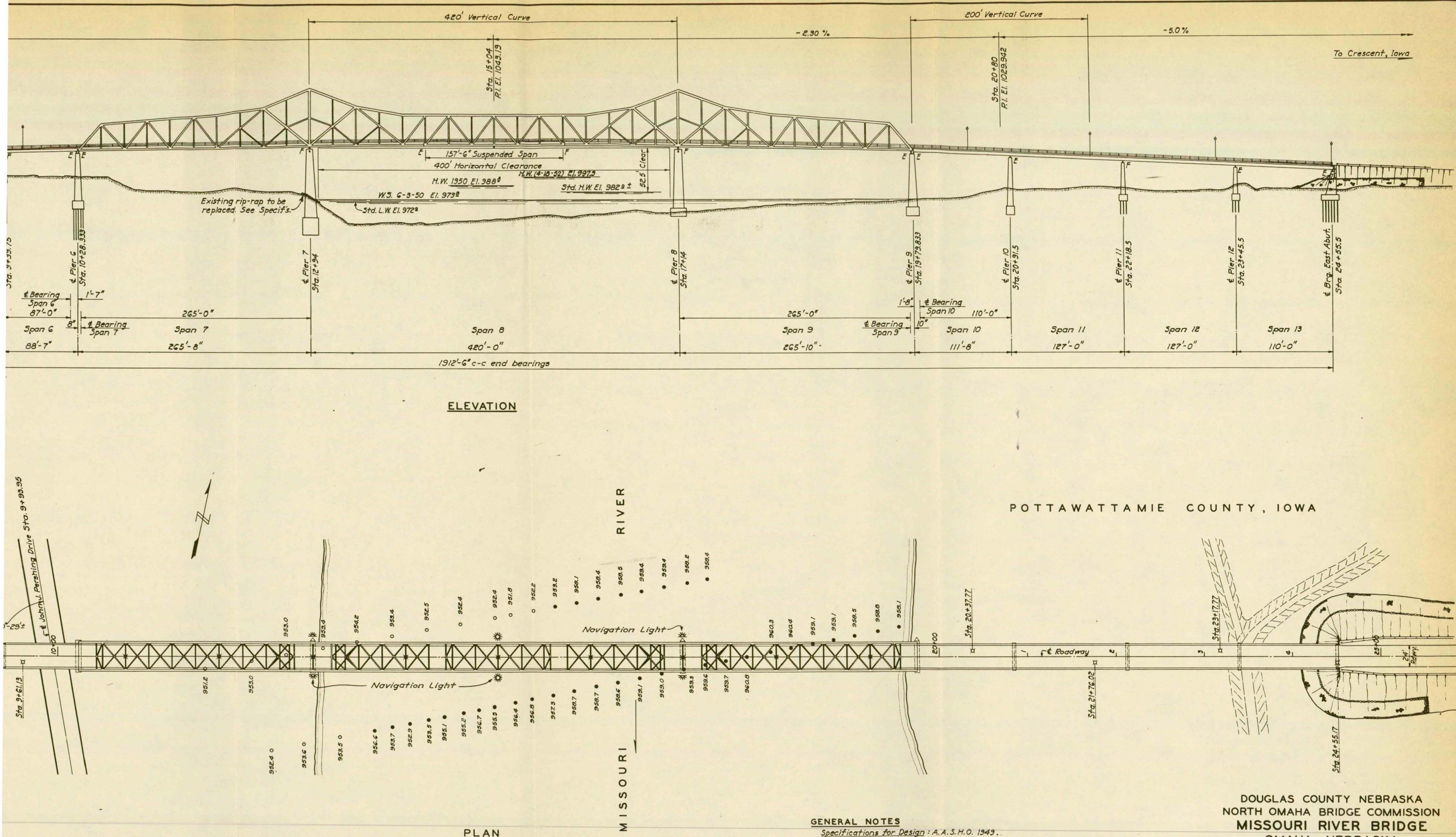
RICHARD F. FERGUSON
OMAHA, NEBRASKA
ASSOCIATE ENGINEERS

MADE BY G.E.G. & F.M.C. jr.
TRACED BY G.E.G. & F.M.C. jr.
CHECKED BY G.H.K. 3-12-51

SCALE: 1 IN. = 50 FT.

PLATE 10

"As Constructed" Revisions 7-20-53



GENERAL NOTES

Specifications for Design: A.A.S.H.O. 1949.

Live Loading: H20-S16-44.

Datum: Elevations shown refer to U.S.C.&G.S. "Mean Sea Level" datum.

Roadway Lighting: Fixtures indicated by ¤. Locate on bridge as shown on Plan and on Omaha Approach as shown on Sh. No. A1.

Soundings: On Plan, • indicates sounding elevation at which rock was encountered, and ○ indicates elevation to which sounding was taken without encountering rock. This sounding information obtained from Corps of Engineers, U.S. Army.

DOUGLAS COUNTY NEBRASKA
NORTH OMAHA BRIDGE COMMISSION
MISSOURI RIVER BRIDGE
OMAHA, NEBRASKA

GENERAL PLAN & ELEVATION

HARRINGTON AND CORTELYOU
KANSAS CITY, MO.
CONSULTING ENGINEERS

RICHARD F. FERGUSON
OMAHA, NEBRASKA
ASSOCIATE ENGINEERS

MADE BY G.E.G. & F.M.C. jr.
TRACED BY G.E.G. & F.M.C. jr.
CHECKED BY G.H.K. 3-12-51

SCALE: 1 IN = 50 FT.

PLATE 11

"As Constructed" Revisions 7-20-53

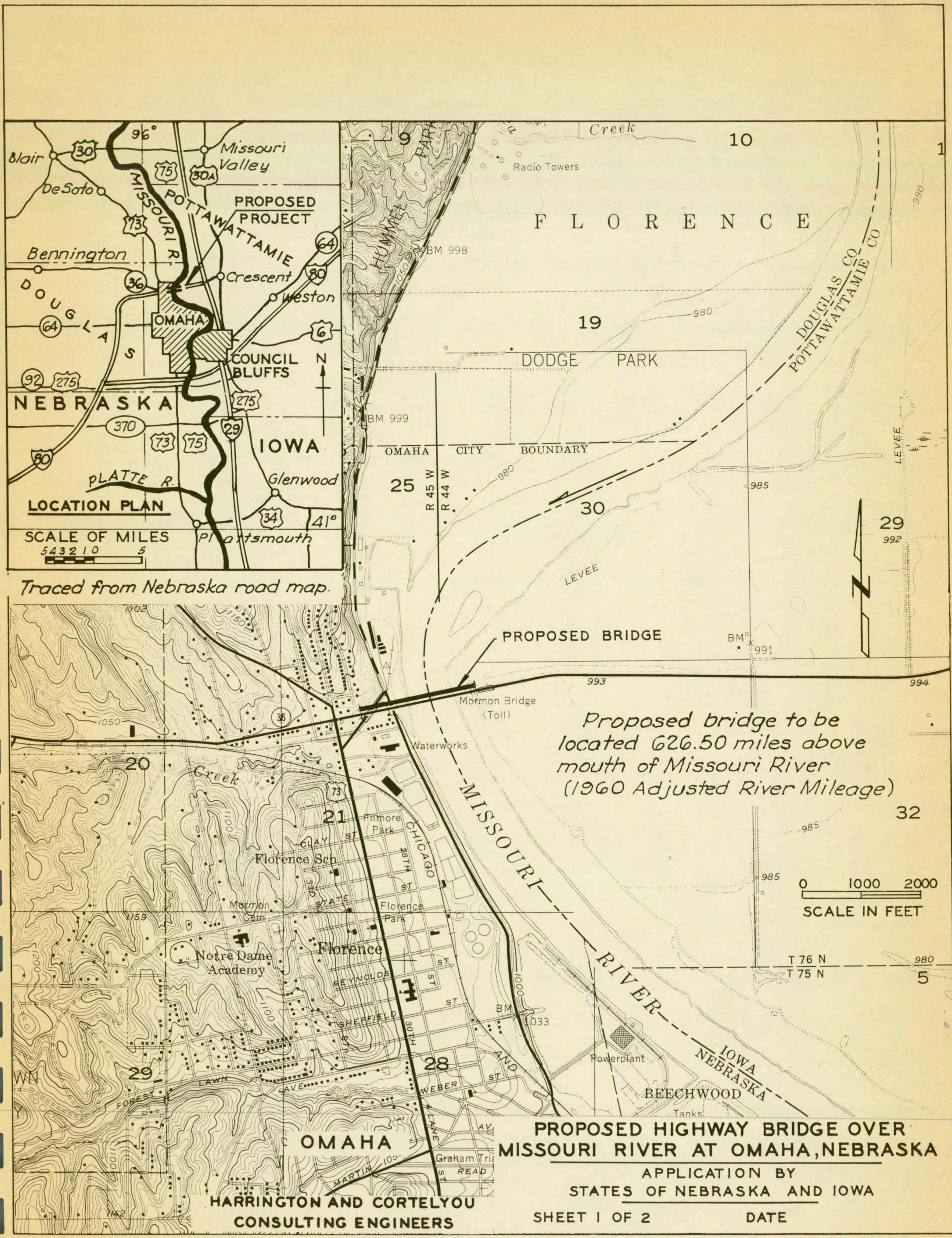
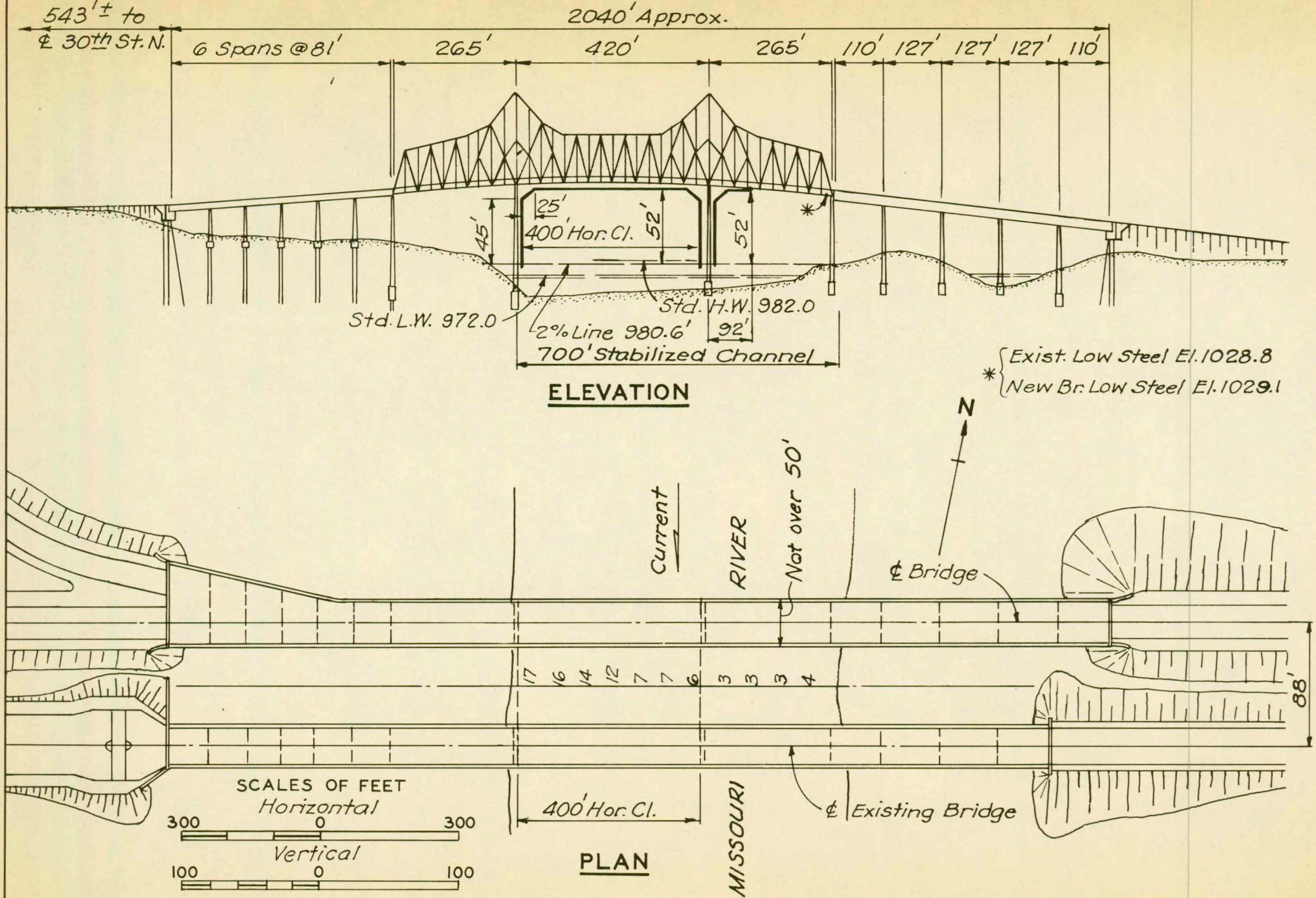

PROPOSED PROJECT
LOCATION PLAN
SCALE OF MILES
Traced from Nebraska road map.
FLORENCE
DODGE PARK
OMAHA CITY BOUNDARY
DOUGLAS CO
POTTAWATTAMIE CO
PROPOSED BRIDGE
Mormon Bridge (Toll)
Proposed bridge to be located 626.50 miles above mouth of Missouri River (1960 Adjusted River Mileage)
MISSOURI RIVER
IOWA
NEBRASKA
0 1000 2000
SCALE IN FEET
OMAHA
HARRINGTON AND CORTELYOU
CONSULTING ENGINEERS
PROPOSED HIGHWAY BRIDGE OVER
MISSOURI RIVER AT OMAHA, NEBRASKA
APPLICATION BY
STATES OF NEBRASKA AND IOWA
SHEET 1 OF 2
DATE

PLATE 12A



Soundings are in feet and refer to water elevation of 973.5. Elevations are in feet and refer to Mean Sea Level, U.S.C.&G.S. datum.

Miles above mouth 626.5 (1960 Adjusted River Mileage)

HARRINGTON AND CORTELYOU
CONSULTING ENGINEERS

PROPOSED HIGHWAY BRIDGE OVER MISSOURI RIVER AT OMAHA, NEBRASKA

APPLICATION BY
STATES OF NEBRASKA AND IOWA

SHEET 2 OF 2 DATE

APPENDIX IV

NAVIGATIONAL CLEARANCES

DEPARTMENT OF THE ARMY
OMAHA DISTRICT, CORPS OF ENGINEERS
6012 U.S. POST OFFICE AND COURT HOUSE
OMAHA, NEBRASKA 68102

IN REPLY REFER TO:

MROVM

24 April 1967

Mr. F. M. Cortelyou, Jr.
Harrington and Cortelyou
Consulting Engineers
1004 Baltimore Avenue
Kansas City, Missouri 64105

Dear Sir:

Reference is made to your letter of 18 April 1967 requesting information in connection with the proposed Interstate 680 bridge over the Missouri River, parallel to the existing Mormon Pioneer Trail Memorial bridge. Our reply is in the sequence of your request.

1. Inclosed is a copy of the latest Missouri River hydrograph for this location. Approximate water depths at the proposed bridge location can be interpolated between the ranges immediately above and below the bridge.

2. The extreme high water elevation of record at this location was 997.3 at a discharge of 396,000 c.f.s. which occurred in April 1952. This District bases flood frequencies on a 100 year period and considering the large dams upstream the maximum expected discharge at this location would be 190,000 c.f.s. for summer flows which would have a water surface elevation of 989.0 M.S.L.

3. We have no plans for future levees or other protective works on either bank in this vicinity. There was a planned recreation site 15, as shown on the hydrograph; however, this has been abandoned due to a lack of local cooperation and the selection of a site about one mile upstream from the Mormon bridge has been made.

4. The location of the new bridge 88 feet upstream from the Mormon bridge centerline, and with the new piers in juxtaposition with piers 6,7,8 and 9 of the Mormon bridge, meets with our tentative approval. We have no desire nor requirement to have the new piers eastward of pier 9 in line with the present piers.

5. The Corps of Engineers is not planning to restore rail service to our boatyard.

APPENDIX IV

MROVM
Mr. F. M. Cortelyou, Jr.

24 April 1967

I trust this is the information you desire. If we can be of further assistance, please feel free to call on us.

Sincerely yours,

L. F. Otto

L. F. OTTO
Chief, Operations Division

1 Incl
as

ADDRESS REPLY TO
DISTRICT ENGINEER
U S ARMY ENGINEER DISTRICT, OMAHA
6012 U S POST OFFICE AND COURT HOUSE
215 NORTH 17TH STREET
OMAHA, NEBRASKA 68102

U. S. ARMY ENGINEER DISTRICT, OMAHA
CORPS OF ENGINEERS
6012 U. S. POST OFFICE AND COURT HOUSE
OMAHA, NEBRASKA 68102

REFER TO: MROVM

7 January 1966

Iowa State Highway Commission
C. A. Pestotnik, Bridge Engineer
Ames, Iowa

Gentlemen:

Your letter of 27 December 1965 requested information concerning a proposed bridge parallel to the existing Mormon Pioneer Trail Memorial Bridge near Omaha, Nebraska.

Inclosed is a hydrographic map, Sheet M400/42, which shows the location of the channel, the channel limits and water depths in the vicinity of the existing bridge.

Current requirements for a proposed bridge at this location are as follows:

Vertical: 52 feet above the 2% line with a maximum infringement of 25 feet horizontal distances from the face of each channel pier, with a minimum vertical clearance of 45 feet at the face of the piers.

Horizontal: 400 feet, pier face to pier face, within limits of the stabilized channel line.

The position of the existing bridge is as shown on the inclosed Notice of Consideration of Plans dated 26 July 1950 (Mo.R. Bridge-Douglas Co., N. Omaha Br. Comm. Mi. 670.8 (1890)). The elevation of the 2% line at the existing bridge is 980.6 M.S.L. It has a horizontal clearance of 400 feet from pier face to pier face, and a vertical clearance of 52.5 feet above Standard High Water (Elev. 982.0) and is 53.9 feet above the 2% line.

Inclosed is a copy of the current Missouri River Navigation Chart No. 17. The existing bridge is located at Mile 626.48 (1960 mileage).

I trust this is the information you desire. If we can be of further assistance, please feel free to call on us.

Sincerely yours,

HARRINGTON & CORTELYOU
JAN 12 1966
RECEIVED

E L Edwards
for L. F. OTTO
Chief, Operations Division

Incls
a/s

(Appendix IV)