Level K

Consultant's Report

C17-0030

MHPR No. RA-VHC-017

Original ☒ or Addendum No. __

Historic District Name: _____

Minnesota Historic Property Record
Background Data Form

1. Name of Property

Historic name: Bridge No. 6580

SHPO inventory no.: RA-VHC-017

Current name: Rice Street Bridge

2. Location

Street & number, intersection of feature carried and feature crossed, or general property location description:
Rice Street (County State-Aid Highway 49) over Interstate 694

City or township: City of Vadnais Heights

County: Ramsey

State: MN

Zip code: 55126

Legal description: T 30 R 22W Section 31 NW SW

UTM Reference: Zone 15E

Easting 491632.1875

Northing 4987970.5

NAD 83

3. Description

Prestressed concrete stringer/multi-beam or girder

4. National Register of Historic Places (NRHP) status

NRHP, individually listed ☐ or eligible ☒:

Date of designation: 2011

NRHP, in listed ☐ or eligible ☐ historic district:

Date of designation:

National Historic Landmark: Date of designation:

5. Previous Designation or Recordation

Local designation program: Date of designation:

Name of program:

Name and location of repository:

Other (e.g. HABS/HAER/HALS): Date of designation:

Name of program:

Name and location of repository:

6. Preparer's Information

Federal or State agency: Minnesota Department of Transportation

Date MHPR prepared: April 20, 2017

Preparer's name/title: Robert M. Frame III, Senior Historian, and Katherine Haun Schuring, Cultural Resource Specialist

Company/organization: Mead & Hunt, Inc.

Email address: Bob.frame@meadhunt.com; Katherine.schuring@meadhunt.com

Street & number: 7900 W 78th Street, Ste. 370

Telephone: 952-941-5619

City or township: Minneapolis

State: Minnesota **Zip code:** 55439

Photographer's name: Daniel Pratt

Company/organization: ARCH3, LLC

Email address: arch3llc@gmail.com

Street & number: 1412 Pascal Street North

Telephone: 651-308-8749

City or township: Saint Paul

State: Minnesota **Zip code:** 55108-2437

A. Narrative

MINNESOTA HISTORIC PROPERTY RECORD
Bridge 6580 – Rice Street Bridge
RA-VHC-017

I. Description

A. Bridge 6580 location and setting

The Rice Street Bridge (Bridge 6580) carries Rice Street (County State-Aid Highway [CSAH] 49) on a north-south axis over a segment of Interstate (I-) 694 that is aligned northwest-southeast. It is located in the city of Vadnais Heights, north of Saint Paul in Ramsey County, Minnesota. Rice Street demarcates the city line between Vadnais Heights to the east and Shoreview to the west. The bridge setting is a lightly populated suburban residential area of the larger Twin Cities metropolitan region. Immediately adjacent to the bridge along Rice Street are several small automobile-oriented retail businesses, such as a gas station and a convenience store.

B. Bridge description

Bridge 6580 is a four-span, prestressed-concrete girder with a total structure length of approximately 239 feet, including two center 72-foot spans and two 45-foot side spans. Within the overall deck width of 63 feet, 3 inches, the bridge carries a 56-foot, undivided, four-lane, two-way roadway and a 2-foot-6-inch sidewalk on each side. The bridge has a skew of approximately 39 degrees (left side forward). The vertical clearance beneath the spans is approximately 15 feet. The horizontal roadway clearance beneath each of the main spans is 54 feet and originally included two double lanes divided by a median, later changed to two lanes northbound and three lanes southbound.

The center spans (spans 2 and 3) are each comprised of 15 precast, prestressed (pretensioned), I-section, concrete girders that are 3 feet, 6 inches deep; 71 feet, 3 inches long; spaced at 4 feet, 2 inches on centers. The side spans (spans 1 and 4) are comprised of eight precast, prestressed (pretensioned), I-section, concrete girders that are 3 feet, 6 inches deep; 44 feet, 11-3/16 inches long; spaced at 8 feet, 4 inches on centers. Each girder has concrete end blocks (shear blocks) on both ends. The girders rest on expansion bearings at the abutments and center (median) pier 2, and fixed bearing assemblies at the two side piers (piers 1 and 3). Concrete diaphragms are located between the beams on all four spans. The deck is constructed of cast-in-place concrete, as are the sidewalks.

The substructure is comprised of two reinforced-concrete abutments on pilings and three reinforced-concrete piers on pilings. Each pier has four square columns separated by angular flat-arched openings. The outside columns of each pier have a pair of vertical flutes on the side facing traffic, with the recess of the fluting deepening at the top of the column to create a shadow. The U-form wingwalls at the abutments are aligned with the skew of the superstructure. Each wingwall is a stepped, three-panel, concrete pilaster, measuring approximately 15 feet tall for the tallest panel, which is adjacent to the superstructure. This pilaster element also serves to terminate the railings with a modern architectural stylistic element. The wingwalls are supported on pilings separate from the abutments. Precast concrete-block slope protection is located between each abutment and side pier (piers 1 and 3).

The railings, which are original, extend the length of the four spans, terminating at the wingwalls, and are comprised of two horizontal aluminum pipes supported by curved cast-aluminum posts. The aluminum railing is mounted on a low reinforced-concrete post-and-rail system on the concrete curb. Each aluminum rail post was bolted directly above a concrete post. The metal rail is 1 foot, 9 inches high and the concrete base rail is 1 foot, 6 inches high for a total rail height of 3 feet, 3 inches above the combination sidewalk-curb. A bronze state bridge plate is mounted on the inside of the northwest railing, but is completely obscured by a metal guardrail added at an unknown date.

Bridge 6580 has experienced few alterations and reflects its historic appearance. In 1982 the Minnesota Department of Transportation (MnDOT) completed a repair and overlay project that involved no structural changes beyond the deck overlay, and repairs to expansion joints and slope paving.[1] In 2015-2016 concrete pier protection was added around the columns of the three piers. In addition, the arch openings in the three piers were in-filled with concrete.[2]

Bridge 6580 is scheduled for removal and replacement in 2017.

II. History and Context

The following historic context provides information on the construction of Bridge 6580 within the framework of the development the Interstate Highway System and prestressed concrete nationally and in Minnesota during the post-World War II (postwar) period, including discussion of key players in the use of prestressed concrete in Minnesota and on Bridge 6580.

A. Bridge history

The Minnesota Highway Department (MHD) constructed the Rice Street Bridge as part of the State Trunk Highway No. 10 (later I-694) Interstate Highway project just north of Saint Paul. The MHD anticipated the expansion of the highway at the time the bridge was constructed: MHD Bridge Engineer A.E. LaBonte noted that "in order to provide a necessary opening for a possible future additional lane in each direction we have allowed 18 feet from the right edge of the pavement to the side pier instead of the usual 10 feet." Improvements to Rice Street were also expected. At the request of the Bureau of Public Roads (BPR), the bridge roadway had been widened from 52 feet to 56 feet "to provide for a future island." The BPR made the request "since the approach roadways will probably be constructed as a four lane divided facility at some time in the future."[3]

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[1] Minnesota Department of Transportation, "Construction Plan for Bridge Repair and Overlay - Bridge No. 6580," Bridge plans (Saint Paul, Minn.: Minnesota Department of Highways, March 31, 1982), available at the Minnesota Department of Transportation.

[2] Minnesota Department of Transportation, "Construction Plan for Pier Protection - Bridge No. 6580," Bridge plans (Saint Paul, Minn.: Minnesota Department of Highways, August 27, 2015), available at the Minnesota Department of Transportation.

[3] The information in this paragraph, including the quoted material, is incorporated from Hess, Roise, and Company, *Advisory Council on Historic Preservations' Program Comment Review of Minnesota Bridges, 1955-1970* (Prepared for Minnesota Department of Transportation, June 2014), 34.

The MHD notified the BPR in April 1956 that it would be seeking funds to construct the Rice Street bridge.[4] E.L. Gardner, Chief Structural Engineer for Ellerbe & Company, prepared the preliminary design study. Gardner, who signed the known bridge plans from Ellerbe & Company, always identified himself as E.L., although his full name was Elza Lloyd Gardner. Other than his position with Ellerbe, little is known about Gardner, who was born on May 1, 1904, in Iowa and died in Saint Paul on February 7, 1983.[5]

Gardner's preliminary design study, submitted on July 26, 1956, looked at two designs: a prestressed, post-tensioned, concrete girder span and a continuous, composite, steel-beam span. It recommended the prestressed-concrete girder option as "more practicable," stating it would be less costly than the alternative, particularly because of "the current critical situation regarding the supply of structural steel." According to Gardner's analysis, the prestressed-concrete option would cost an estimated $169,860 and the continuous steel-beam option would cost an estimated $176,927.[6]

A final design and estimate was submitted by Gardner almost one year later, on May 14, 1957. The design included prestressed, post-tensioned, concrete girder spans, following the preliminary design study, which also specified post-tensioned beams. The cost estimate had grown to $223,778, with about half the increase in the post-tensioned beams, which jumped from about $39,000 to $62,000. The reason for the increase was not explained.[7]

Ellerbe & Company's overall plans for Bridge 6580, again signed by Gardner as the engineer of record, were submitted to MHD and approved by the MHD Chief Engineer on July 23, 1957. The approved plans included pretensioned concrete girders instead of the previously submitted post-tensioned girders, with no explanation for the change.[8]

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[4] Hess, Roise, and Company, *ACHP Program Comment Review*, 34.

[5] E.L. Gardner, "The Lafayette Bridge," *Modern Steel Construction* 9, no. 1 (First Quarter 1969): 3–5; "Elza Lloyd Gardner: Find A Grave Memorial 683468," *Find A Grave*, n.d.; United States of America, Bureau of the Census, *Sixteenth Census of the United States, 1940* (Washington, D.C.: National Archives and Records Administration, 1940), M–T0627–00875–00128–Sheet No. 10A.

[6] Ellerbe & Company, *Preliminary Design and Recommendations: Bridge No. 6580 Trunk Highway 10 and Rice Street* (Prepared for the Minnesota Department of Highways, July 26, 1956), 1–3, available in the Bridge 6580 files, MnDOT Bridge Project Records, St. Paul, Minnesota.

[7] Ellerbe & Company, *Final Design and Estimate: Bridge No. 6580 Rice St./T.H. No. 10* (Prepared for the Minnesota Department of Highways, May 14, 1957), 1, available in the Bridge 6580 files, MnDOT Bridge Project Records, St. Paul, Minnesota.

[8] E.L. Gardner, Ellerbe & Co., "Construction Plan for Bridge No. 6580, TH No. 393, North of St. Paul," Bridge plans (Saint Paul, Minn.: Minnesota Department of Highways, July 23, 1957), available at the Minnesota Department of Transportation; see notes regarding pretensioned girders on sheet 3, "Prestressed Concrete Girder Details."

On August 2, 1957, BPR district engineer A.L. Overbee sent a letter to MHD Commissioner L.P. Zimmerman authorizing "construction of a prestressed girder bridge, type X781, 56 feet in width."[9] The MHD issued a request for proposal for construction on July 23, 1957, with bids due on August 23. The Sheehy Construction Company was awarded the contract for Bridge 6580 with a bid of $217,437.76.[10]

In 1957 MnDOT awarded the contract for the design and fabrication of the prestressed girders to the Elk River Concrete Products Company of Elk River, Minnesota, a division of Cretex Companies. In that same year the firm constructed its first two prestressed casting beds under the technical guidance of prestressed concrete pioneer Charles Zollman.[11] About the same time, December 1957 and January 1958, Charles C. Zollman and Associates, Consulting Engineers of Newtown Square, Pennsylvania (just outside Philadelphia), prepared the calculations for Bridge 6580's prestressed beams. Zollman's firm was a subcontractor to Elk River Concrete Products Company (see below for more on Zollman and Elk River Concrete Products).[12] In a letter dated November 15, A.H. Bailey of Elk River notified F.C. Fredrickson at the MHD that the company would be fabricating the girders for Bridge 6580. He noted that "The coarse aggregate will be gotten from Barton's pit at Osseo, the sand from Big Lake Sand and Gravel at Big Lake, the cement from Universal at Duluth, the prestressed strand from American Steel and Wire, the reinforcing steel from U.S. Steel Supply, and the sole plates and pipe sleeves will be fabricated at Bros Incorporated."[13] The modern aluminum railings were supplied by Wheeler Lumber Bridge and Supply Company of Saint Louis Park, Minnesota.[14]

Ellerbe's 1956 plan had shown 36-inch-deep I-section beams, 12 inches wide at the top and 18 inches at the base. MHD's final plans showed 42-inch-deep girders. A drawing dated October 29, 1957, compared a 42-inch girder modeled after the Ellerbe girder from MHD's plans with a proposed alternative of a slightly different geometry.[15] There were other changes in addition to the beam depth. Elk River submitted a series of computations by Zollman and Associates dated January 9, 1958, "to suggest a new strand pattern in order to use draped strands in beams G 1, G2 [for the 45-foot spans] and to drap [sic] the strands in beams G3, G4, G5 [for the 72-foot spans] in three points instead of two as suggested in the

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[9] A.L. Overbee, Division Engineer, "To L.P. Zimmerman, Commissioner of Highways Regarding SP No. 6285-07," Letter, (August 2, 1957), Bridge 6580 files, Minnesota Department of Transportation.

[10] Hess, Roise, and Company, *ACHP Program Comment Review*, 35.

[11] Don Stolz et al., *Cretex Times* (Edina, Minn.: Beaver's Pond Press, 1997), 103–105; Jim Nystrom, Dennis Voight, and Roy Barthel, Elk River Concrete (Cretex) Early Years; Mead & Hunt Interview by Robert M. Frame and Darrell Berry, at Elk River, Minnesota, September 17, 2009, Mead & Hunt, Minneapolis Office.

[12] Charles C. Zollman and Associates, Consulting Engineers, *Calculations for Bridge 6580 Prestressed Girders* (Newtown Square, Pa., 1958), available in the Bridge 6580 files, Minnesota Department of Transportation.

[13] A.H. Bailey, Elk River Concrete Products Co., "To the Minnesota State Highway Department Regarding Fabrication of Prestressed Girders for Bridge 6580," Letter, November 15, 1957, available in the Bridge 6580 files, Minnesota Department of Transportation.

[14] G. Duane Bell, Wheeler Lumber Bridge and Supply Co., "To the Minnesota State Highway Department Regarding Fabrication of Bridge Railing for Bridge 6580," Letter, September 27, 1957, available in the Bridge 6580 files, Minnesota Department of Transportation.

[15] Hess, Roise, and Company, *ACHP Program Comment Review*, 35.

original design of 12-2-57." The "purpose of these computations to redesign 3'-6" beam section standard to a modified AASHO II beam section—thereby saving Cretex Companies cost of formwork for a non-standard section which will no longer be used."[16]

In February 4, 1958, letter to A.H. Bailey at Elk River Concrete Products, MHD Bridge Engineer A.E. LaBonte stated: "We have reviewed the design computations of the pretensioned girder for the above bridge [6580] as made by your consulting engineers, Charles C. Zollman and Associates, and have found them to be satisfactory." LaBonte stipulated that Elk River had to prepare shop drawings for the girders, which would need to be approved by MHD prior to any fabrication.[17]

Elk River responded to this request promptly, submitting shop drawings on February 18, 1958. On February 26, C.F. Bertossi, MHD's engineer of bridge plans, returned the marked-up drawings, with a letter providing additional comments. One comment was the need to "change either the pipe and bolt spacing in the sole plate unit or the cable spacing." The plans called for spacing of 2-5/8 inches. He remarked: "It might be simpler to obtain new sole plate units since the sole plates with the 3" dimension will be used for all future bridges." Elk River subsequently met with Bertossi and decided that the "height of the 1" pipe [would be] changed from 3" to 2-5/8"." This was reflected on shop drawings that Elk River sent to MHD on March 7. In addition, "instead of welding the 1" pipe onto the 3/8" x 8" bar, two holes the size of the O.D. of the 1" pipe will be punched in the bar and the pipe inserted through the holes and held in this position until the concrete has set." The contractor added: "We would appreciate your advising us as soon as possible if you find anything radically wrong with this shop drawing as we are pressed for time and have instructed the fabricator to start his fabrication on the assumption that this drawing will be approved."[18]

That optimism was not completely warranted. In a letter to Elk River on March 11, Bertossi required "the 3" vertical dimension to the centerline of the pipe in the sole plate" rather than 2-5/8". Bertossi did, however, concede on another issue: "We . . . understand that Mr. W. C. Nitardy has permitted the use of unwelded pipes for the transverse anchor bolts in the sole plates to facilitate placement of the pretensioning cables...This deviation from plan details of the sole plate will be permitted for this bridge project only on a performance observation basis."[19] This exception was not put to the test in the end, as Elk River reported in January 1959, well after the work was done: "The sole plates with the removable sleeve that we were going to try out on this work were delayed in the fabricator's shop so that we did not

[16] Charles C. Zollman and Associates, Consulting Engineers, *Calculations for Bridge 6580 Prestressed Girders* (Newtown Square, Pa., 1958), sheets 1 & 26 of 30, Bridge 6580 files, Minnesota Department of Transportation.

[17] A.E. LaBonte, Bridge Engineer, "To Elk River Concrete Products Co. Regarding Bridge 6580 Design Computations," Letter, (February 4, 1958), Bridge 6580 files, Minnesota Department of Transportation.

[18] The information in this paragraph, including the quoted material, is incorporated from Hess, Roise, and Company, *ACHP Program Comment Review*, 36–37.

[19] C.F. Bertossi, MHD Engineer of Bridge Plans, "To Elk River Concrete Products Co. Regarding Bridge No. 6580, Pretensioned Girder Details," Letter, (March 11, 1958), Bridge 6580 files, Minnesota Department of Transportation.

receive them until after we had finished pouring this bridge. We had the sole plates as originally shown on the plan drawing in stock so these were used on the bridge."[20] Bartossi's letter of March 11, 1958, concluded with the statement that "the print being returned is stamped for approval as noted and we request that after the original tracing has been revised you will send us a cloth reproduction to keep for our permanent files." Thus the final plan approval was granted.[21]

Sheehy Construction Company of Saint Paul, which had been incorporated only three years earlier in 1955, won the contract for Bridge 6580's construction, which was completed in late 1958 (see Figures 1-4). The MHD signed the Final Inspection Report on November 29, 1958.[22] The I-694 segment crossed by Bridge 6580 opened in 1961 (see Figures 3-4).[23]

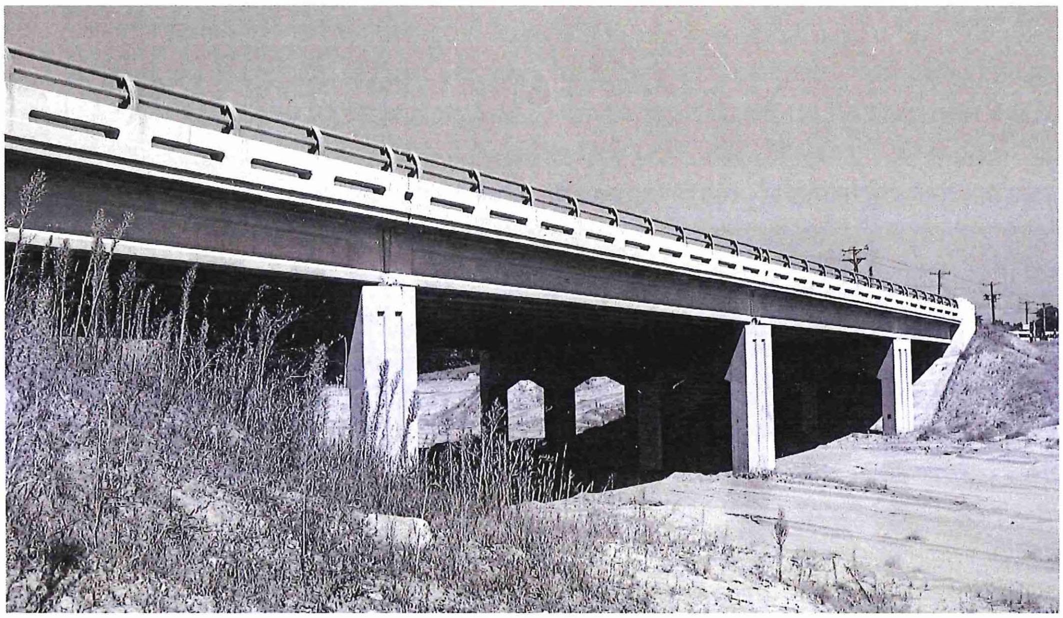

Figure 1. Perspective view of the east side of Bridge 6580, looking northwest, in 1958. In this view, the bridge has been constructed but the Interstate Highway beneath is not yet complete. Image available at State of Minnesota, Minnesota Highway Department, Bridge Division files, Gale Family Library, Minnesota State Archives, Minnesota History Center, Saint Paul, Minn.

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[20] A.H. Bailey, Elk River Concrete Products Co., "To Walter J. Grabner, Minnesota Department of Highways," Letter, (January 29, 1959), Bridge 6580 files, Minnesota Department of Transportation.

[21] C.F. Bertossi, MHD Engineer of Bridge Plans, "To Elk River Concrete Products Co. Regarding Bridge No. 6580, Pretensioned Girder Details"; A.H. Bailey, Elk River Concrete Products Co., "To Walter J. Grabner, Minnesota Department of Highways."

[22] "Sheehy Construction Co. Incorporation Record," *Minnesota Secretary of State*, January 21, 1955, https://mblsportal.sos.state.mn.us/Business/SearchDetails?filingGuid=d8ee2fd0-b2d4-e011-a886-001ec94ffe7f; *Bridge No. 6580*, Final Bridge Inspection Report (Minnesota Highway Department, November 29, 1958), Bridge 6580 files, Minnesota Department of Transportation.

[23] "Interstate 694 Minnesota: History," *Interstate Guide*, n.d., www.interstate-guide.com/i-694_mn.html; "I-694 MN - History," *Roadnow*, 2017, m.roadnow.com/i694mn/Minnesota-Route-Description.html.

Figure 2. Perspective view of east side of Bridge 6580, looking southwest, in 1958. In this view, the bridge has been constructed but the Interstate highway beneath is not yet complete. Image available at State of Minnesota, Minnesota Highway Department, Bridge Division files, Gale Family Library, Minnesota State Archives, Minnesota History Center, Saint Paul, Minn.

Figure 3. Perspective view of west side of Bridge 6580, looking northeast, on November 28, 1961. By this time, I-694 has been opened. Image available at State of Minnesota, Minnesota Highway Department, Bridge Division files, Gale Family Library, Minnesota State Archives, Minnesota History Center, Saint Paul, Minn.

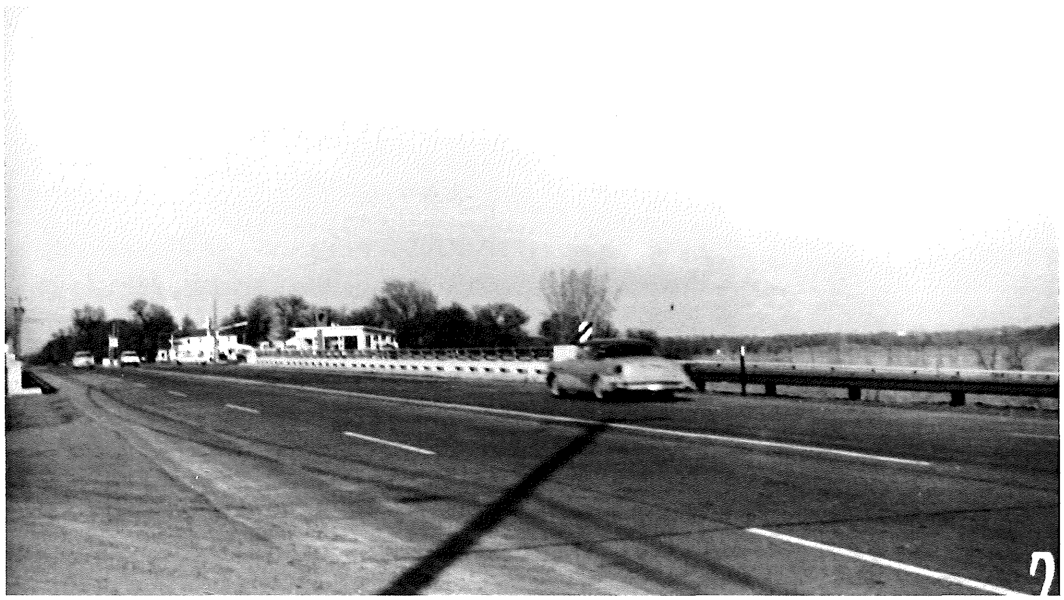

Figure 4. Deck view of Bridge 6580, looking northeast, on November 28, 1961. Image available at State of Minnesota, Minnesota Highway Department, Bridge Division files, Gale Family Library, Minnesota State Archives, Minnesota History Center, Saint Paul, Minn.

B. Area of significance and historic context

Bridge 6580 is significant under National Register of Historic Places (National Register) *Criterion C* in the area of Engineering at the state level; it is exempt from the Advisory Council on Historic Preservation Program Comment for Common Post-1945 Concrete and Steel Bridges under Section IV(C). The bridge is one of the earliest uses of prestressed concrete in the state of Minnesota. Prestressed concrete represents a significant advance in construction materials and was first used by the MHD in 1957. Bridge 6580 was constructed the following year. Additionally, the history of the bridge's construction distinguishes it as a pioneering example of prestressed-concrete girder bridges in Minnesota. Extensive consultation between the MHD and Elk River Concrete Company during the bridge's design and girder fabrication indicates the process was in the early phases of development for the bridge type.[24] The bridge's significance is demonstrated through the use of prestressed, pretensioned girders.

(1) Development of prestressed concrete nationally

Prestressed concrete first achieved widespread use as a bridge construction material in the middle of the twentieth century and subsequently was used for a large number of bridges. Prestressed concrete was developed in the late 1920s in Europe as a method for overcoming concrete's natural weakness in

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[24] Mead & Hunt, Inc., "Inventory form for Bridge 6580" (prepared for the Minnesota Department of Transportation, July 2013, available within Mead & Hunt, Inc., *Evaluation Report and Historic Context Minnesota Bridges, 1955-1970 (including Trunk Highway Evaluations)* [prepared for the Minnesota Department of Transportation, July 2013]; Hess, Roise, and Company, *ACHP Program Comment Review*, 37.

tension. It was considered innovative because it allowed for longer spans and elements than reinforced concrete, which was the preferred concrete bridge construction material at the time.[25]

Prestressed concrete is best defined in *A Context for Common Bridge Types*:[26]

> In prestressed concrete bridges, the tensile forces caused by the application of loads are reduced in the main structural members by inducing internal compressive forces by means of high tensile strength wires, cables or (occasionally) bars. The compressive forces may be applied during fabrication of the member by stretching the steel reinforcement prior to casting and curing of the concrete. After the concrete has cured, the tension on the steel is released, thus transferring the load to the concrete. The concrete is in direct contact with the steel so that bonding of the two materials can occur. When external loads (traffic and the weight of the deck and other bridge components) are applied to the member, tensile forces that are thus created are counterbalanced by the internal compressive forces induced by the pre-tensioning of the steel. This method of pre-stressing is called pre-tensioning.
>
> Another method of pre-stressing, called post-tensioning, involves placing sleeves or ducts in the concrete member during fabrication, into which steel reinforcement is placed after curing of the concrete. The reinforcement is then stretched (stressed) by jacking, and locked in place by anchor plates or other locking devices. If bonding is desired, grout may be injected into the sleeves. In some cases, however, a protective covering is applied to the steel to de-bond it from the concrete in order to control cracking in end sections. Occasionally, though usually in more modern bridges that have not yet achieved "historic age," a combination of pre-tensioning and post-tensioning is used. But, whatever the method employed, when compressive forces are properly calculated and proper fabrication methodology is followed, the prestressed bridge members will not develop stress cracks.

Unlike reinforced concrete, prestressed beams require specialized tensioning or casting beds for their manufacture, meaning they cannot be produced just anywhere or by anyone, or at the bridge site itself. The design and construction of the beds were technological achievements in their own right in the early years of prestressed concrete usage, thus limiting manufacture of prestressed concrete to those precasters who made the investment in beds and could provide transportation of the beams to the bridge site. Precasting of prestressed concrete units also allowed for cost savings, as large quantities of beams could be mass produced at plants and then delivered to construction sites, allowing for reuse of forms.[27] Historian Carl Condit describes the importance of precast beams: "The precasting and prestressing of girders for concrete bridges have brought their construction as close to the methods of mass production as the building arts have yet come."[28] The ability to quickly produce large volumes of prestressed-concrete bridge components allowed for fabrication and use on a large scale.

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[25] Robert M. Frame III and Richard E. Mitchell, "Constructing Suburbia: The Hidden Role of Prestressed Concrete," *Minnesota History* 64, no. 4 (Winter 2014): 159.

[26] Parsons Brinckerhoff and Engineering and Industrial Heritage, *A Context for Common Bridge Types*, NCHRP 25-25, Task 15 (prepared for the National Cooperative Highway Research Program, October 2005), 3-101.

[27] Tung Y. Lin, *Design of Prestressed Concrete Structures* (New York: John Wiley & Sons, Inc., 1955), 31; Tung Y. Lin and Felix Kulka, "Fifty-Year Advancement in Concrete Bridge Construction," *Journal of the Construction Division, Proceedings of the American Society of Civil Engineers* 101, no. CO3 (September 1975): 494-495.

[28] Carl W. Condit, *American Building: Materials and Techniques from the First Colonial Settlements to the Present, 2d ed.* (Chicago: University of Chicago Press, 1982), 257.

With the introduction of precasting concrete units in large quantities, it was quickly considered an ideal bridge construction material. The ability to use prestressed concrete to span longer lengths without adding weight also contributed to its popularity. Between 1951, when the first prestressed-concrete bridge was constructed, and the mid-1950s, when the material was widely used in bridge building, information was readily disseminated on prestressed concrete to a wide audience. The Prestressed Concrete Institute (PCI), established in in 1954 in Tampa, Florida, became influential in the formulation of code provisions for prestressed concrete. The PCI, along with other organizations such as the American Concrete Institute (ACI), promoted the use and benefits of prestressed concrete in bridge construction. These groups disseminated information about prestressed concrete to bridge engineers and contractors through conferences, symposiums, and publications, such as the *PCI Journal* and *ACI Journal.* Articles written by bridge designers, fabricators, manufacturers, and university professors touted the advantages of this material, and the Bureau of Public Road's (BPR's) 1954 *Criteria for Prestressed Concrete Bridges* provided codified standards.[29]

The first prestressed-concrete bridge constructed in the United States was the Walnut Lane Memorial Bridge in Philadelphia; it was replaced by a new prestressed-concrete bridge in 1989.[30] The bridge was designed by a Belgian engineer Gustave Magnel, and opened to traffic in 1951.[31] Magnel began working on the theory of prestressed concrete in the 1920s at the University of Ghent in Belgium and promoted the idea during a lecture series around North American universities in 1946. His book *Prestressed Concrete,* published in 1948, was significant as one of the first books on prestressed concrete in English.[32] Magnel was ultimately responsible for carrying the knowledge of Europe's prestressed concrete methods to the United States.

The Walnut Lane Memorial Bridge was a three-span, prestressed-concrete bridge supported by 13 concrete girders in each span. The girders were prestressed by using four post-tensioned wire cables embedded in the concrete.[33] The main span was 160 feet, long even by today's standards. Following the successful completion of the Walnut Lane Memorial Bridge, other states began exploring prestressed concrete as a building material for bridges. By 1955, when construction began on the Lake Pontchartrain Causeway outside New Orleans, Louisiana, engineers were comfortable enough with prestressed concrete construction to build the 24-mile-long bridge. At the time of construction, it was the longest precast, prestressed-concrete bridge in the world.[34]

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[29] Charles C. Zollman, "The End of the 'Beginnings,'" in *Reflections on the Beginnings of Prestressed Concrete in America* (Chicago: Prestressed Concrete Institute, 1981), 310.

[30] George D. Nasser, "The Legacy of the Walnut Lane Memorial Bridge," *Structure Magazine* (October 2008), 31.

[31] Joseph H. Wierbicki, P.E., A.G. Lichtenstein & Associates, Inc., "Walnut Lane Bridge, HAER No. PA-125," Historic American Engineering Record, Northeast Field Area, National Park Service, March 1988, http://www.loc.gov/pictures/collection/hh/item/pa1791/.

[32] Charles C. Zollman, "Magnel's Impact on the Advent of Prestressed Concrete," *Journal of Prestressed Concrete* 23, no. 3 (May – June 1978): 29-31.

[33] Nasser, 27.

[34] Nasser, 30.

(2) Minnesota's prestressed-concrete bridges

With the implementation of the Federal-Aid Highway Act of 1956, Interstate and highway construction projects flourished in Minnesota. The need for Interstate bridges prompted the construction of specialized facilities to manufacture prestressed-concrete beams, an undertaking that required substantial investment. Prestressed concrete quickly emerged as an important material for Interstate and non-Interstate bridges. It was used for 57 percent of Minnesota's Interstate bridges between 1956 and 1970.[35]

Prestressed concrete was first used by the MHD in 1957, a year after the implementation of the Federal-Aid Highway Act of 1956. Within the first three years of prestressed concrete usage on the Trunk Highway System in Minnesota, 70 bridges were built and contracts were let for 14 more.[36] In only 13 years the MHD constructed more than 450 prestressed-concrete structures on both Interstate and non-Interstate routes. Ellerbe & Company's Chief Structural Engineer, E.L. Gardner, designed the first State-owned, prestressed-concrete bridge in 1957. Bridge 9053 (extant) was constructed as part of the I-35W project and carries 94th Street over the Interstate in the Twin Cities suburb of Bloomington. Prestressed concrete was selected over steel as the construction material because it was the less expensive option, a result of using precast, prestressed concrete produced in large quantities. In addition, steel deliveries would not meet the expedited timing conditions for the project.[37]

Use of prestressed concrete in MHD bridges significantly increased after its first use in Bridge 9053. In 1958 the Walter Butler Company recommended using prestressed concrete for four bridges along a portion of the I-94 corridor through Saint Paul. The company cited prestressed concrete's economy over steel. Their designs followed the standards codified in the 1954 *Criteria for Prestressed Concrete Bridges*, published by the BPR.[38] At about this time, the MHD retained Ellerbe & Company to prepare final plans for a portion of I-35E, which included bridges crossing the corridor as well as a section of I-694 that was near the I-35E work. Early segments completed by Ellerbe & Company using prestressed concrete include the Arlington Avenue Bridge (Bridge 6579, nonextant), the Wheelock Parkway Bridge (Bridge 6511, built in 1959, extant), the Larpenteur Avenue Bridge (Bridge 6514, built in 1960, extant), and the Rice Street Bridge (Bridge 6580).[39]

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[35] Minnesota Department of Transportation, *Bridge Inventory Database*, 2009.

[36] Mead & Hunt, Inc., *Evaluation Report and Historic Context Minnesota Bridges, 1955-1970 (including Trunk Highway Evaluations)* (prepared for the Minnesota Department of Transportation, July 2013), 87–88.

[37] Ellerbe & Company, "Final Design and Estimate: Bridge No. 9053, 94th Street/T.H. 65 for State of Minnesota Department of Highways," 1957, available in the Bridge 9053 Records, Minnesota Department of Transportation Central Files, Saint Paul, Minn.

[38] Walter Butler Company, "Preliminary Design Report for S.P. 1982-08, 6280-23 & 6280-25, Interstate Route 35E," Saint Paul, Minn., 1959, available at the Minnesota Department of Transportation, Saint Paul, Minn.

[39] Report of Commissioner of Public Works of the City of Saint Paul, for 1956-1957-1958, (Saint Paul, Minn.: [City of Saint Paul], 1958), 11; "Progress," *Saint Paul Dispatch*, November 2, 1960, n.p., available at the Minnesota Highway Department, newspaper clipping files, Minnesota State Archives, Minnesota Historical Society, Saint Paul, Minn.; "I-694 MN - History."

Interestingly, Ellerbe & Company did not identify its 1950s-1960s bridge design work in its promotional material, despite being pioneers in prestressed-concrete bridge design, including the state's first prestressed-concrete bridge and the Lafayette Bridge, a major Mississippi River crossing in Saint Paul. The one book published on the company history neglects to mention the firm's engineering or transportation projects of any kind during the 1950s and 1960s, providing instead chapters on its well-known architectural specialties of health-care facilities and educational and commercial buildings. The only mention of the firm's bridge work is included in its 1963 federal form titled "Architect-Engineer Experience Data," which lists all of the firm's work to date. On the form, Ellerbe & Company identified $18 million in ongoing bridge construction on the Interstate Highway System, along with another $1.5 million in state highway bridge construction. The dollar amount of Interstate Highway and bridge work ranked among their largest efforts listed, including work back to 1942 that involved major buildings for the military and the Mayo Clinic.[40]

The MHD and Minnesota's prestressed concrete industry collaborated over the use and development of prestressed-concrete bridge members. Area manufacturers, such as the Elk River Concrete Products Company, were active in urging the MHD to permit innovations in prestressed concrete fabrication, such as alterations to concrete mixtures, in order to improve concrete quality. They also promoted the incorporation of accelerants to cure concrete and speed the manufacturing time, and adopted methods for increasing the strength of the prestressed-concrete beams. The collaboration between the MHD and manufacturers was a mutually beneficial relationship for both the state and privately owned companies.[41]

Elk River Concrete Products, fabricator of the beams used on Bridge 6580, was uniquely equipped to produce prestressed-concrete bridge members during this early period of use and development. Founded in 1917 by L.D. Bailey and D.W. Longfellow, Elk River Concrete was the first of several companies in the Midwest that would comprise Cretex Companies, Inc. in the 1920s. By the 1950s Elk River Concrete had eight plant locations across Minnesota, including a concrete pipe plant and bridge fabrication department. Elk River Concrete's bridge design department was under the leadership of L.D. Bailey's son, Albert, with engineer Charles C. Zollman providing technical guidance.[42]

Zollman, born 1916 in the Netherlands, studied under Gustave Magnel at the University of Ghent before immigrating to the United States in 1941. Following World War II the two men renewed their correspondence, out of which grew a professional relationship. During Magnel's North American lecture series, Zollman acted as his representative, making arrangements for the tour. After the tour was complete, Zollman worked with Magnel to translate chapters of what would become *Prestressed*

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[40] Gardner, "The Lafayette Bridge," 3–5; Thomas Farr Ellerbe and Bonnie J Hayskar, *The Ellerbe Tradition: Seventy Years of Architecture & Engineering: From the Papers of Thomas Farr Ellerbe* (Minneapolis, Minn.: Ellerbe, Inc., 1980), 77–112; Ellerbe & Company, Saint Paul, *Ellerbe and Company, Architects, Engineers, Planners, Saint Paul, Rochester, Minnesota* (Saint Paul, Minn.: N.p., 1963).

[41] Mead & Hunt, Inc., 88.

[42] Stolz et al., *Cretex Times*, 42, 51, 104.

Concrete into English.[43] It was Zollman who proposed Magnel's design for the Walnut Lane Memorial Bridge to the City of Philadelphia. Zollman's employer, the Preload Corporation located in Garden City, New York, was also chosen to fabricate the prestressed-concrete beams, and Zollman acted as a supervisor for the design.[44] After completion of the Walnut Lane Memorial Bridge, Zollman emerged as one of the America's engineering experts on the design, fabrication, and installation of prestressed-concrete beams.

Albert Bailey had studied the prestressing process, but needed further advice on the techniques and installation for the new, and expensive, casting and tensioning beds. In the mid-1950s he reached out to Zollman, as well as Zollman's coworker Morris Schupack, to act as a consultants for designing and constructing the new prestressed concrete precasting area in the plant at Elk River. Later, Zollman would remark:

> The wise potential investor, the intelligent producer is the one who is willing to assume that he doesn't know anything about it [prestressed concrete fabrication] – most likely an understatement – but who then surrounds himself with competent men and lets them carry the ball.[45]

Zollman applied his expertise garnered while working on the Walnut Lane Memorial Bridge and developed a complex pattern for building casting beds, just one facet of the significant infrastructure required to manufacture, transport, and erect prestressed-concrete beam bridges.[46] In 1957, with Zollman's guidance, Elk River Concrete built two casting beds at its Elk River location and began producing prestressed-concrete members, primarily for MHD Interstate bridges, through the 1960s.[47] At the same time, Zollman acted as a design consultant for Elk River Concrete on MHD bridge projects and developed alternate designs for stringers in order to reduce construction costs of casting for non-standardized, prestressed bridge sections.[48] With their combined knowledge and skill, Bailey and Zollman "gave Cretex its leading position in bridge construction using prestressed products."[49]

(3) Interstate development in Minnesota and the Twin Cities metropolitan area

The rise in widespread prestressed-concrete bridge construction coincided with the end of World War II and the initiative to develop a national Interstate Highway System. In April 1944 President Franklin D. Roosevelt received the final report of the National Interregional Highway Committee, a task force

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[43] Zollman, "Magnel's Impact on the Advent of Prestressed Concrete," 28, 31.

[44] Nasser, 27.

[45] Charles C. Zollman, "Planning and Design of Installations of Today's Pretensioned Requirements," *Journal of Prestressed Concrete* 2 (March 1958), 74.

[46] Jim Nystrom, interview by Mead & Hunt, Inc., Oakdale, Minn., January 28, 2008. Nystrom was an employee at Cretex, which is still in operation.

[47] Nystrom, Voight, and Barthel, Elk River Concrete (Cretex) Early Years; Mead & Hunt Interview by Robert M. Frame and Darrell Berry, at Elk River, Minnesota.

[48] Charles C. Zollman Consultants, "Alternate Stringer Design, 1958," Minnesota State Highway Department, available in the Bridge 6579 Records, Minnesota Department of Transportation Central Files, Saint Paul, Minn.

[49] Stolz et al., *Cretex Times*, 104.

convened in 1941 to make plans for a federal highway construction program that could be implemented after the war to offset anticipated unemployment. The committee's report, entitled *Interregional Highways*, called for the construction of 39,000 miles of Interstate express highways, including 5,000 miles constructed in and around major cities. The roads were to follow new alignments, with right-of-way selected cooperatively by federal, state, and local governments. To ensure a smooth flow of traffic, the new Interstates were to have limited access and grade separations, or bridges, to eliminate intersections. *Interregional Highways* formed the basis for the Federal-Aid Highway Act of 1944, which called for the creation of a 40,000-mile Interstate Highway System that would "connect principal metropolitan areas…industrial centers…serve the national defense, and connect…with routes of continental importance in the Dominion of Canada and the Republic of Mexico."[50]

When World War II came to an end in August 1945, it seemed as though road and bridge building would immediately emerge as a domestic priority. The need for improvements was clear. In Minnesota and other states, road construction slowed during the war. Shortages of materials and funding had caused even routine maintenance to be deferred. Meanwhile, major highways had been used heavily by an ever-expanding fleet of large trucks that transported raw materials and equipment for the war effort. As trucks increased in size and number, it became clear that many of the state's existing bridges were no longer sufficient to carry the heavy new loads.[51]

As a result of the need for new roadways and bridges, government leaders began to chart a course for nationwide road-building projects. The Federal-Aid Highway Act of 1944 provided funds for planning and surveys, and facilitated cooperation between federal, state, and local governments. However, it was not until the Federal-Aid Highway Act of 1956, with the increased funding it provided, that rapid development of the Interstate Highway System occurred. After passage of the 1956 Act, the MHD announced plans to proceed with a $66 million road and bridge construction program, and construction started in earnest. The undertaking was described by *Minnesota Highways* as "a record shattering" effort representing the "biggest twelve-month's contract" in the state's history. Among other things, the program enabled the MHD to improve 530 miles of Minnesota Trunk Highways and construct 41 new bridges, including 22 grade separations and 19 stream crossings on this system.[52] Many of these efforts upgraded major Trunk Highway routes to expressway standards. Both expressways and freeways were designed to provide fast and safe mass transportation within and between metropolitan areas.

Within Minnesota, in addition to updates to the Trunk Highway System, three Interstate routes were proposed to pass through the state, covering some 900 miles and corresponding closely to the eventual

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[50] Patricia Cavanaugh, *Politics and Freeways: Building the Twin Cities Interstate System* (Minneapolis, Minn.: University of Minnesota Center for Transportation Studies/Center for Urban and Regional Affairs, 2006), 7; Bruce E. Seely, *Building the American Highway System: Engineers as Policy Makers* (Philadelphia: Temple University Press, 1987), 177-182.

[51] Automotive Safety Foundation, "Highway Transportation in Minnesota: An Engineering Analysis," Saint Paul, Minn., September 1954, 78; Michael T. Morris, "Before the Interstate: The Minnesota Highway Department from 1921-1956" (M.A., University of Wisconsin, River Falls, 1990), 96-97.

[52] "6-Month Program Covers 530 Miles," *Minnesota Highways* 6, no. 4 (February 1957), 1.

alignments of I-35, I-90, and I-94.[53] I-35 was designed as a north-south route entering the state from Iowa and terminating in Duluth. I-90 was designed as an east-west route across the southern portion of the state from the border with La Crosse, Wisconsin, to Sioux Falls, South Dakota. I-94 was planned as an east-west route entering the state at Hudson, Wisconsin, and running northwest through Saint Paul and Minneapolis to Fargo, North Dakota.

The Twin Cities metropolitan freeway system eventually included five Interstate routes: I-35, including I-35W through Minneapolis and I-35E through Saint Paul; and I-94, including its outer beltline comprised of I-494 encircling the southern and western portions of the greater metro area, and I-694 encircling the northern and eastern portions of the metro area. The construction of I-694 was authorized in 1956. One of the earliest sections of I-694 to be completed was a short section from Rice Street east to I-35E; this section included Bridge 6580 and was opened to traffic in 1961.[54]

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[53] District Nine Resource Section - Minnesota Highway Department, "History of the Interstate System at the National Level," 1975, 19.

[54] "Interstate 694 Minnesota: History"; "I-694 MN – History."

B. Photographs

MINNESOTA HISTORIC PROPERTY RECORD

INDEX TO PHOTOGRAPHS

BRIDGE 6580 MHPR No. RA-VHC-017
UTM Coordinates 491632m E/ 4987970m N/Zone 15 T
Carrying Rice Street (Trunk Highway 49) over Interstate 694
Saint Paul
Ramsey County
Minnesota

Large format photographs by Daniel R. Pratt, February 2017.

RA-VHC-017-01	VIEW OF BRIDGE 6580 IN CONTEXT, LOOKING NORTHWEST.
RA-VHC-017-02	VIEW OF BRIDGE 6580 EAST ELEVATION, LOOKING NORTHWEST.
RA-VHC-017-03	VIEW OF BRIDGE 6580 WEST ELEVATION, LOOKING EAST.
RA-VHC-017-04	VIEW OF BRIDGE 6580 STEPPED CONCRETE END POST AT NORTHEAST CORNER, LOOKING WEST-SOUTHWEST.
RA-VHC-017-05	VIEW OF BRIDGE 6580 SOUTH ABUTMENT, LOOKING SOUTHEAST.
RA-VHC-017-06	VIEW OF BRIDGE 6580 RAILING, END POST, DECK GIRDER, BEARING, AND ABUTMENT AT NORTHEAST CORNER, LOOKING NORTHWEST.
RA-VHC-017-07	VIEW OF BRIDGE 6580 DECK GIRDER BEARING AT NORTH ABUTMENT, LOOKING NORTHEAST.
RA-VHC-017-08	VIEW OF BRIDGE 6580 GIRDER AND BEAM DECK SYSTEM FROM SOUTH ABUTMENT, LOOKING NORTH.
RA-VHC-017-09	VIEW OF BRIDGE 6580 SOUTH ABUTMENT, PIER, AND DECK SYSTEM, LOOKING SOUTH FROM CENTER PIER.
RA-VHC-017-10	VIEW OF BRIDGE 6580 GIRDER AND BEAM DECK SYSTEM FROM NORTH ABUTMENT, LOOKING SOUTH
RA-VHC-017-11	VIEW OF BRIDGE 6580 DECK SYSTEM FROM CENTER OF ROADWAY, LOOKING UP AND SOUTHWEST.
RA-VHC-017-12	VIEW OF BRIDGE 6580 NORTH APPROACH ON RICE STREET, LOOKING SOUTH-SOUTHEAST.
RA-VHC-017-13	VIEW OF BRIDGE 6580 WEST RAILING AND DECK SURFACE AT NORTH END OF BRIDGE, LOOKING SOUTHEAST.

RA-VHC-017-14	VIEW OF BRIDGE 6580 PIER, DECK GIRDER, AND RAILING ON SOUTH END OF WEST ELEVATION, LOOKING NORTHEAST.
RA-VHC-017-15	VIEW OF BRIDGE 6580 DECK, CURB PROFILE, AND RAILING NEAR SOUTH END OF BRIDGE, LOOKING NORTH.

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SEE INDEX TO PHOTOGRAPHS FOR CAPTION

MHPR No. RA-VHC-017-01

MINNESOTA HISTORIC PROPERTY RECORD
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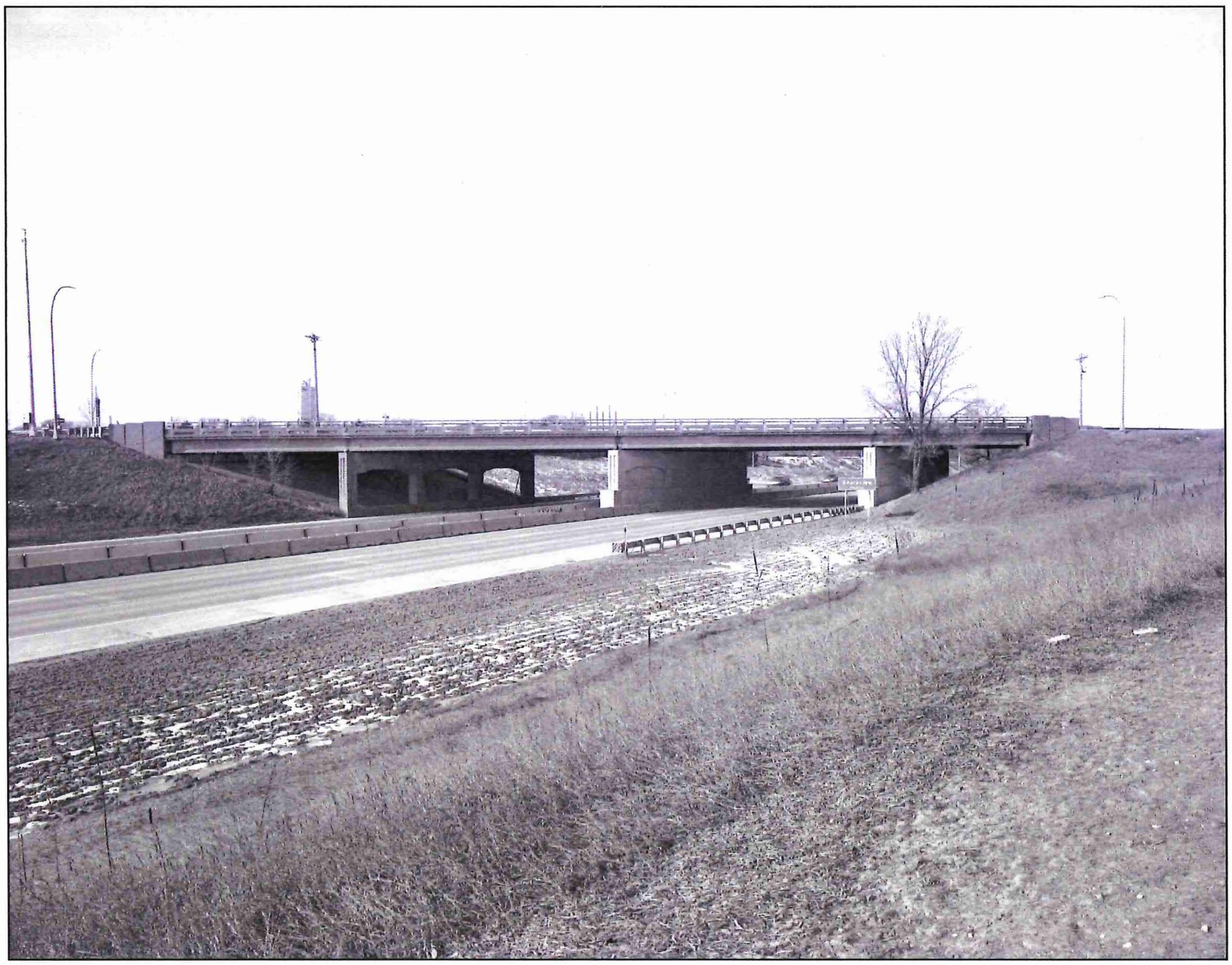

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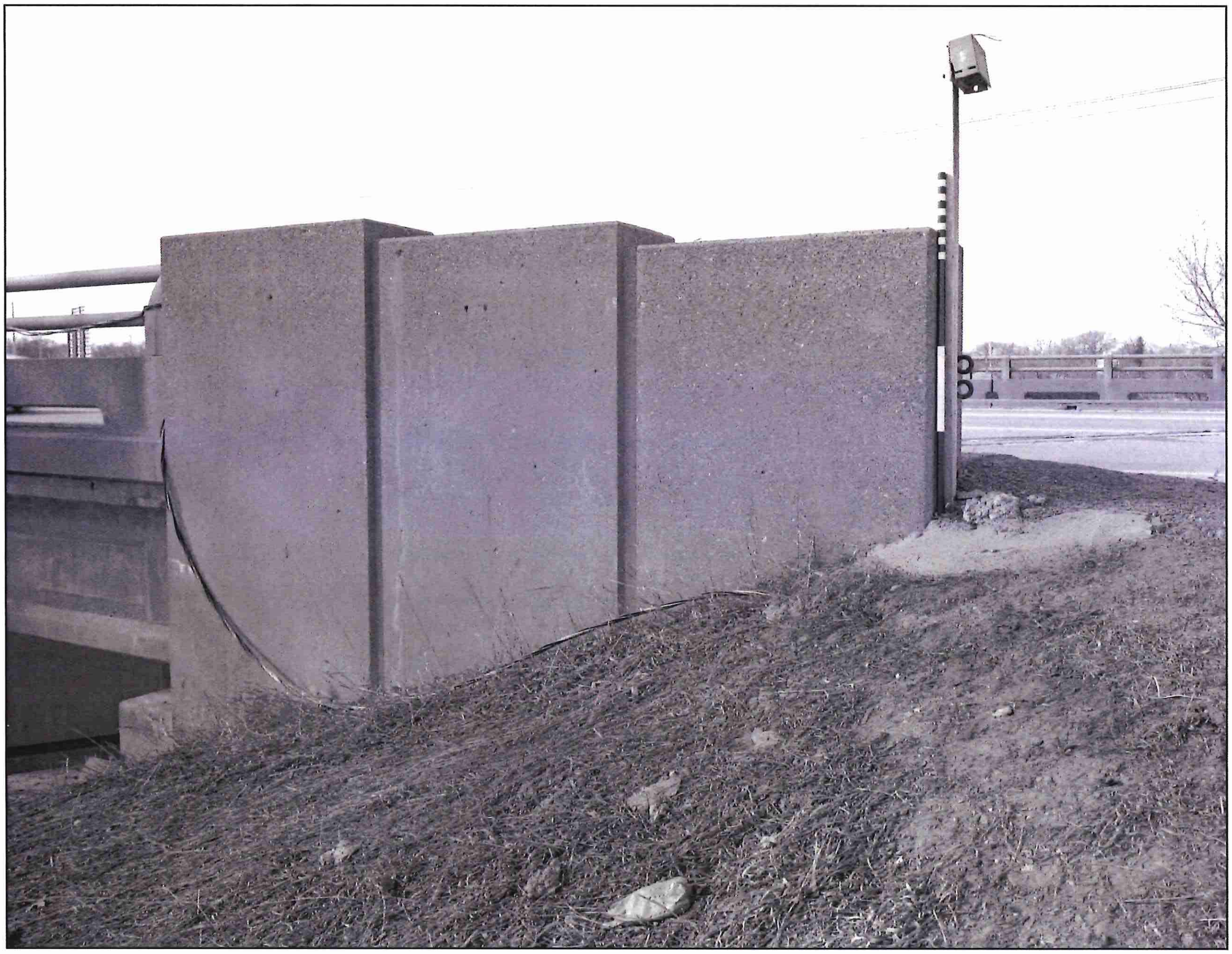

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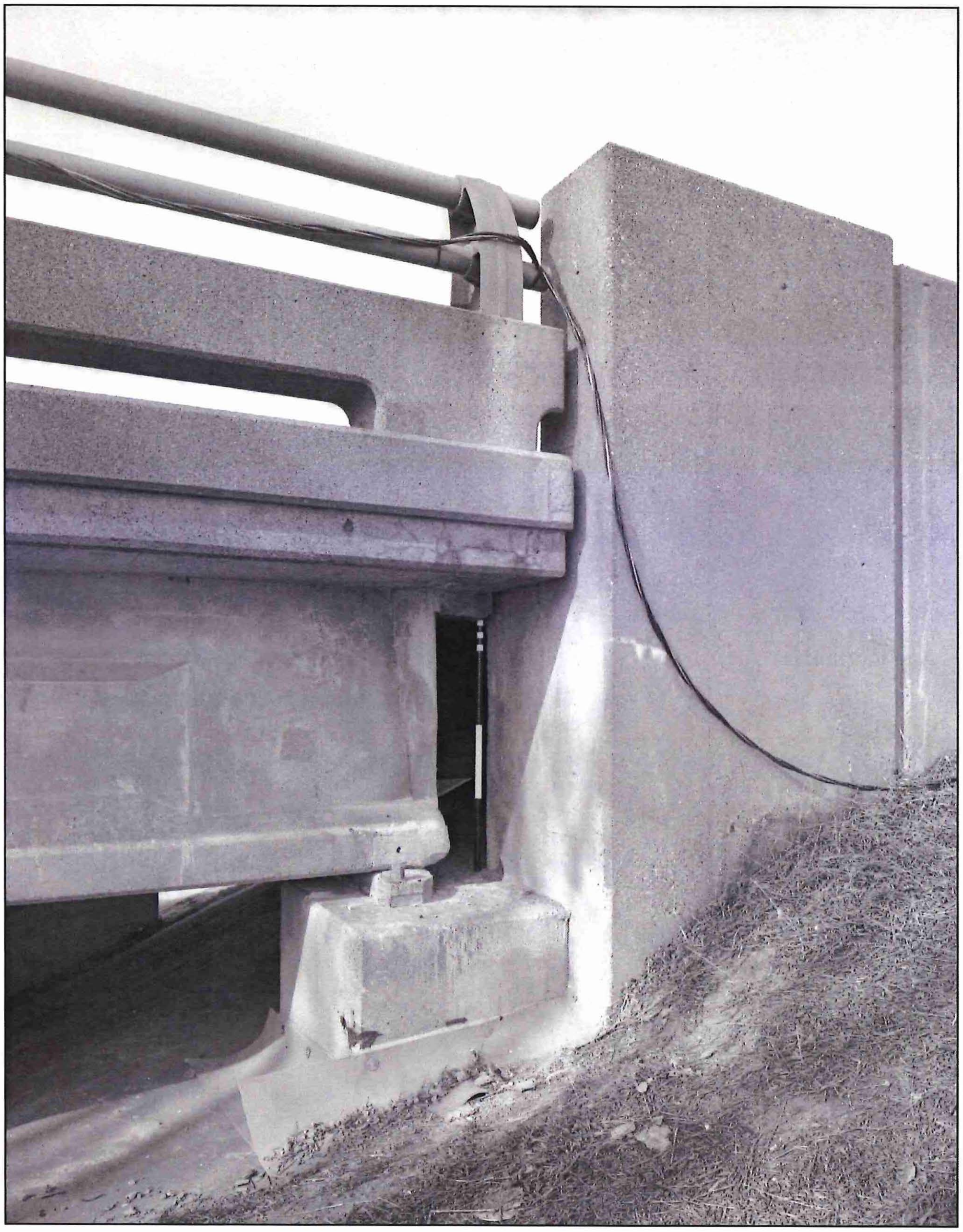

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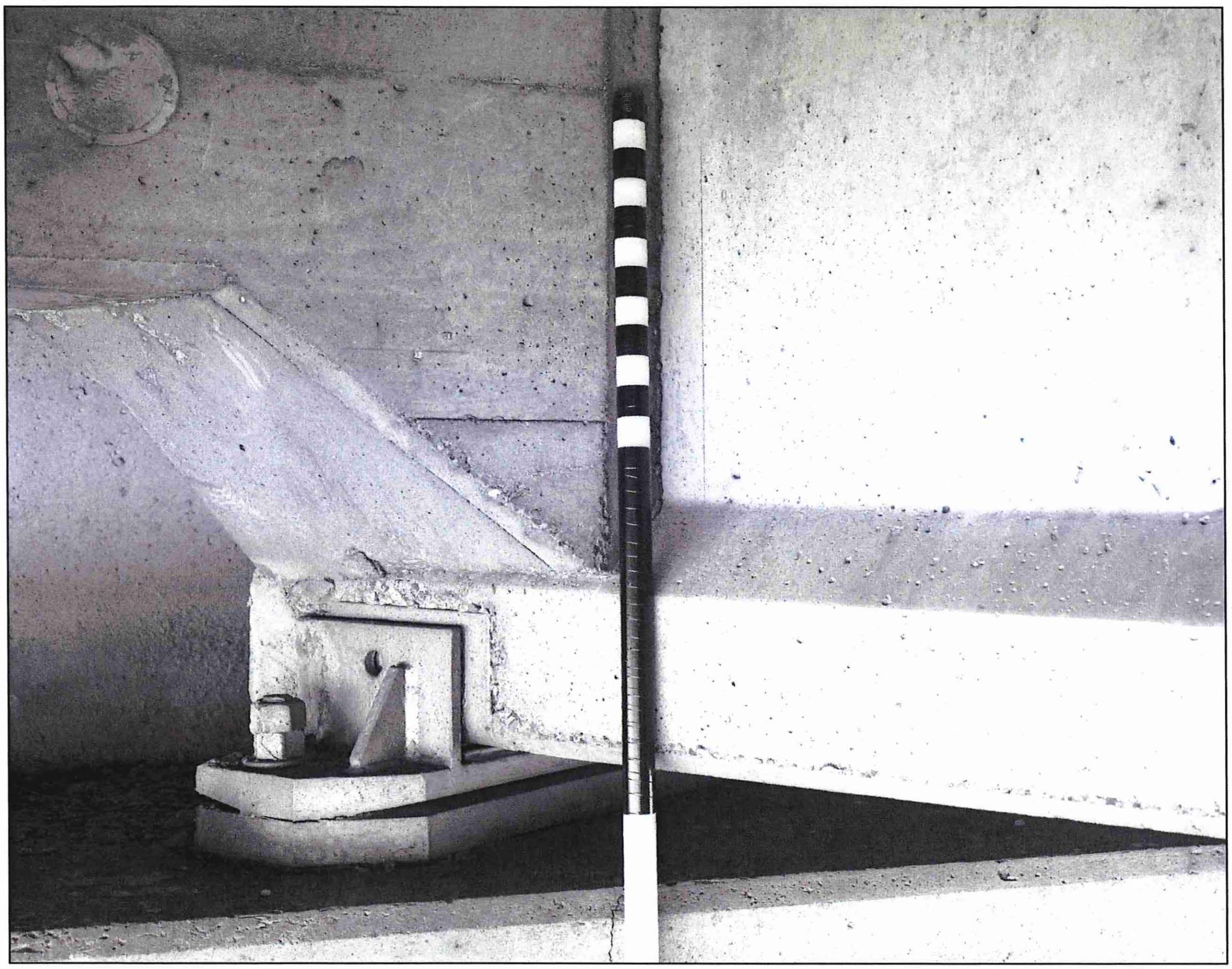

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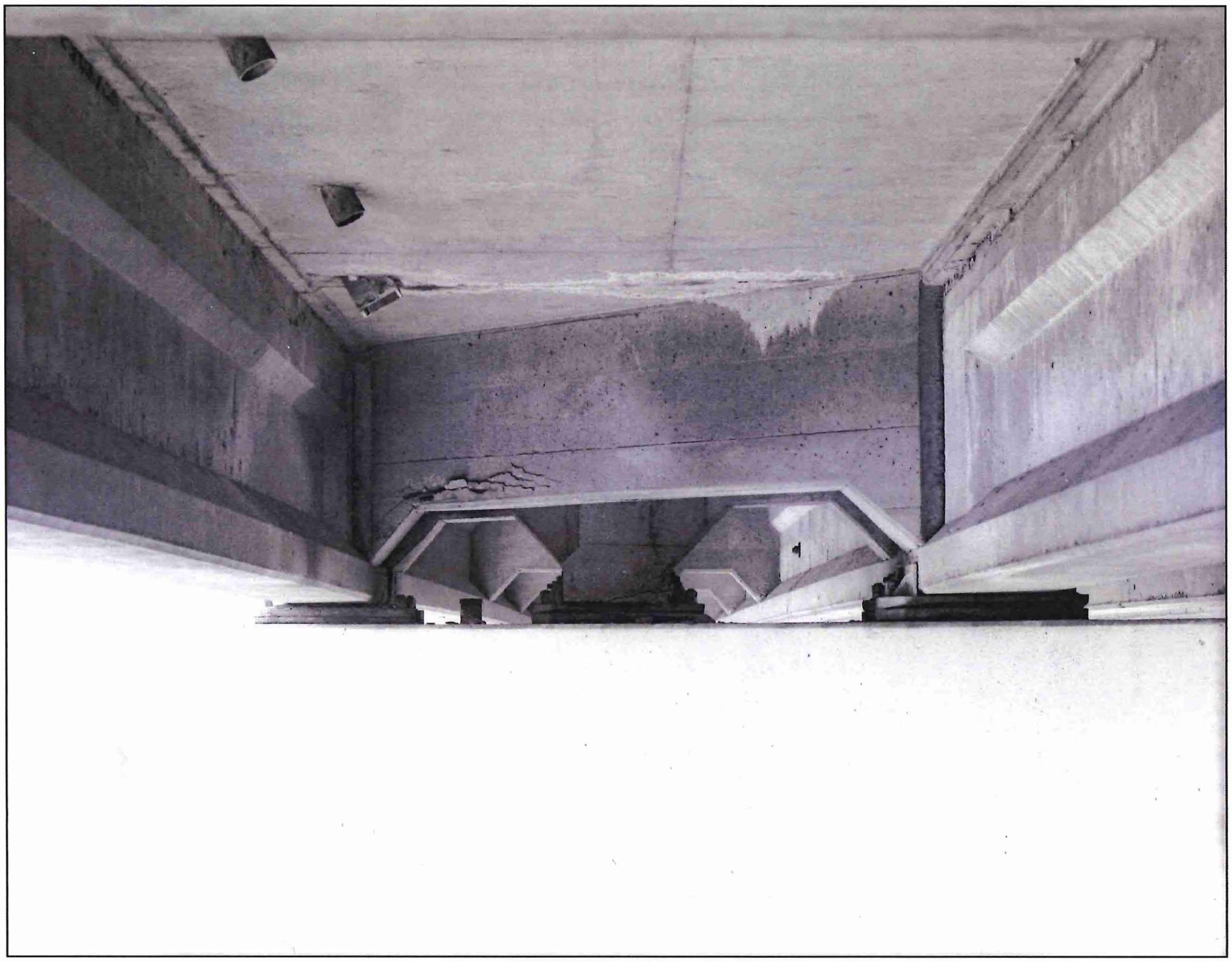

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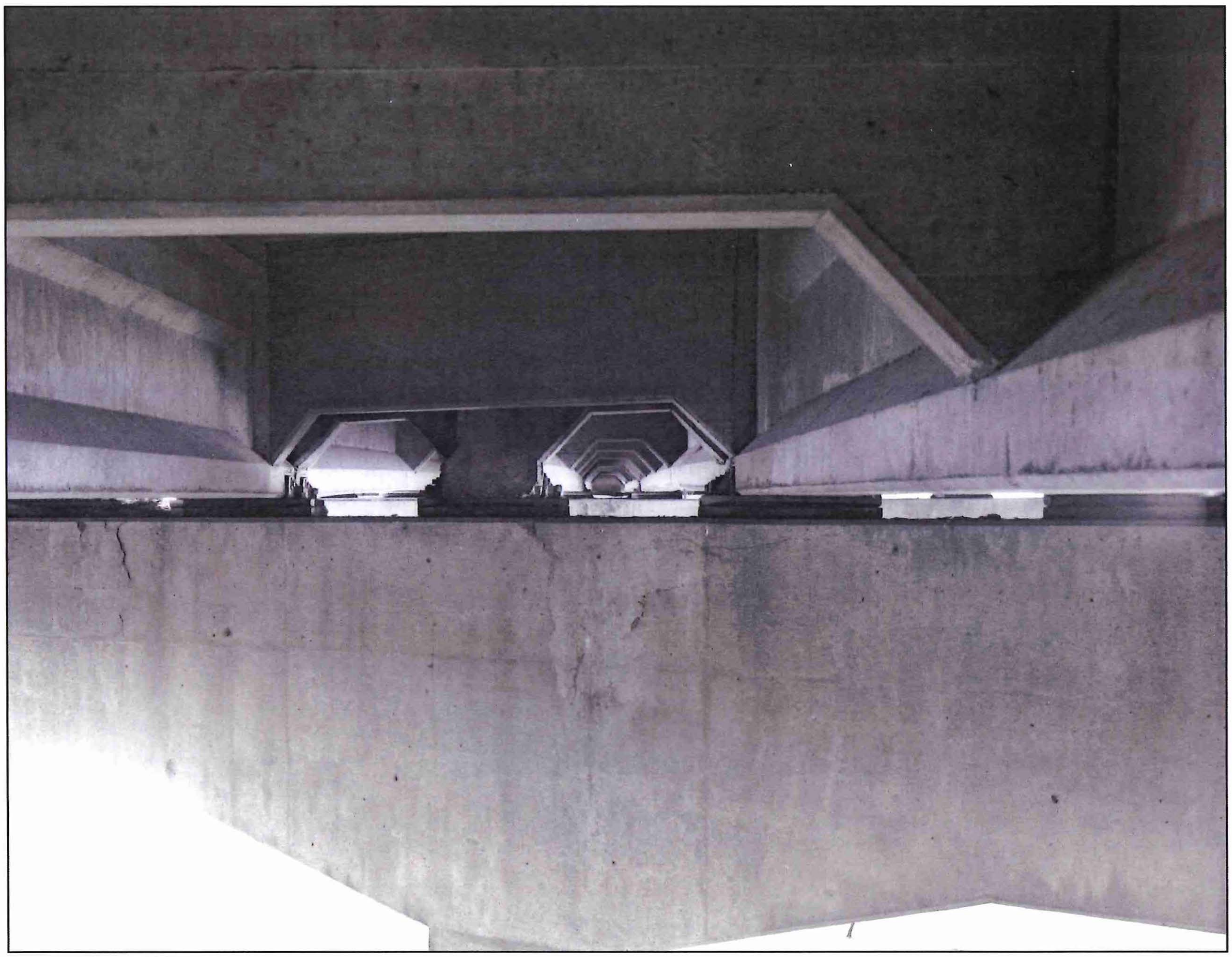

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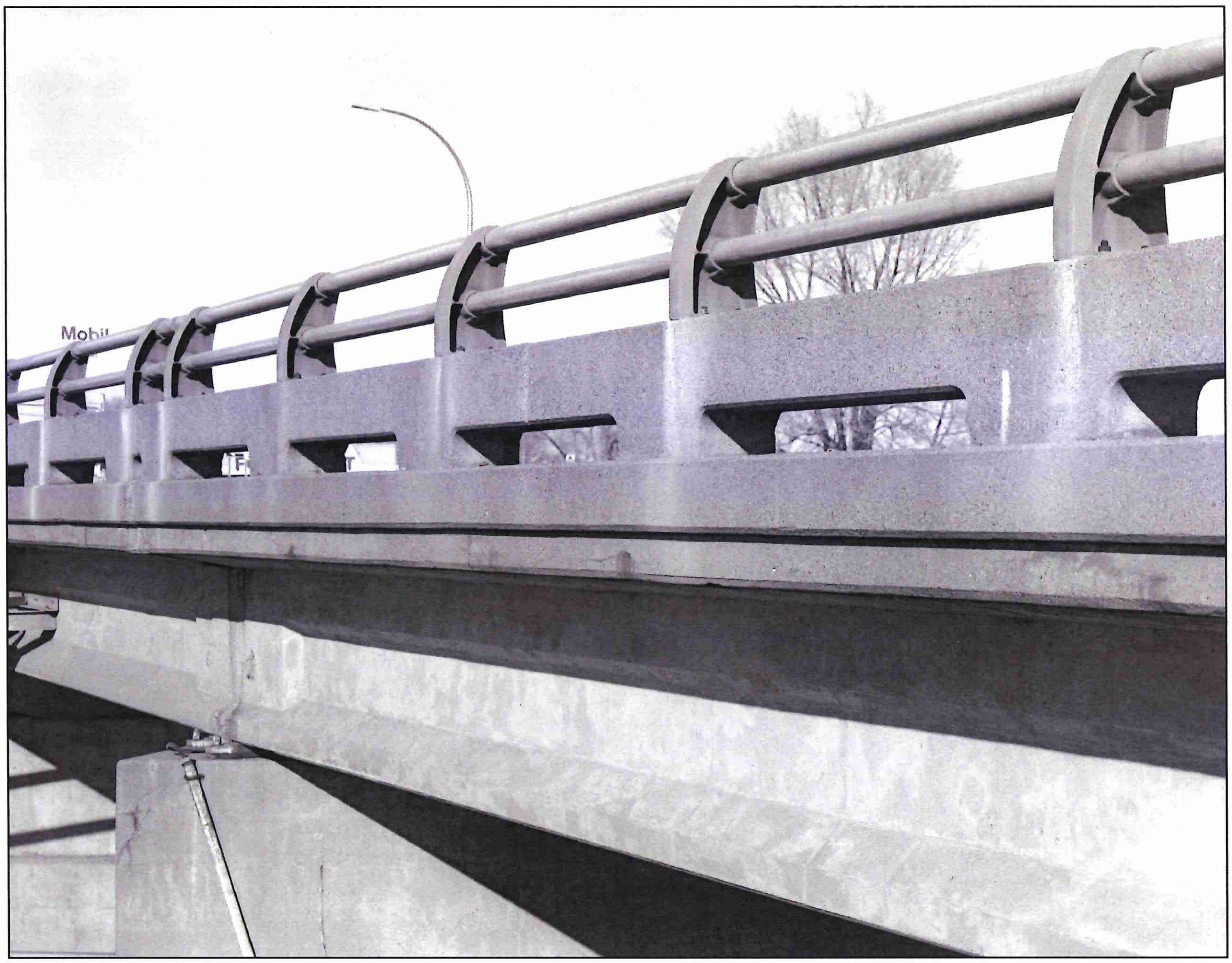

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MHPR No. RA-VHC-017-15

C. Major Bibliographic References

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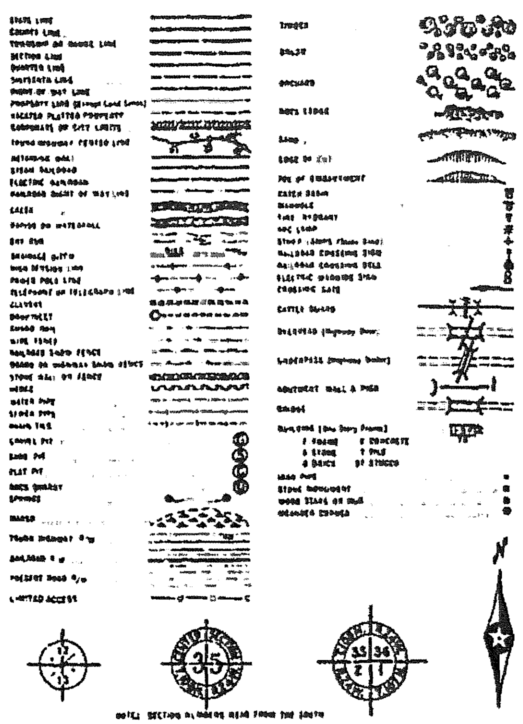
D. Drawings and Plan Recordation

CONVENTIONAL SIGNS



STATE OF MINNESOTA
DEPARTMENT OF HIGHWAYS
CONSTRUCTION PLAN FOR BRIDGE NO. 6580
TRUNK HIGHWAY NO. 393
NORTH OF ST. PAUL

AT A POINT 6628' NORTH OF THE SOUTHWEST CORNER OF THE NORTHWEST QUARTER OF SECTION 31 T30N R22W.

MINNESOTA PROJECT I 393-1(37)

GROSS LENGTH		FEET		MILES
BRIDGES LENGTH		FEET		MILES
EXCEPTIONS LENGTH	0.0	FEET	0.0	MILES
NET LENGTH		FEET		MILES

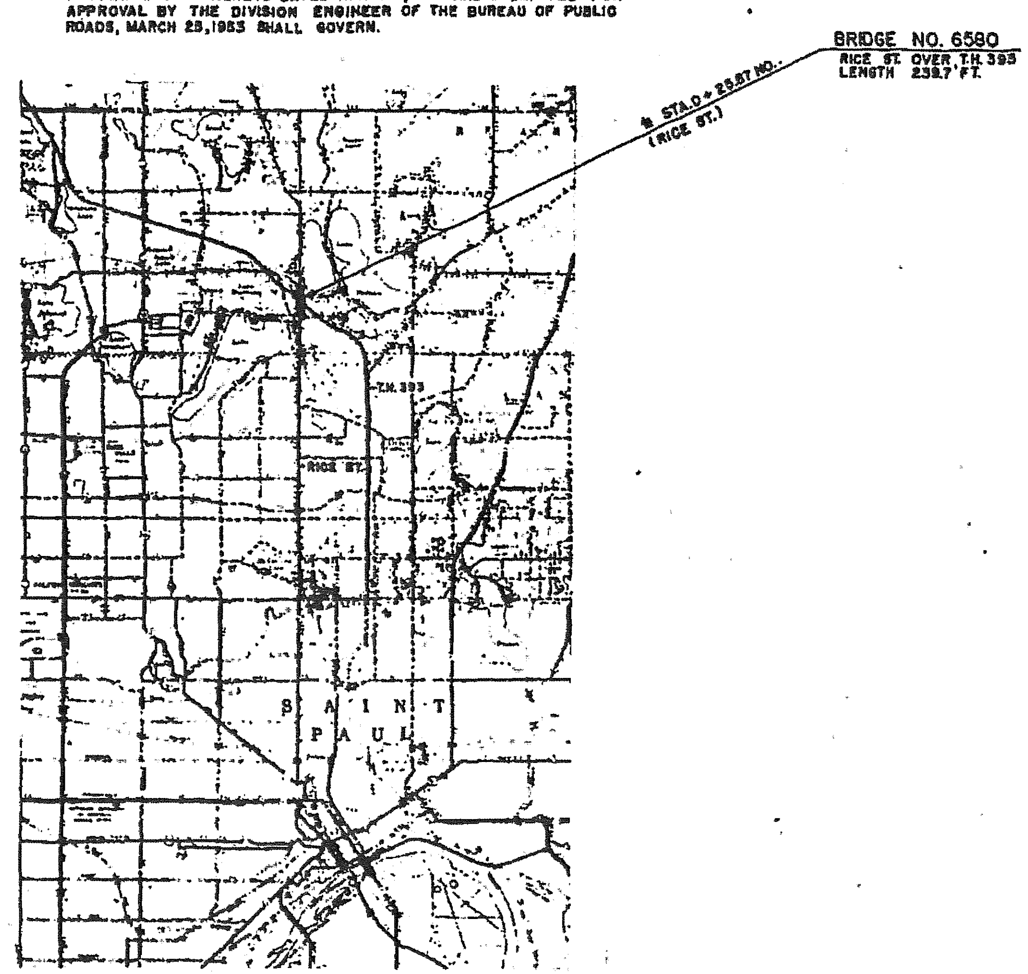
STATE PROJECT NO. 6285-07

GROSS LENGTH		FEET		MILES
BRIDGES LENGTH		FEET		MILES
EXCEPTIONS LENGTH	0.0	FEET	0.0	MILES
NET LENGTH		FEET		MILES

LAYOUT
Scale 1 Inch = 5280 Feet

SPECIFICATIONS

THE SPECIFICATIONS FOR HIGHWAY CONSTRUCTION DATED JULY 1, 1947 AND SUBMITTED FOR APPROVAL BY THE DIVISION ENGINEER OF THE BUREAU OF PUBLIC ROADS OCTOBER 15, 1947, AS MODIFIED BY "SUPPLEMENT I" THERETO DATED APRIL 15, 1953 AND SUBMITTED FOR APPROVAL BY THE DIVISION ENGINEER OF THE BUREAU OF PUBLIC ROADS, MARCH 25, 1953 SHALL GOVERN.

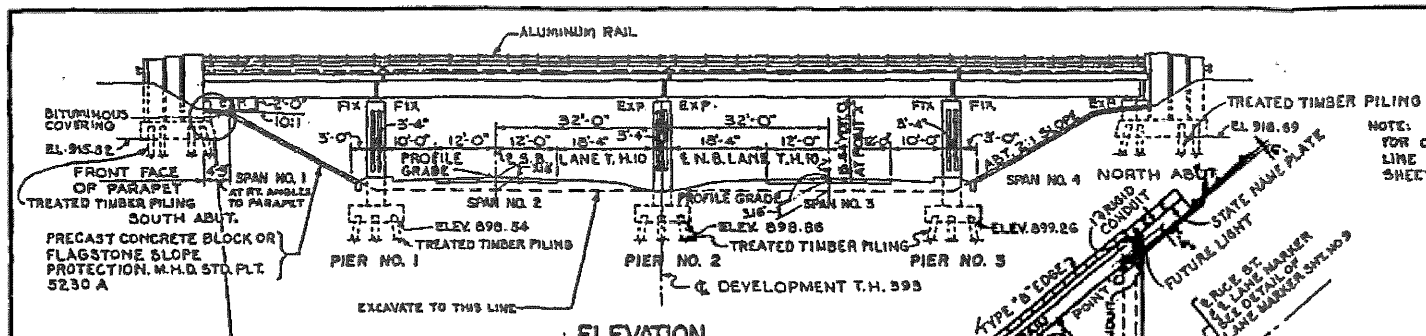


Recommended for Approval: A.C. LaBonte 7-23-57
Recommended for Approval: 7-23-57
Approved: July 23 1957

DEPARTMENT OF COMMERCE
BUREAU OF PUBLIC ROADS

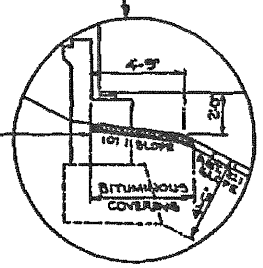
APPROVED: MICRO-FILMED

DISTRICT ENGINEER DATE

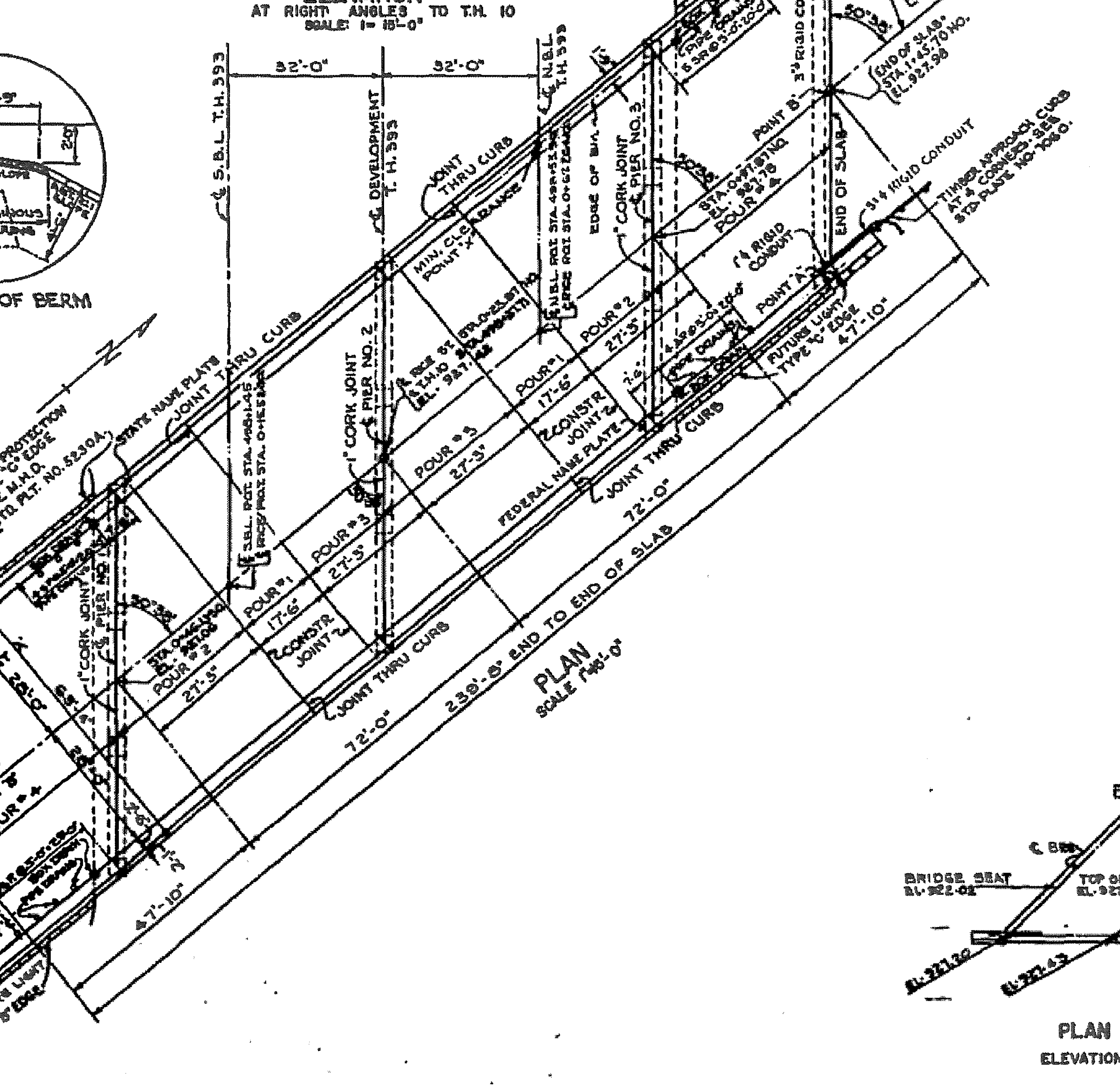


ELEVATION

AT RIGHT ANGLES TO T.H. 10
SCALE: 1" = 16'-0"



DETAIL OF BERM



PLAN

SCALE 1" = 16'-0"

DESIGN DATA *

1953 A.A.S.H.O. DESIGN SPECIFICATIONS
H20 S16 44 AND ALTERNATE LOADING
DESIGNATED IN PPM 20-4 SECTION 4C
fc=1200 n=10 fs=20,000 INTERM. GRADE REINF.
fs=18000 CARBON STEEL M.H.D. 3306

* THE PRESTRESSED GIRDERS ARE DESIGNED IN ACCORDANCE WITH "AASHO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES" (1953) AND "CRITERIA FOR PRESTRESSED CONCRETE BRIDGES U.S. BUREAU OF PUBLIC ROADS" (1954) EXCEPT AS MODIFIED BY THE SPECIAL PROVISIONS.

B.M. ELEV. 926.43
SPK IN ROOT OF 20" OAK
15' LT. [illegible] STA. 498 + 58
MSL 1929 ADJ.

CONSTRUCTION NOTES

THE MINNESOTA SPECIFICATIONS FOR HIGHWAY CONSTRUCTION DATED JULY 1, 1947 AND SUBMITTED FOR APPROVAL BY THE DIVISION ENGINEER OF THE BUREAU OF PUBLIC ROADS ON OCTOBER 15, 1947, AS MODIFIED BY "SUPPLEMENT NO. 1" [illegible] DATED APRIL 15, 1953, AND SUBMITTED FOR APPROVAL BY THE DIVISION ENGINEER OF THE BUREAU OF PUBLIC ROADS ON MARCH 25, 1953, SHALL GOVERN.

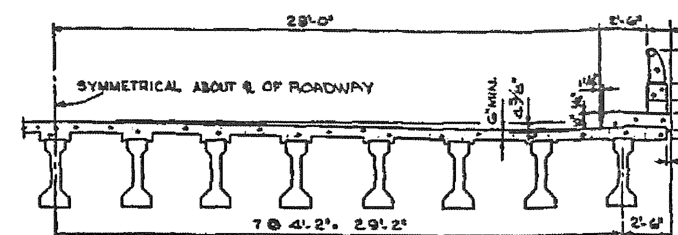
ALL REINFORCEMENT BARS SHALL BE INTERMEDIATE GRADE BARS DEFORMED

SLAB POURING SEQUENCE SHALL BE AS INDICATED ON PLAN AT LEFT AND THE CURB SHALL BE PLACED AFTER THE ENTIRE ROADWAY SLAB HAS BEEN PLACED.

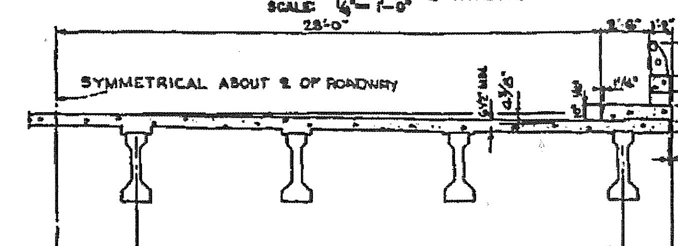
SIDEWALK AT ABUTMENTS TO BE POURED AFTER COMPLETE BRIDGE SIDEWALK HAS BEEN POURED.

STRUCTURAL STEEL SHALL CONFORM TO M.H.D. 3305.

EDGES OF CONCRETE ON ALL EXPOSED CONSTRUCTION OR EXPANSION JOINTS TO BE FORMED WITH 1/2" V STRIPS UNLESS OTHERWISE NOTED.



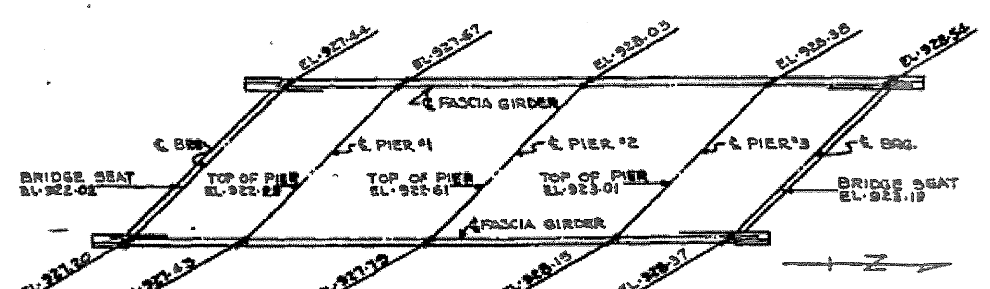
HALF TRANSVERSE SECTION THRU DECK–SPANS 2 & 3
TAKEN AT RIGHT ANGLES TO ℄ ROADWAY
SCALE: 1/8" = 1'-0"



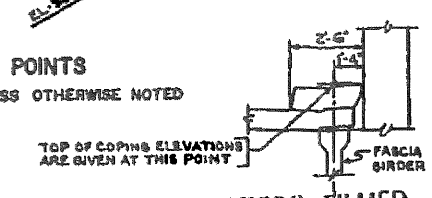
HALF TRANSVERSE SECTION THRU DECK–SPANS 1 & 4
TAKEN AT RIGHT ANGLES TO ℄ ROADWAY
SCALE: 1/8" = 1'-0"

LIST OF SHEETS

1	GENERAL PLAN & ELEVATION
2	DECK DETAILS AT PIERS AND ABUTMENTS
3	ABUTMENTS - PLAN & ELEVATION
4	ABUTMENTS - REINFORCING
5	ABUTMENT SIDEWALK & REINF. DETAILS
6	PIER DETAILS
7	PRESTRESSED CONCRETE GIRDER DETAILS
8	PRESTRESSED CONCRETE GIRDER DETAILS
9	DECK PLAN & DETAILS
10	DECK REINFORCEMENT - SPANS 1 & 4
11	DECK REINFORCEMENT - SPANS 2 & 3
12	RAILING DETAILS
13	BRIDGE SURVEY
14	BRIDGE SURVEY



PLAN SHOWING VERTICAL CONTROL POINTS
ELEVATIONS GIVEN ARE TO TOP OF COPING UNLESS OTHERWISE NOTED



MICRO-FILMED

SCHEDULE OF QUANTITIES FOR ENTIRE BRIDGE

ITEM NO.	401.571	2401.501	2401.501	2401.541	2402.521	2452.506	2452.504	2452.511	2452.517	2405.551	2405.551	2402.581	2481.501	2402.501	2402.501	2402.5[illegible]	2[illegible]4.501	2514.501	2402.505	2441.501
ITEM	SPECIAL BRIDGE EXCAVATION	CONCRETE MIX. NO. 1A6	CONCRETE MIX. NO. 3Y6	REINFORCEMENT BARS	STRUCTURAL STEEL	TREATED TIMBER PILING DELIVERED	TREATED TIMBER PILING DRIVEN	TREATED TIMBER TEST PILES IN PLACE 55 LIN.	TREATED TIMBER TEST PILES IN PLACE 40 LIN.	PRESTRESSED CONCRETE GIRDERS TYPE NO. 1	PRESTRESSED CONCRETE GIRDERS TYPE NO. 2	BRONZE NAME PLATES	POLYJOINT WATERPROOFING	SHEET COPPER	CONDUIT SYSTEM	METAL RAILING	TIMBER APPROACH CURB	FLAGSTONE SLOPE PROTECTION	WROUGHT BRONZE	DOUBLE LINE BY PASS
UNIT	LUMP SUM	CU. YD.	CU. YD.	LB.	LB.	LIN. FT.	LIN. FT.	PILE	PILE	GIRDER	GIRDER	UNIT	LIN. FT.	LB.	SYSTEM	LIN. FT.	CURB	SQ. YD.	LB.	BY PASS
QUANTITY	ONE	225.5	957.8	147,210	24670	1960	7128	4	6	16	30	3	14	225	ONE	4144	4	588	865	ONE

* SEE SPECIAL PROVISIONS

ELLERBE AND COMPANY
ARCHITECTS AND ENGINEERS
1400 FIRST NATIONAL BANK BUILDING
ST. PAUL 1, MINNESOTA

E. L. Gardner
Date ______ Reg. No. 2371

TRUNK HIGHWAY NO. 393
STATE OF MINNESOTA
DEPARTMENT OF HIGHWAYS

BRIDGE NO. 6580

NORTH OF ST. PAUL
RICE ST. OVER T. H. 393
56 FT. ROADWAY 2 - 2'-6" SIDEWALKS
45-72-72-45 PRESTRESSED GIRDER SPANS

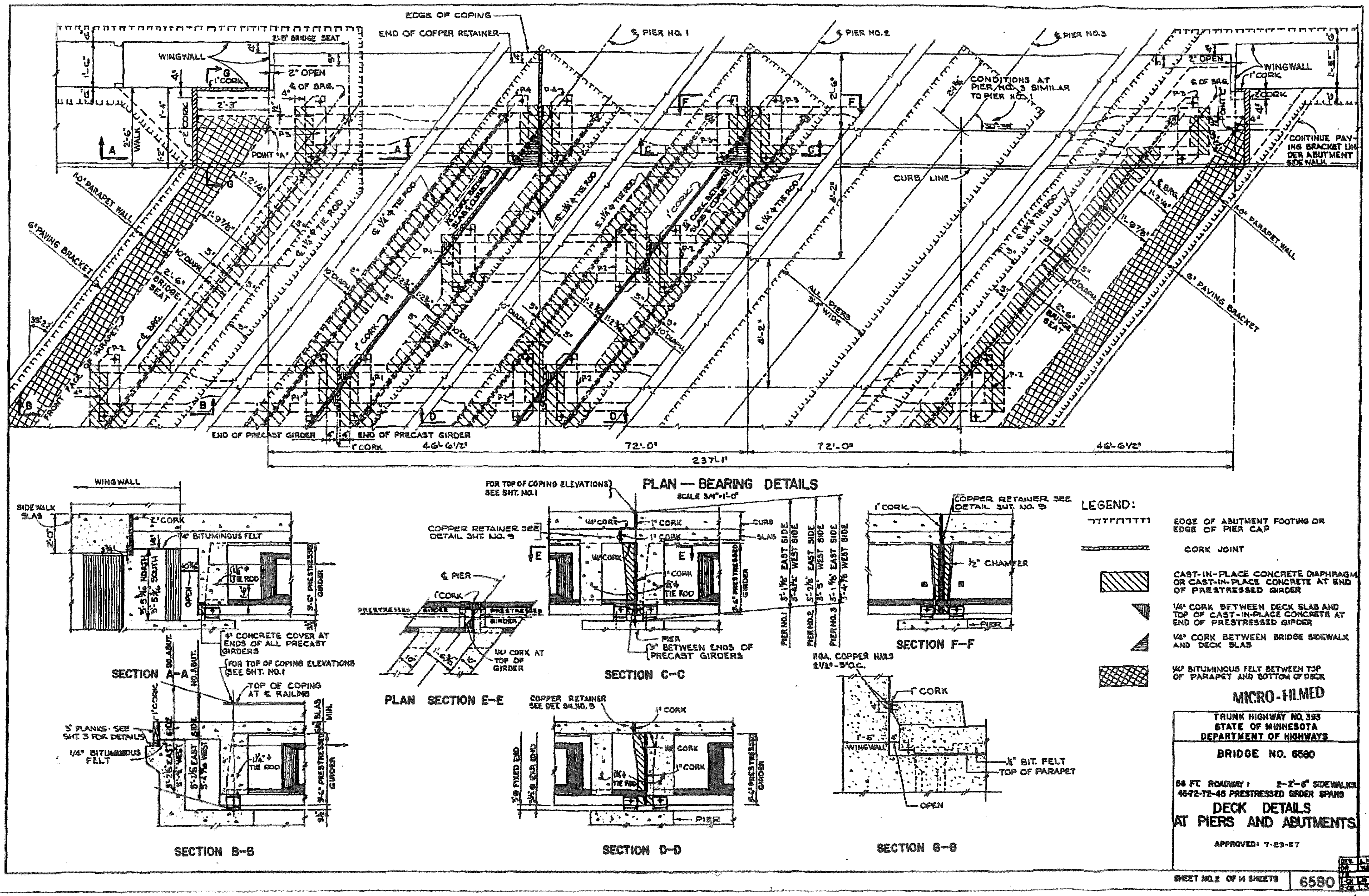
GENERAL PLAN & ELEVATION

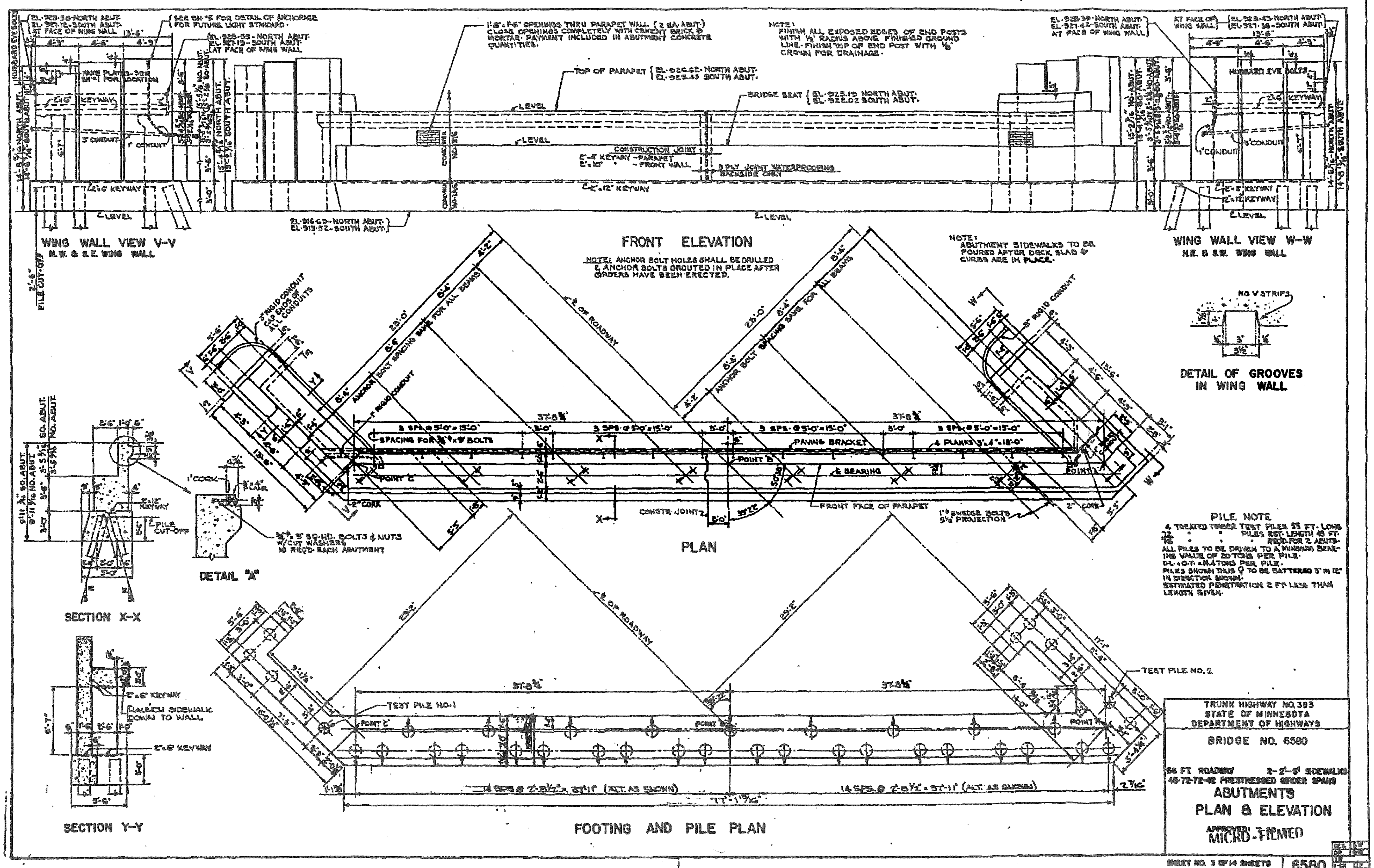
SEC. 36 & 31 T30N R23W & R22W
MOUNDS VIEW TWP. RAMSEY COUNTY

APPROVED: 7-23-57
BRIDGE ENGINEER CHIEF ENGINEER

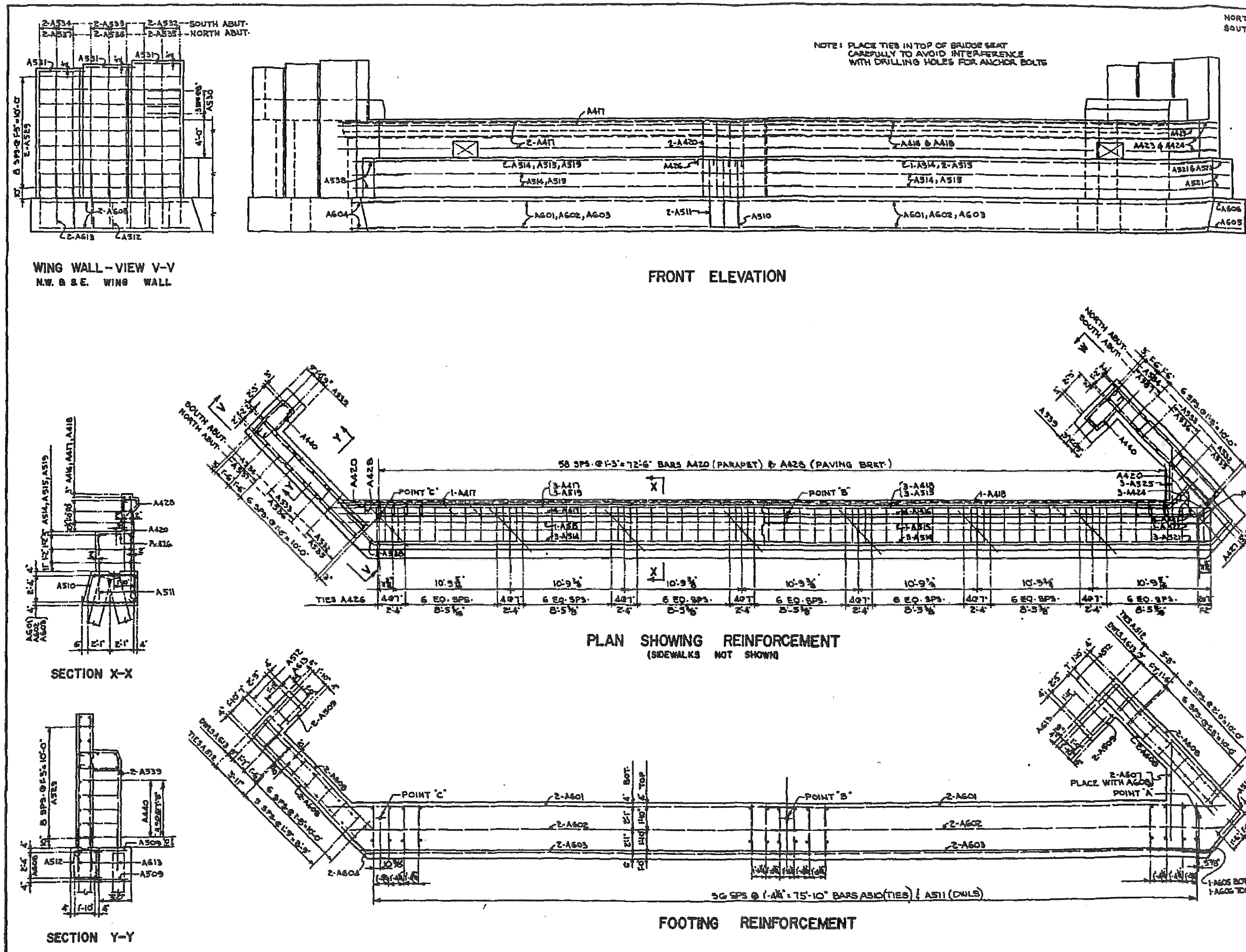
MINN. PROJ. NO. I 393-1(37) STATE PROJ. NO. 6285-07 (T.H. 393)

SHEET NO. 1 OF 14 SHEETS 6580


PLAN — BEARING DETAILS
SCALE 3/4"=1'-0"
EDGE OF COPING
END OF COPPER RETAINER
℄ PIER NO. 1
℄ PIER NO. 2
℄ PIER NO. 3
CONDITIONS AT PIER NO. 3 SIMILAR TO PIER NO. 1
WINGWALL
2" OPEN
℄ OF BRG.
1" CORK
POINT "A"
CURB LINE
CONTINUE PAVING BRACKET UNDER ABUTMENT SIDEWALK
1'-0" PARAPET WALL
6" PAVING BRACKET
ALL PIERS 3'-6" WIDE
10" DIAPH.
1 1/4" ⌀ TIE ROD
END OF PRECAST GIRDER
46'-6 1/2"
72'-0"
72'-0"
46'-6 1/2"
237'-1"
SECTION A-A
SECTION B-B
PLAN SECTION E-E
SECTION C-C
SECTION D-D
SECTION F-F
SECTION G-G
FOR TOP OF COPING ELEVATIONS SEE SHT. NO. 1
COPPER RETAINER SEE DETAIL SHT. NO. 9
4" CONCRETE COVER AT ENDS OF ALL PRECAST GIRDERS
TOP OF COPING AT ℄ RAILING
3" PLANKS - SEE SHT. 3 FOR DETAILS
1/4" BITUMINOUS FELT
3" BETWEEN ENDS OF PRECAST GIRDERS
1/4" CORK AT TOP OF GIRDER
1/2" CHAMFER
11GA. COPPER NAILS 2 1/2"-3"O.C.
1/2" BIT. FELT
TOP OF PARAPET
OPEN
LEGEND:
EDGE OF ABUTMENT FOOTING OR EDGE OF PIER CAP
CORK JOINT
CAST-IN-PLACE CONCRETE DIAPHRAGM OR CAST-IN-PLACE CONCRETE AT END OF PRESTRESSED GIRDER
1/4" CORK BETWEEN DECK SLAB AND TOP OF CAST-IN-PLACE CONCRETE AT END OF PRESTRESSED GIRDER
1/4" CORK BETWEEN BRIDGE SIDEWALK AND DECK SLAB
1/4" BITUMINOUS FELT BETWEEN TOP OF PARAPET AND BOTTOM OF DECK
MICRO-FILMED
TRUNK HIGHWAY NO. 393
STATE OF MINNESOTA
DEPARTMENT OF HIGHWAYS
BRIDGE NO. 6580
56 FT. ROADWAY + 2-2'-6" SIDEWALKS
46-72-72-46 PRESTRESSED GIRDER SPANS
DECK DETAILS AT PIERS AND ABUTMENTS
APPROVED: 7-23-57
SHEET NO. 2 OF 14 SHEETS
6580



FRONT ELEVATION
NOTE: ANCHOR BOLT HOLES SHALL BE DRILLED & ANCHOR BOLTS GROUTED IN PLACE AFTER GIRDERS HAVE BEEN ERECTED.
NOTE: FINISH ALL EXPOSED EDGES OF END POSTS WITH ½" RADIUS ABOVE FINISHED GROUND LINE. FINISH TOP OF END POST WITH ⅛" CROWN FOR DRAINAGE.
TOP OF PARAPET { EL. 926.62 - NORTH ABUT. EL. 925.43 SOUTH ABUT.
BRIDGE SEAT { EL. 925.19 NORTH ABUT. EL. 922.02 SOUTH ABUT.
WING WALL VIEW V-V
N.W. & S.E. WING WALL
WING WALL VIEW W-W
N.E. & S.W. WING WALL
NOTE: ABUTMENT SIDEWALKS TO BE POURED AFTER DECK, SLAB & CURBS ARE IN PLACE.
DETAIL OF GROOVES IN WING WALL
PLAN
SECTION X-X
DETAIL "A"
SECTION Y-Y
PILE NOTE
FOOTING AND PILE PLAN
TEST PILE NO. 1
TEST PILE NO. 2
TRUNK HIGHWAY NO. 393
STATE OF MINNESOTA
DEPARTMENT OF HIGHWAYS
BRIDGE NO. 6580
ABUTMENTS
PLAN & ELEVATION
MICRO-FILMED
SHEET NO. 3 OF 14 SHEETS
6580



TRUNK HIGHWAY NO. 393
STATE OF MINNESOTA
DEPARTMENT OF HIGHWAYS

BRIDGE NO. 6580

58 FT. ROADWAY 2-2'-6" SIDEWALKS
45-72-72-45 PRESTRESSED GIRDER SPANS

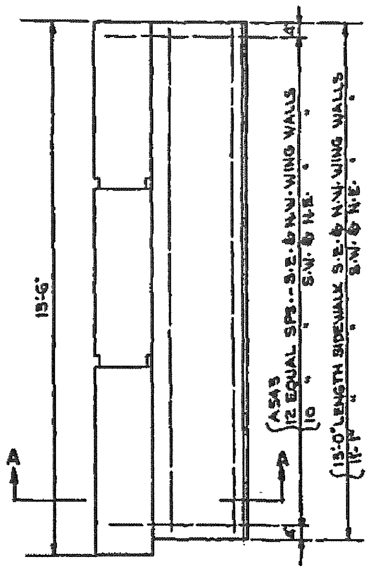
ABUTMENTS—REINFORCING

MICRO-FILM

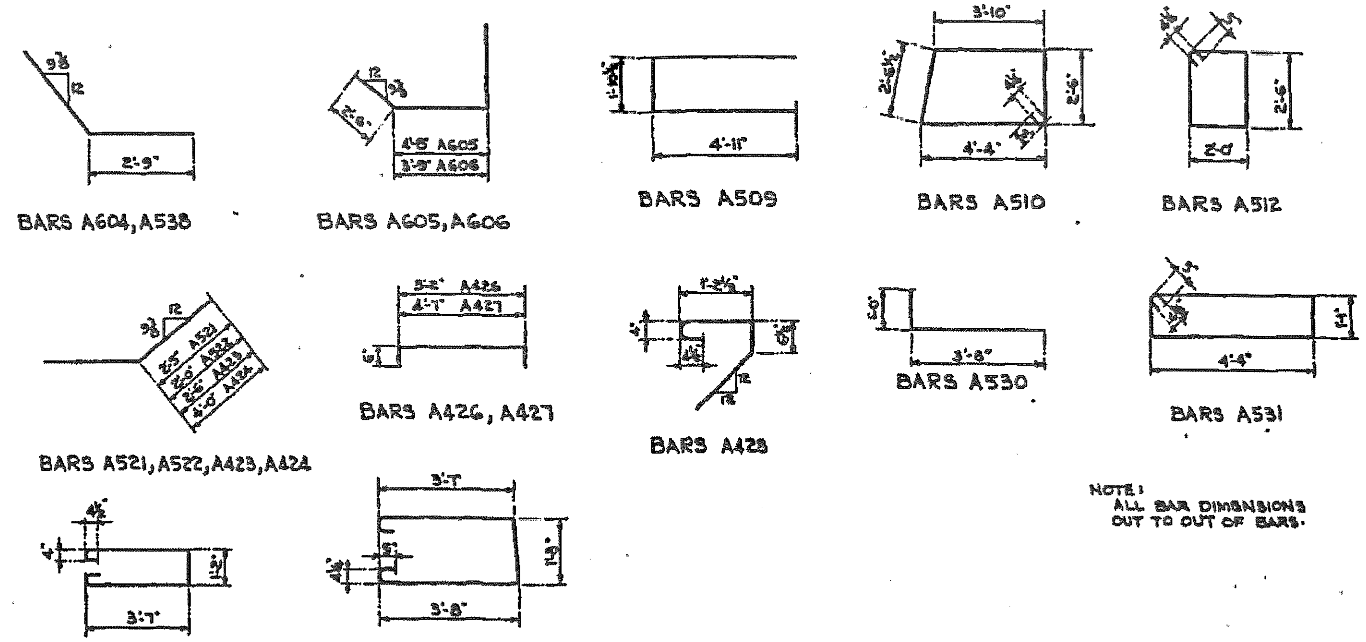
APPROVED: 7-23-57

SHEET NO. 4 OF 14 SHEETS

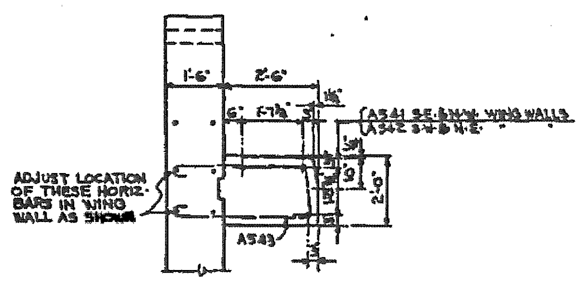
6580



PLAN



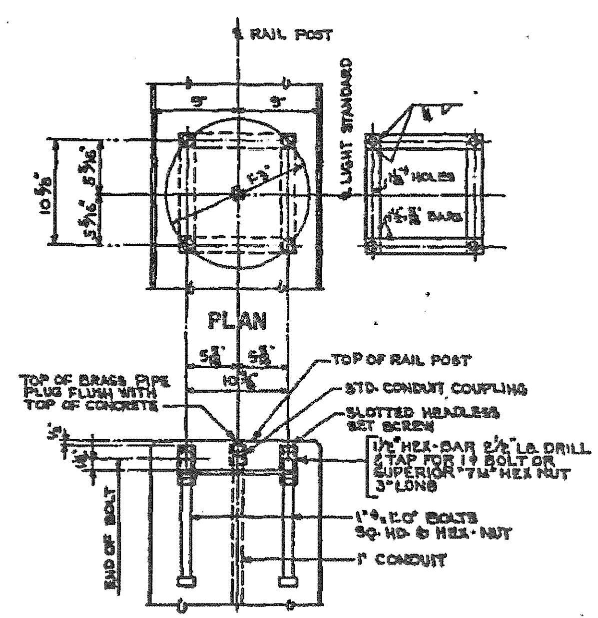
NOTE:
ALL BAR DIMENSIONS OUT TO OUT OF BARS.



SECTION A-A

SIDEWALK REINFORCEMENT DETAILS

NOTE:
ABUTMENT SIDEWALKS TO BE PLACED AFTER ENTIRE BRIDGE SIDEWALK HAS BEEN PLACED.



SECTION

DETAIL OF ANCHORAGE FOR FUTURE LIGHT STANDARD

SUMMARY OF QUANTITIES FOR CONDUIT SYSTEM
△ 52 FT. 1" CONDUIT GALV. (.53 LBS/L.F.) SEE SH. #3
△ 40 FT. 3" CONDUIT GALV. (.90 LBS/L.F.) SEE SH. #6
△ 84 FT. 3" CONDUIT GALV. (.90 LBS/L.F.) SEE SH. #3
□ 4 ANCHORAGES FOR FUTURE LIGHT STANDARD

△ ESTIMATED LENGTH - EXACT LENGTH TO BE DETERMINED BY FIELD MEASUREMENTS.

⌖ CONDUIT SHALL CONFORM TO M.H.D. 2432 & SHALL INCLUDE GALVANIZED METAL CONDUIT, LIGHT STANDARD ANCHORAGE, FASTENINGS, FITTINGS, END PLUGS, & CAPS IN PLACE.

□ SEE DETAIL THIS SHEET.

SUMMARY OF QUANTITIES FOR 2 ABUTMENTS	
+ EXCAVATION	
CONCRETE MIX No. 1A6	102.5 CU. YDS.
CONCRETE MIX No. 3Y6	147.5 CU. YDS.
REINFORCEMENT BARS	12,960 LBS.
3 PLY JOINT WATERPROOFING	14 LIN. FT.
1-STD. NAME PLATE NO. 8220 BRIDGE 6580 DATED 196[illegible]	
4 TREATED TIMBER TEST PILES IN PLACE 55' LG.	
▪ TREATED TIMBER PILING	3240 LIN. FT.
✦ BENCH MARK DISK	ONE
△ 32-¾"ϕ 3" BOLTS SQ. HD. & NUT & CUT WASHER	
△ 16 BEARING ASSYS. (SEE DETAIL SH. NO. 8)	
△ 32-1"ϕ ANCHOR BOLTS (SEE DETAIL SH. NO. 9)	
□ CONDUIT INCLUDED IN CONDUIT SYSTEM	
△ 8 GALVANIZED HUBBARD EYE BOLTS NO. 39982	

✦ STATE WILL FURNISH DISK. PAYMENT FOR PLACING DISK TO BE INCLUDED IN PRICE BID FOR OTHER ITEMS.

□ SEE SUMMARY OF QUANTITIES FOR CONDUIT SYSTEM ABOVE.

△ TO BE INCLUDED IN WEIGHT OF STRUCTURAL STEEL FOR SUPERSTRUCTURE.

▪ DOES NOT INCLUDE TEST PILES.

+ EXCAVATION FOR FOOTING INCLUDED IN ITEM 401371

BILL OF REINFORCEMENT FOR 2 ABUTMENTS					
BAR	NO.	SIZE	LENGTH	SHAPE	LOCATION
A601	8	#6	43'-0	STR.	FOOTING HORIZ.
A602	8	#6	48'-0	"	" "
A603	8	#6	40'-0	"	" "
A604	4	#6	5'-6	BENT	" " END
A605	2	#6	11'-5	"	" " "
A606	2	#6	10'-6	"	" " "
A607	4	#6	6'-0	STR.	" " "
A608	16	#6	14'-5	"	WING FOOTING HORIZ.
A509	8	#5	11'-7	BENT	" " "
A510	116	#5	13'-0	"	FOOTING TIES
A511	232	#5	6'-0	STR.	FRONT WALL VERT.
A512	28	#5	9'-10	BENT	FOOTING TIES
A613	80	#6	4'-6	STR.	WING WALL DWLS.
A514	12	#5	[illegible]	"	FRONT WALL HORIZ.
A515	10	#5	41'-0	"	" " "
▪ A416	8	#4	[illegible]	"	" " "
▪ A417	16	#4	[illegible]	"	" " "
▪ A418	8	#4	[illegible]	"	" " "
A519	8	#5	[illegible]	"	" " "
▪ A420	248	#4	[illegible]	"	PARAPET WALL VERT.
A521	6	#5	4'-11	BENT	FRONT WALL END
A522	2	#5	4'-6	"	" " "
A423	8	#4	5'-0	"	" " "
A424	6	#4	6'-6	"	" " "
A525	6	#5	6'-6	STR.	" " "
A426	116	#4	4'-2	BENT	" " TIES
A427	4	#4	5'-1	"	" " "
A428	120	#4	3'-6	"	PAVING BRACKET
A529	12	#5	13'-2	STR.	WING WALL HORIZ.
A530	16	#5	4'-6	BENT	" " "
A531	12	#5	11'-6	"	" " "
A532	12	#5	11'-8	STR.	" " VERT.
A533	12	#5	11'-7	"	" " "
A534	12	#5	11'-5	"	" " "
A535	12	#5	12'-2	"	" " "
A536	12	#5	11'-10	"	" " "
A537	12	#5	11'-5	"	" " "
A538	6	#5	6'-0	BENT	FRONT WALL END
A539	8	#5	7'-8	STR.	WING WALL VERT.
A440	20	#4	5'-3	BENT	" " HORIZ.
A541	6	#5	12'-7	STR.	SIDEWALK LONGIT.
A542	6	#5	10'-6	"	" "
A543	48	#5	9'-1	BENT	" TIES

▪ BARS TO BE CUT IN FIELD AS REQ'D. AT OPENING.

TRUNK HIGHWAY NO. 393
STATE OF MINNESOTA
DEPARTMENT OF HIGHWAYS

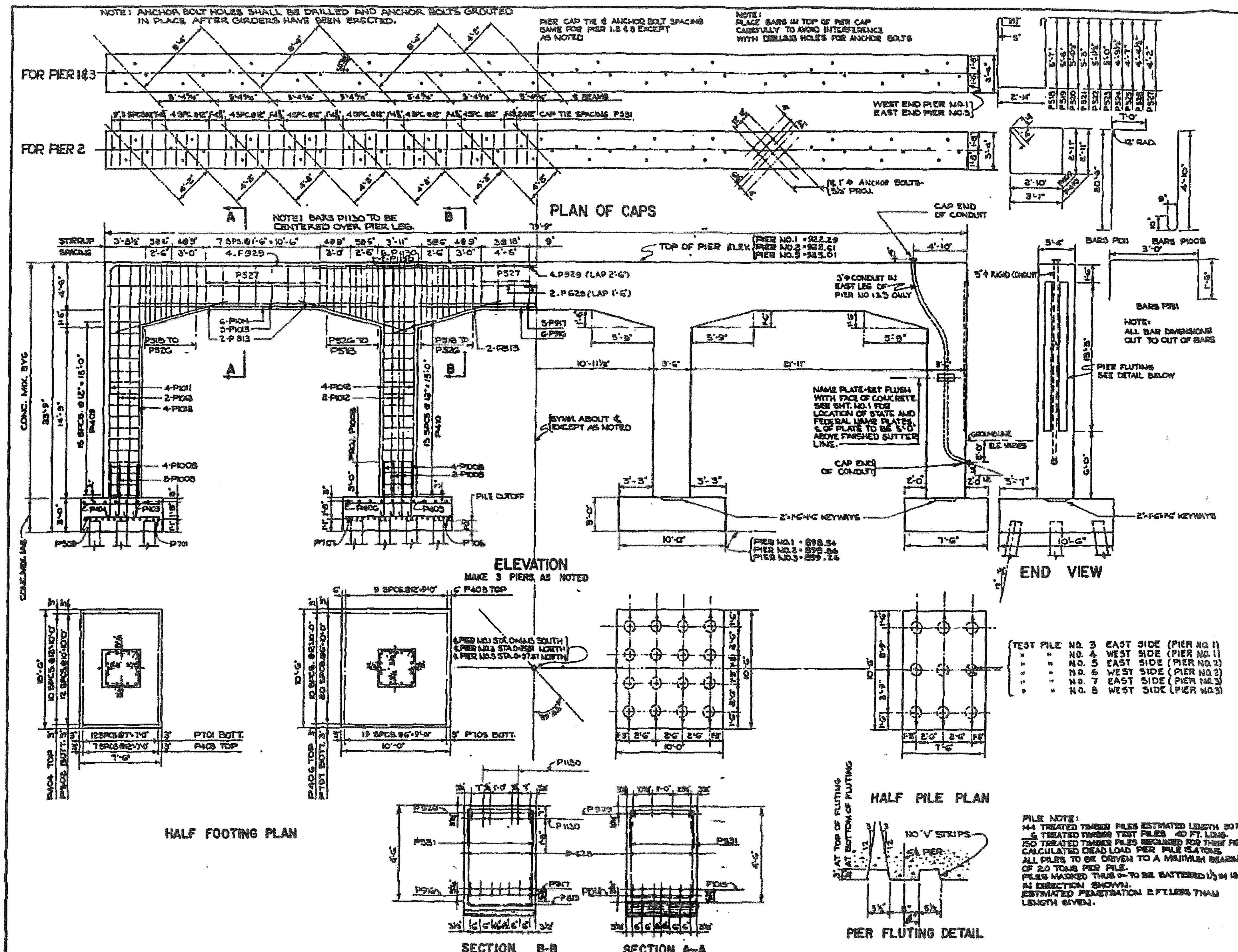
BRIDGE NO. 6580

56 FT. ROADWAY 2-2'-6" SIDEWALKS
46-72-72-46 PRESTRESSED GIRDER SPANS

ABUTMENT SIDEWALK & REINF. DETAILS

APPROVED: 7-23-57

MICRO-FILMED



PILE NOTE:
144 TREATED TIMBER PILES ESTIMATED LENGTH 30 FT.
6 TREATED TIMBER TEST PILES 40 FT. LONG.
150 TREATED TIMBER PILES REQUIRED FOR THREE PIERS.
CALCULATED DEAD LOAD PER PILE 18 TONS.
ALL PILES TO BE DRIVEN TO A MINIMUM BEARING OF 20 TONS PER PILE.
PILES MARKED THUS o- TO BE BATTERED 1/2 IN 12 IN DIRECTION SHOWN.
ESTIMATED PENETRATION 2 FT. LESS THAN LENGTH GIVEN.

BILL OF REINFORCEMENT FOR THREE PIERS

	BAR	NO.	SIZE	LENGTH	SHAPE	LOCATION
	P701	78	#7	15'-0"	STR'T	FOOTING BOTT.
	P502	78	#5	7'-0"	"	" "
	P403	108	#4	15'-0"	"	" TOP
	P404	66	#4	7'-0"	"	" "
	P705	120	#7	10'-0"	"	" BOTT.
	P406	66	#4	9'-6"	"	" TOP
	P707	136	#7	9'-6"	"	" BOTT.
	P1008	144	#10	5'-11"	BENT	" DOWEL
	P409	96	#4	12'-4"	"	COLUMN TIES
	P410	96	#4	12'-10"	"	COLUMN TIES
	P1011	24	#10	26'-11"	"	" VERTICAL
	P1012	180	#10	25'-6"	STR'T	" "
	P813	36	#8	11'-0"	"	CAP AT COLUMN
	P1014	36	#10	26'-5"	"	" LONG. BOTT.
	P1015	30	#10	20'-4"	"	" " "
	P916	18	#9	25'-4"	"	" " "
	P917	15	#9	20'-1"	"	" " "
	P518	18	#5	15'-2"	BENT	" STIRRUPS
	P519	18	#5	15'-0"	"	" "
	P520	18	#5	14'-9"	"	" "
	P521	18	#5	14'-6"	"	" "
	P522	18	#5	14'-5"	"	" "
	P523	18	#5	14'-0"	"	" "
	P524	18	#5	13'-7"	"	" "
	P525	18	#5	13'-2"	"	" "
	P526	18	#5	12'-8"	"	" "
	P527	72	#5	12'-4"	"	" "
O	P628	12	#6	40'-4"	STR'T	" LONG. CENTER
O	P929	24	#9	36'-4"	"	" TOP
	P1130	48	#11	14'-0"	STR'T	" " "
	P531	228	#5	6'-0"	BENT	" TIES

O LAP 1'-6"
O LAP 2'-6"

SUMMARY OF QUANTITIES FOR THREE PIERS

+	EXCAVATION	
	CONCRETE MIX NO. 1A6	12.3 CU. YDS.
	CONCRETE MIX NO. 3Y8	226.4 CU. YDS.
	REINFORCEMENT BARS	49,510 LBS.
*	152 - ANCHOR BOLTS (DETAIL ON SHT. # 3)	
*	76 - BEARING ASSYS. (DETAIL ON SHT. # 5)	
□	CONDUITS INCLUDED IN CONDUIT SYSTEM	
	1-STD. NAME PLATE NO. 8340 BRIDGE(GRADATION)...	
	1-FEDERAL NAME PLATE NO. 8323 - BRONZE(...)	
	6-TREATED TIMBER TEST PILES IN PLACE 40 FT. LONG	
*	TREATED TIMBER PILING	4320 LIN. FT.

* INCLUDED IN THE WEIGHT OF STRUCTURAL STEEL FOR SUPERSTRUCTURE.

□ SEE SHT. NO. 5 FOR SUMMARIES OF CONDUIT SYSTEM.

* DOES NOT INCLUDE TEST PILES.

\+ EXCAVATION FOR FOOTING INCLUDED IN ITEM 40L871

TRUNK HIGHWAY NO. 393
STATE OF MINNESOTA
DEPARTMENT OF HIGHWAYS

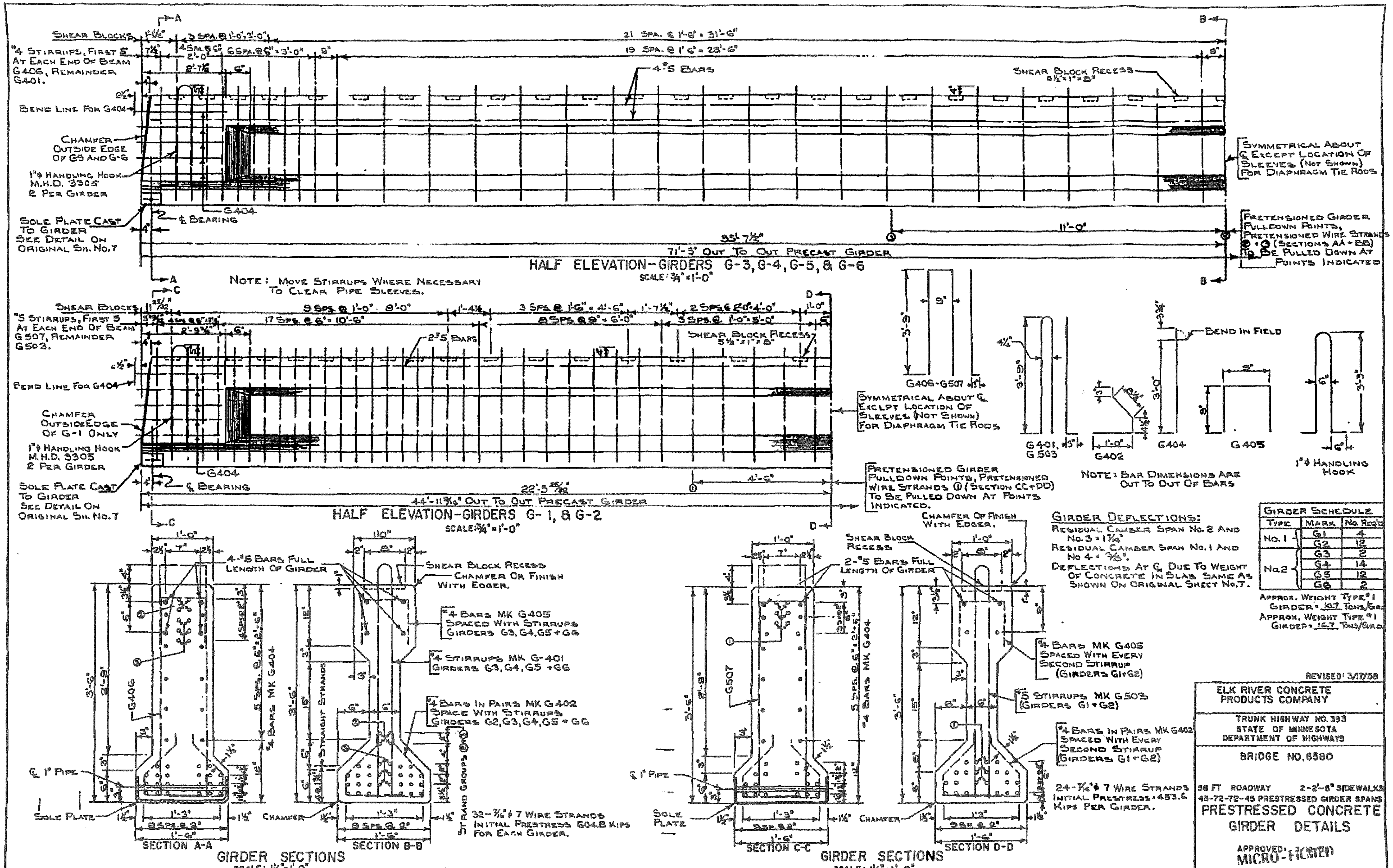
BRIDGE NO. 6580

56 FT. ROADWAY 2-2'-6" SIDEWALKS
48-72-72-48 PRESTRESSED GIRDER SPANS

PIER DETAILS

MICRO-FILMED

APPROVED: 7-23-57



Girder Deflections:

Residual Camber Span No. 2 And No. 3 = 1 7/16"

Residual Camber Span No. 1 And No. 4 = 7/8".

Deflections At ℄ Due To Weight Of Concrete In Slab Same As Shown On Original Sheet No. 7.

Girder Schedule

Type	Mark	No. Req'd
No. 1	G1	4
	G2	12
No. 2	G3	2
	G4	14
	G5	12
	G6	2

Approx. Weight Type #1 Girder = 10.7 Tons/Gird.

Approx. Weight Type #1 Girder = 16.7 Tons/Gird.

REVISED: 3/17/58

ELK RIVER CONCRETE PRODUCTS COMPANY

TRUNK HIGHWAY NO. 393
STATE OF MINNESOTA
DEPARTMENT OF HIGHWAYS

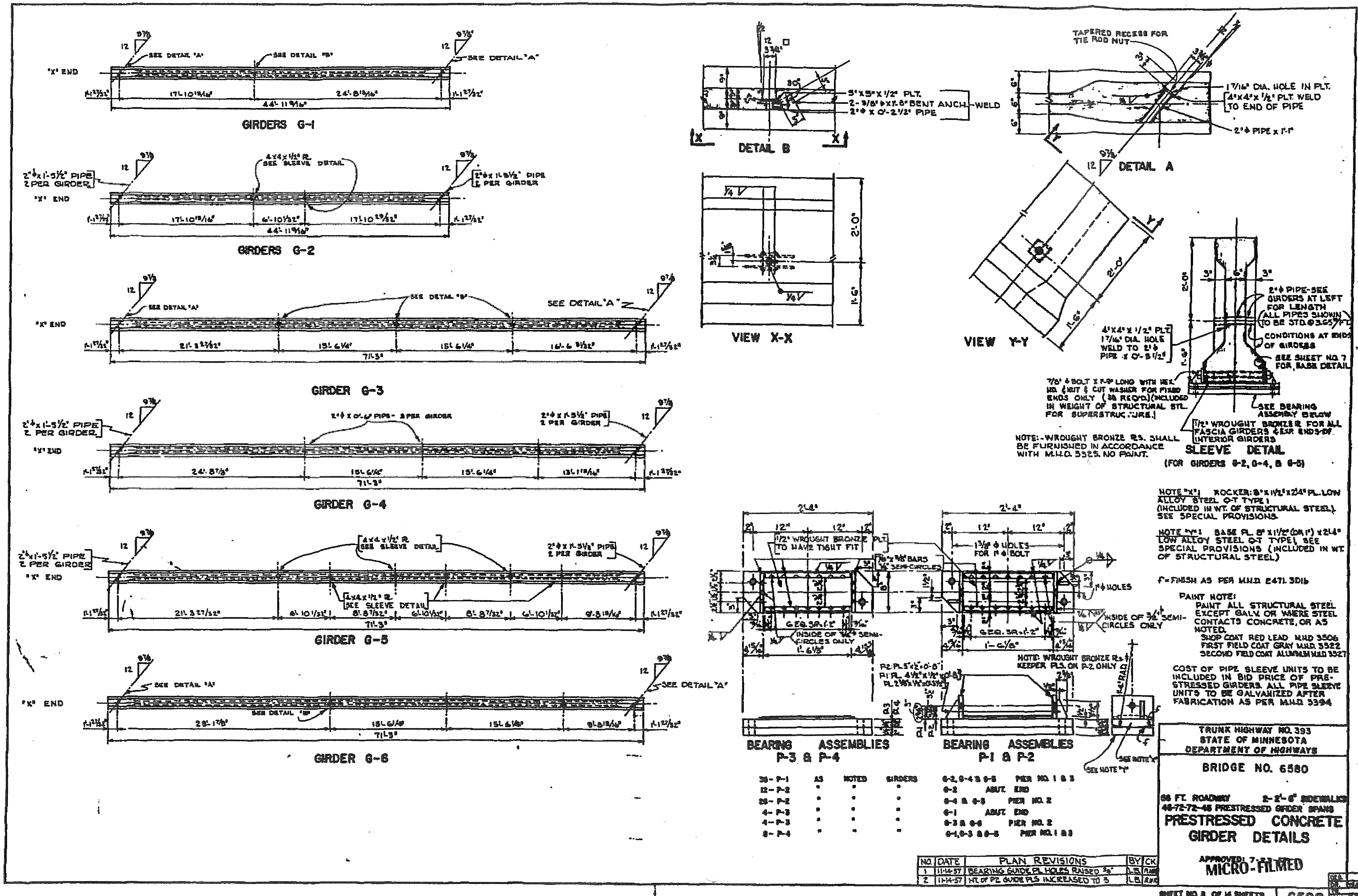
BRIDGE NO. 6580

58 FT ROADWAY 2-2'-6" SIDEWALKS
45-72-72-45 PRESTRESSED GIRDER SPANS

PRESTRESSED CONCRETE GIRDER DETAILS

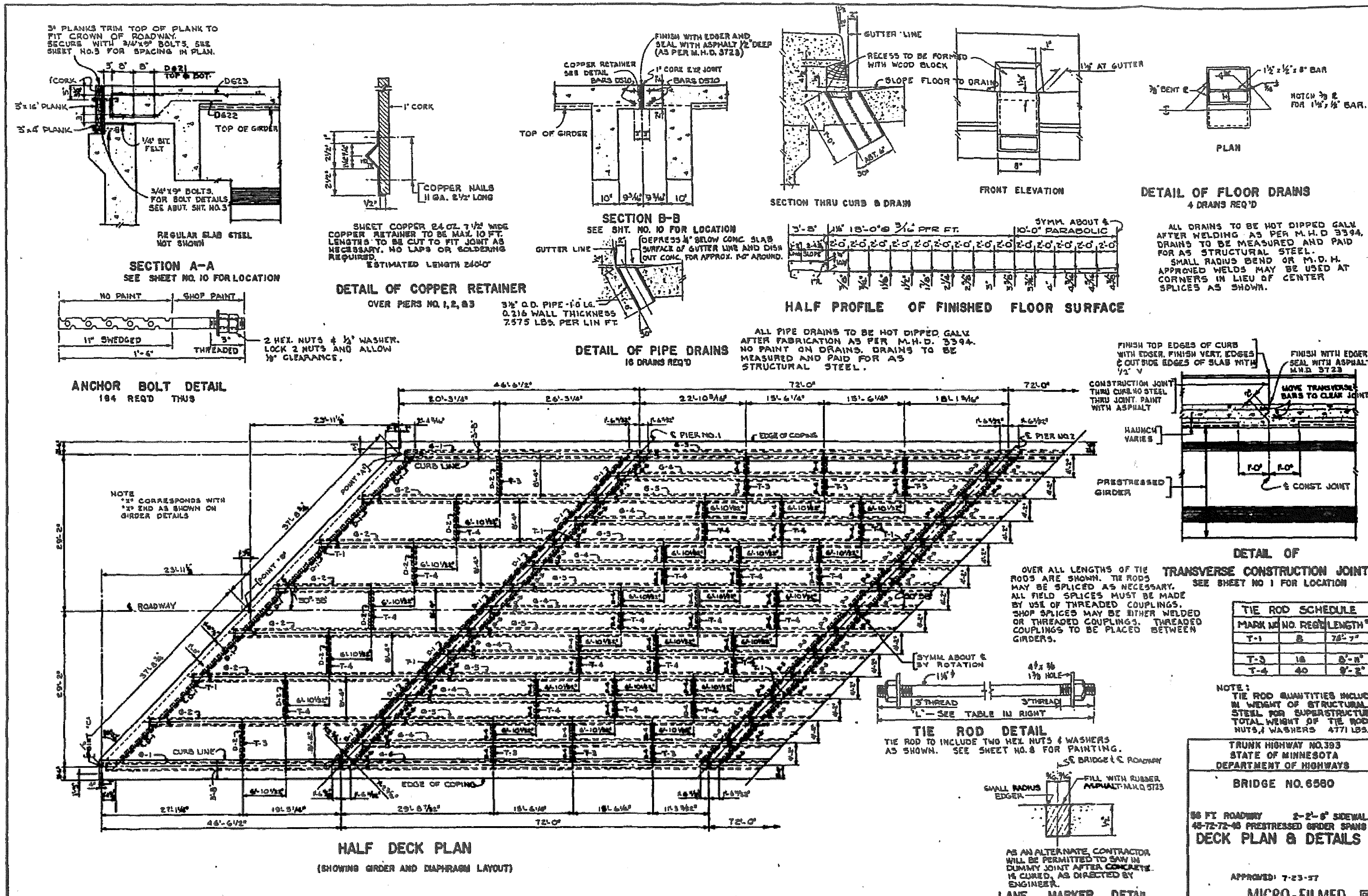
APPROVED: 3/(?)/58

MICRO-FILMED



38-P-1	AS	NOTED	GIRDERS	G-2, G-4 & G-5	PIER NO. 1 & 3
12-P-2	"	"	"	G-2	ABUT. END
28-P-2	"	"	"	G-4 & G-5	PIER NO. 2
4-P-3	"	"	"	G-1	ABUT. END
4-P-3	"	"	"	G-3 & G-6	PIER NO. 2
8-P-4	"	"	"	G-1, G-3 & G-6	PIER NO. 1 & 3

NO.	DATE	PLAN REVISIONS	BY	CK
1	11-14-57	BEARING GUIDE PL. HOLES RAISED 3/8"	L.B.	R.M.
2	11-14-57	HT. OF P2 GUIDE PLS INCREASED TO 5	L.B.	R.M.



TIE ROD SCHEDULE		
MARK NO	NO. REQ'D	LENGTH "L"
T-1	8	78'-7"
T-3	18	8'-8"
T-4	40	9'-3"

NOTE:
TIE ROD QUANTITIES INCLUDED IN WEIGHT OF STRUCTURAL STEEL FOR SUPERSTRUCTURE. TOTAL WEIGHT OF TIE RODS, NUTS, & WASHERS 4771 LBS.

TRUNK HIGHWAY NO. 393
STATE OF MINNESOTA
DEPARTMENT OF HIGHWAYS

BRIDGE NO. 6580

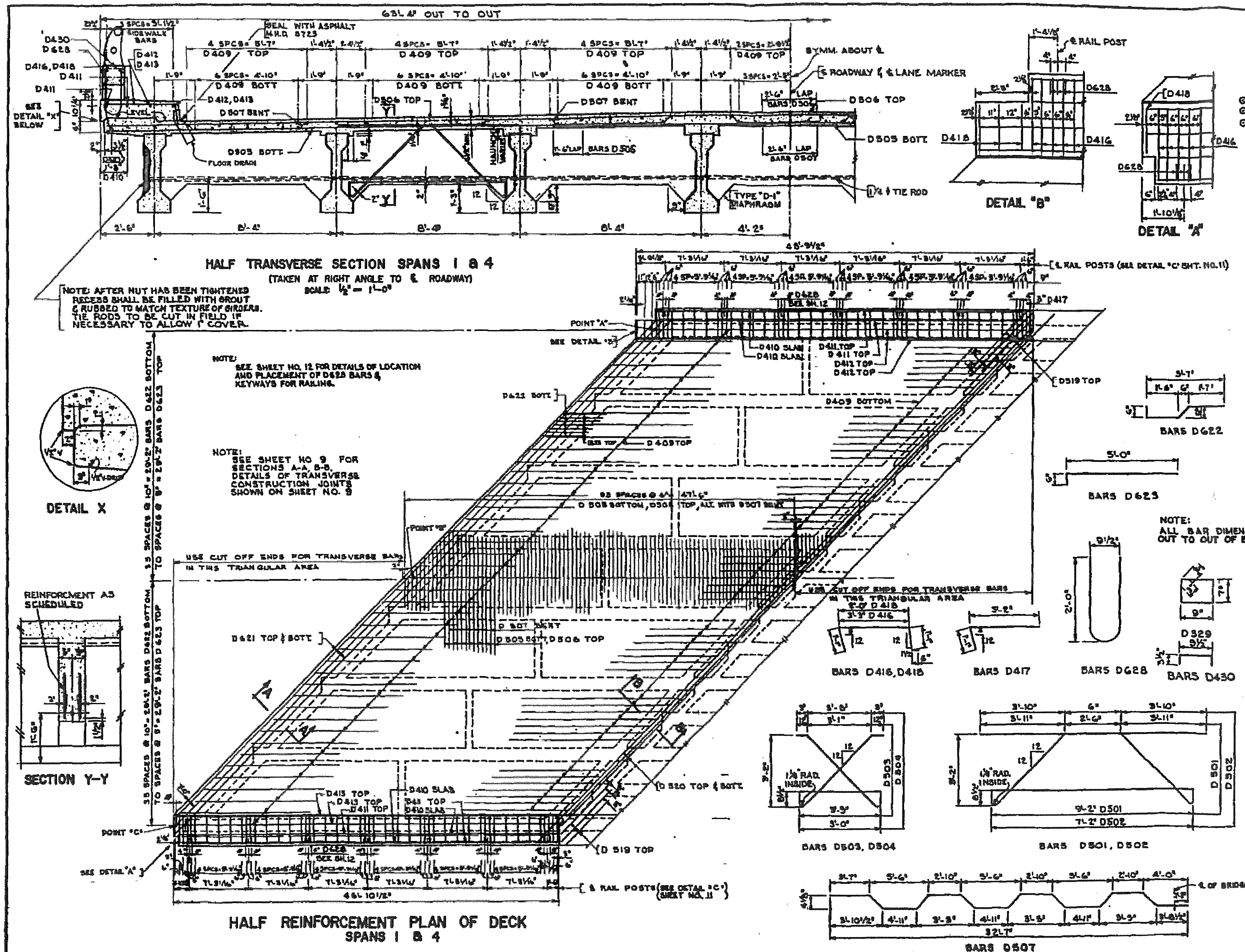
56 FT. ROADWAY 2-2'-6" SIDEWALKS
48-72-72-48 PRESTRESSED GIRDER SPANS

DECK PLAN & DETAILS

APPROVED: 7-23-57

MICRO-FILMED

SHEET NO. 9 OF 14 SHEETS 6580



BILL OF REINF. BARS FOR SUPERSTRUCTURE

	BAR	NO.	SIZE	LENGTH	SHAPE	LOCATION
	D501	56	#5	31'-8"	BENT	DIAPHRAGM D1.
	D502	28	#5	26'-3"	"	" " D2
	D503	112	#5	16'-2"	"	" " D3
	D504	68	#5	15'-11"	"	" " D4
⊙ ○	D505	900	#5	26'-11"	STR'T.	SLAB TRANSVERSE
⊙ ▪	D506	600	#5	32'-7"	"	" " "
⊙ ▪	D507	32	#5	35'-5"	BENT	" " "
▪	D409	[illegible]	#4	37'-0"	STR'T.	LONGITUDINAL
▪	D408	[illegible]	#4	25'-0"	"	" " "
□	D410	16	#4	24'-1"	"	" " "
□	D411	16	#4	24'-1"	"	SIDEWALK " "
□	D412	8	#6	23'-3"	"	" " "
□	D413	8	#4	24'-8"	"	" " "
	D414	16	#4	20'-4"	"	" " "
□	D415	32	#4	23'-5"	"	" " "
	D416	[illegible]	#4	5'-9"	BENT	" TRANSVERSE
	D417	8	#4	4'-3"	"	" " "
	D418	8	#4	4'-6"	"	" " "
	D519	16	#5	8'-0"	STR'T.	SLAB TRANS. AT PIER
□	D520	24	#5	40'-3"	"	" " "
□	D621	24	#6	[illegible]	"	END WEB AT ABUTMENT
	D622	[illegible]	#6	4'-[illegible]	BENT	" " " "
	D623	[illegible]	#6	[illegible]	"	
	D724	16	#7	26'-5"	STR'T	HORIZ. RAIL #1 & 4
	D725	16	#7	39'-3"	"	" " "
	D726	32	#7	20'-5"	"	" " " #2 & 3
	D727	16	#7	30'-4"	"	" " "
	D628	204	#6	4'-4"	BENT	RAIL POST (BRIDGE)
	D329	[illegible]	#3	3'-4"	"	RAIL TIES
	D430	204	#4	1'-5"	"	RAIL POST (BRIDGE)

⊙ A CERTAIN NUMBER OF THESE BARS TO BE CUT IN TWO FOR SKEWED ENDS OF SLAB, ONE LONG & ONE SHORT

○ 1'-6" LAP
□ 2'-0" LAP
▪ 2'-6" LAP

DIAPHRAGM STEEL SCHEDULE

DIAPHRAGM		STEEL	
MARK NO.	NO. REQ'D.	MARK NO.	NO. REQ'D.
D-1	28	D501	2 PER DIAPH.
D-2	14	D502	" "
D-3	56	D503	" "
D-4	84	D504	" "

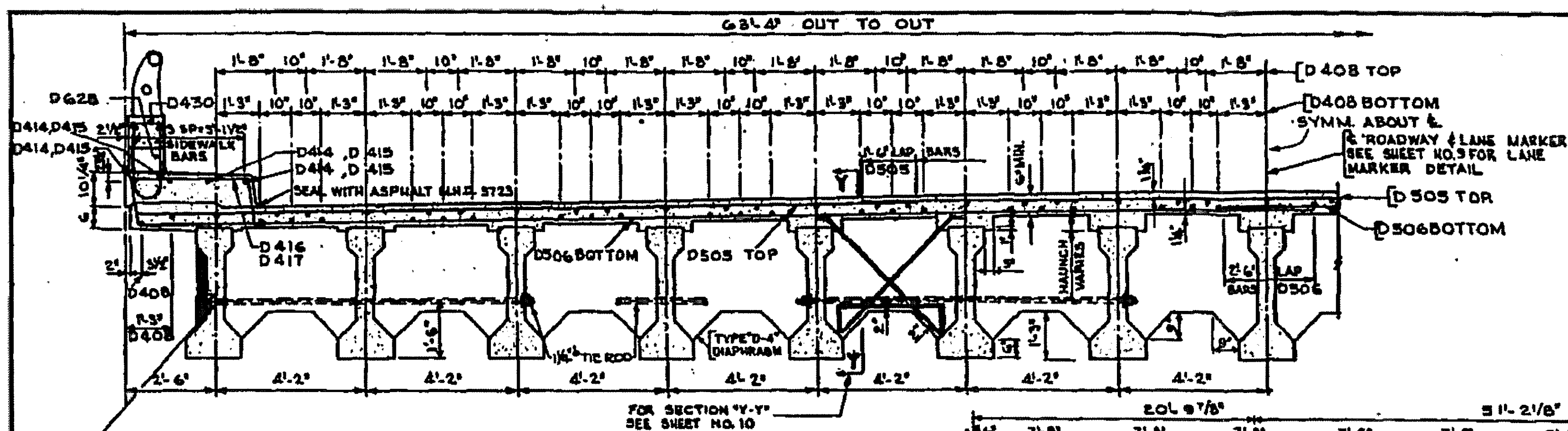
TRUNK HIGHWAY NO. 393
STATE OF MINNESOTA
DEPARTMENT OF HIGHWAYS

BRIDGE NO. 6580

56 FT. ROADWAY 2-2'-6" SIDEWALKS
48-72-72-48 PRESTRESSED GIRDER SPANS

DECK REINFORCEMENT
SPANS 1 & 4

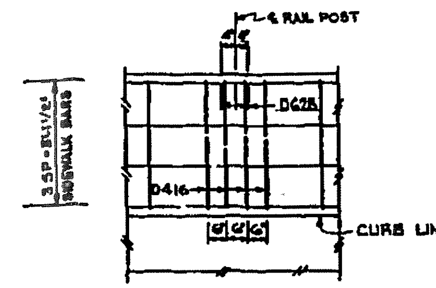
APPROVED: 7-29-57



HALF TRANSVERSE SECTION NEAR ℄ SPANS 2 & 3

(TAKEN AT RIGHT ANGLE TO ℄ ROADWAY)
SCALE: 1/2" = 1'-0"

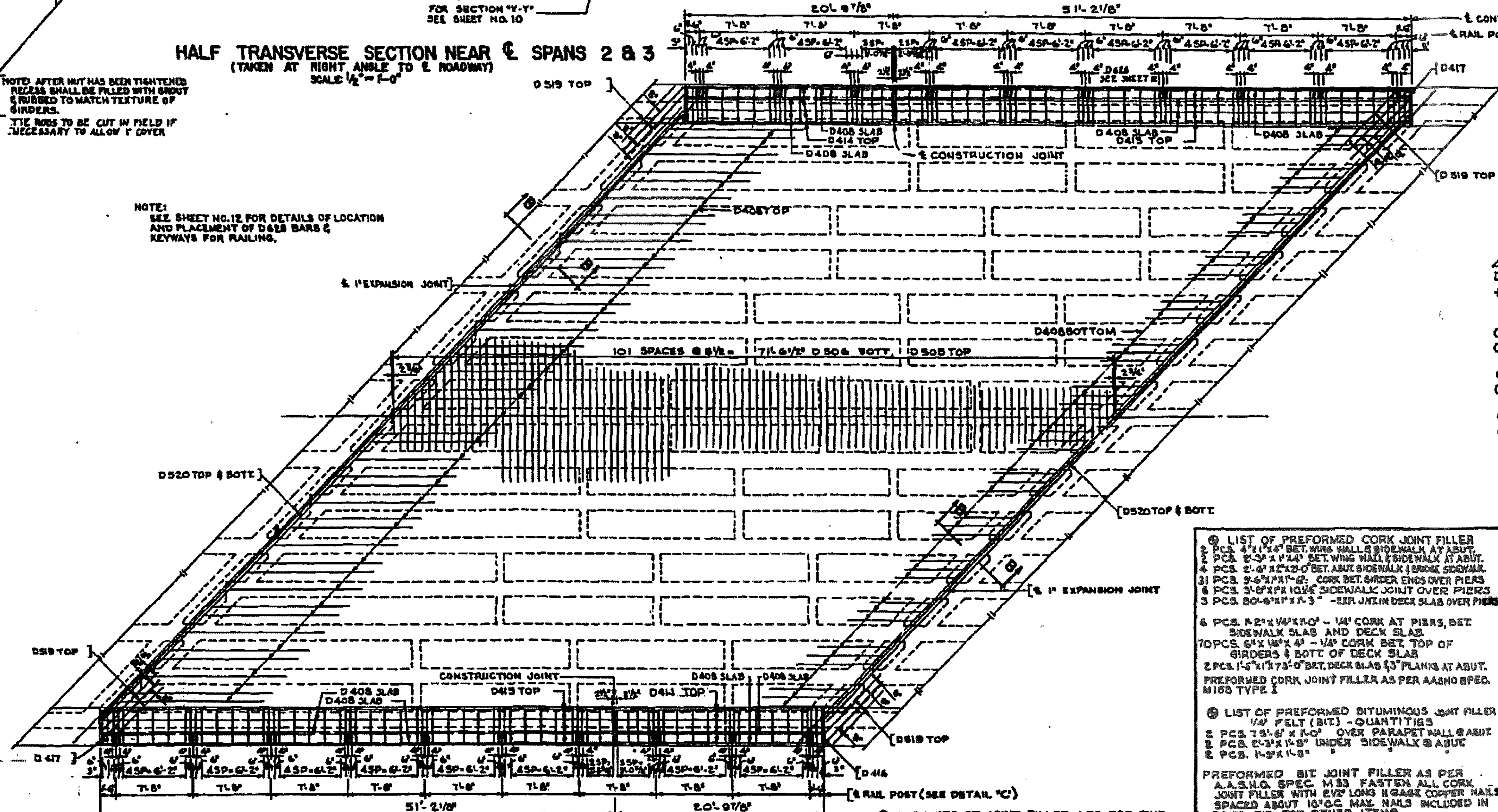
NOTE: AFTER NUT HAS BEEN TIGHTENED RECESS SHALL BE FILLED WITH GROUT & RUBBED TO MATCH TEXTURE OF GIRDERS.
TIE RODS TO BE CUT IN FIELD IF NECESSARY TO ALLOW 1" COVER



DETAIL "C"

(PLAN OF SIDEWALK AT RAIL POST)

NOTE:
SEE SHEET NO. 12 FOR DETAILS OF LOCATION AND PLACEMENT OF D628 BARS & KEYWAYS FOR RAILING.



HALF REINFORCEMENT PLAN OF DECK

SPANS 2 & 3

SUMMARY OF QUANTITIES FOR SUPERSTRUCTURE		
	CONCRETE MIX NO. 3Y6	485.9 CU.YDS.
	REINFORCEMENT BARS	84,740 LBS.
△	PRESTRESSED GIRDERS - TYPE NO. 1	16
□	PRESTRESSED GIRDERS - TYPE NO. 2	30
+	STRUCTURAL STEEL	24,970 LBS.
	BRONZE PLATES	865 LBS.
	SHEET COPPER	225 LBS.
O	PREFORMED CORK JOINT FILLER (SEE SCHEDULE)	
O	PREFORMED BIT. JOINT FILLER (SEE SCHEDULE)	
	ORNAMETAL METAL RAILING	474.2 LIN. FT.
O	32 - 3/4" X 9" BOLTS, SQ. HD. & NUT & CUT WASHER	
O	8 PCS. 3" X 4" X 18'-0" PLANKS	
	8 PCS. 3" X 16" X 18'-0" PLANKS	
O	16 PIPE DRAINS	
O	4 BOX DRAINS	

△ GIRDERS G-1 & G-2
□ GIRDERS G-3, G-4, G-5, G-6
O INCLUDED IN WEIGHT OF STRUCTURAL STEEL
O INCLUDED IN PRICE BID FOR OTHER ITEMS
+ 1 1/2% HAS BEEN ADDED TO THE WT. OF STRUCTURAL STEEL AS PER M.H.D. 2402.4A2

LIST OF PREFORMED CORK JOINT FILLER

2 PCS. 4" x 1" x 4" BET. WING WALL & SIDEWALK AT ABUT.
2 PCS. 2'-3" x 1" x 4" BET. WING WALL & SIDEWALK AT ABUT.
4 PCS. 2'-6" x 2" x 2'-0" BET. ABUT. SIDEWALK & BRIDGE SIDEWALK.
31 PCS. 3'-6" x 1" x 1'-6" CORK BET. GIRDER ENDS OVER PIERS
6 PCS. 3'-8" x 1" x 10 1/4" SIDEWALK JOINT OVER PIERS
3 PCS. 80'-8" x 1" x 1'-3" - EXP. JNT. IN DECK SLAB OVER PIERS

6 PCS. 1'-2" x 1/4" x 1'-0" - 1/4" CORK AT PIERS, BET. SIDEWALK SLAB AND DECK SLAB.
70 PCS. 6" x 1/4" x 4" - 1/4" CORK BET. TOP OF GIRDERS & BOTT. OF DECK SLAB
2 PCS. 1'-5" x 1" x 73'-0" BET. DECK SLAB & 3" PLANKS AT ABUT.

PREFORMED CORK JOINT FILLER AS PER AASHO SPEC. M153 TYPE I

LIST OF PREFORMED BITUMINOUS JOINT FILLER 1/4" FELT (BIT.) - QUANTITIES

2 PCS. 73'-6" x 1'-0" OVER PARAPET WALL @ ABUT.
2 PCS. 2'-3" x 1'-8" UNDER SIDEWALK @ ABUT.
2 PCS. 1'-3" x 1'-8" "

PREFORMED BIT. JOINT FILLER AS PER A.A.S.H.O. SPEC. M33. FASTEN ALL CORK JOINT FILLER WITH 2 1/2" LONG 11 GAGE COPPER NAILS SPACED ABOUT 10" O.C. MAX. NAILS INCLUDED IN PRICE BID FOR OTHER ITEMS

THE LISTS OF JOINT FILLER ARE FOR THE CONTRACTOR'S CONVENIENCE ONLY. ANY ADDITIONAL JOINT FILLER MATERIAL REQUIRED AS SHOWN ON THE PLANS SHALL BE FURNISHED BY THE CONTRACTOR WITH NO ADDITIONAL COMPENSATION. TRIM JOINT FILLER MATERIAL AS REQUIRED IN THE FIELD.

TRUNK HIGHWAY NO. 393
STATE OF MINNESOTA
DEPARTMENT OF HIGHWAYS

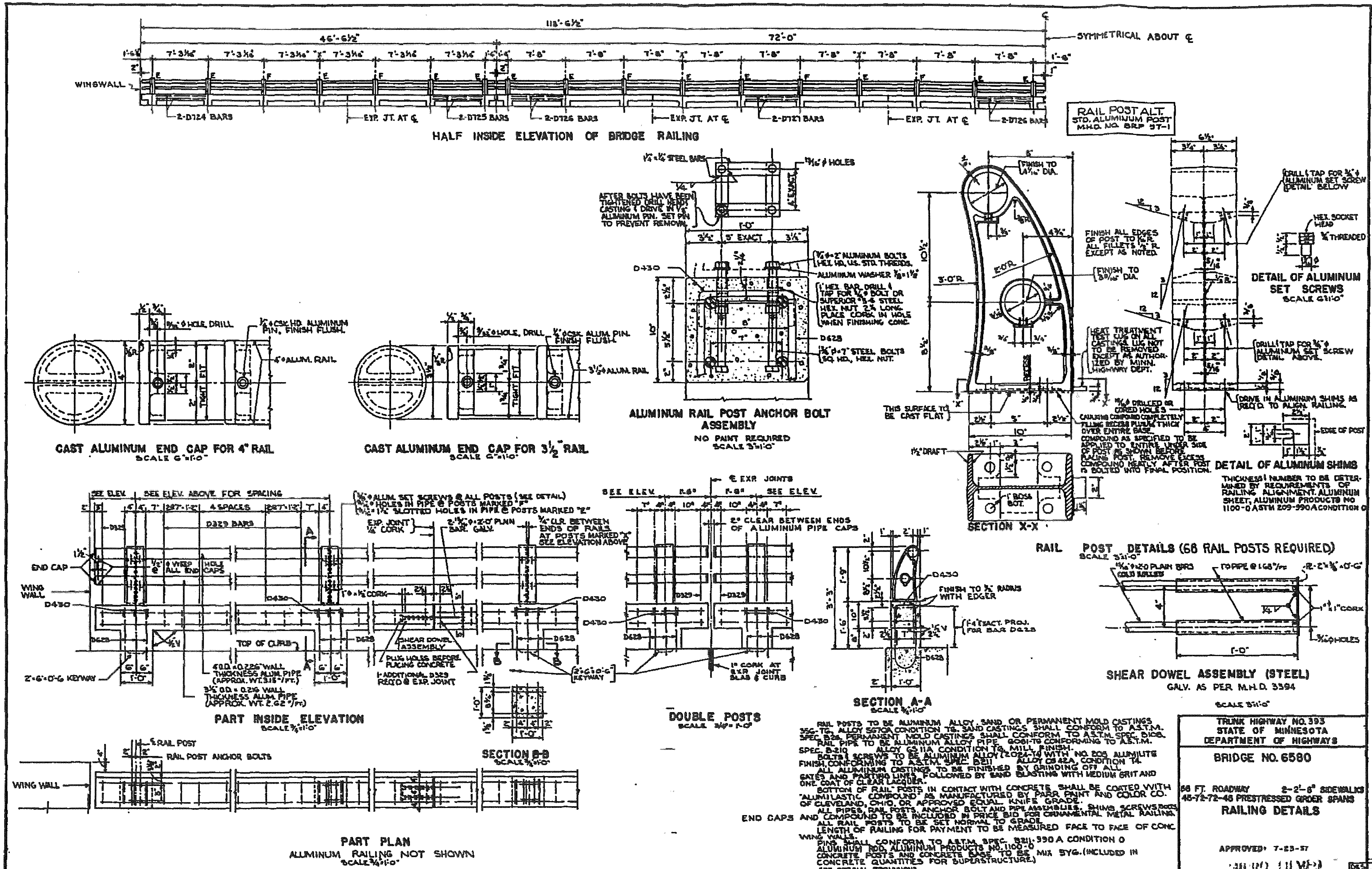
BRIDGE NO. 6580

56 FT. ROADWAY 2-2'-6" SIDEWALKS
45-72-72-45 PRESTRESSED GIRDER SPANS

DECK REINFORCEMENT

SPANS 2 & 3

APPROVED: 7-23-57



RAIL POSTS TO BE ALUMINUM ALLOY, SAND OR PERMANENT MOLD CASTINGS 356-T6, ALLOY SG70A CONDITION T6. SAND CASTINGS SHALL CONFORM TO A.S.T.M. SPEC. B26. PERMANENT MOLD CASTINGS SHALL CONFORM TO A.S.T.M. SPEC. B108.

RAIL PIPE TO BE ALUMINUM ALLOY PIPE 6061-T6 CONFORMING TO A.S.T.M. SPEC. B210 ALLOY GS11A CONDITION T6, MILL FINISH.

BOLTS & SCREWS TO BE ALUMINUM ALLOY (2024-T4) WITH NO. 205 ALUMILITE FINISH, CONFORMING TO A.S.T.M. SPEC. B211 ALLOY CG42A, CONDITION T4.

ALL ALUMINUM CASTINGS TO BE FINISHED BY GRINDING OFF ALL GATES AND PARTING LINES, FOLLOWED BY SAND BLASTING WITH MEDIUM GRIT AND ONE COAT OF CLEAR LACQUER.

BOTTOM OF RAIL POSTS IN CONTACT WITH CONCRETE SHALL BE COATED WITH "ALUMILASTIC COMPOUND" AS MANUFACTURED BY PARR PAINT AND COLOR CO. OF CLEVELAND, OHIO, OR APPROVED EQUAL. KNIFE GRADE.

ALL PIPES, RAIL POSTS, ANCHOR BOLT AND PIPE ASSEMBLIES, SHIMS, SCREWS, PINS, END CAPS AND COMPOUND TO BE INCLUDED IN PRICE BID FOR ORNAMENTAL METAL RAILING.

ALL RAIL POSTS TO BE SET NORMAL TO GRADE.

LENGTH OF RAILING FOR PAYMENT TO BE MEASURED FACE TO FACE OF CONC. WING WALLS.

PINS SHALL CONFORM TO A.S.T.M. SPEC. B211-990A CONDITION O ALUMINUM ROD, ALUMINUM PRODUCTS NO. 1100-O

CONCRETE POSTS AND CONCRETE BASE TO BE MIX 3Y6. (INCLUDED IN CONCRETE QUANTITIES FOR SUPERSTRUCTURE.)

SEE SPECIAL PROVISIONS.

TRUNK HIGHWAY NO. 393
STATE OF MINNESOTA
DEPARTMENT OF HIGHWAYS

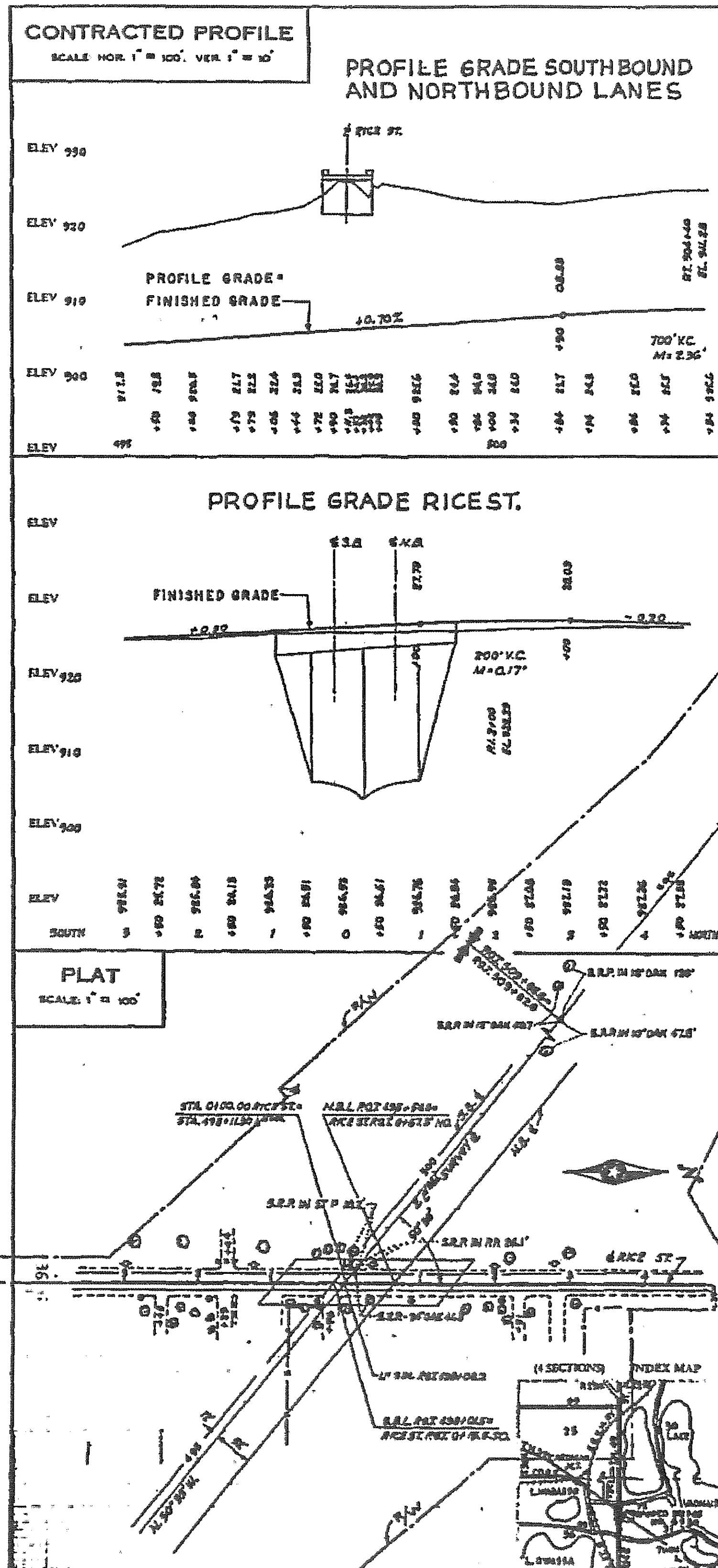
BRIDGE NO. 6580

68 FT. ROADWAY 2-2'-6" SIDEWALKS
46-72-72-46 PRESTRESSED GIRDER SPANS

RAILING DETAILS

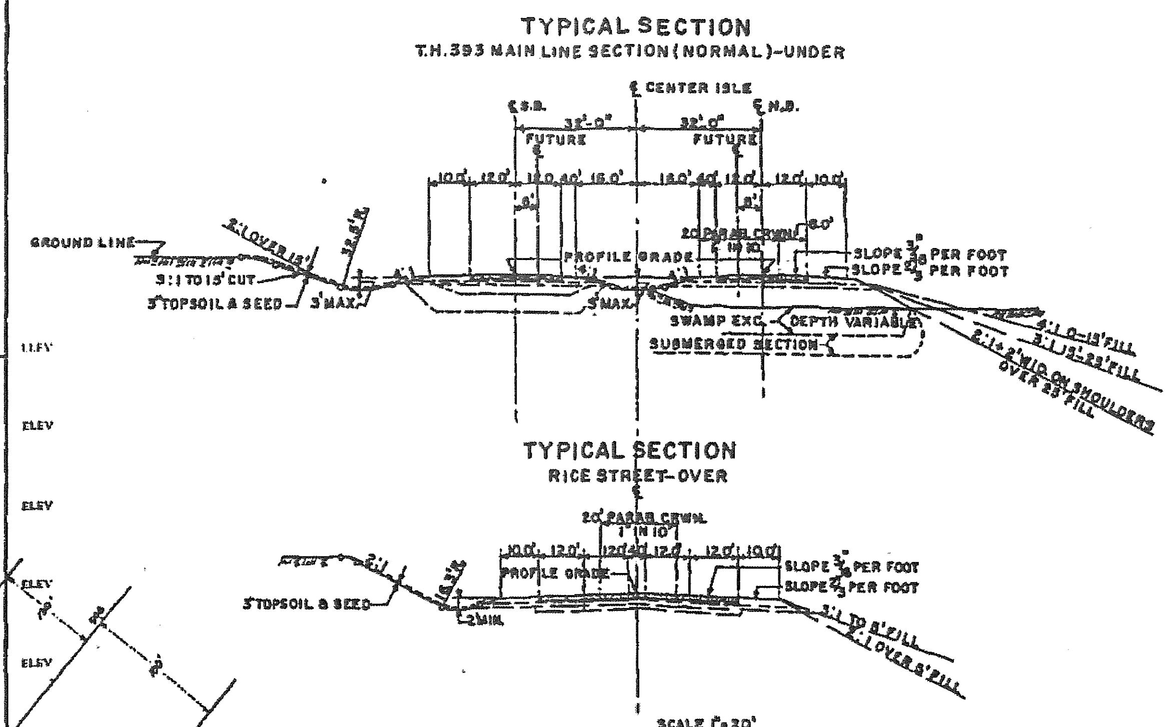
APPROVED: 7-23-57

SHEET NO. 12 OF 14 SHEETS — 6580



PLAN AND PROFILE

SCALE: 1" = 10'



SEE SHEET 14 FOR PLAN & PROFILE

FOLLOW SEPARATE "INSTRUCTIONS FOR PREPARATION OF BRIDGE SURVEYS" WHEN MAKING BRIDGE SURVEYS.

DATA

1. Preliminary recommendations of Engineer in charge of Bridge Survey:
   a. Net span length and type of bridge 48'-72'-72'-48' PRESTRESSED GIRDER SPANS
   b. Width of roadway on bridge 56'
   c. Number and width of sidewalks, if any 2 - 1'-6" CURBS
   d. Locate center of bridge at station ℄ RICE ST. 0+25.67 NORTH
   e. If a skew bridge is recommended, the angle of skew should be 38° - 27'
   f. Is piling required? YES
2. Special features: Waterfalls, dams, exceptional floods, ice, driftwood, sliding banks, logging, etc.
3. Changes: In height or length from that of old bridge, and reasons why.

DATA (Contd.)

4. Other bridges in vicinity:
   a. Over same stream (particularly structures which carry high water without overflow of roadway); give location, length, height above water, net cross-sectional area at high water stage and estimated age.
   b. Over or under same highway or railroad; give location, length, horizontal and vertical clearances and estimated age.
   c. Reasons why these bridges are, or are not, fair indications of what length the proposed bridge should be.
5. If structure is over a drainage ditch, is ditch gradient liable to be altered?
6. Navigation clearances required, if any.
7. Information and evidence in regard to high water stages was obtained as follows.
8. Must contractor provide for traffic during construction of proposed bridge? If so, by what means?

HIGH AND LOW WATER ELEVATIONS

Data obtained from .... reflects highest water elevation in the area of this construction to be .... and the lowest water elevation to be .... The above figures are for informational purposes only. The state neither warrants nor represents that these figures for high water and low water are in any way indicative of the high water or low water to be expected or encountered during this construction.

SHIPPING POINT

Proposed Bridge is 0.5 miles SE of a CARDIGAN JUNCTION which is the nearest Railroad shipping point.

*(Give name of town, station or siding)

Date — Project or County Engineer

Date — District Engineer

STATE OF MINNESOTA
DEPARTMENT OF HIGHWAYS

BRIDGE SURVEY

FOR

PROPOSED BRIDGE LOCATED 3.2 MILES N. OF ST. PAUL (TOWN OR CITY) ON T.H. 393 (T.H., S.A.R. OR C.A.R. NUMBER)

SEC. 36 & 31 TWP. 30 N. R. 23W - 22W

TOWNSHIP MOUNDS VIEW COUNTY RAMSEY

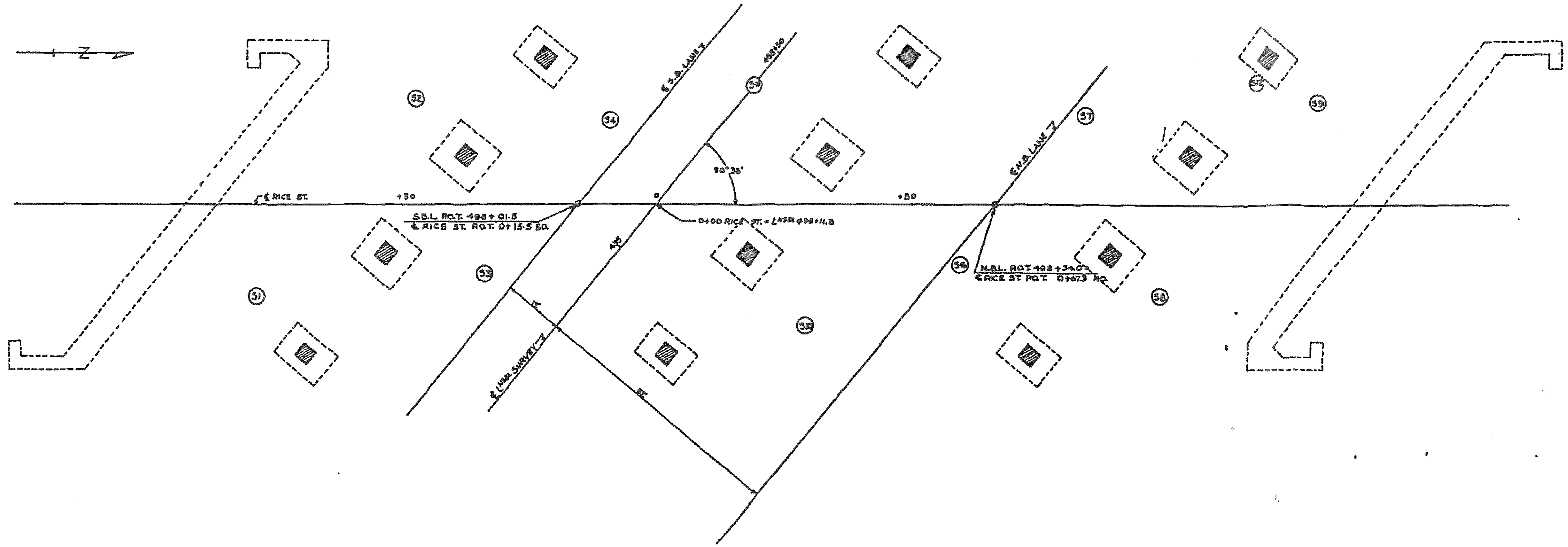
SURVEY MADE DURING MONTH OF DEC. 1963 - JUNE 1964

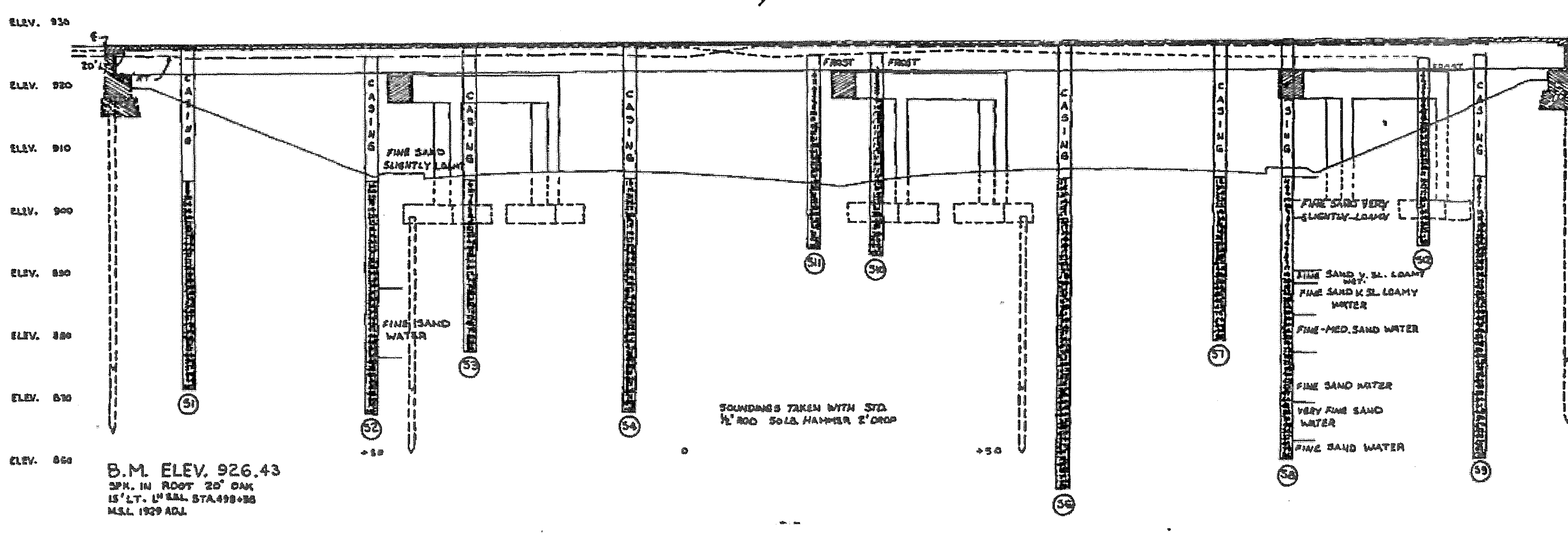
SURVEY MADE BY HUNZIKER

MICRO-FILMED

BRIDGE No. 6580

PLAN AND PROFILE
SCALE 1" = 10'-0"





B.M. ELEV. 926.43
SPK. IN ROOT 20" OAK
15' LT. L N.B.L. STA. 498+38
M.S.L. 1929 ADJ.

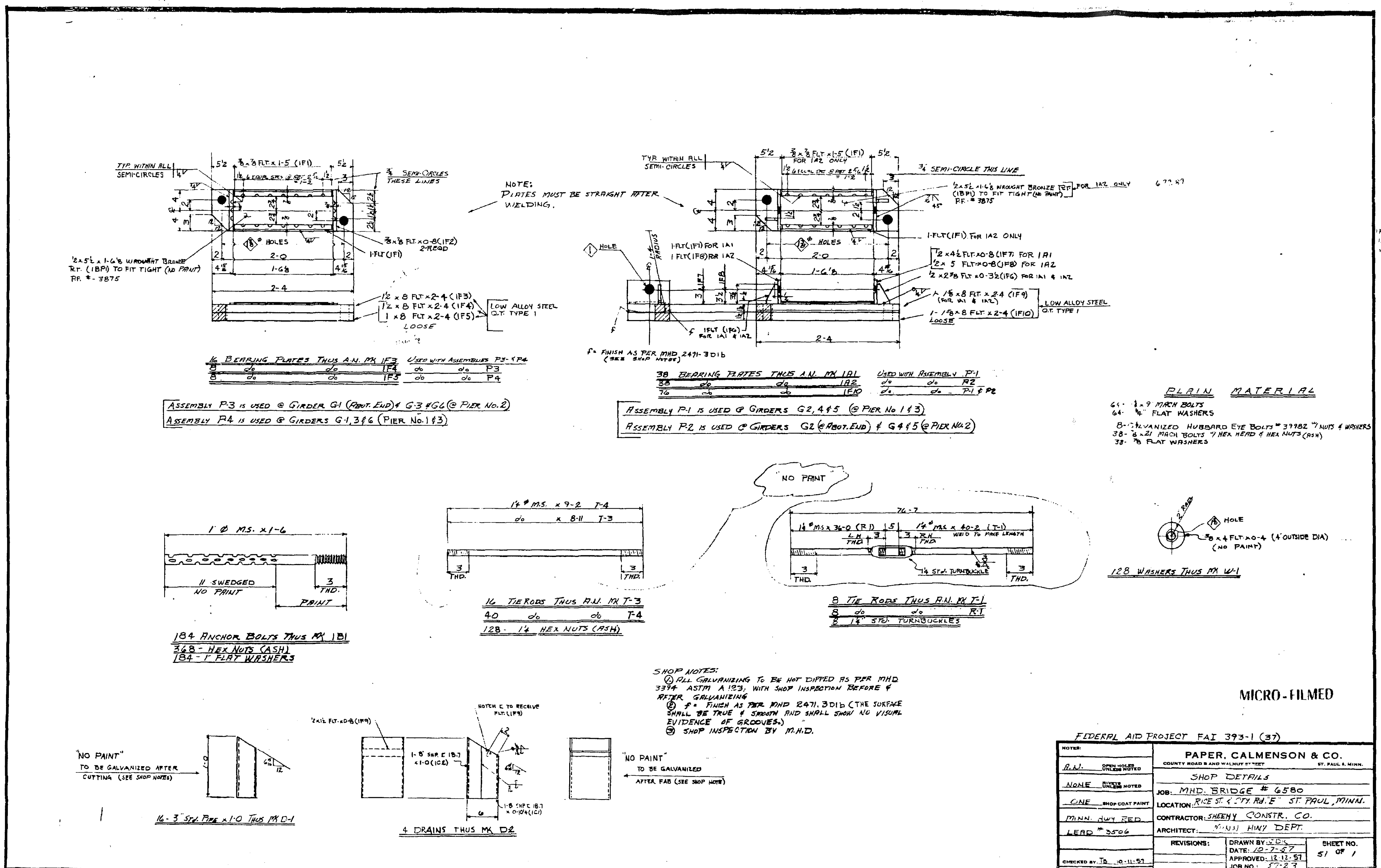
TRUNK HIGHWAY NO. 393
STATE OF MINNESOTA
DEPARTMENT OF HIGHWAYS

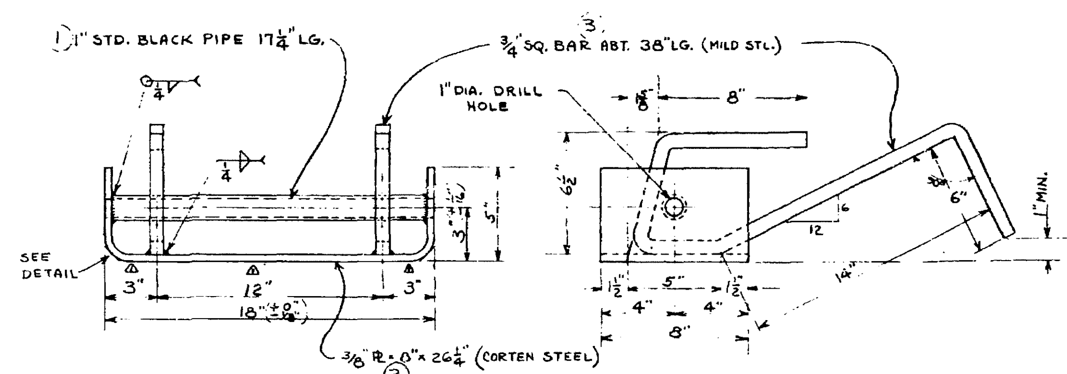
BRIDGE NO. 6580

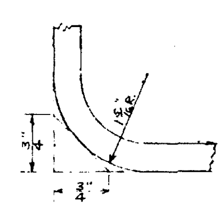
47-72-72-47 FOOT BEAM SPANS
56 FOOT ROADWAY
BRIDGE SURVEY

SHEET NO. 14 OF 14 SHEETS 6580

MINN. PROJ. NO. I-393-1(37) STATE PROJ. NO. 6285-07 (T.H. 393)


NOTE: PLATES MUST BE STRAIGHT AFTER WELDING.
16 BEARING PLATES THUS A.N. MK 1F3
8 do do 1F4
8 do do 1F5
USED WITH ASSEMBLIES P3 & P4
ASSEMBLY P-3 IS USED @ GIRDER G-1 (ABUT. END) & G-3 & G6 (@ PIER No. 2)
ASSEMBLY P4 IS USED @ GIRDERS G-1, 3 & 6 (PIER No. 1 & 3)
LOW ALLOY STEEL Q.T. TYPE 1
LOOSE
38 BEARING PLATES THUS A.N. MK 1A1
38 do do 1A2
76 do do 1F10
USED WITH ASSEMBLY P-1
ASSEMBLY P-1 IS USED @ GIRDERS G2, 4 & 5 (@ PIER No 1 & 3)
ASSEMBLY P-2 IS USED @ GIRDERS G2 (@ ABUT. END) & G4 & 5 (@ PIER No. 2)
FINISH AS PER MHD 2471-3.01b (SEE SHOP NOTES)
PLAIN MATERIAL
64 - 3/4 x 9 MACH BOLTS
64 - 3/4" FLAT WASHERS
8 - GALVANIZED HUBBARD EYE BOLTS #39982 w/ NUTS & WASHERS
38 - 5/8 x 21 MACH BOLTS w/ HEX HEAD & HEX NUTS (ASH)
38 - 7/8 FLAT WASHERS
NO PAINT
184 ANCHOR BOLTS THUS MK 1B1
368 - HEX NUTS (ASH)
184 - 1" FLAT WASHERS
16 TIE RODS THUS A.N. MK T-3
40 do do T-4
128 - 1 1/4 HEX NUTS (ASH)
8 TIE RODS THUS A.N. MK T-1
8 do do R-1
8 1 1/4 STD. TURNBUCKLES
128 WASHERS THUS MK W-1
SHOP NOTES:
(1) ALL GALVANIZING TO BE HOT DIPPED AS PER MHD 3394 ASTM A 123; WITH SHOP INSPECTION BEFORE & AFTER GALVANIZING
(2) FINISH AS PER MHD 2471.3.01b (THE SURFACE SHALL BE TRUE & SMOOTH AND SHALL SHOW NO VISUAL EVIDENCE OF GROOVES.)
(3) SHOP INSPECTION BY M.H.D.
"NO PAINT" TO BE GALVANIZED AFTER CUTTING (SEE SHOP NOTES)
16 - 3" STD. PIPE x 1-0 THUS MK D-1
4 DRAINS THUS MK D2
"NO PAINT" TO BE GALVANIZED AFTER FAB (SEE SHOP NOTE)
MICRO-FILMED
FEDERAL AID PROJECT FAI 393-1 (37)
PAPER, CALMENSON & CO.
COUNTY ROAD B AND WALNUT STREET ST. PAUL 8, MINN.
SHOP DETAILS
JOB: MHD. BRIDGE # 6580
LOCATION: RICE ST. & CTY. Rd. "E" ST. PAUL, MINN.
CONTRACTOR: SHEEHY CONSTR. CO.
ARCHITECT: MINN HWY DEPT.
DRAWN BY: S.D.K.
DATE: 10-7-57
APPROVED: 12-12-57
JOB NO.: 57-23
SHEET NO. 51 OF 1
CHECKED BY: TB 10-11-57
6580





92 REQD

HOT DIPPED GALVANIZED AFTER FABRICATION ASTM A123
WELDING OF LOW ALLOY SHALL BE DONE BY ELECTRIC ARC,
USING A LOW HYDROGEN PROCESS. ELECRODES OF PROPER
GRADE TO CORRESPOND TO THE STRENGTH OF THE LOW ALLOY
STEEL SHALL BE USED AND SUBJECT TO THE APPROVAL
OF THE ENGINEER. TESTS OF THE PROCESS AND
WORKMANSHIP WILL BE REQUIRED DURING FABRICATION.
SHOP INSPECTION BY M.H.D. BEFORE AND AFTER
GALVANIZING.

BRIDGE # 6580

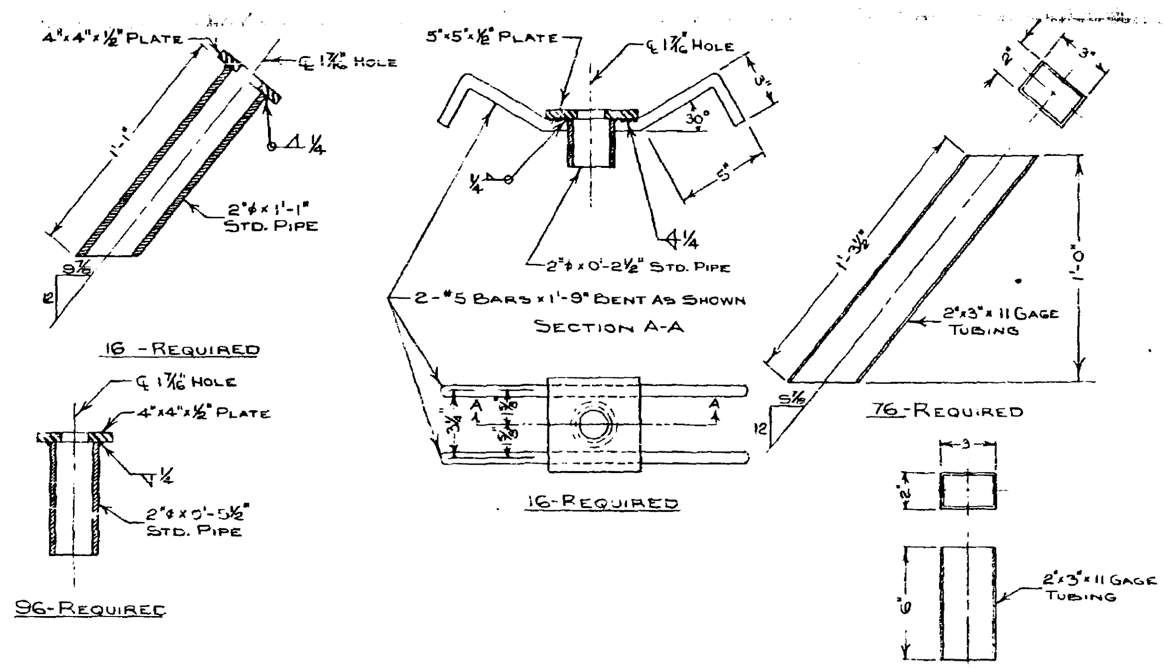
B/M ON M-71885

B-71885-1

BRIDGE NO. 6580
S.P. NO. 6285-07
(T.H. 393)

BROS INCORPORATED MINNEAPOLIS 14 MINN.			
BRIDGE SOLE PLATES & SLEEVES			
BR. 6580,			
MINN. DEPT. OF HIGHWAYS			
DWG. CJP		CHECKED J.S.W.	SCALE 3" = 1'-0" DATE 11-14-57
	ORDER No. 8413 1957	B-71885-1 B-71886-1 B-71887-1	

SHT. 1 2-2-59



ALL PIPE SLEEVES AND ASSEMBLIES TO BE GALVANIZED AFTER FABRICATION PER ASTM-A123
SHOP INSPECTION BY M.H.D. BEFORE AND AFTER GALVANIZING.

BRIDGE NO. 6580

MATERIAL: MEDIUM STRUCTURAL STEEL FOR BARS AND PLATES

MICRO-FILMED

BROS INCORPORATED
MINNEAPOLIS, 14 MINNESOTA

PRESTRESSED GIRDER SPANS
45-72-72-45
56' ROADWAY 2-2'-6" SIDEWALKS
MOUNDS VIEW, RAMSEY COUNTY

PIPE SLEEVES

STATE BRIDGE NO. 6580
STATE PROJECT NO. 6285-07
FEDERAL PROJECT NO.

DATE	DRAWING NO.
1/31/58	E-6580

SHT. 4 2-2-57