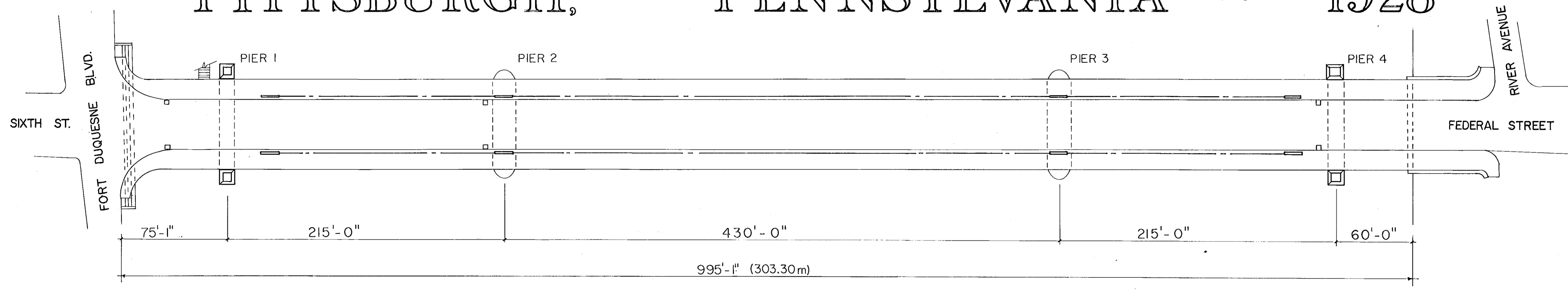


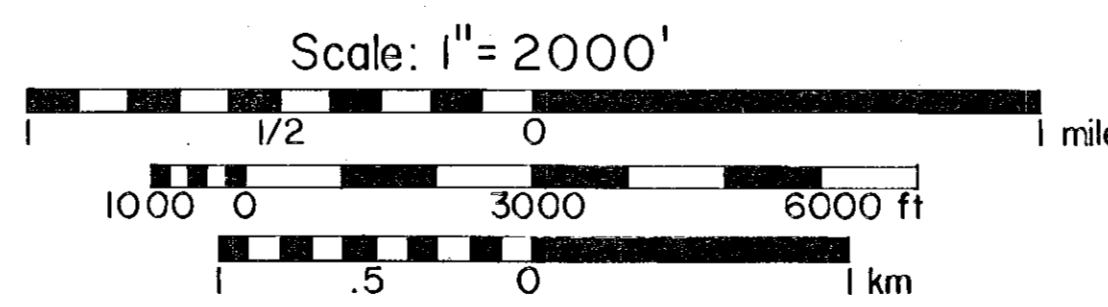
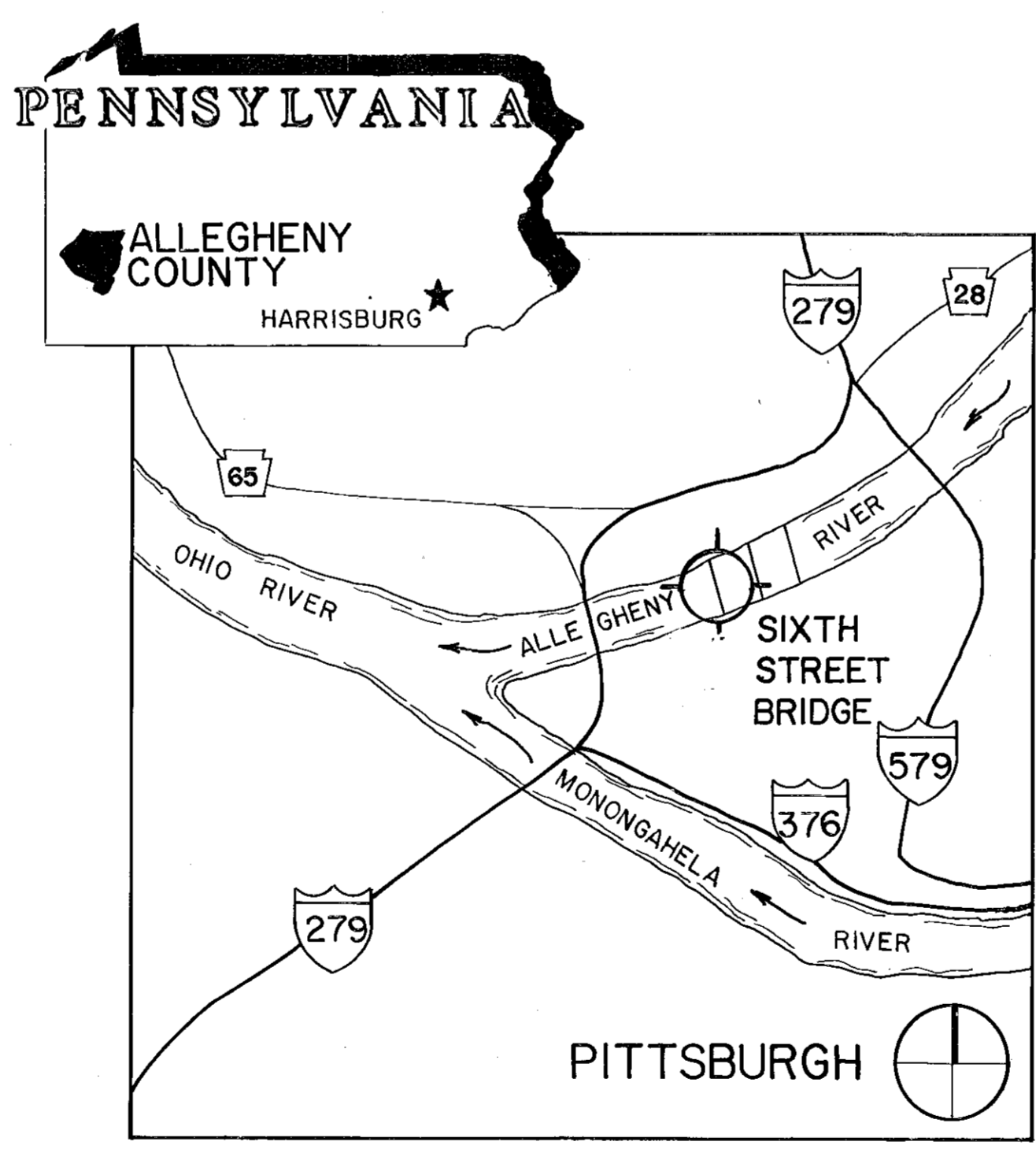
THREE SISTERS BRIDGES, SIXTH STREET BRIDGE PITTSBURGH, PENNSYLVANIA 1928



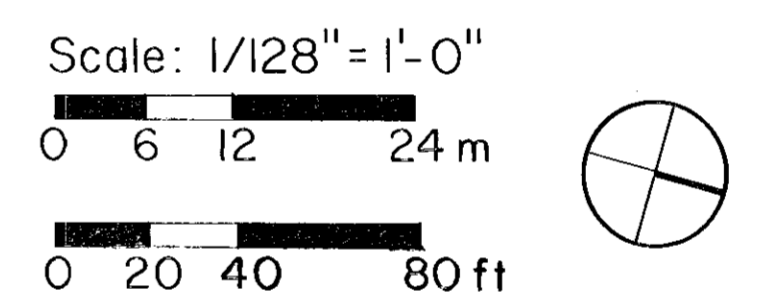
PLAN

The "Three Sisters Bridges" represent an adaptive engineering design response to political and technical concerns. County engineers successfully maneuvered around federally-mandated clearances, aesthetic and financial considerations raised by local agencies, and the lack of adequate anchorage points along the river banks. The structures are the only trio of nearly identical bridges and among the few surviving examples of large eyebar suspension bridges in the United States. They were the first self-anchored suspension bridges built in this county.

The Sixth Street Bridge is at the site of Pittsburgh's first Allegheny River bridge, Lothrop's 1819-20 wooden covered St. Clair Bridge. Replaced by a John A. Roebling suspension bridge in 1860, the bridge was rebuilt again in 1892 using a Theodore Cooper bowstring truss design to support growing railway traffic between Pittsburgh and adjacent competitor, Allegheny City, north of the river. The current three-span structure measures 995 feet with a main span of 430 feet. The design's deck-stiffening girder provided compressive support while lowering visual barriers between Pittsburgh and the historically distinct Northside, annexed in 1907. The American Institute of Steel Construction named the Sixth Street Bridge "The Most Beautiful Steel Bridge of 1928".



Based on General Highway Map of Allegheny County, Pennsylvania, Prepared by Pennsylvania Department of Transportation, 1991, and the U.S.G.S. 7.5 x 15 min. series Topographic Map, Pittsburgh West Pennsylvania Quadrangle, 1979.
UTM: 17/584500/4477500



The Pennsylvania Historic Bridges Recording Project - II is a part of the Historic American Engineering Record (HAER), a long-range program of documenting historically significant engineering, industrial, and maritime sites in the United States. The HAER program is administered by the National Park Service, U.S. Department of the Interior. The Pennsylvania Historic Bridges Recording Project - II was co-sponsored during the summer of 1998 by HABS/HAER under the general direction of E. Blaine Cliver, Chief; the Pennsylvania Department of Transportation, Bureau of Environmental Quality, Wayne W. Kober, Director; and the Pennsylvania Historical and Museum Commission, Brent D. Glass, Executive Director and State Historic Preservation Officer.

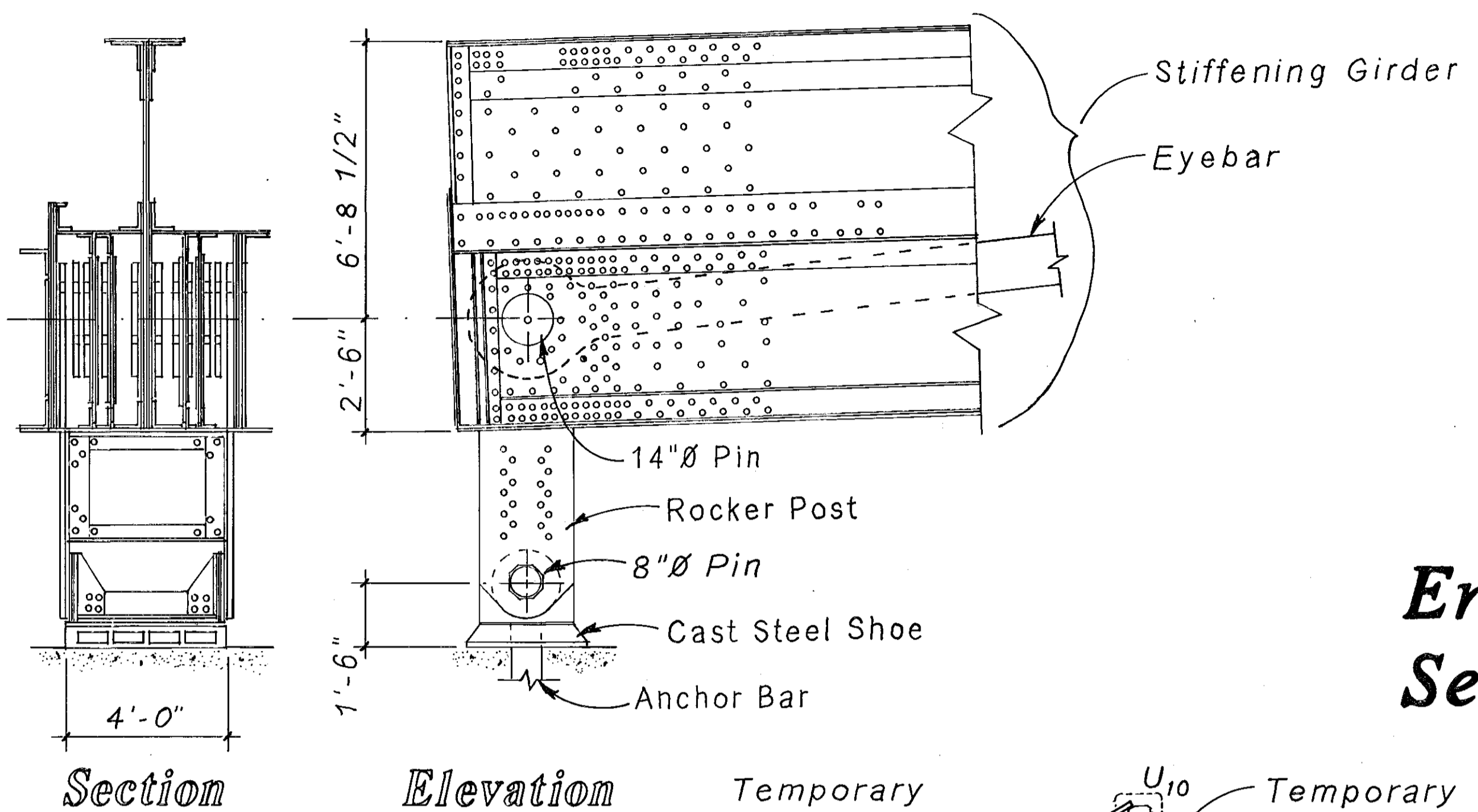
The fieldwork, measured drawings, historical reports, and photographs were prepared under the direction of Eric DeLony, Chief of HAER. The team consisted of James P. Hanley, Architectural Field Supervisor (Bloomington, IL); Grace H. Wallace (Dallas, TX), Julia Maleeva (ICOMOS, Sofia, Bulgaria), Rachel J. Zsembery (Carnegie Mellon University), Susan H. Gordon (University of Virginia), Architects; Justin M. Spivey (HAER), Engineer/Historian; Helen P. Ross (Fredericksburg, VA), Ben A. Shackelford (Georgia Institute of Technology) and Elizabeth Haven Hawley (Georgia Institute of Technology), Historians; Dr. Dario Gasparini, P.E. (Case Western Reserve University) and Dr. Tom Boothby, P.E. (Penn State University), Engineers; and Jet Lowe (HAER), Photographer.

DELINEATED BY: SUSAN H. GORDON, 1998
 PENNSYLVANIA HISTORIC BRIDGES RECORDING PROJECT - II
 UNITED STATES DEPARTMENT OF THE INTERIOR
 PITTSBURGH
 THREE SISTERS BRIDGES, SIXTH STREET BRIDGE (1928)
 SPANNING ALLEGHENY RIVER AT SIXTH STREET
 ALLEGHENY COUNTY
 PENNSYLVANIA
 SHEET 1 of 8
 HISTORIC AMERICAN ENGINEERING RECORD
 PA-490-A

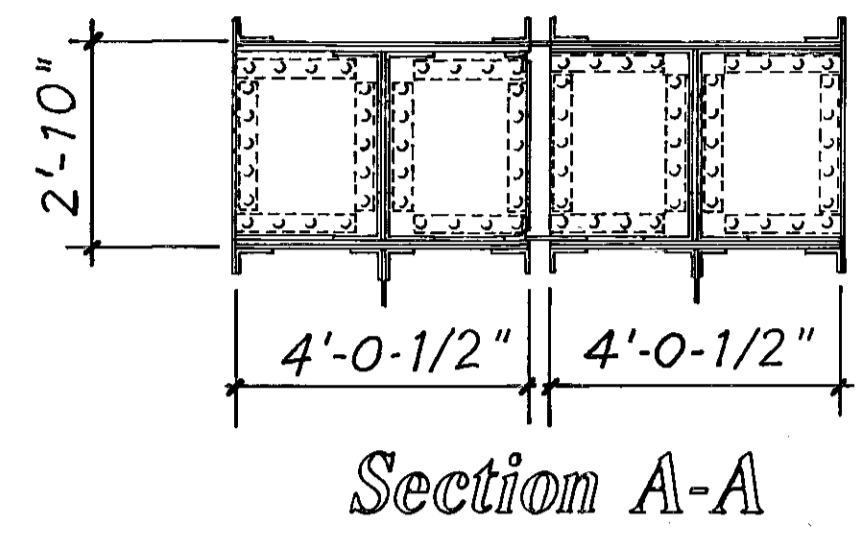
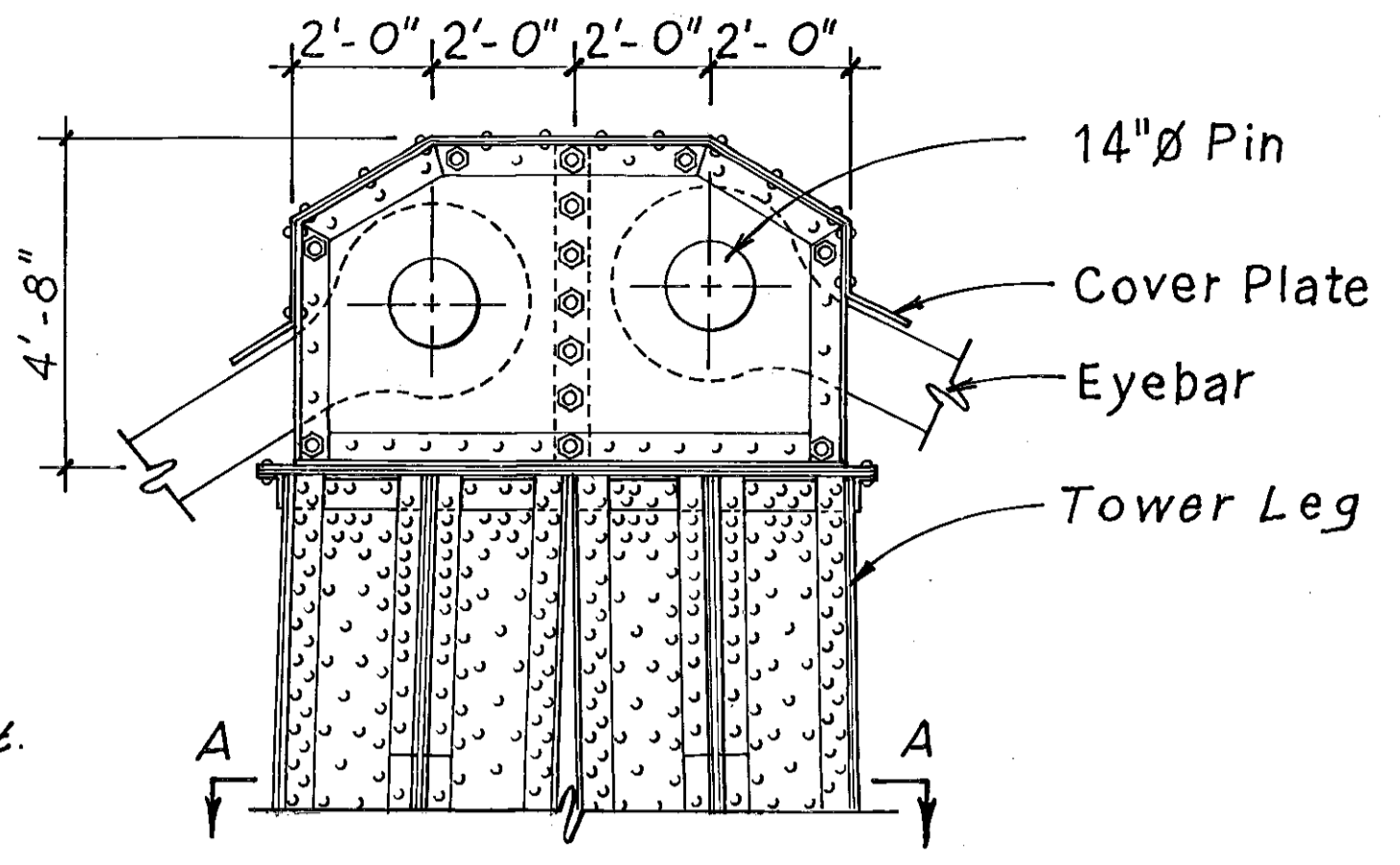
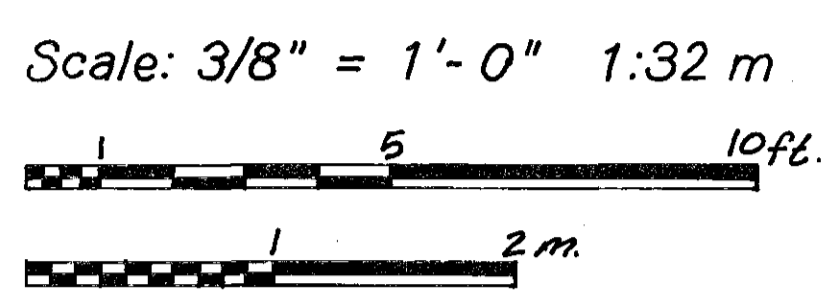
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L₀

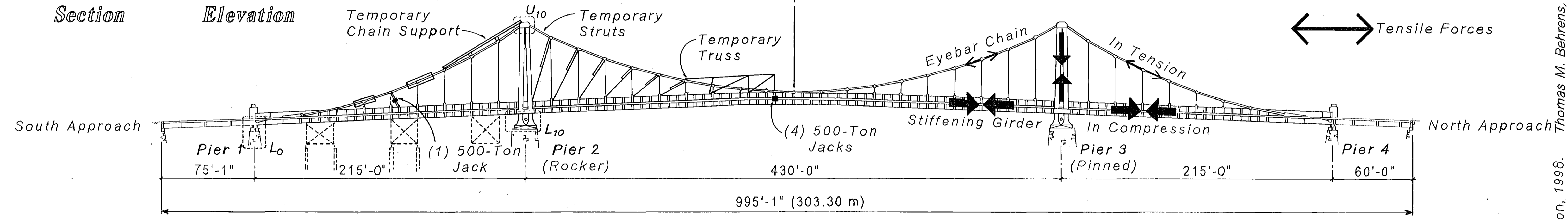
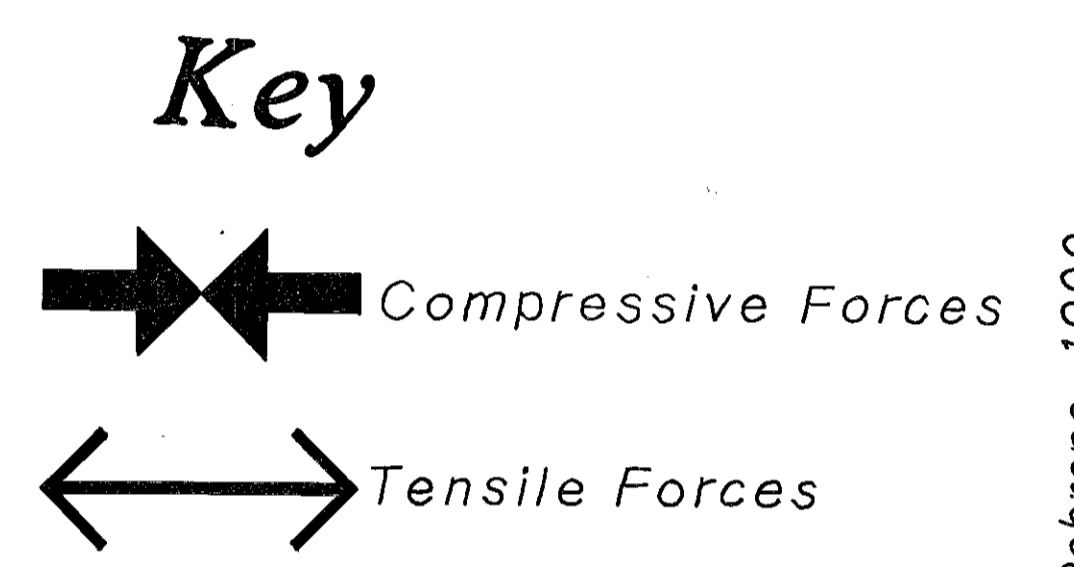
*Rocker Post
At End of Span*



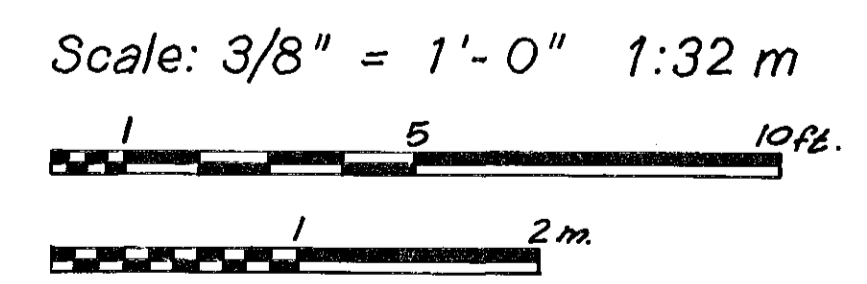
U₁₀
Tower Top



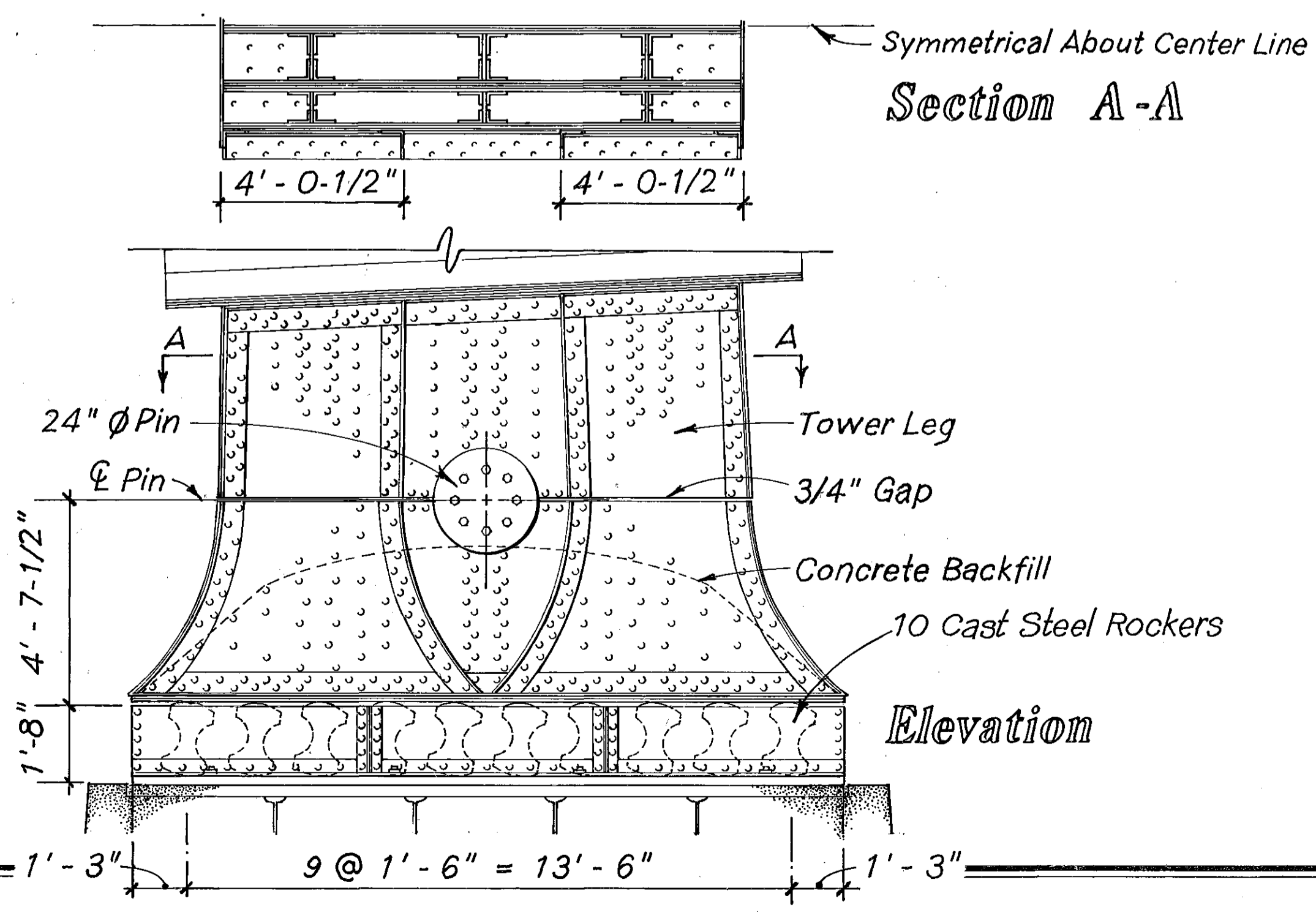
Erection Sequence | **Force Schematic**



*Erection Sequence adapted from
Vernon R. Covell. "Erecting a
Self-Anchored Suspension Bridge"
Engineering News Record Vol. 97
No. 13 (September 13, 1926).*



L₁₀
Rocker Bearing



A suspension bridge works by hanging a roadway from cables — or chains — under tension. Though a few unstiffened suspension bridges exist, a longitudinal stiffening truss or girder is usually added to prevent excessive movement of the deck. The cables pass over towers and are anchored at both ends. Conventional suspension bridges use massive concrete or rock anchorages to resist the cable's tension. In self-anchored suspension bridges, however, the cables are fastened to both ends of the longitudinal girders. These girders are therefore compression struts in addition to stiffening the roadway.

Because each of Pittsburgh's 'Three Sisters' appears to be a self-contained unit not dependent on the river banks for anchorage, a debate ensued among engineers whether these structures were cantilevers rather than suspension bridges. While current wisdom holds them to be the latter, the erection procedure shows how each bridge was built in halves toward the center. Temporary diagonal struts between chain and deck provided shear resistance, turning each incomplete half into a trussed cantilever arm. These struts 'freed themselves' when the halves were jacked together and connected to form a suspension bridge.

DELINATED BY: Julia Malceva, James P. Hanley & Susan H. Gordon, 1998. Thomas M. Behrens, 1999
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NATIONAL PARK SERVICE
UNITED STATES DEPARTMENT OF THE INTERIOR

THREE SISTERS BRIDGES, SIXTH STREET BRIDGE (1928)
SPANNING ALLEGHENY RIVER AT SIXTH STREET
ALLEGHENY COUNTY
PITTSBURGH

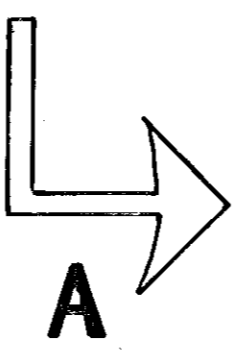
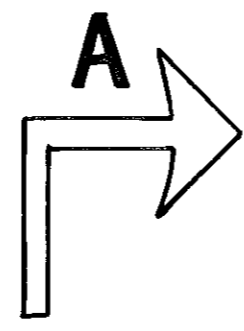
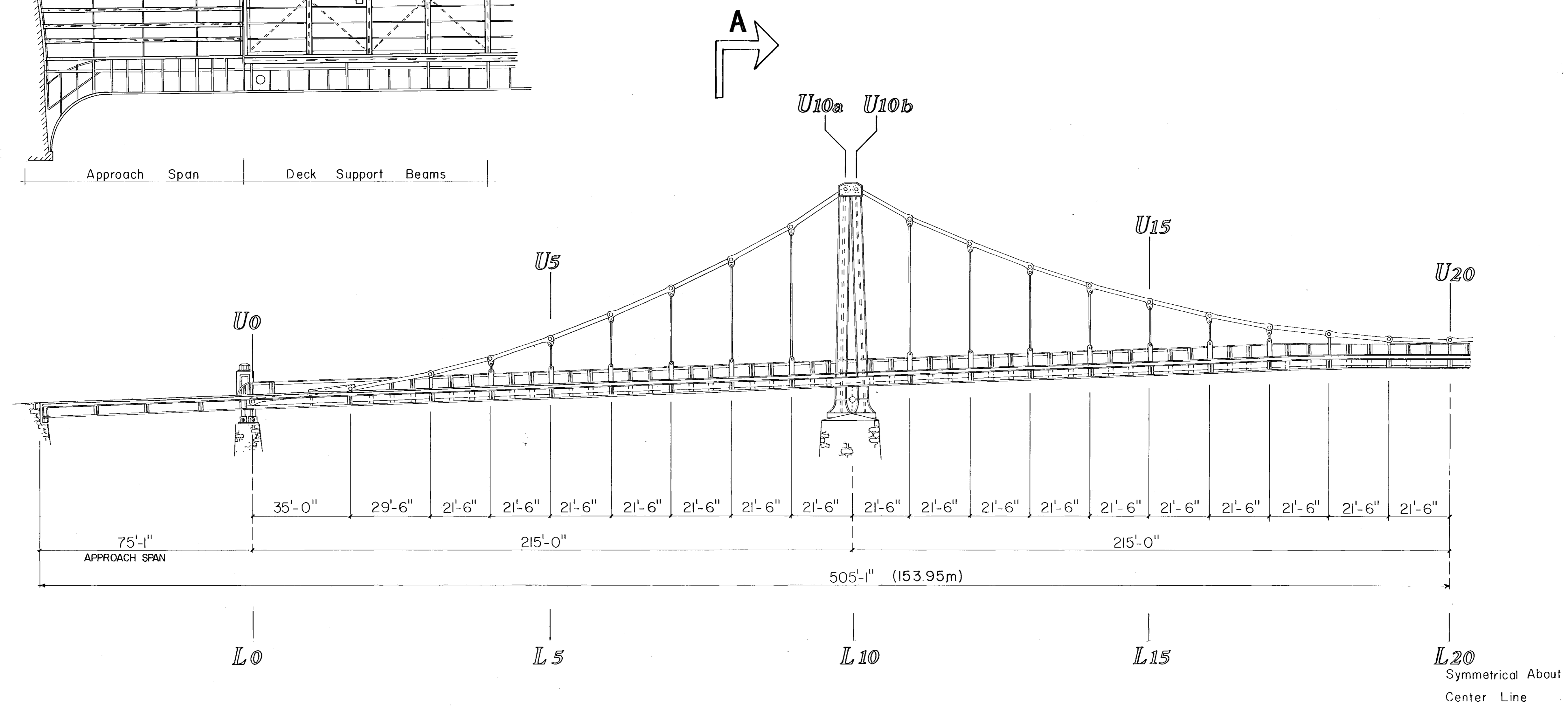
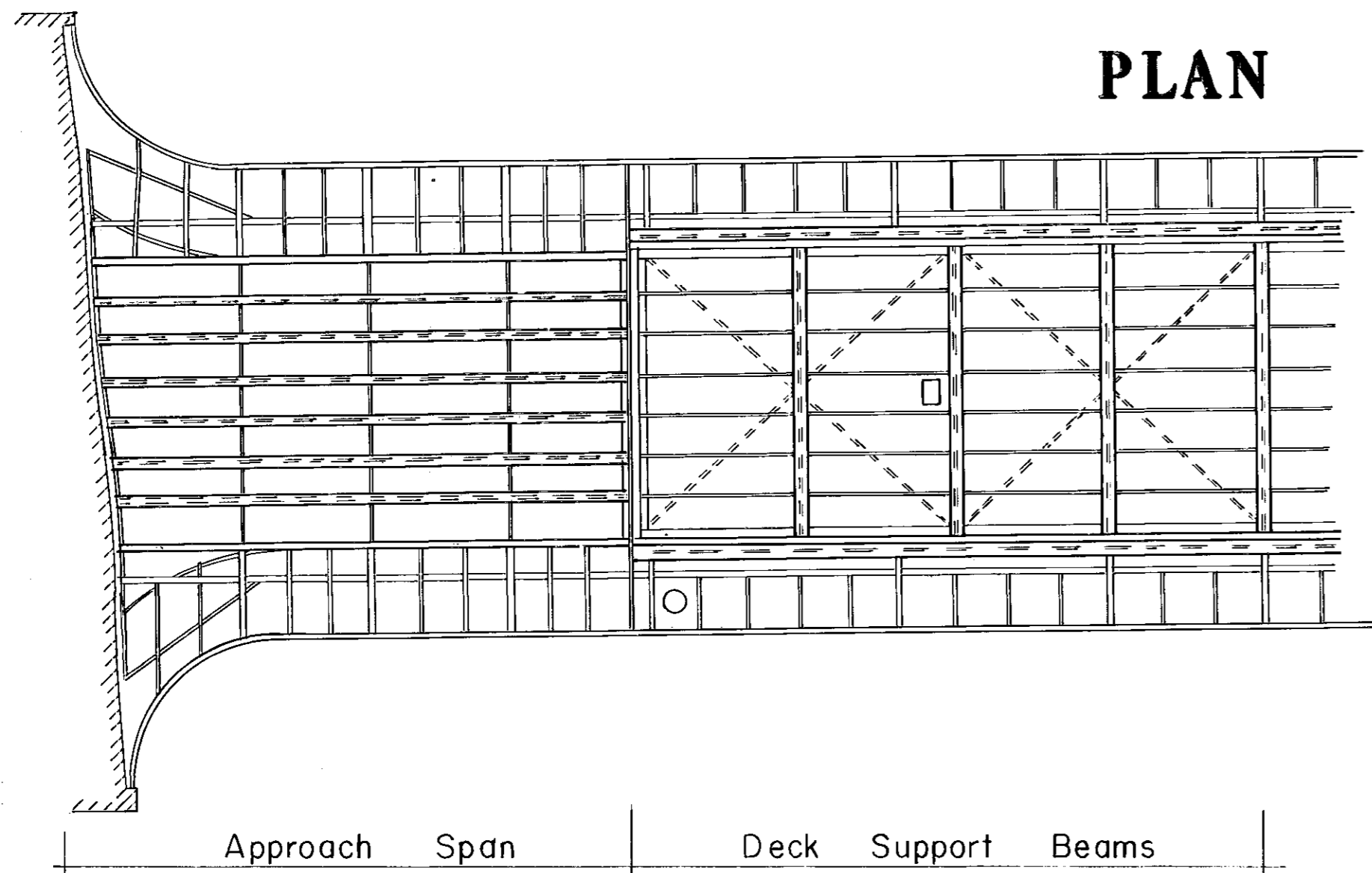
PENNSYLVANIA

HISTORIC AMERICAN
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SHEET
2 of 8

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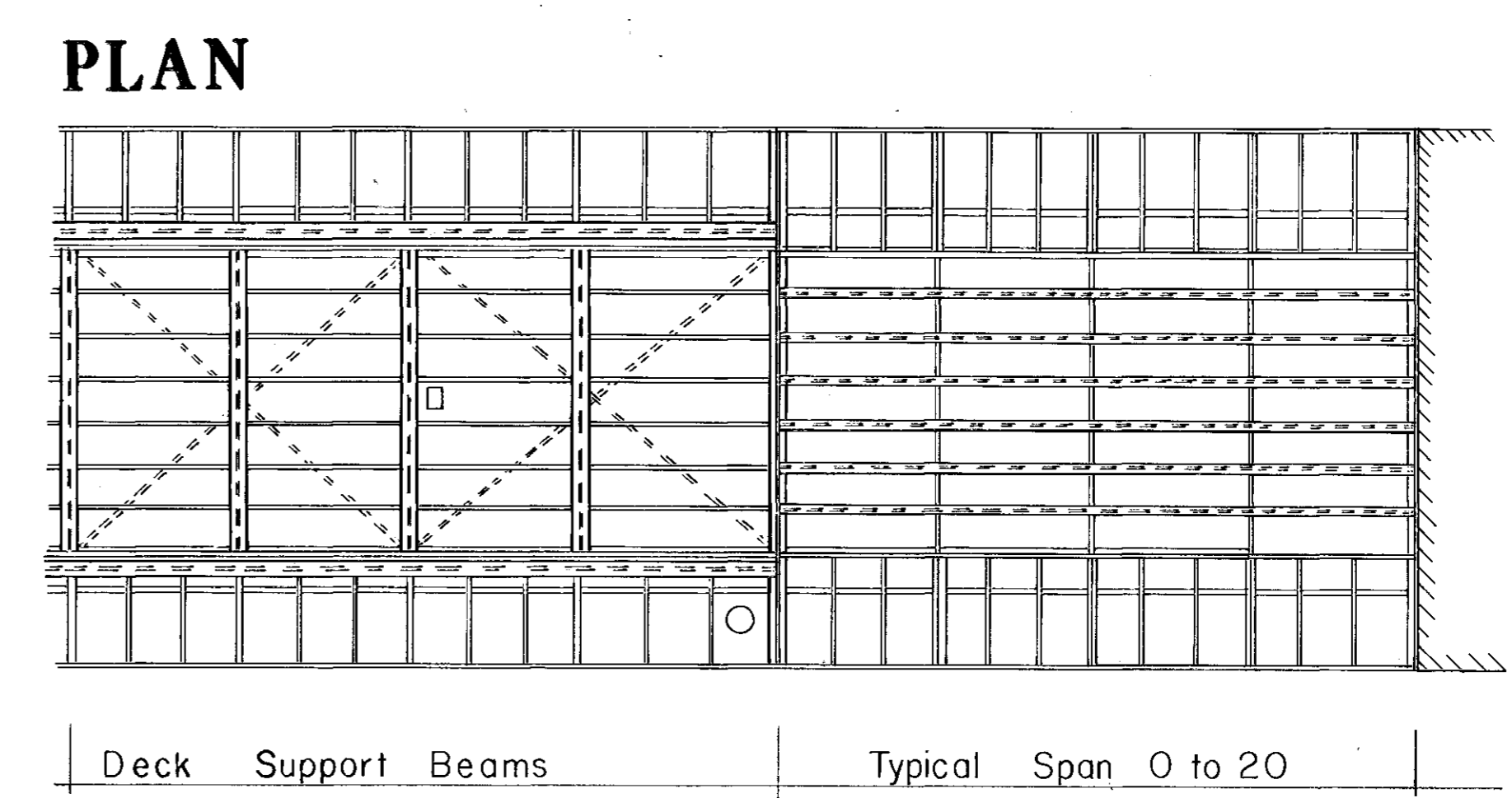
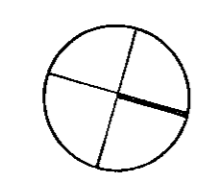
TRIM LINE



Scale: 3/64" = 1'-0"

0 3 6 12m

0 10 20 40 ft



DELINATED BY: Rachel J. Zsembert, 1998

PENNSYLVANIA HISTORIC BRIDGES RECORDING PROJECT - II

UNITED STATES DEPARTMENT OF THE INTERIOR

THREE SISTERS BRIDGES, SIXTH STREET BRIDGE (1928) SPANNING ALLEGHENY RIVER AT SIXTH STREET ALLEGHENY COUNTY PENNSYLVANIA

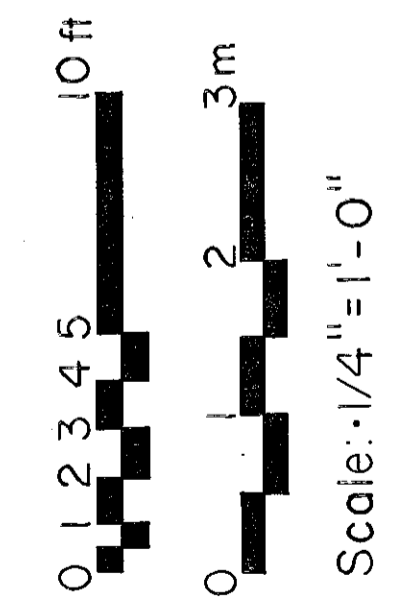
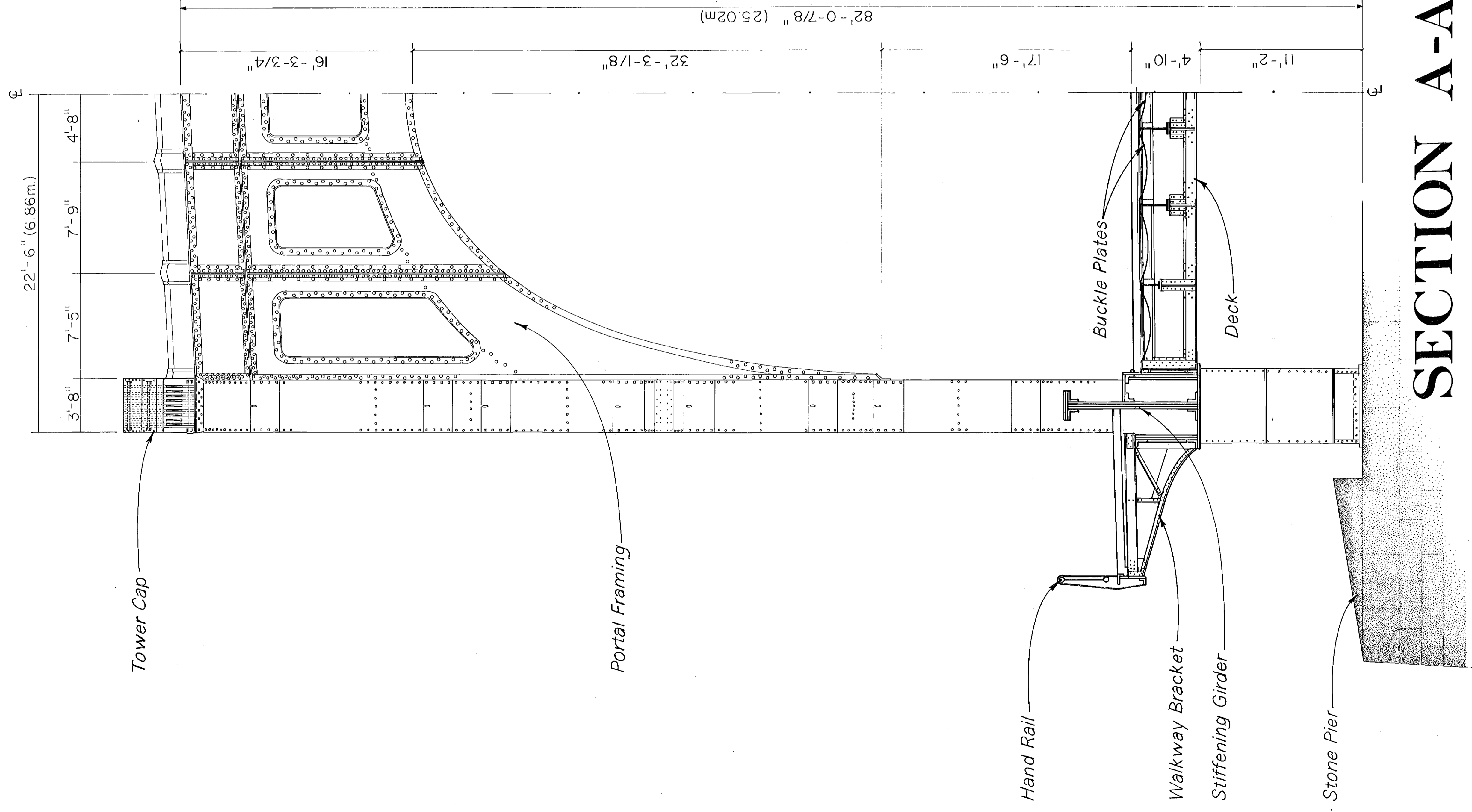
HISTORIC AMERICAN ENGINEERING RECORD

SHEET 3 of 8

PA-490-A

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TRIM LINE



SECTION A-A

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 RECORDING PROJECT-II
 UNITED STATES DEPARTMENT OF THE INTERIOR

Thomas M. Behrens, 1999
 THREE SISTERS BRIDGES, SIXTH STREET BRIDGE (1928)
 SPANNING ALLEGHENY RIVER AT SIXTH STREET
 ALLEGHENY COUNTY
 PITTSBURGH

PENNSYLVANIA
 HISTORIC AMERICAN
 ENGINEERING RECORD
 SHEET
 4 of 8

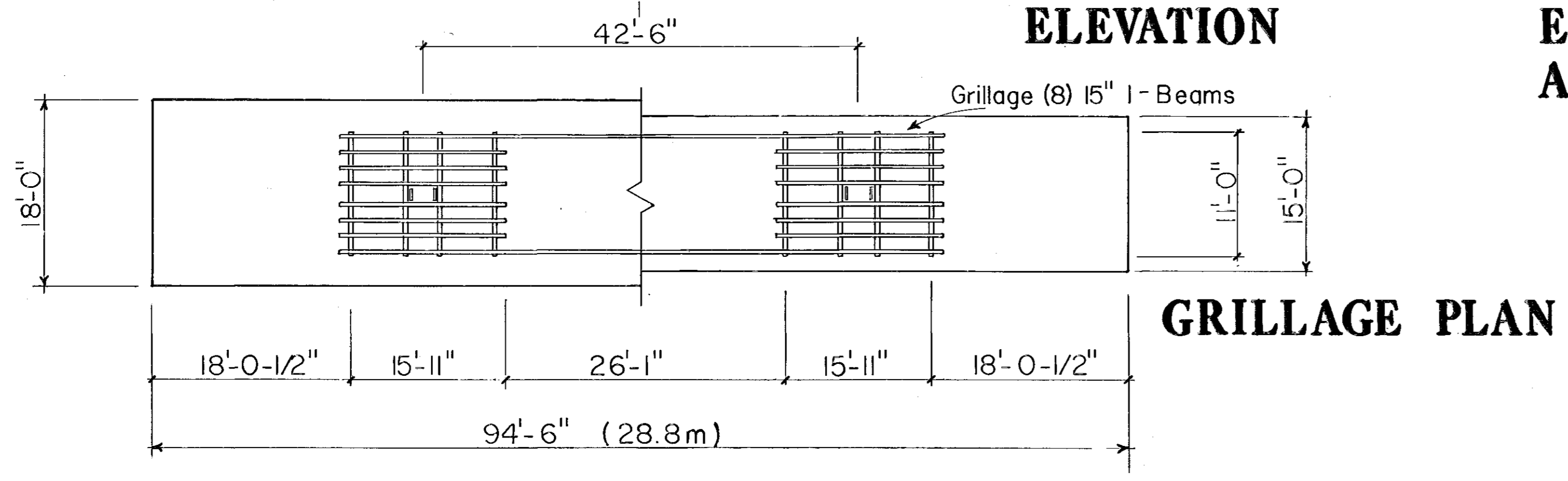
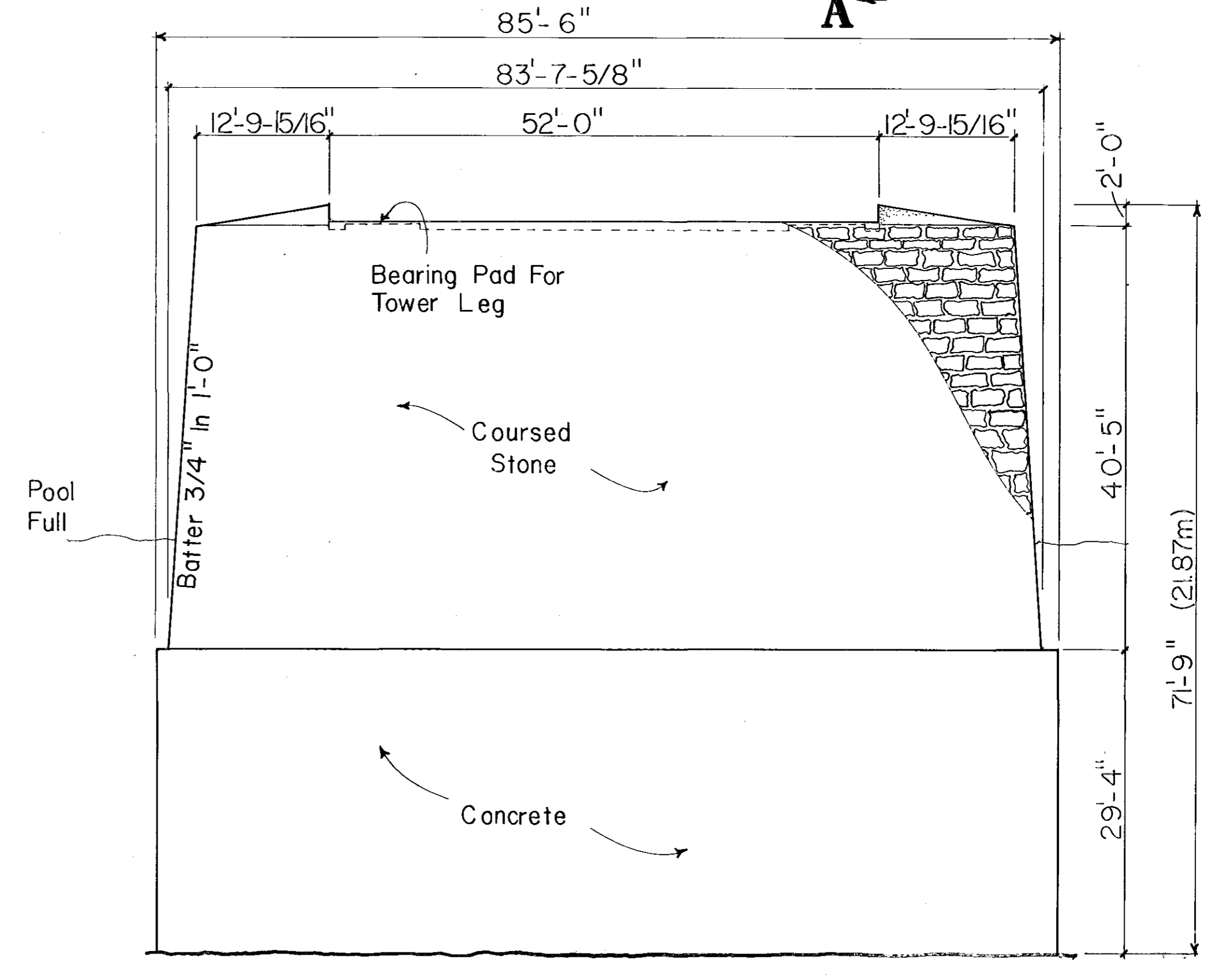
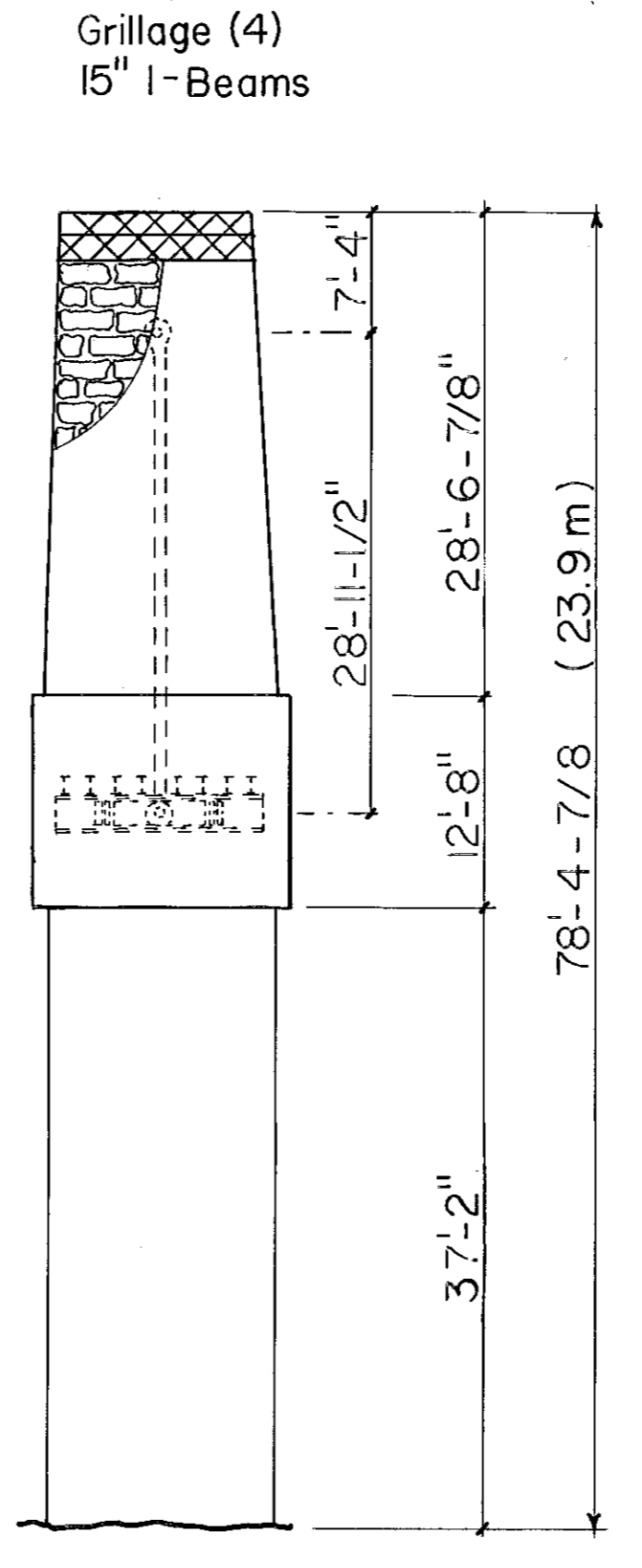
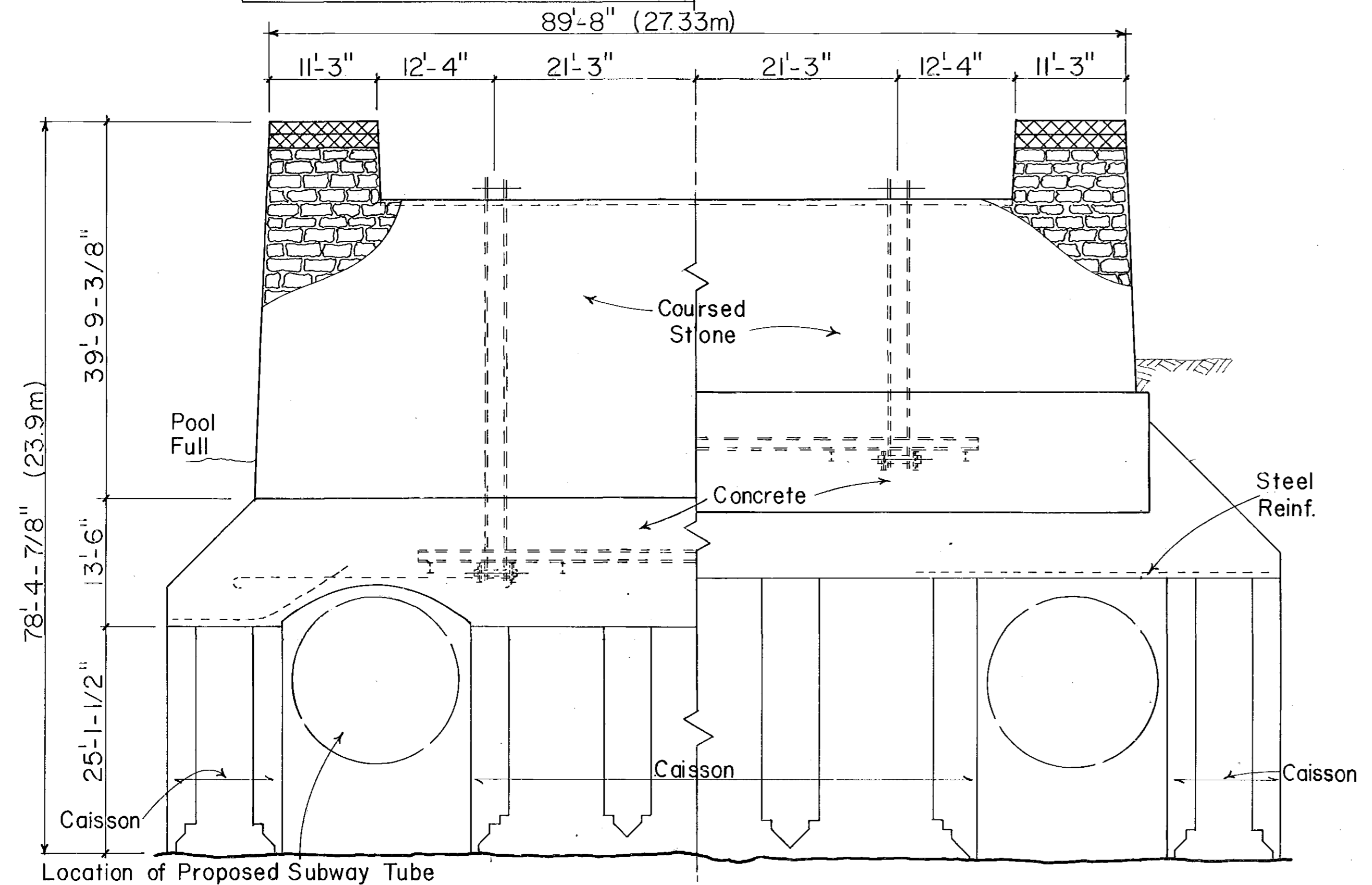
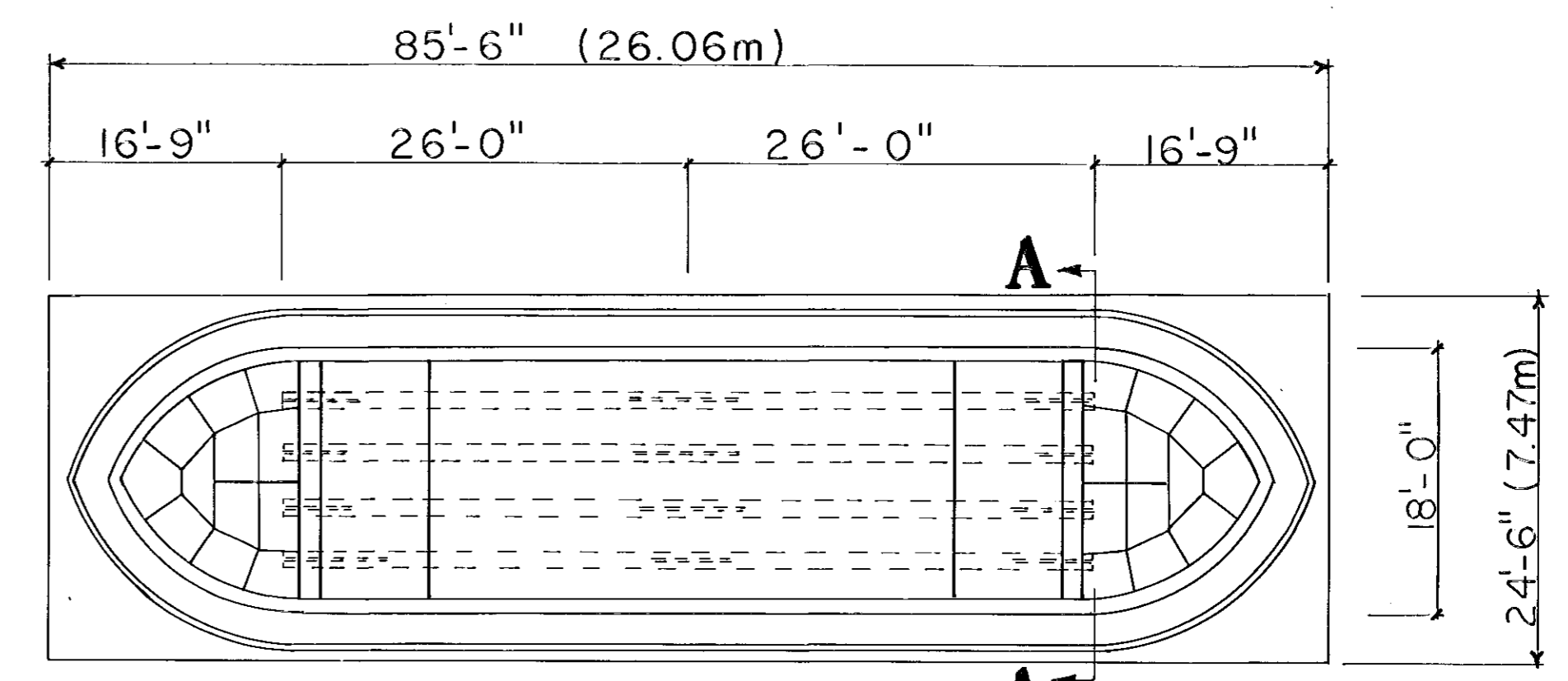
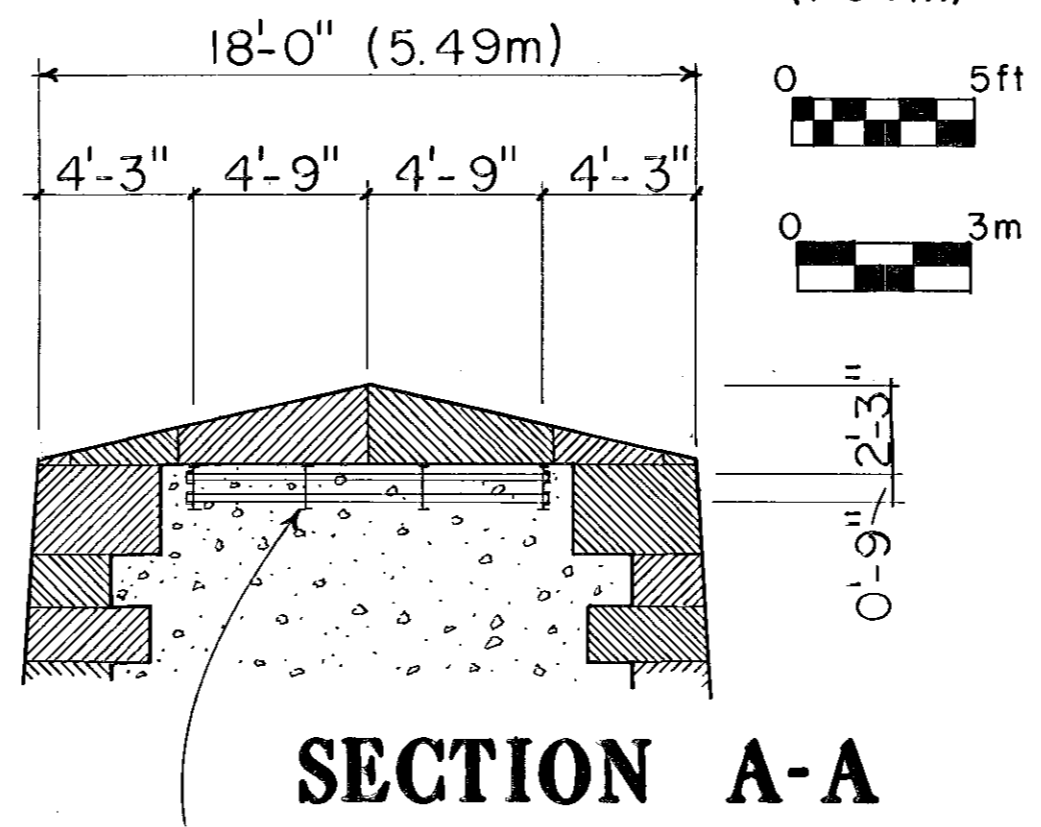
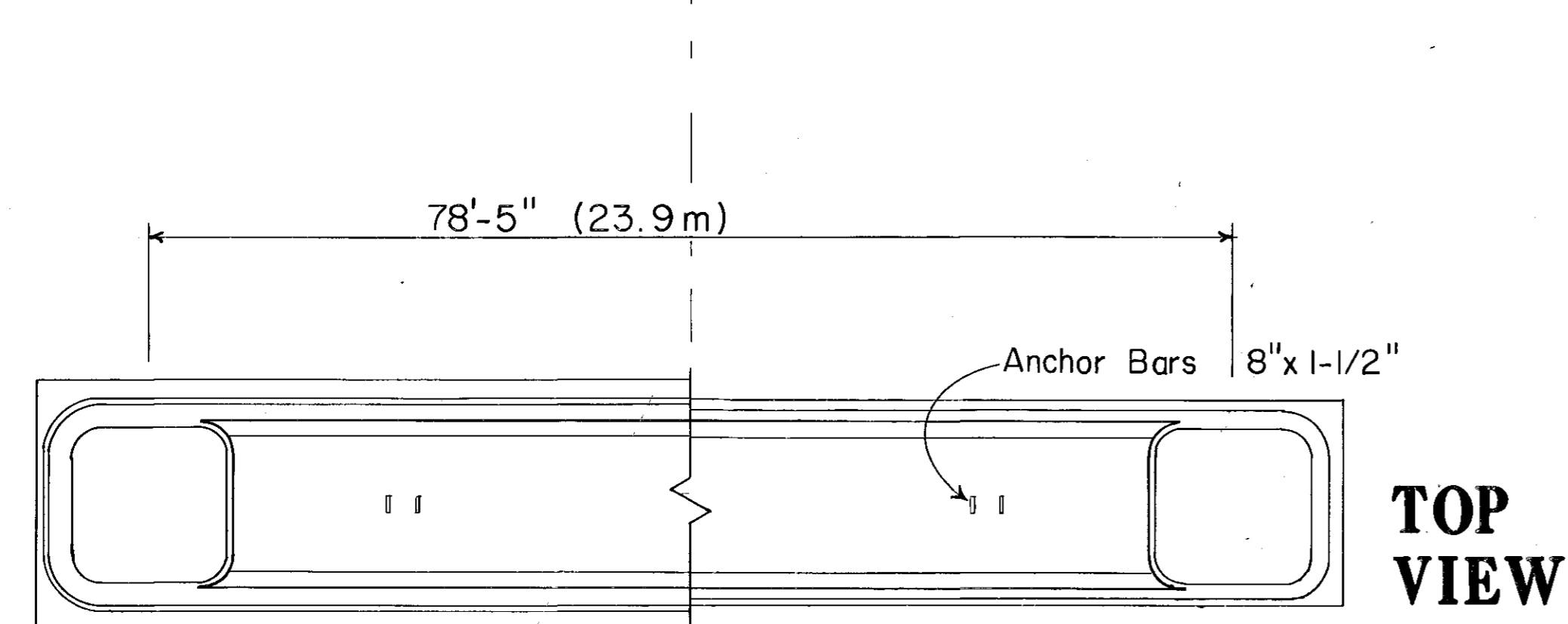
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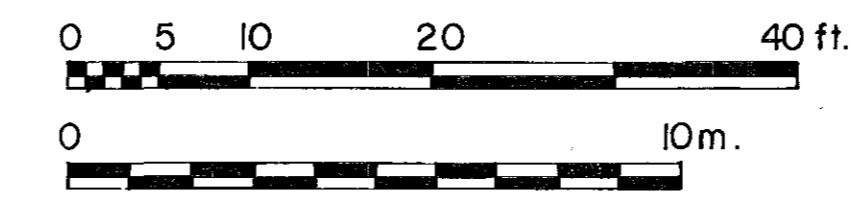
N^o1 N^o4

SCALE: 3/16" = 1'-0" (1:64m)

PLAN



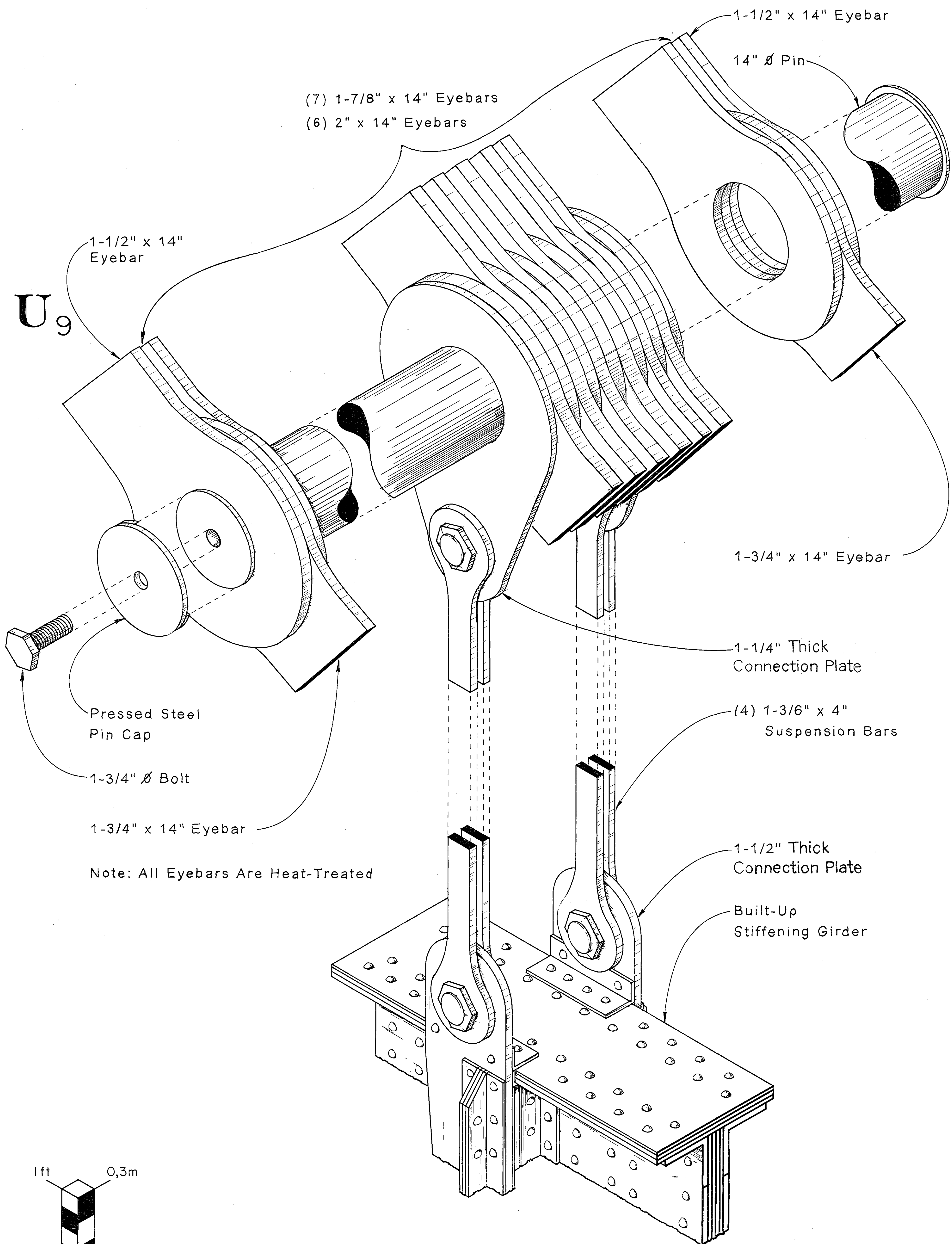
SCALE: 3/32" = 1'-0" (1:128m)



DETAIL AT PIERS N^o1 & N^o4

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 HISTORIC AMERICAN ENGINEERING RECORD
 SHEET 5 of 8
 PA-490-A

CONNECTION DETAILS



(7) 1-7/8" x 14" Eyebars
 (6) 2" x 14" Eyebars

U₉
 1-1/2" x 14" Eyebar

1-1/2" x 14" Eyebar
 14" Ø Pin

1-3/4" x 14" Eyebar

Pressed Steel Pin Cap
 1-3/4" Ø Bolt

1-1/4" Thick Connection Plate

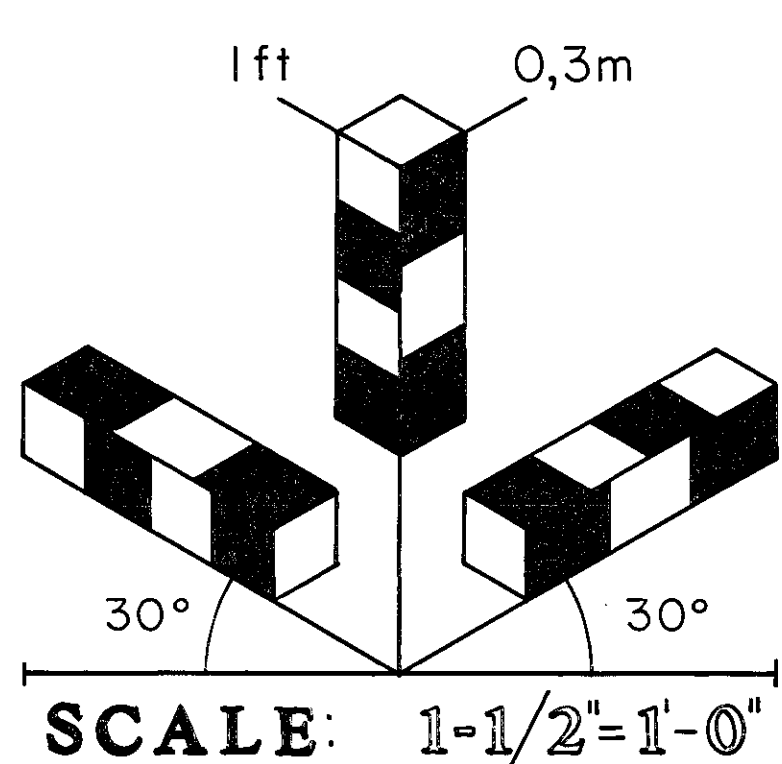
(4) 1-3/8" x 4" Suspension Bars

1-3/4" x 14" Eyebar

1-1/2" Thick Connection Plate

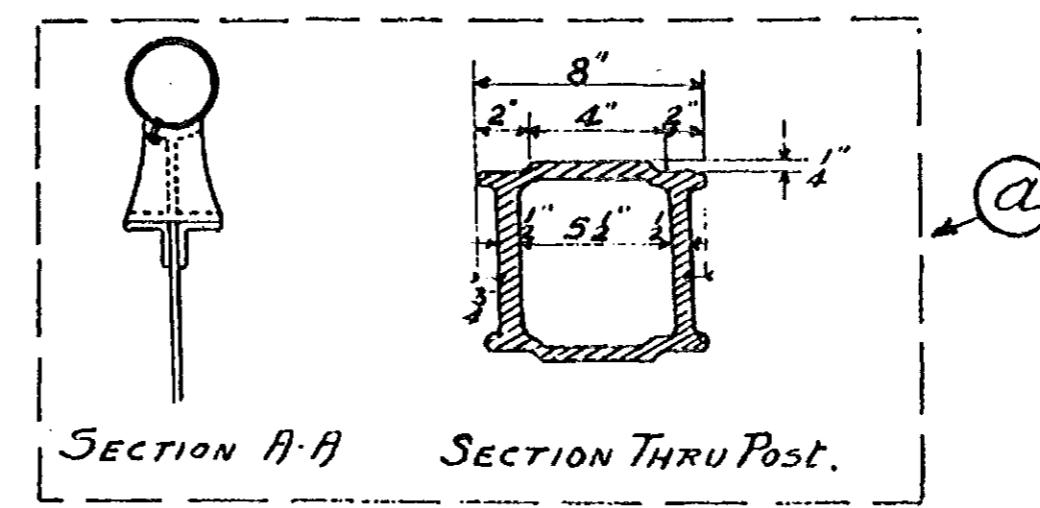
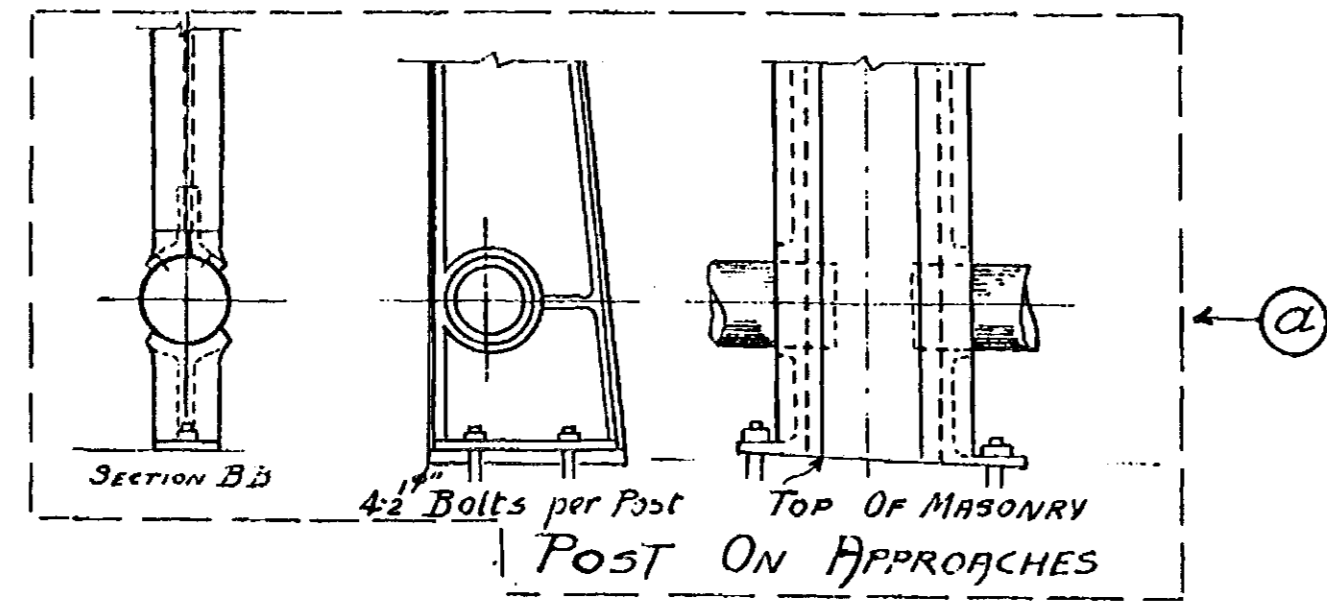
Built-Up Stiffening Girder

Note: All Eyebars Are Heat-Treated

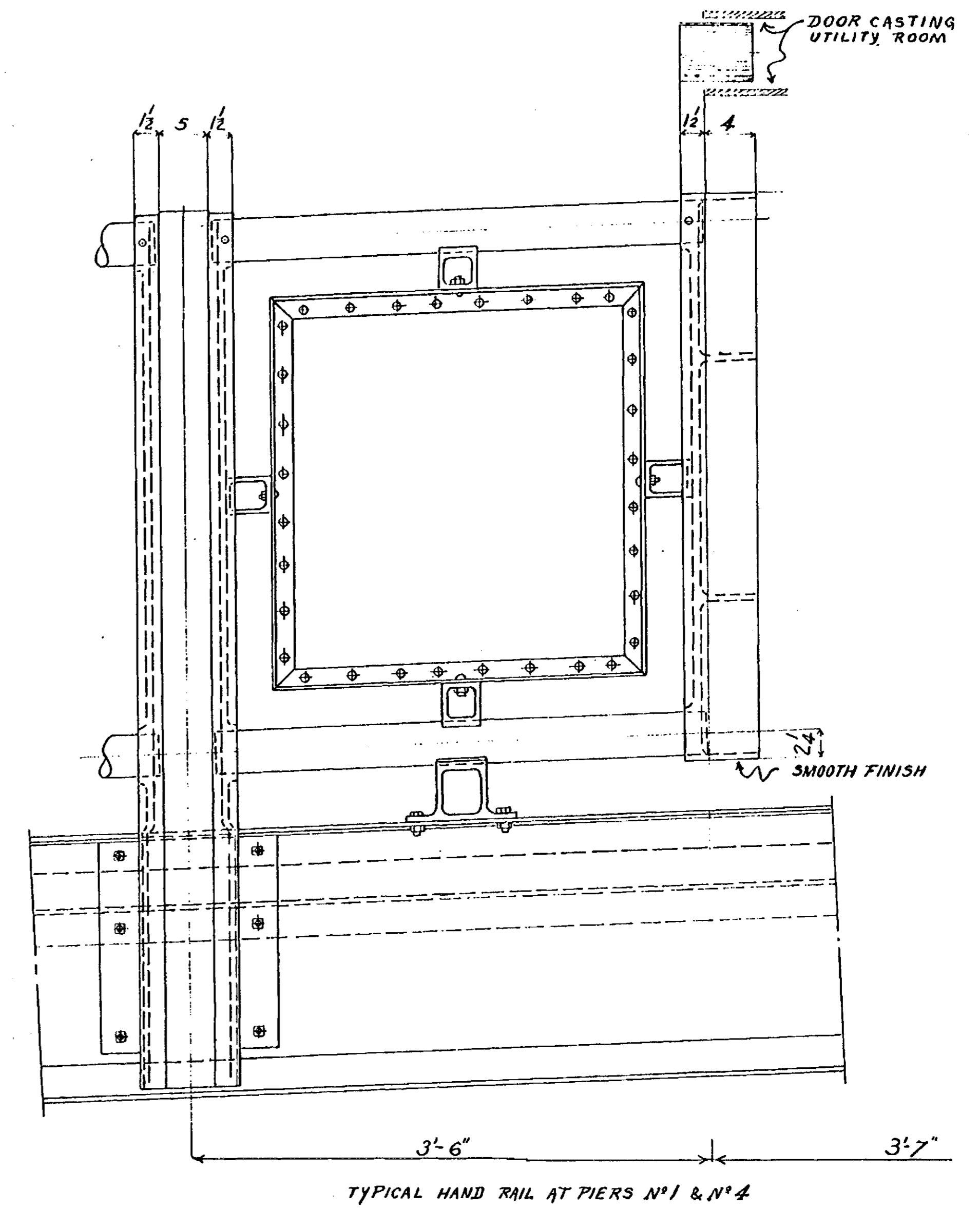
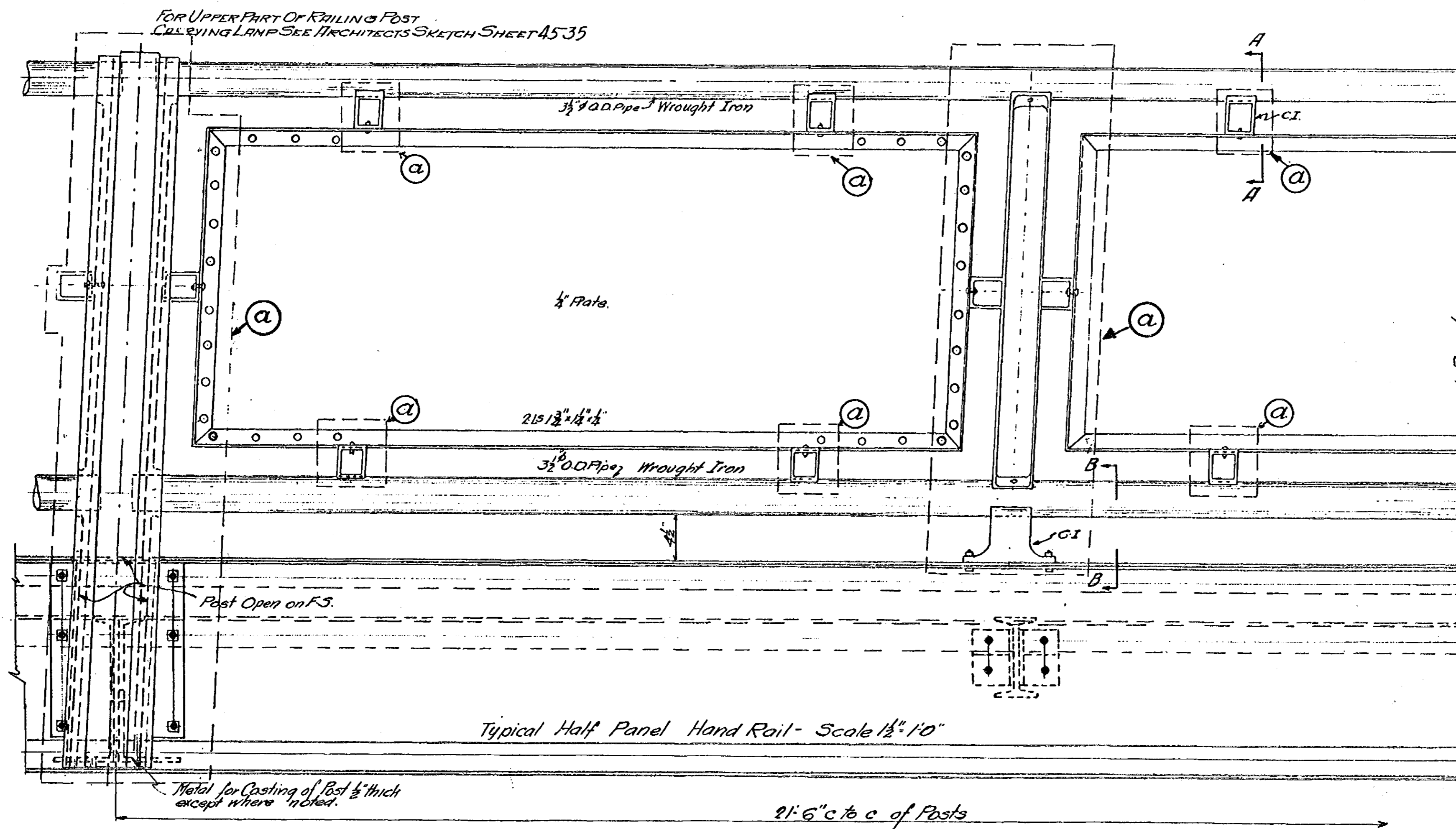
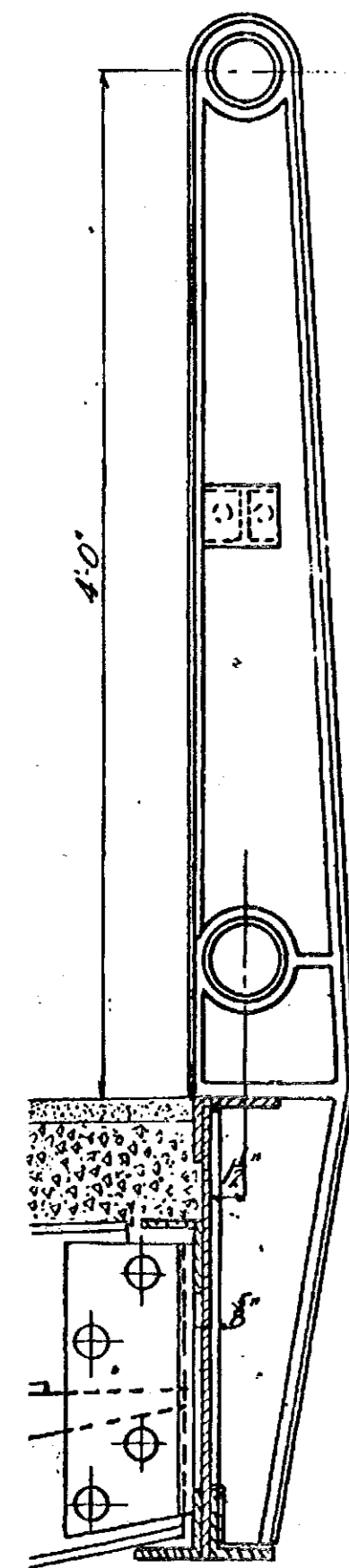


L₉

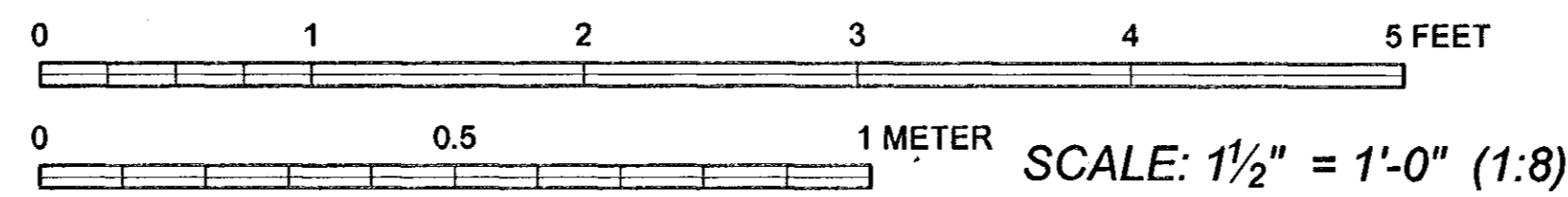
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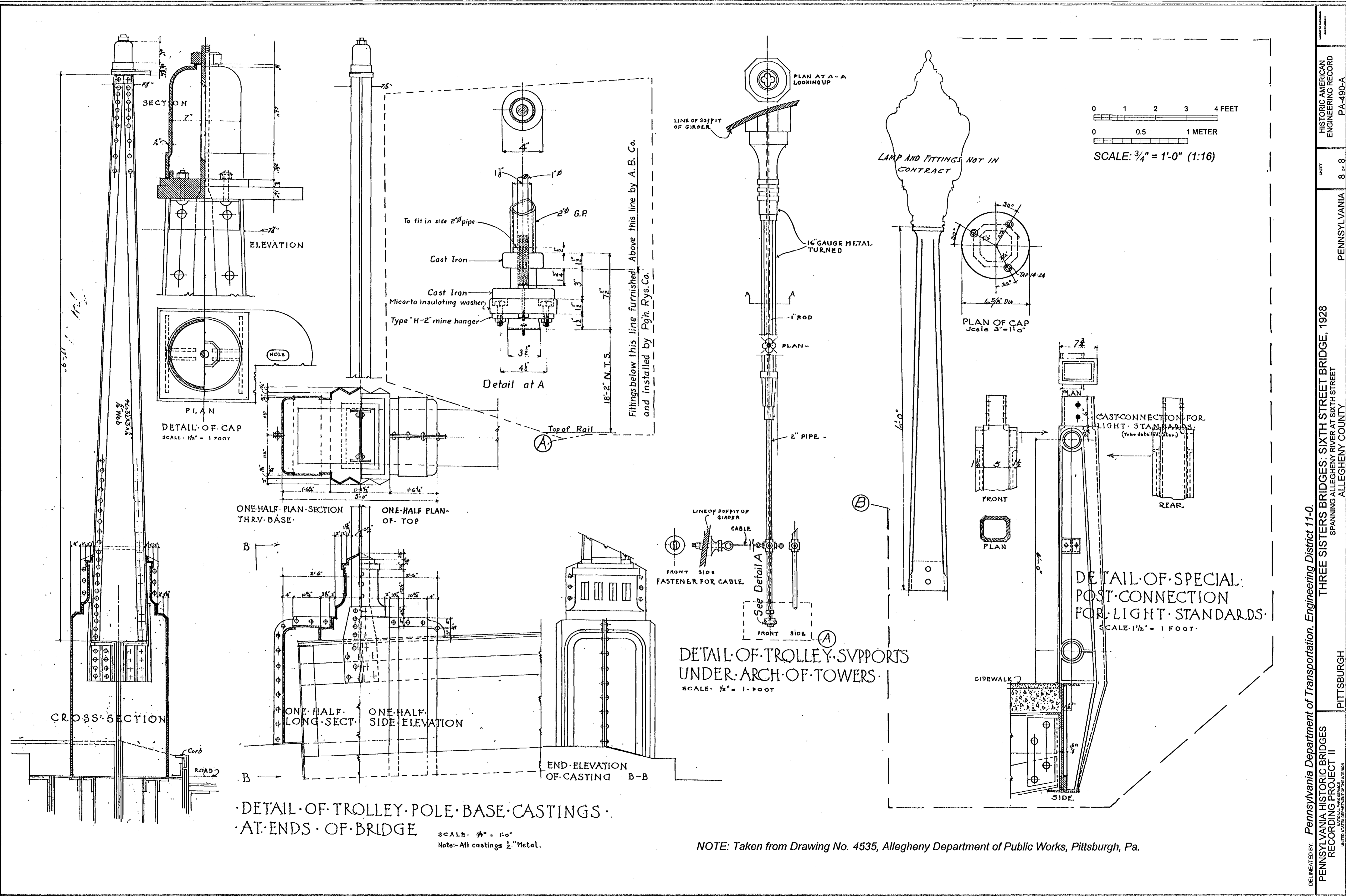


Rivets 7/8"
No Paint on surfaces to
be covered with Gunite.
Scale 1/2" = 1'-0"



NOTE: Taken from Drawing Nos. 4534 and 4583, Allegheny
County Department of Public Works, Pittsburgh, Pa.





DELIMITED BY: Pennsylvania Department of Transportation, Engineering District 11-0.
PENNSYLVANIA HISTORIC BRIDGES
RECORDING PROJECT II
NATIONAL PARK SERVICE
UNITED STATES DEPARTMENT OF THE INTERIOR

THREE SISTERS BRIDGES, SIXTH STREET BRIDGE, 1928
SPANNING ALLEGHENY RIVER AT SIXTH STREET
ALLEGHENY COUNTY

PENNSYLVANIA
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NOTE: Taken from Drawing No. 4535, Allegheny Department of Public Works, Pittsburgh, Pa.