

1. SITE I.D. NO

HAER INVENTORY

Historic American Engineering Record
Department of the Interior, Washington, D.C.

2. INDUSTRIAL CLASSIFICATION

Bridges, Trestles, and Aqueducts

7 5 8 5

3. PRIORITY

1

4. DANGER OF DEMOLITION?
(SPECIFY THREAT) YES NO UNKNOWN

BFAM: continuous concrete

Local Designation Number:

N2 67030110013300

5. DATE

1910/1911

6. GOVT SOURCE OF THREAT

OWNER

ADMIN

7. OWNER/ADMIN

City of Tacoma

8. NAME(S) OF STRUCTURE

North 21st Street Bridge

9. OWNER'S ADDRESS

City Public Works Department
City-County Building
Tacoma, Washington 98402

10. STATE

WA

COUNTY NAME

Pierce

CITY/VICINITY

Tacoma

CONG.
DIST.

03

STATE

COUNTY NAME

CITY/VICINITY

COUNTY

CONG.
DIST.

11. SITE ADDRESS (STREET & NO)

between North Fife and Oakes

Crossing: Buckley Gulch

S.T.R. 31 21N 3E

12. EXISTING
SURVEYS NR NHL HABS HAER-I HAER NPS CL6 CONF STATE COUNTY LOCAL OTHER

13. SPECIAL FEATURES (DESCRIBE BELOW)

 INTERIOR INTACT EXTERIOR INTACT ENVIRONS INTACT

14. UTM ZONE

EASTING

NORTHING

SIGN

SCALE

 1:24 1:62.5 OTHER

QUAD NAME Tacoma North, Washington

UTM ZONE

EASTING

NORTHING

SIGN

SCALE

 1:24 1:62.5 OTHER

QUAD NAME

15. CONDITION

70 EXCELLENT71 GOOD72 FAIR73 DETERIORATED74 RUINS75 UNEXPOSED76 ALTERED82 DESTROYED85 DEMOLISHED

16. INVENTORIED BY

Lisa Soderberg

AFFILIATION

HAER/Washington State Bridge Inventory

DATE

April 1979

17. DESCRIPTION AND BACKGROUND HISTORY, INCLUDING CONSTRUCTION DATE(S), HISTORICAL DATE(S), PHYSICAL DIMENSIONS,
MATERIALS, EXTANT EQUIPMENT, AND IMPORTANT BUILDERS, ENGINEERS, ETC.

This continuous concrete rigid-frame girder bridge, designed by Waddell and Harrington in 1910, is similar to the longer spanned concrete rigid-frame bridge on 23rd Street which was also designed by the renowned firm. The 21st Street Bridge carried a double track street railway down the middle of its 48 foot wide roadway, providing railway transportation to a residential area in northern Tacoma.

The bridge consists of three 60' reinforced concrete spans with four continuous girders. It is supported on gravity abutments and separate reinforced concrete columns spaced 16' apart. The truncated corners of the columns reflect observations that J.A.L. Waddell made about column design in his book Bridge Engineering: "The architectural treatment of the columns should be in conformity with the lines of the remainder of the structure. For plain, massive work in which there is no ornamentation, rectangular columns with vertical sides will prove quite satisfactory. For more

(CONT OVER)

18. ORIGINAL USE

Bridge/vehicular

PRESENT USE

Bridge/vehicular

ADAPTIVE USE

19. REFERENCES—HISTORICAL REFERENCES, PERSONAL CONTACTS, AND/OR OTHER

City Public Works Department Files.

Carl W. Condit, American Building Art, (New York; 1961), p. 207.

Bridge plate: "City of Tacoma, 1910".

J.A.L. Waddell, Bridge Engineering, 2 Vols., (New York; 1916) pp. 925, 936.

(CONT OVER)

20. URBAN AREA 50,000
POP. OR MORE? YES NO

21. HCRS REGION

N W

22. PUBLIC ACCESSIBILITY

 YES, LIMITED YES, UNLIMITED NO UNKNOWN

23. EDITOR

INDEXER

24. LOCATED IN AN HISTORIC DISTRICT?

 YES NO

NAME

DISTRICT I.D. NO

Description (continued)

elaborate structures, it will be best to batter the sides of the shaft." The stark geometric concrete form of the 21st Street Bridge is by no means elaborate. However, it is noteworthy that the battered corners were used as ornamental embellishments in an attempt to break the rigid rectangular exterior lines.

Like the 23rd Street Bridge, the width and thickness of the slabs and beams are massive and oversized. The slab is 9" thick. The beams range from 4' to 7' in width, and from 9" to 11" in depth.

The configuration of the steel reinforcement reflects the specifications that J.A.L. Modell outlined in Bridge Engineering. In his 2 volume book, he warned that "the arrangement of the reinforcement in continuous girders requires considerable care...Bars bent up from the bottom reinforcement should be used in the reinforcement over the supports as far as possible; and they should be arranged so as to reinforce for diagonal tension in the most effective manner. Bars should be extended some distance past the points where they could theoretically stop, in order to ensure that the bond stresses will be low. This procedure will also keep the unit stresses in the steel low, which will strengthen the girder considerably in diagonal tension..When stirrups are required as web reinforcement, those in the central portion of the girder should be of the type shown in Figure 37tt; while those in the end portions, where the moment is negative, should be similar but inverted." The reinforcement in the 21st Street Bridge is almost identical to that prescribed in the diagram.

The 21st Street Bridge was built for the City of Tacoma by the contractors (resman, Putnam and Healy at a cost of \$82,000. It is significant as an early example of a continuous concrete girder bridge. It was built almost simultaneously with the 950 foot Asylum Avenue Viaduct in Knoxville, which Carl Condit documented in American Building Art, as the first continuous concrete girder bridge to be constructed.



25. Photos and Sketch Map of Location

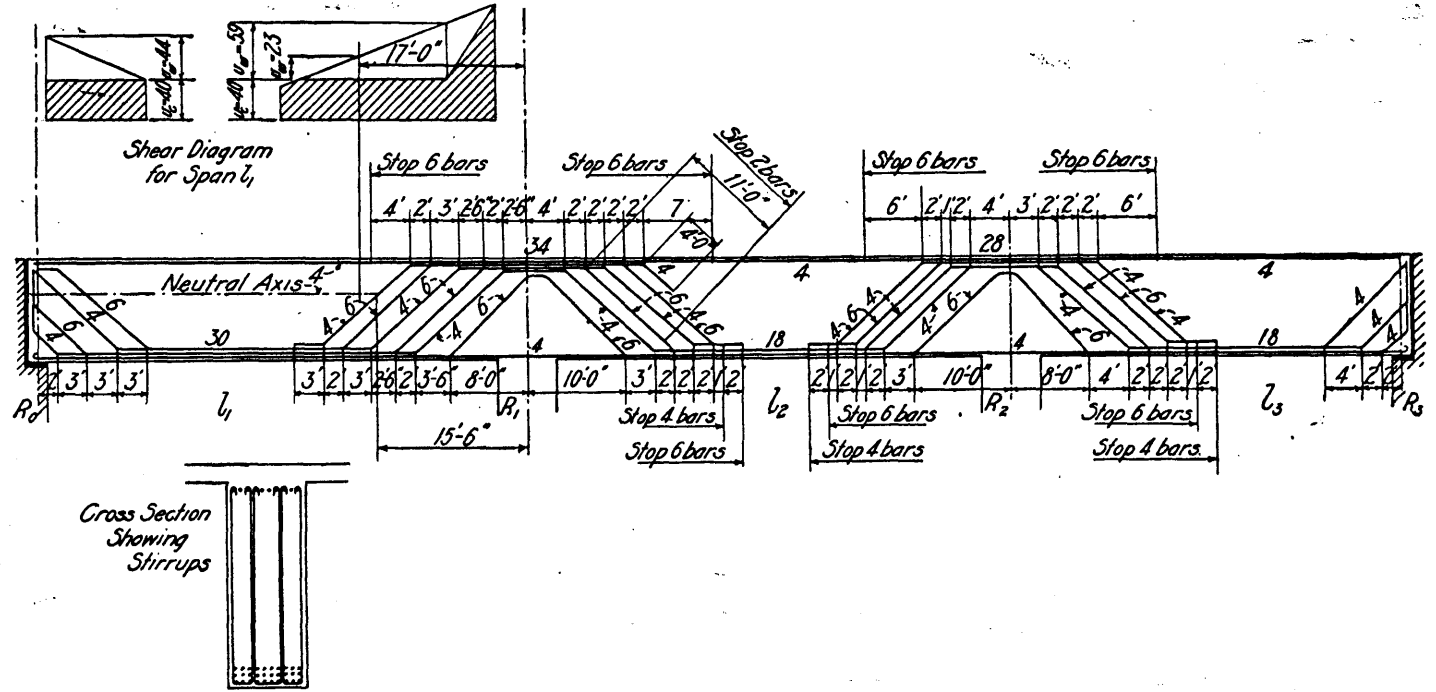


FIG. 37u. Shear Diagram and Details of Reinforcement for a Three-Span Continuous Girder.

from J.A.L. Waddell, Bridge Engineering, 2 Vols., (New York, 1916), 1:933.