NAER INVENTORY

U.S. Department of the Interior
Heritage Conservation and Recreation Service

1. SITE I.D. NO

2. INDUSTRIAL CLASSIFICATION
Bridges, Trestles, and Aqueducts
MOVE: bascule
7 6 5 0

3. PRIORITY
1

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

5. DATE
1915-1919

6. GOVT SOURCE OF THREAT — OWNER — ADMIN

7. OWNER/ADMIN
City of Seattle

8. NAME(S) OF STRUCTURE
h. University Bridge
c. Fremont Bridge
a,b. Ballard Bridge

9. OWNER'S ADDRESS
Engineering Department
Seattle Municipal Building, Room 704
Seattle, WA 98104

10. STATE	COUNTY	COUNTY NAME	CITY/VICINITY	CONG. DIST.
W A	0 3 3	King	Seattle	0 3

STATE — COUNTY — COUNTY NAME — CITY/VICINITY — CONG. DIST.

11. SITE ADDRESS (STREET & NO.)
Crossing: Lake Washington Ship Canal
h. 10 551150 5277780
c. 10 548920 5277150

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	QUAD NAME
a	1 0	5 4 6 9 3 0	5 2 7 8 8 2 0		☒ 1:24 ☐ 1:62.5 ☐ OTHER	Seattle North, Washington
b	1 0	5 4 6 9 3 0	5 2 7 8 8 2 0		☒ 1:24 ☐ 1:62.5 ☐ OTHER	Seattle North, Washington

15. CONDITION 70 ☐ EXCELLENT 71 ☐ GOOD 72 ☐ FAIR 73 ☐ DETERIORATED 74 ☐ RUINS 75 ☐ UNEXPOSED 76 ☐ ALTERED 82 ☐ DESTROYED 85 ☐ DEMOLISHED

16. INVENTORIED BY
Lisa Soderberg

AFFILIATION
HAER/Washington State Bridge Inventory

DATE
September 1980

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

The construction of several moveable spans was incorporated into the design of Seattle's Lake Washington Ship Canal. Between 1915 and 1919, three double-leaf trunnion bascule bridges of the transverse cross-girder type were constructed to span the waterway at Fremont Avenue, at 15th Avenue Northwest, and at Eastlake Avenue. The bridges, which are the earliest examples within the State of a double-leaf bascule bridge, were designed by the City of Seattle under the direction of A.H. Dimock, City Engineer. They were erected under the supervision of F.A. Rapp.

The bascule bridge design was selected over a fixed span and vertical lift design. The fixed span design was eliminated immediately because it necessitated the construction of extremely long approaches. In a letter to the city council, the city engineer wrote that a vertical lift bridge would require 200 foot towers in order to provide the necessary vertical clearance of 150 feet. "Such towers ... of steel are far from pleasing ornaments to any waterfront."

(CONT OVER)

18. ORIGINAL USE
vehicular

PRESENT USE
vehicular

ADAPTIVE USE

19. REFERENCES—HISTORICAL REFERENCES, PERSONAL CONTACTS, AND/OR OTHER
City Engineering Department files.
"Three Double-Leaf Bascule Bridges at Seattle, Washington," Engineering News-Record, Vol. 84, pp. 718-722.
"Service Performance of Grid Deck on University Bridge, Seattle," Engineering News-Record, 20 September 1934, p. 376.

(CONT OVER)

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

21. N W

22. PUBLIC ACCESSIBILITY ☐ YES, LIMITED ☒ YES, UNLIMITED ☐ NO ☐ UNKNOWN

23. EDITOR — INDEXER 50 51 52

24. LOCATED IN AN HISTORIC DISTRICT? ☐ YES ☒ NO NAME DISTRICT I.D. NO

Description (continued)

He emphasized the merits of the bascule bridge design and claimed that "the advantage of this type from the navigator's point of view is that it provides a perfectly clear and unobstructed channel permitting the passage of a vessel of any height. This feature of the bascule bridge was in direct contrast to the design of the lift bridge in which the height of the vessel passing beneath the bridge was limited by the height of the lift span.

The double-leaf trunnion bascule design adopted by the city of Seattle has its origins in a general design developed by the Chicago Department of Public Works in 1898. The three bridges consist of half-through type trusses with a horizontal top chord and a curved bottom chord. The trusses are raised and lowered by means of two counterweights that are built into the rear of the trusses, below the deck. These counterweights are composed of steel boxes that are filled with concrete. Two pockets were formed in the concrete to provide for a means of adjusting the weight according to wet and dry seasons.

The leaves are each operated by two direct current motors of 100 horsepower capacity at 550 volts. Each leaf was designed to be operated independently, and by one motor. The internal gears in the operating mechanism are composed of cast steel concave racks that were designed and patented by Alexander Van Babo, engineer of bridge design at the Chicago Department of Public Works. The gear trains drive operating pinions of forged steel that engage the innerfaces of the racks which are built into the counterweight arms of the trusses. There is also an emergency hand operating connection which can open the bridge in six hours. In 1928, auxiliary power equipment was placed in the three bridges.

All connections were assembled and reamed before the trusses were erected. The leaves were erected in the horizontal position. However, when one leaf was completed it was raised to the vertical position so that half of the channel remained unobstructed throughout construction.

Because the Federal government assumed a share of the cost of the canal, it placed conditions upon the general proportions of the bridges. The government maintained that "the structures should be of a permanent character and should give a clear channel width of 200 feet with a clearance height of 30 feet above the lake level for a width of 150 feet." All three bascule spans are greater than 200 feet in length. The curb of the Fremont Avenue Bridge is 37 feet above the waterline. The clearance height of the other two bridges is 52 feet, substantially above the height set by the Federal government. The additional height enabled small craft to pass beneath the bridges and minimized the number of openings. Because of the greater height of the Eastlake Avenue and 15th Avenue Bridges, there was no need to construct counterweight pits. The three bridges were each 40 feet wide and were designed to carry a double-track railway.

Construction began first on the University Bridge at Eastlake Avenue which was to replace two temporary timber draw spans. However, the 291 foot structure which consists of a 218 foot bascule span, was not completed until 1919 because of delays in carrying out specifications for the substructure. The massive, concrete substructure is 20 feet thick, 65 feet high, and 40 feet wide. The foundation rested directly on firm material on one side of the channel. However, on the other side of the channel, it was necessary to drive deep pile foundations in order to support the bridge. Booker, Kiehl, and Whipple were the contractors for the substructure. The United States Steel Products Company was the contractor for the superstructure. Construction was supervised by E.K. Triol.

The total cost of constructing the University Bridge which included a permanent steel span and two temporary untreated timber trestle approaches was $825,275, almost twice the cost of each of the other two bascule bridges. This was due to the cost of the massive concrete foundations and to the reletting of portions of the work at wartime prices.

Description (continued)

In 1933, an open mesh deck was installed to reduce the floor weight which permitted the widening of the roadway. The decking was designed and built by the Irving Iron Works of Long Island City, New York. Shop-welded cantilever girders were extended from the steel span to support the two additional traffic lanes.

The 502 foot bridge at Fremont Avenue was completed in 1917, and provided the primary entranceway to the community of Fremont. The steel for the 242 foot bascule span was fabricated by the Pacific Coast Steel Company. The United States Steel Products Company was the contractor for the superstructure. The substructure was built by the Pacific States Construction Company. In contrast to the University Bridge, permanent concrete approaches were built initially at Fremont Avenue by the West Coast Construction Company. The Fremont Avenue Bridge was equipped with four 100 horse-power motors. The total cost of the bridge was $410,000. In 1928, the original wood block paving was removed and replaced with open, steel pavement. At this time, new operating motors with hydraulic variable speed transmission were also added. These motors were considered to be a "new venture in moveable bridge machinery."

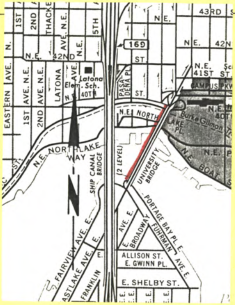
In 1917, the 15th Avenue N.W. Bridge was also completed, firmly linking Seattle and Ballard. The 295 foot structure which consisted of a 218 foot bascule span cost $479,000. The steel was fabricated by the Dyer Brothers of San Francisco. Hans Pederson was the contractor for both the substructure and superstructure, and J. Charles Rathburn was the city's superintendent for the construction of the bridge. In 1941, the temporary approaches were replaced by permanent approach spans. The four towers were replaced by a single tower in 1969.

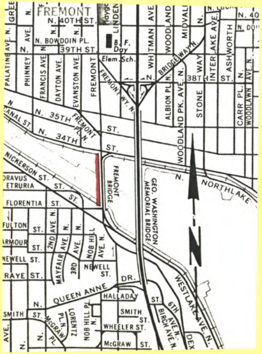
The design engineers in Seattle articulated the importance of aesthetics in city bridge design. On April 20, 1914 the city engineer wrote a letter to the city council: "of late years, it is recognized that it may be possible to secure graceful and pleasing lines, even in steel structures, without spending any large additional amount of money. It is fortunately possible owing to the height at which our bridges will be built above the water level to secure equal mechanical efficiency with a well balanced and pleasing effect." D.R. Huntington, City Architect, was responsible for the architectural treatment of the piers of the three bascule bridges. The massive, concrete piers of the University Bridge and the handsome towers on the Fremont Bridge provide an appropriate architectural frame for the passageway between Puget Sound and Lake Washington. However, the architectural treatment of these three bascule bridges do not equal the monumental stature of the cross-girder bascule bridge built across the canal at Montlake Avenue in 1924.

References (continued)

F.A. Rapp, "Heavy Foundation Work for Bascule Bridge at Seattle," Engineering News Record, 15 April 1920, pp. 774-776.
Letter from City Engineer to City Council, April 20, 1914.

25. Sketch Map of Location





A Montlake Avenue Bridge
B University Bridge
C Fremont Bridge
D Ballard Bridge

50
51

Ballard Bridge

50
51
52