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
BEAM: reinforced concrete

3. PRIORITY: 1

5. DATE: 1936/66

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

6. GOVT SOURCE OF THREAT: OWNER ADMIN

7. OWNER/ADMIN: State Department of Transportation

8. NAME(S) OF STRUCTURE: Purdy Bridge

9. OWNER'S ADDRESS:
Department of Transportation
Highway Administration Building
Olympia, Washington 98504

10. STATE COUNTY: WA 053 | COUNTY NAME: Pierce | CITY/VICINITY: Purdy | CONG. DIST.: 03

STATE COUNTY: | COUNTY NAME: | CITY/VICINITY: | CONG. DIST.:

11. SITE ADDRESS (STREET & NO)
crossing: Henderson Bay
13.6 East Mason County

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 10 | EASTING 528140 | NORTHING 5248680 | SIGN
SCALE ☒ 1:24 ☐ 1:62.5 ☐ OTHER ____ QUAD NAME: Burley, Washington

UTM ZONE | EASTING | NORTHING | SIGN
SCALE ☐ 1:24 ☐ 1:62.5 ☐ OTHER ____ QUAD NAME:

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: March 1979

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

The Purdy Bridge is a 550 foot continuous box girder. Constructed under the supervision of Pierce County engineers in 1936, it is one of a handful that were designed and built in Pierce and King Counties during the 1930's. Although the hollow-box concrete girder was economical and used extensively throughout Europe, there are few American examples. In his book, American Building Art, Carl Condit asserts that the Purdy Bridge is the "nearest American rival to Freyssinet's girder spans." At the time that it was built, its 190 foot central span was the longest single span among concrete girder forms. The bridge also includes two additional 140 foot girder spans and two 40 foot cantilever ends, extending beyond the concrete box piers. It provides a 2 lane roadway, 20 feet wide, curb to curb.

Other designs in concrete also were considered by Pierce County engineers prior to the selection of the hollow-box girder design. Solid web girders had proven successful and economical in other situations. However, the enormous dead weight of a 190 foot solid web girder below the roadway level eliminated the feasibility of using such a design (CONT OVER)

18. ORIGINAL USE: vehicular | PRESENT USE: vehicular | ADAPTIVE USE:

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 REFERENCES—HISTORICAL REFERENCES, PERSONAL CONTACTS, AND/OR OTHER

State Department of Transportation files.
Carl Condit, American Building Art, 2 Vols., (New York, 1960) 2:209.
F.R. Easterday, "Concrete Box-Girders of Record Span," Engineering News-Record, 3 March 1938, pp. 339-342.

(CONT OVER)

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

21. HCRS REGION: NW

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)
to span Henderson Bay. If the half-through girder type which extended above the roadway level were used, it would be necessary to build it with considerable depth, and consequently lose all the benefits of flange action that are available in the road slab.

"Hollow-box girders, on the other hand," stated a contemporary article in Engineering News-Record, "are of minimum section and weight, make use of the full roadway slab as a compression flange for positive bending, can easily be given adequate section for negative bending, afford ample space for tension reinforcement, and if braced with transverse internal diaphragms have the strongest section that can be made with a given quantity of material."

In the Purdy Bridge, the concrete was poured around a hollowed steel box girder of which the roadway slab forms the top flange. The box girder is 15 feet wide, and 7 feet deep at the crown, increasing to 14 feet at the piers. It is composed of three webs, and a bottom slab which is 6 inches thick in the tension zone, and of greater thickness in the compression zone, as stresses require. At approximately 20 foot intervals, 8 inch transverse diaphragms brace and interconnect all longitudinally extending parts.

The pier shafts which are also of cellular construction, are flush with the outer sides of the deck box-girder. The shells and webs are 16 inches thick. A minimum cover of 3 inches of the Class A concrete encase the steel pier shafts to protect them from the corroding forces of the saltwater. Small openings through the diaphragms of the box girder allow the water to drain through the pier shaft to an outlet above the footings.

The long, 190 foot middle section was designed as a simple suspended beam, completely separated from the rest of the structure. The suspended span is seated on shelves at the end sections of the 190 foot span which are continuous with the deck structure of the two continuous 140 foot spans, and the two 40 foot cantilever spans. The ends of the suspended section that bear upon the shelf are locked in laterally by 15 inch solid concrete sections at the ends of the shelf. Although the engineers believed that the entire deck structure probably could have been made continuous from end to end, it was explained that in "deference to convention," expansion joints were put at each end of the 100 foot mid section in the 190 foot span.

One of the major advantages to the hollow-box girder design, was its low cost. The total cost of the bridge was $62,000 or approximately $5.64 per square foot of net roadway width. Throughout bridge construction, cost factors dictated the bridge's form. Due to the commerical use of the upper portion of Henderson Bay, an 18 foot clearance at high tide was required by the War Department. It was recognized that pier construction must be carried down to a depth of 20 feet, because of the strong tidal currents, and the potential scour risks. However, construction would be costly. Although new piers for the channel span would have to be provided, it was reasoned that if a minimum number of additional piers were constructed in deep water, the cost of the bridge would be reduced. The overriding cost considerations of the hollow-box concrete girder with only two deep water piers created a distilled concrete form that was visually powerful in its organic structural simplicity.

The Purdy Bridge was built by Pierce County under the supervision of the county engineer, Mr. Forest R. Easterday. Mr. W.H. Craft was resident engineer in charge of construction. The concrete work was completed by the Portland Dredging Company. The detailed design was prepared by W.H. Witt Company of Seattle. However, the major design features and layout of the bridge were suggested by Homer M. Hadley, regional structural engineer of the Portland Cement Association. The Purdy Bridge, which is significant as an early and rare American example of hollow-box concrete girder, is one of several unique concrete bridge designs of cellular construction conceived and carried out by Mr. Hadley throughout Washington during his lifetime.

ABSTRACT

HAER NO | LC | TECH REPORT | HIST REPORT | CONTEMP PHOTO | HIST PHOTO | CONTEMP DRWG | HIST DRWG | COLOR PLATE | PHOTOGRAM | SW | FILM

GPO 937 842

25. Photos and Sketch Map of Location