**10. NAME(S) OF STRUCTURE**
State Bridge Number 393

**11. PHOTOS (W/ FILM ROLL & FRAME NO.) AND SKETCH MAP OF LOCATION**
32B:20-35 33B:2-3

32B:21A

**12. SOURCES**


Mack, Warren W. "A History of Motor Highways in Delaware", in Reed, Henry Clay, Delaware: A History of the First State, vol.2, pp.535-550 (NY: Lewis Historical Publishing Co., 1947).
Delaware State Program. Delaware State Highways; The Story of Roads in Delaware.... [Newark, Delaware: Press of Kells, 1919].
Federal Writers' Project. Delaware: A Guide to the First State. (New York: Viking Press, 1938).
The National Cyclopaedia of American Biography, vol. A (New York: James T. White & Co., 1930
Spero, Paula A. C. Metal Truss Bridges in Virginia: Suffolk Construction District. (Charlottesville, Virginia: Virginia Highway & Transportation Research Council, 1981).
New Castle County Engineer's Correspondence, 1928, DE Archives.
New Castle County Engineer Quarterly Reports, Hagley Museum.
Delaware State Archives. State of Delaware, New Castle County Levy Court, Specifications, Proposals, Contract and Bond. ms., State Archives, Dover, DE.
Delaware State Archives. New Castle County Road Commissioners Records, 1750-1940.
Delaware DOT records: contract files.
Plans on file at Delaware DOT: County, Contract #79-009-10, 83-570-01, 28A


**13. INVENTORIED BY:** **AFFILIATION** **DATE**

P.A.C. Spero & Company with Kidde Consultants for Delaware DOT — April-November 1988

# HABS/HAER INVENTORY

**See "HABS/HAER Inventory Guidelines" before filling out this card.**

**1. NAME(S) OF STRUCTURE**

State Bridge Number 393

**2. LOCATION**

S. R. 299 over Appoquinimink River
Odessa, New Castle, Delaware

**3. DATE(S) OF CONSTRUCTION**

1928

**4. USE (ORIGINAL/CURRENT)**

Vehicular

**5. RATING**

SW

**6. CONDITION**

Fair: Holes in deck with exposed reinforcement; some concrete deterioration in abutments.

**7. DESCRIPTION**

State Highway Bridge 393 (Odessa Bridge) is a 97'-1" plate girder swing bridge. This center bearing swing span has a "bob-tail" configuration; i.e, the pier is located off-center, with a 39'-4" span on the shorter, east end and a 57'-9" span on the west end. The short end thus requires a concrete counterweight to balance it. The plate girders are 6'-6" deep, with 5"x3" angles acting as stiffeners. The concrete deck is supported on floor beams and measures 22'-6" wide; it carries two lanes of traffic. When closed the structure is supported on concrete abutments with U-shaped wing walls. The cylindrical center pier is concrete supported on timber piles. The wing walls are toped with concrete parapets, configured with solid end blocks and incised rectangular panels. A plaque indicates the construction date, 1928, and credits Charles E. Grubb, county engineer, the Selbyville Manufacturing Co., contractors, and Harrington, Howard, and Ash, consulting engineers. The members of the Levy Court are also named. The swing mechanism is no longer in use.

**8. HISTORICAL DATA**

Delaware Department of Transportation records state that Bridge 393 was built in 1928. Photo archives at Delaware Department of Transportation indicate that the current Bridge 393 replaced an earlier, cable-stayed metal truss swing bridge. Preliminary drawings for the replacement also illustrate the previous bridge. Original drawings on file at the Department, dated January 1928, show the configuration and construction details of the bridge. According to these drawings the bridge was designed to carry two fifteen ton trucks with 30% impact. New Castle Engineer's Reports detail rural bridge bond funding for the construction of the bridge amounting to $43,236.67 and including the cost of advertising, blueprints, engineering and construction. Bridge 393 was designed by the firm of Harrington, Howard and Ash of Kansas City, Mo., who made movable bridges a specialty; several of the movable bridges surveyed in Delaware were designed by the principals of this firm or its successors. John Lyle Harrington and Ernest E. Howard both began their bridge-building careers in association with J. A. L. Waddell, whose 1892 design for a vertical lift bridge at South Halstead Street in Chicago had established his eminence as a pioneer of the type. Harrington went to work in Waddell's office in Kansas City, Mo, after graduating from the University of Kansas in 1895; he left to pursue further education and worked for a succession of bridge companies until 1907, when he returned to Kansas City to enter a consulting practice in partnership with Waddell. It was there that he met Howard, who had been working with the firm of Waddell and Hedrick since 1901 as draftsman, designer, and resident engineer. Upon the 1907 reorganization of the firm as Waddell and Harrington, Howard assumed the position of associate engineer. In 1914, Harrington, Howard, and Louis R. Ash formed Harrington, Howard & Ash which designed and constructed bridges until 1928. In addition to Bridge 393, their work in Delaware includes Bridge 688, a bascule span built in 1927 to carry South Market Street over the Christina River in Wilmington. They also were consulting engineer for the Rising Sun Bridge (#1), the only through truss bridge identified within the state, constructed in 1928. Howard and Ash became associated with the firm of Ash, Howard, Needles and Tammen, designers of the 1932 bascule bridge carrying Wilmington's North Church Street over the Brandywine (Bridge #577). Harrington and Howard patented numerous improvements to movable bridges and held offices in national professional organizations, and Howard contributed several articles to professional journals.

**9. SIGNIFICANCE**

State Highway Bridge 393 is one of two remaining historic swing bridges on Delaware highways. Designed by Harrington, Howard and Ash, a firm with principals trained by J.A. L. Waddell, the Odessa Bridge is also a bob-tail swing bridge, an unusual type. According to J. A. L. Waddell, imminent nineteenth and early twentieth century bridge engineer and historian, as well as an innovator of the type, swing bridges were the most common movable spans in use prior to 1916. The earliest swing bridges were constructed of wood and were put into motion by the approaching vehicle. As the rotating wooden bridge gave way to the metal swing span, its form varied. The main span could be made of plate girders; open-webbed, riveted girders; riveted trusses; or pin-connected trusses. Plate girders were considered appropriate for spans up to 140 feet, as in the Odessa Bridge. A swing bridge rotates on its central pier and rests in a position perpendicular with the roadway, thus opening two channels for passing marine traffic. Disadvantages of the swing bridge, in general, included the time required for opening and closing the bridge, the obstruction of the waterway created by the pivot pier, and the uselessness of dock-front property adjacent to the opening span. In addition to classifying swing spans by structural type, they can be differentiated by the mode in which they rotate and are attached to the central pier. The span's weight is either supported at the center pivot (center bearing) or on small roller bearings or wheels that run on a steel track (rim bearing) a short distance from the center. Both these types were in common use, each with its own advantages. Since the pivot bearing wears with use and is expensive and difficult to replace, parts which should serve only to steady the span, not to carry loads, were frequently overloaded. Often a bridge designed to be center bearing would function in a rim-bearing capacity. For this reason, it was recommended that center-bearing swing spans be used only for short, lightweight spans. Long, heavy spans were designed as either rim-bearing swing bridges or as combination center bearing and rim bearing. Solely rim-bearing swing spans had strong disadvantages and were not hastily recommended. The rollers and track necessary in rim bearing spans required great care in construction and delicate adjustments in their erection. Repair work was expensive, and unequal settlement of the bridge disrupted the entire turning apparatus. Span length and site conditions thus controlled the choice of swing bridge form and mechanical design. Among the widely varying types of swing-span bridges affected by the site conditions was a curious type, the bobtailed swing span. This was a swing span which was not symmetrical about the centerline, wherein one of the arms was shortened and counterweighted to balance the structure. The Odessa Bridge is a plate girder, bobtailed swing bridge which rotates on a center bearing, appropriate to a relatively short, light span.