

LEHIGH VALLEY RAILROAD, DELAWARE RIVER BRIDGE
(Bridge No. 76)
Pennsylvania Historic Railroad Bridges Recording Project
Spanning Delaware River, south of Lehigh River
Easton
Northampton County
Pennsylvania

HAER No. PA-543

HAER
PA
48-EATO,
14-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
1849 C Street, NW
Washington, DC 20240

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Location: Spanning Delaware River, south of Lehigh River, between Easton, Northampton County, Pennsylvania, and Phillipsburg, Warren County, New Jersey.

USGS Quadrangle: Easton, Pennsylvania-New Jersey (7.5-minute series).

UTM Coordinates: 18/482885/4503840

Dates of Construction: 1866 (substructure), 1901-02 (superstructure).

Basis for Dating: Secondary sources.

Designer: Unknown.

Fabricators: Pencoyd Iron Works (Philadelphia), Central Iron & Steel, Lukens Iron & Steel, and Slatington Rolling Mill Co.

Builder: American Bridge Co. (Edgemoor, Pennsylvania).

Present Owner: Norfolk Southern Railroad.

Present Use: Railroad bridge.

Structure Types: Pin-connected skew fish-belly Pratt deck truss; riveted deck and half-through plate girders.

Significance: This structure occupies the piers of the first railroad bridge to cross the Delaware River at Easton. It is also notable for its fish-belly deck trusses, an unusual variant of the Pratt design.

Historian: Justin M. Spivey, April 2001.

Project Information: The Historic American Engineering Record (HAER) conducted the Pennsylvania Historic Railroad Bridges Recording Project during 1999 and 2000, under the direction of Eric N. DeLony, Chief. The project was supported by the Consolidated Rail Corporation (Conrail) and a grant from the Pennsylvania Historical and

Museum Commission (PHMC). Justin M. Spivey, HAER engineer, researched and wrote the final reports. Preston M. Thayer, historian, Fredericksburg, Virginia, conducted preliminary research under contract. Jet Lowe, HAER photographer, and Joseph E. B. Elliott, contract photographer, Sellersville, Pennsylvania, produced large-format photographs.

Description and History

From the late nineteenth century well into the twentieth, the Central Railroad of New Jersey (CNJ) and Lehigh Valley Railroad (LVRR) were chasing each other down the Lehigh River, usually on opposite banks. One exception to this rule was at Easton, where both ended up on the Lehigh's south bank just before its confluence with the Delaware. A lucrative market for shipping anthracite coal to East Coast port cities had motivated this duplication of railroad routes. LVRR was the first railroad to compete with canals in bringing coal down the Lehigh Valley to Easton, starting in 1855. There it connected with existing rail links to Philadelphia, Trenton, and New York. CNJ, which had reached Phillipsburg, New Jersey (across the Delaware from Easton), in 1852, provided the most direct of several routes to the Hudson River waterfront. According to railroad historian Robert F. Archer, CNJ initially envisioned LVRR as a "western feeder," even purchasing some of its stock. The two railroads also shared a bridge across the Delaware River between Easton and Phillipsburg, New Jersey.¹ This relationship soon soured, however, as LVRR began assembling its own route east to New York. In response, CNJ acquired its own route west into the coal fields in 1871.² It is unclear when CNJ constructed its own bridge upstream of the LVRR structure.

A succession of four structures have stood on the piers supporting the present LVRR bridge. The shared bridge, completed in 1854, was an incredible double-deck structure, with CNJ and LVRR on top and the Belvidere Delaware Railroad (BDRR) below. Stone piers supported arch-reinforced wooden Howe truss spans, evidently with wrought-iron vertical tension rods. The east end of the lower level curved southward, taking BDRR's main line down the river to Trenton, while the upper level continued along a straight alignment to connect with CNJ.³ A parallel wooden truss bridge was added in 1866 on upstream extensions of the existing piers.⁴ Ten years later, Kellogg & Maurice of Athens, Pennsylvania, erected ten wrought-iron truss spans in place of the 1854 structure. Eight spans carried the two-track main line, which curved southward toward the Easton & Amboy Railroad, LVRR's route to New York. All trusses were framed skew to the piers, with spans 5 through 8 accommodating the curve (see Table 1). Two additional trusses north of spans 7 and 8 formed a single-track spur that connected with CNJ and the Morris & Essex Railroad. The deck truss spans had three lines of trusses, and in the original configuration, relatively light floor beams carrying longitudinal timber stringers.⁵ This was clearly not a structure capable of carrying twentieth-century train loads.

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Table 1. Delaware River Bridge span table (1876 configuration), numbered from west to east. All spans are pin-connected.

Span No.	Description	Length
1	Skew double-intersection Pratt deck truss over Delaware Canal	180'-0"
2 to 4	Skew double-intersection Pratt deck trusses over Delaware River (172'-0" each)	516'-0"
5	Skew double-intersection Pratt deck truss over Delaware River	168'-0"
6	Skew double-intersection Pratt deck truss	109'-0"
7	Skew double-intersection Pratt through truss over Morris Canal and BDRR	109'-0"
8	Skew Pratt deck truss	88'-0"
Total		1,170'-0"

Source: Kellogg & Maurice, Builders, "Bridge over Delaware River at Easton" (n.d.), in Large Drawer 2531, Railroad Museum of Pennsylvania, Pennsylvania Historical & Museum Commission, Strasburg, Pa.

The present structure dates to LVRR's system-wide replacement of wrought-iron bridges during 1901 and 1902.⁶ As part of this effort, the railroad contracted with American Bridge Co.'s Edgemoor plant (recently acquired from the Edge Moor Iron Works) to reconstruct the Delaware River bridge. American Bridge installed new two-track spans upstream of the existing bridge on the 1866 pier extensions and reconfigured the 1876 trusses to carry a single track, providing a three-track crossing. LVRR records indicate that American Bridge subcontracted fabrication work to four different firms, Pencoyd Iron Works of Philadelphia, Central Iron & Steel, Lukens Iron & Steel, and Slatington Rolling Mill Co.⁷ Together they produced seven new spans, five pin-connected Pratt deck trusses and two riveted plate girders (see Table 2). Crews replaced span 8 of the existing bridge with an earth embankment, and incorporated the stone pier into a reinforced concrete abutment for both existing span 7 and new span 7. A LVRR drawing from 1901 indicated that the spur track was to be abandoned, but the railroad evidently decided to keep it in service. An Interstate Commerce Commission valuation survey of 1917 noted that American Bridge had installed new riveted deck girders on the spur during the 1902 reconstruction.⁸ The completed bridge, four tracks wide at its east end, with CNJ's two-track bridge close alongside, must have made for an impressive crossing.

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Table 2. Delaware River Bridge span table (1902 configuration), numbered from west to east. All truss spans are pin-connected.

Span No.	Description	Length
1	Skew fish-belly Pratt deck truss over Delaware Canal	174'-0"
2 to 4	Skew fish-belly Pratt deck trusses over Delaware River (174'-0" each)	522'-0"
5	Skew fish-belly Pratt deck truss over Delaware River	167'-0"
6	Skew riveted deck girder	91'-0"
7	Skew riveted half-through girder over Morris Canal and BDRR	112'-0"
Total		1,066'-0"

Source: Interstate Commerce Commission, Bureau of Valuation, Engineering Field Notes, Lehigh Valley Railroad, Notebook No. 10, pp. 1-12 (19 Oct. 1917), in Box 1711, Record Group 134, National Archives, College Park, Md.

A significant feature of the 1902 bridge are the five deck truss spans, which are a variant of the Pratt design called a fish-belly. Its defining characteristic is a lower chord that curves downward from the ends toward the middle, providing additional depth at mid-span. Selection of the fish-belly design was dictated by the limited distance between the pier tops and the existing track elevation. The 1876 trusses, designed for lighter train loads, were only 25'-0" deep. Because a truss's strength is determined by depth and chord area, maintaining the existing depth would have required substantially heavier chord members. The bridge's designers decided instead to increase the new trusses' depth to 32'-2" in the middle four of eight panels, creating a more efficient design.

The 1902 portion of LVRR's Delaware River bridge presently remains intact, but the reconfigured 1876 wrought-iron trusses have since been removed. These may have been considered a temporary expedient to provide a third track, and were taken away either after the railroad's traffic declined or the trusses' condition deteriorated. Following bankruptcy in 1970, former LVRR lines became part of the Conrail system.⁹ LVRR's Lehigh River line and its Delaware River bridge were acquired by Norfolk Southern Railroad in 1999.

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Notes

1. Robert F. Archer, *The History of the Lehigh Volley Railroad: "The Route of the Block Diamond"* (Forest Park, Ill.: Heimburger House Publishing Co., 1977), 31-32.
2. James N. J. Henwood, "Central Railroad of New Jersey," in *Encyclopedia of American Business History and Biography: Railroads in the Age of Regulation, 1900-1980*, edited by Keith L. Bryant, Jr. (New York: Facts on File, 1988), 63.
3. Archer, *History of the Lehigh Volley*, 37-38; Fred J. Moll, "Covered Railroad Bridges of Pennsylvania," 3, typescript in file "Bridges - Misc.," Box 13, Research Files, Railroad Museum of Pennsylvania, Pennsylvania Historical & Museum Commission, Strasburg, Pa.
4. Larry DeYoung, interview by Preston M. Thayer, July 1999.
5. Kellogg & Maurice, "Span No. 1" (n.d.), milepost 76.62, region/division/branch 630501, aperture card files, Consolidated Rail Corp., Philadelphia, Pa. [transferred to Norfolk Southern Railway Co., Atlanta, Ga.; hereinafter cited as Conrail aperture cards].
6. "Bridges and Buildings," *Railway Age* 33, No. 14 (3 Oct. 1902): 352.
7. Milepost 76.62, region/division/branch 630501, correspondence files, Consolidated Rail Corp., Philadelphia, Pa. [transferred to Norfolk Southern Railway Co., Atlanta, Ga.].
8. Lehigh Valley Railroad, "Lehigh Division, Sketch Showing Present and Proposed Crossing over Bel. Del. R. R. (Penna. R. R.) at Phillipsburg, N. J." (31 Jan. 1901), in Conrail aperture cards; cf. Interstate Commerce Commission, Bureau of Valuation, Engineering Field Notes, Lehigh Valley Railroad, Notebook No. 10, pp. 1-12 (19 Oct. 1917), in Box 1711, Record Group 134, National Archives, College Park, Md.
9. Richard Saunders, "Conrail," in *Encyclopedia of American Business History and Biography: Railroads in the Age of Regulation, 1900-1980*, edited by Keith L. Bryant, Jr. (New York: Facts on File, 1988), 93.

Acknowledgment

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