

PHILADELPHIA AND READING RAILROAD:
SCHUYLKILL RIVER VIADUCT
(Reading Railroad: Schuylkill River Viaduct)
(Falls Bridge)
Spanning Schuylkill River,
SE of Roosevelt Boulevard Extension Bridge
Philadelphia
Philadelphia County
Pennsylvania

HAER No. PA-39

HAER
PA,
SI-PHILA,
697-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HAER
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HISTORIC AMERICAN ENGINEERING RECORD

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Photographs by Perry E. Borchers of the Ohio State University, 1971.

- PA-39-1 EAST EMBANKMENT AND FIRST ARCH, FROM SOUTH--LEVEL
Copy photograph of photogrammetric plate
LC-HAER-GS05-B-1971-301L.
- PA-39-2 EAST EMBANKMENT AND FIRST ARCH, FROM SOUTH--CONVERGENT--LEVEL
Copy photograph of photogrammetric plate
LC-HAER-GS05-B-1971-302L.
- PA-39-3 DIAGONAL VIEW FROM SE ALONG LENGTH OF BRIDGE--LEVEL
Copy photograph of photogrammetric plate
LC-HAER-GS05-B-1971-303L.
- PA-39-4 WEST END AS SEEN FROM SOUTH--LEVEL
Copy photograph of photogrammetric plate
LC-HAER-GS05-B-1971-304L.
- PA-39-5 VIEW FROM EAST BANK LOOKING SW, SHOWING PARTIAL UPSTREAM
ELEVATION OF BRIDGE.
Copy photograph of photogrammetric plate
LC-HAER-PS13-2000-701.
- PA-39-6 VIEW FROM WEST BANK LOOKING NORTH, SHOWING RELATIONSHIP BETWEEN
HIGHWAY BRIDGE PIER AND LANDED ARCHES OF RAILROAD BRIDGE.
Copy photograph of photogrammetric plate
LC-HAER-PS13-2000-702.
- PA-39-7 VIEW FROM WEST BANK LOOKING NW, SHOWING PAIRED LANDED ARCHES OF
BRIDGE.
Copy photograph of photogrammetric plate
LC-HAER-PS13-2000-703.

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INVENTORY OF PHOTOGRAMMETRIC IMAGES

The glass photogrammetric plates listed below are not reproducible except with special permission. However, reference prints and film copy negatives have been made from the plates indicated by an asterisk (*) and are included in the Library of Congress collection of formal HABS/HAER photographs.

- 9 5" x 7" glass plate negatives (3 stereopairs and one stereotriplet) produced by Perry E. Borchers of the Ohio State University in 1971.

One survey control contact print from each plate; survey control information for each pair/triplet.

LC-HAER-GS05-B-1971-301L * EAST EMBANKMENT AND FIRST ARCH, FROM SOUTH--LEVEL

LC-HAER-GS05-B-1971-301R EAST EMBANKMENT AND FIRST ARCH, FROM SOUTH--LEVEL

Left and right overlap: 90%

LC-HAER-GS05-B-1971-302L * EAST EMBANKMENT AND FIRST ARCH, FROM SOUTH--CONVERGENT--LEVEL

LC-HAER-GS05-B-1971-302R EAST EMBANKMENT AND FIRST ARCH, FROM SOUTH--CONVERGENT--LEVEL

Left and right overlap: 90%

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LC-HAER-GS05-B-1971-303L * DIAGONAL VIEW FROM SE ALONG LENGTH OF
BRIDGE--LEVEL

LC-HAER-GS05-B-1971-303R DIAGONAL VIEW FROM SE ALONG LENGTH OF
BRIDGE--LEVEL

Left and right overlap: 90%

LC-HAER-GS05-B-1971-304L * WEST END AS SEEN FROM SOUTH--LEVEL

LC-HAER-GS05-B-1971-304LC WEST END AS SEEN FROM SOUTH--LEVEL

LC-HAER-GS05-B-1971-304R WEST END AS SEEN FROM SOUTH--LEVEL

L and LC overlap: 90%

LC and R overlap: 95%

3 Stereopairs of 2.5" x 2.5" master contact prints mounted on
5" x 7" cardstock.

No original negatives; no survey control information. Copy
prints and copy negatives have been made from each image.

LC-HAER-PS13-2000-701 * VIEW FROM EAST BANK LOOKING SW, SHOWING
PARTIAL UPSTREAM ELEVATION OF BRIDGE.

LC-HAER-PS13-2000-702 * VIEW FROM WEST BANK LOOKING NORTH, SHOWING
RELATIONSHIP BETWEEN HIGHWAY BRIDGE PIER AND
LANDED ARCHES OF RAILROAD BRIDGE.

LC-HAER-PS13-2000-703 * VIEW FROM WEST BANK LOOKING NW, SHOWING
PAIRED LANDED ARCHES OF BRIDGE.

PROJECT INFORMATION STATEMENT

Photogrammetric images were incorporated into the HABS/HAER collections in the
summers of 1985 and 1986. Inventories of the images were compiled and filed
as data pages for each structure recorded. Since the glass photogrammetric
plates are not reproducible except with special permission, a reference print
and film copy negative were made from one plate of each stereopair and from
the most informative plates in sequential sets. The reference prints and copy

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negatives were then incorporated into the formal HABS/HAER photograph collections.

The Photogrammetric Images Project was a cooperative endeavor between the HABS/HAER Division of the National Park Service and the Prints and Photographs Division of the Library of Congress. The reference prints and film copy negatives of the original plates were made by the Library of Congress Photoduplication Service with funds provided by the Library of Congress Flat Film Preservation Fund. Additional reproductions were made by HABS/HAER. The project was supervised by HABS/HAER Architect John A. Burns, AIA, and completed by HABS Historians Jeanne C. Lawrence (University of London) in 1985 and Caroline R. Alderson (Columbia University) in 1986.

ADDENDUM TO
PHILADELPHIA & READING RAILROAD, SCHUYLKILL RIVER VIADUCT
(Reading Railroad, Schuylkill River Viaduct)
(Falls Bridge)
Pennsylvania Historic Railroad Bridges Recording Project
Spanning Schuylkill River, southeast of Roosevelt Blvd. Bridge
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Pennsylvania Historic Railroad Bridges Recording Project
Spanning Schuylkill River, southeast of Roosevelt Blvd. Bridge
Philadelphia
Philadelphia County
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Photographs PA-39-1 through PA-39-7 were previously transmitted to the Library of Congress.

Joseph Elliott, photographer, winter 1999.

- PA-39-8 LOOKING NW, BRIDGE AT WEST FALLS (HAER No. PA-553) IN FOREGROUND.
- PA-39-9 LOOKING NW FROM EAST BANK OF SCHUYLKILL RIVER.
- PA-39-10 DETAIL OF ARCHES, LOOKING SE.
- PA-39-11 OVERVIEW FROM WEST BANK OF SCHUYLKILL RIVER, LOOKING EAST.
- PA-39-12 LOOKING NORTH FROM BRIDGE AT WEST FALLS.
- PA-39-13 EAST END OF BRIDGE, LOOKING NE.
- PA-39-14 DETAIL, BASE OF ARCH NEAR KELLY DRIVE, LOOKING WEST.
- PA-39-15 WEST END OF BRIDGE, LOOKING NORTH.
- PA-39-16 DETAIL OF WEST END, LOOKING NORTH.

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All color xerographic copies were made from a duplicate color transparency.

Joseph Elliott, photographer, winter 1999.

PA-39-17 (CT) OVERVIEW FROM WEST BANK OF SCHUYLKILL RIVER,
LOOKING EAST.

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ADDENDUM TO PHILADELPHIA & READING RAILROAD, SCHUYLKILL RIVER VIADUCT (Reading Railroad, Schuylkill River Viaduct) (Falls Bridge)

This report supplements three (3) data pages previously transmitted to the Library of Congress.

Location: Spanning Schuylkill River, southeast of Roosevelt Blvd. Bridge, Philadelphia, Philadelphia County, Pennsylvania.

USGS Quadrangle: Germantown, Pennsylvania (7.5-minute series).

UTM Coordinates: 18/483530/4428260

Dates of Construction: 1853-56.

Basis for Dating: Secondary sources.

Date of Alteration: 1935.

Designer: Gustavus A. Nicolls (General Superintendent, Philadelphia & Reading Railroad).

Builder: Philadelphia & Reading Railroad.

Present Owner: CSX Transportation.

Present Use: Railroad bridge.

Structure Type: Stone arch.

Significance: The Falls Bridge is an early and ambitious implementation of the "false skew" method of stone arch construction, first used on an American railroad by the Philadelphia & Reading Railroad in 1848. The "false" skew is created by offsetting parallel arch ribs, avoiding the formidable geometry of a truly skewed arch barrel. Unable to find a willing contractor, the railroad's own workers

executed the complex construction sequence, using a previous wooden bridge as falsework and maintaining traffic throughout.

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

A true skewed masonry arch, where the barrel runs at an acute angle to the bridge, requires stone work of a substantially more complex geometry than for a "right," or perpendicular, arch. Perhaps motivated by a dearth of skilled masons in the eighteenth-century U.S., Benjamin H. Latrobe devised an easier method of constructing skewed arches, whereby a "false" skew is formed from a series of right arch ribs. Each arch rib, while perpendicular to the bridge, is slightly offset from its neighbor, forming a stepped approximation of the skew angle. Latrobe proposed a bridge of this type to span the Schuylkill River near the falls at Philadelphia in 1802.¹ Although this particular bridge was not built, it does represent the origin of an idea executed many times over in the Philadelphia area.

The Philadelphia & Reading Railroad (P&R) constructed the country's first stone false skew arch in or near Philadelphia in 1848, with three spans each 42'-0" long. This was the work of General Superintendent Gustavus A. Nicolls, who in 1845 began systematically replacing the P&R's many wooden bridges in stone. Sagging spans on the Peacock's Lock Bridge at Reading, and a fire that destroyed the first Falls Bridge after only three years of service, had clearly shown the limitations of wooden construction. According to annual reports, the P&R built at least five small stone arch bridges each year for the remainder of the decade.² Longer spans, however, had to wait. Nicolls initially proposed a stone replacement for the Peacock's Lock and Falls bridges in 1848, but did not gain approval from the railroad's directors until 1853.³

Nicolls' design for the Falls Bridge took the false skew concept to new lengths. In addition to six spans, each 78'-0", over the river and East River Drive, the Falls Bridge also contains five narrower (9'-0") arches for pedestrian traffic, and a 30'-0" arch for West River Drive, all on a straight alignment.⁴ The Syracuse, New York, firm of Denison, Scoville, Candee,

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and Company signed a contract with the P&R for the Peacock's Lock and Falls bridges, but was evidently not qualified for the complex project. The railroad canceled the contract and used its own crews to build the bridges, which were completed in 1856.⁵ On the Falls Bridge, previous wooden spans served as false-work.⁶ Thanks to periodic repairs, such as reinforcement of spandrel walls in 1935, the bridge still carries rail traffic today.

Notes

1. J. Dutton Steele, "On Skew Bridges, and on the Construction of Falls Skew Bridge over the Schuylkill, near Philadelphia," *Transactions of the American Society of Civil Engineers* 1 (1870): 209-13.
2. Philadelphia and Reading Rail Road Company, *Annual Report of the President and Managers of the Philadelphia and Reading Rail Road Company to the Stockholders, January 13, 1845*, Temple Univ. Library, Philadelphia, Pa.; and *ibid.* for succeeding years.
3. Jay V. Hare, *History of the Reading* (Philadelphia: ABC Duplicator Co., 1966), 56.
4. Reading Co., "Reconstruction of Downstream Spandrel Wall, Bridge No. 5/40A over West River Drive, Footwalk, Schuylkill River and East River Drive at West Falls," drawing dated 28 Sep. 1935, milepost 5.40, region/division/branch 100341, aperture card files, Consolidated Rail Corp., Philadelphia, Pa. [transferred to Norfolk Southern Railway Co., Atlanta, Ga.].
5. Hare, *History of the Reading*, 56-57.
6. David Plowden, *Bridges: The Spans of North America* (New York: W. W. Norton & Co., 1974), 30.

Additional Sources

1. Richard Cook, *The Beauty of Railroad Bridges in North America, Then and Now* (San Marino, Calif.: Golden West Books, 1987), 28-29.
2. "Philadelphia and Reading Railroad Bridge," *Gleason's Pictorial Drawing Room Companion* 1, No. 3 (17 May 1851): 48.