

HISTORIC AMERICAN ENGINEERING RECORD

BOSTON & MAINE RAILROAD: PARK STREET BRIDGE (Bridge No. 088/076)

NH State No. 545

Location: Spanning the tracks of the former Boston & Maine Railroad on Park Street, Exeter, Rockingham County, New Hampshire

USGS Exeter, NH Quadrangle
UTM Coordinates: 19.340480.4760720

Date of Construction: 1892

Fabricator/Builder: R.F. Hawkins Iron Works, Springfield, Massachusetts

Present Owner: New Hampshire Department of Transportation
Concord, New Hampshire

Present Use: Vehicular and pedestrian bridge

Significance: The Park Street Bridge is a simple, one span, low Warren truss bridge. It is a somewhat early example of a metal truss bridge type with riveted connections that was later utilized throughout the state.

Project Information: The Park Street Bridge was recorded in May, 2003 by Lisa Mausolf, Preservation Consultant, for the New Hampshire Department of Transportation (NHDOT). Dr. James L. Garvin of the New Hampshire Division of Historical Resources provided the description of the bridge. The NHDOT is currently performing maintenance on the bridge.

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Description

The Park Street Bridge (Bridge No. 088/076) was built in 1892 to carry Park Street over what were then the Boston & Maine Railroad tracks. The bridge is located in a residential neighborhood within the Town of Exeter, in Rockingham County, approximately 0.3 mile north of the Exeter railroad station. A builder's plate stating that the span was built in 1892 by the R.F. Hawkins Iron Works in Springfield, Massachusetts was present when the bridge was inventoried in 1982 but has since been removed.

The Park Street Bridge is a single-span low or "pony" Warren truss bridge with a span of 58'-3" between bearing pins and a height between top and bottom chords of 10'-0". The center-to-center separation of the two trusses is 20'-4", providing a roadway width of 17'-6" between felloe guards. The bridge is aligned in a northeast-southwest direction and has a skew of 40 degrees. The superstructure is supported by wide granite abutments built of large mortared blocks of quarry-faced granite ashlar laid in courses of even height. The bridge bearings rest on modern concrete seats that have been poured on top of the original stone abutments, and the floor stringers and deck are supported by concrete backwalls that are integral with the concrete seats. The bridge was raised ten inches in 1963 by the addition of a steel pedestal at each bridge bearing (see below, "Maintenance"). The eastern bearings of the bridge are the fixed bearings.

The bridge is composed of built-up truss members riveted to gusset plates. Although the metal truss members have not been tested, the bridge is assumed to be fabricated from steel rather than wrought iron. Some channels incorporated in the built-up chords bear the imprint of "Jones & Laughlin," a prolific steel manufacturer in Pittsburgh in the late nineteenth and the twentieth centuries.

The bottom chord of each Warren truss has three panels. Two of the three panels in each truss are 21'-5 1/2" in length. Because the bridge is skewed, the end panels on the eastern end of the northern truss and on the western end of the southern truss are shorter, measuring 15'-5" in length. The trusses have vertical members connecting the three upper panel points to the midpoints of the lower panels and permitting the attachment of an intermediate floor beam between each of the lower panel points.

The top chords and inclined end posts are built-up riveted box sections. The sides of the top chords are composed of two 6" by 4" by 1/2" angles, placed back-to-back and connected by continuous riveted cover plates 18 inches in width. The inclined end posts are of similar construction, but of lighter cross-section, being composed of two 5" by 3" by 1/2" angled placed back-to-back and connected by 16-inch-wide continuous cover plates.

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Description (continued)

The bottom chords are composed of two angles, placed back-to-back and separated by nine inches, the width of the truss diagonals and posts. The bottom chord members at the center panel of each truss are of heavier cross-section than the chord members of the two end panels. The latter are 3 1/2" by 3" by 1/2" angles, while the lower chords of the center panels, enlarged in 1913, are 6" by 3 1/2" by 1/2" angles.

The two inner diagonals and the vertical members in each truss are built-up riveted channels, with flanges composed of angles, turned out, and connected by open webs of riveted lacing. In 1940, the two inner diagonals in each truss were strengthened by welding a 6" by 3/8" plate to the vertical faces of each angle. This was the first recorded use of welding, as distinct from riveting, on the bridge. These added plates have since been removed.

The two outer diagonals in each truss, connecting the truss hips to the bottom chords, are composed of a parallel pair of 4" by 3" angles, turned out and riveted at their ends to the upper and lower gusset plates but not connected along their lengths by lacing or tie plates.

The floor system of the bridge is composed of a series of rolled steel I-beams supported at each lower panel point and at the feet of the intermediate vertical members. The ends of these beams project beyond the southern truss, where they support a cantilevered sidewalk and a water pipe that crosses the bridge below the elevated sidewalk deck. The bridge floor is stiffened by two rows of lower lateral bracing composed of 1" square rods with forge-welded outer end loops and with adjusting turnbuckles connecting upset and threaded inner ends.

At the centerline of the bridge, where the two rows of lateral bracing are attached to the floor beams, a line of longitudinal steel struts or stringers act as spacers between the floor beams. These aligned struts were originally built up of top and bottom angles, each measuring 2 1/2" by 2 1/2" by 3/8", turned out and connected with riveted lattice bars measuring 2 1/4" in width. In 1940, a section of this built-up strut was replaced by a length of 10", 20# channel, oriented vertically. Later, other sections of built-up strut were similarly replaced.

The nail-laminated wooden floor of the bridge is composed of four-inch-thick decking, attached to and supported by ten rows of 6" by 10" wooden stringers placed about 2'-0" on centers. In 1958, the stringers were increased in size from 4" by 10", and the decking

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Description (continued)

was increased in thickness from 3" to 4". Brackets attached to the web of the steel floor beams support the ends of the wooden stringers. Each bracket is a nine-inch-long section of steel angle, measuring 4" by 3" by 3/8".

A cantilevered sidewalk of the bridge originally extended along the southerly side of the structure, outside the south truss. It was removed during the bridge rehabilitation of 2003, but the cantilevered floor beams that supported it were retained to support a large water pipe that runs across the bridge, outside the southern lower chord.

The total width of this sidewalk was 5"-7 1/2", and its clear width is approximately four feet. In its original design, the sidewalk was laid directly over the upper flanges of the cantilevered floor beams, and its elevation therefore approximately matched that of the main floor of the bridge. Following the installation of the water pipe, the deck of the sidewalk was raised well above the elevation of the bridge floor by wooden struts and frames attached to the cantilevered floor beams, allowing the pipe to cross the bridge below the sidewalk. Each end of the raised sidewalk was reached by three risers.

R.F. Hawkins Iron Works

The Park Street Bridge was erected by the R.F. Hawkins Iron Works of Springfield, Massachusetts, a regionally-significant bridge company. In the late 19th century numerous private bridge companies such as the Hawkins Iron Works specialized in particular types of truss designs and fabricated them for use by municipalities and railroad companies. Like many others in the bridge manufacturing business, Richard Fenner Hawkins was without formal engineering training. The corporate history of the R.F. Hawkins Iron Works is long and complicated although its lineage is directly related to William Howe, the inventor of the Howe truss and in fact, Hawkins was married to Howe's niece (Healey 1990).

The successor firm to various construction companies including Stone & Harris, D.L. Harris & Co., Hawkins, Herthal & Burrall and Hawkins & Burrall, the R.F. Hawkins Iron Works was first known under this name in 1877 and was headquartered in Springfield, Massachusetts. Around 1885 a branch known as the Vermont Construction Company opened in St. Albans, Vermont and built a number of notable spans for the Central Vermont Railroad. In addition to bridges, the R.F. Hawkins Iron Works also manufactured structural and decorative architectural ironwork, boilers, and railway

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R.F. Hawkins Iron Works (continued)

turntables. In the 1880s the company produced Howe, lattice and plate girder bridges. In 1890, the shops employed 200 people and supplied twenty-three railroad bridges and thirty highway bridges. The Boston & Albany Railroad was a major source of orders and the Hawkins Iron Works benefited greatly from the railroad's policies concerning the replacement of wooden bridges and the elimination of grade-level crossings. In 1894 alone, Hawkins supplied the railroad with twenty-four bridges (Healey 1990).

The Massachusetts Historical Commission records include twenty-two bridges known to have been erected by the R.F. Hawkins Iron Works in Massachusetts. These bridges include both double and single intersection Warren types, lesser numbers of Pratt, Pennsylvania and Lattice trusses, a girder and a swing bridge. Of the twenty-two bridges which have been inventoried, six are single intersection Warren pony truss bridges. The six bridges were all erected between 1891 and 1894 (Mass. Hist. Comm.).

Boston & Maine Railroad

The Boston & Maine Railroad was chartered by the Massachusetts legislature and incorporated in New Hampshire on June 27, 1835. The portion of the line in New Hampshire dates to 1840-1841. The section of line from Plaistow to East Kingston was completed on January 1, 1840, to Exeter on June 26, to Newmarket on July 28, 1841 and to a temporary station south of Dover on September 24. The line was extended over the Cocheco River into Dover by the end of the same year. As a result of connections with other lines, the through route to Portland, Maine was completed in February 1843.

In 1891 the Boston & Maine straightened, regraded, and double-tracked the main line between Exeter and Newmarket Junction, and between Dover and South Berwick, Maine (RR Commissioners Report, 1892, p. 5). The same year a new stone passenger depot was erected at Exeter, replacing the previous station which had been destroyed by fire. The construction of the Park Street bridge in 1892 was part of the many improvements that this section of the line saw at that time. A mile up the line another bridge was also replaced in 1892, in this case with a deck plate girder (B & M list, 1952).

In later years, much of the line was reduced to a single track. In 1983 the Boston & Maine Railroad became Guilford Transportation Industries' main freight line. The track is also used by Amtrak.

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Park Street Bridge

What is now known as Park Street is one of Exeter's oldest public ways. It is mentioned in town records as early as 1650 and for a hundred and fifty years was one of the main avenues to the water side of town. Over this route, a large proportion of the original growth of the forests was transported. The street appears on the town plan of 1846 as Back Street but had been renamed Park Street by the time of the 1874 map (*Exeter News-Letter*, January 22, 1892).

When the railroad was first constructed, the Park Street crossing was at grade. A few years later, a bridge was built over the track, in part to accommodate school children traveling to the brick schoolhouse nearby (*Exeter News-Letter*, March 9, 1892). The bridge was criticized for its steep approaches at either end (*Exeter News-Letter*, Feb. 26, 1892).

In 1891 the Boston & Maine removed the existing bridge and proposed the installation of a new iron bridge as part of the railroad improvements then being made. In January of 1892 the abutments for the new bridge were constructed (*Exeter News-Letter*, Jan. 8, 1892). However, as proposed, the new bridge would have been built higher than the old one. The Exeter selectmen notified the railroad that they would not permit the bridge to be raised to the height planned and the work was stopped. Subsequently, the railroad expressed the desire to get rid of both the bridge and the crossing. At Town Meeting in 1892, the Boston & Maine Railroad formally asked that Park Street be discontinued (*Exeter News-Letter*, January 22, 1892). At the meeting, local voters directed the selectmen to use all possible effort to secure a grade crossing with gates maintained by the railroad (*Exeter News-Letter*, March 11, 1892). There is no indication of what happened to the negotiations between the town and the railroad but in the end, the B & M succeeded in installing a new bridge rather than the grade crossing desired by local voters. In July a gang of men from the iron works arrived to put the new iron bridge in position (*Exeter News-Letter*, July 15, 1892). On August 12, the local newspaper announced that the bridge had been completed and was now open to travel. The change in the street grade had left one abutter, E.V. Gilman, without means of leaving his premises (*Exeter News-Letter*, August 12, 1892).

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Maintenance

Repairs to the bridge are well documented by drawings housed at the New Hampshire Department of Transportation. The trusses themselves show few major alterations despite more extensive repairs to the floor system. In 1913 two sections of the lower chord on the south truss were replaced as well as two floor beams and a lateral brace. More repairs were carried out to floor beams in 1922-1923 and 1926-1927. In 1940 additional work was done to strengthen the trusses by replacing the two upper chords on the central triangle on each side. In addition, a section of the central strut was replaced. Four floor beams were replaced in 1946. In 1963 the bridge was raised ten inches by the addition of six steel pedestals at the corners of the bridge and at each end of the central strut. In recent years, concrete pads have been added at the ends of the bridge. In 1927 and again in 1958 the timber stringers and planking were replaced. The matched boards on the outsides of the bridge were replaced in 1927.

Existing Low Warren Truss Bridges in New Hampshire

On July 7, 1999 the State historic bridge inventory committee met to review the status of single span low Warren trusses in New Hampshire. As of that date, 27 low Warren trusses had been reviewed by the committee and seven, including the Park Street Bridge in Exeter, were found to be eligible for the National Register of Historic Places. Of the 27, thirteen had been removed since 1987 and two more were slated for removal, making the remaining low Warren trusses increasingly rare examples of a once plentiful, significant bridge type in New Hampshire. The Exeter bridge is noteworthy as the only extant example dating from the 19th century.

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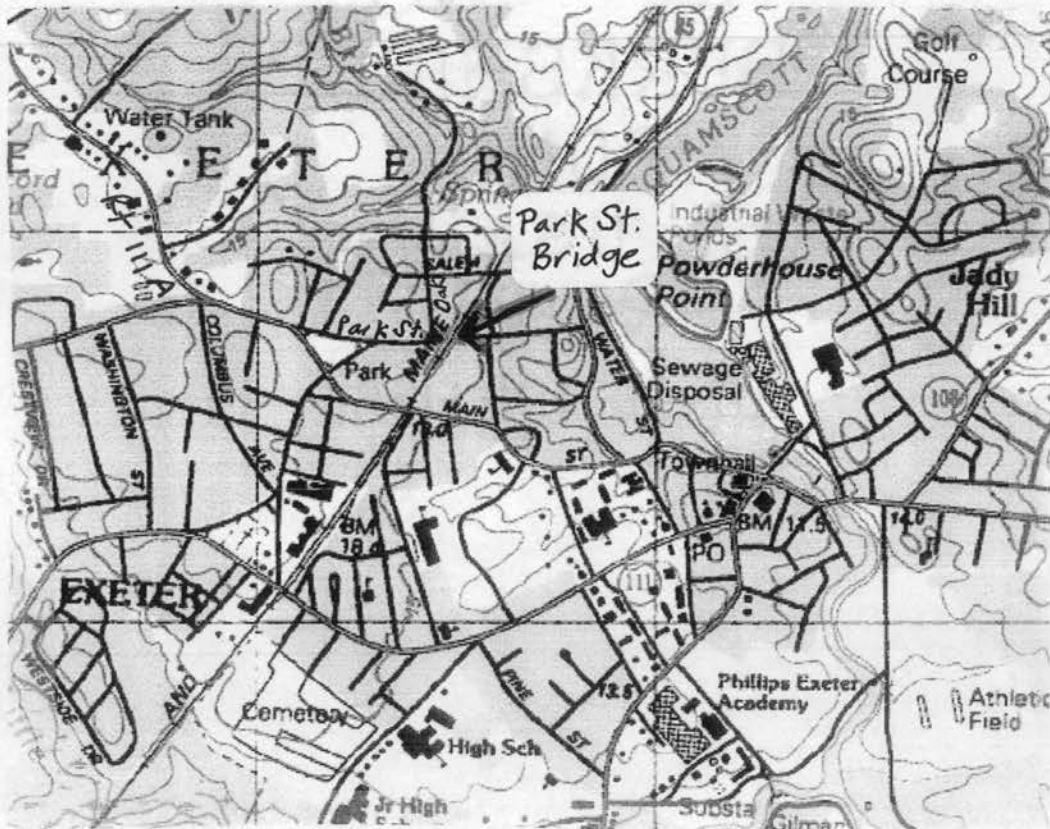
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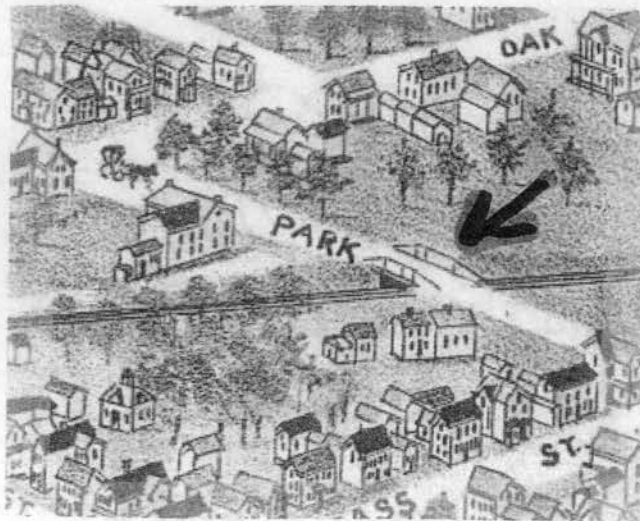
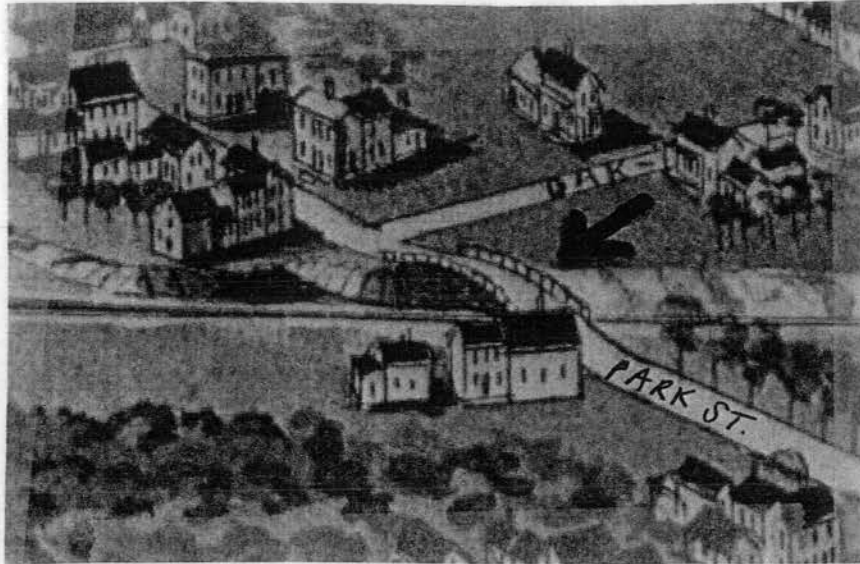
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Location Map
Source: USGS Exeter, NH Quadrangle, Scale = 1:24000

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Views of Park Street Bridge, 1884 and 1896

Sources: H. Wellge, *Exeter, N.H. County Seat of Rockingham County*. Brockton, Massachusetts: Norris & Wellge, 1884.

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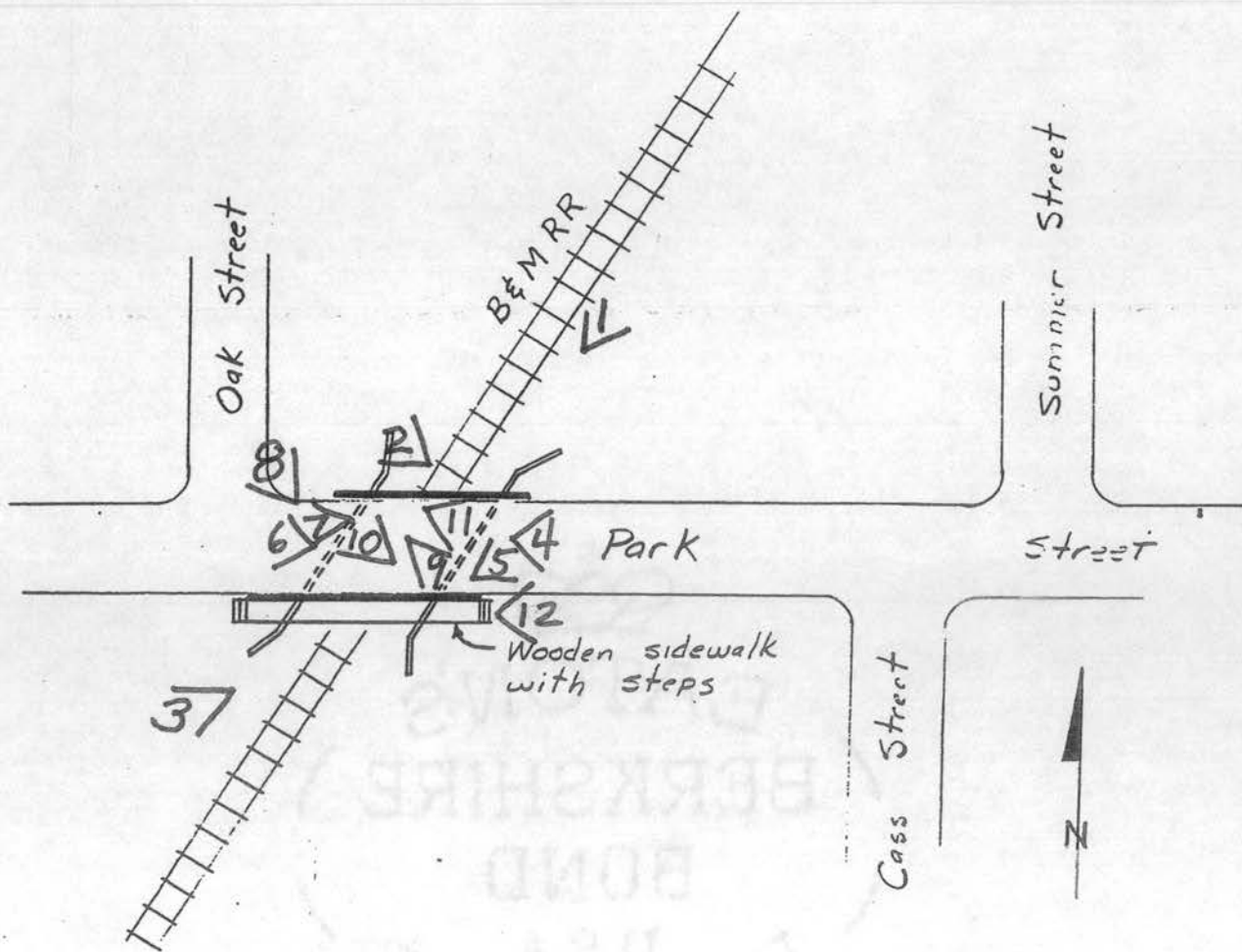
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Photographer: Charley Freiberg, Views 1, 2, 4-6, 8, May 2003
Lisa Mausolf, Views 7, 9-12, May 2003
Paul Spinney, NHDOT, View 3, April 2003

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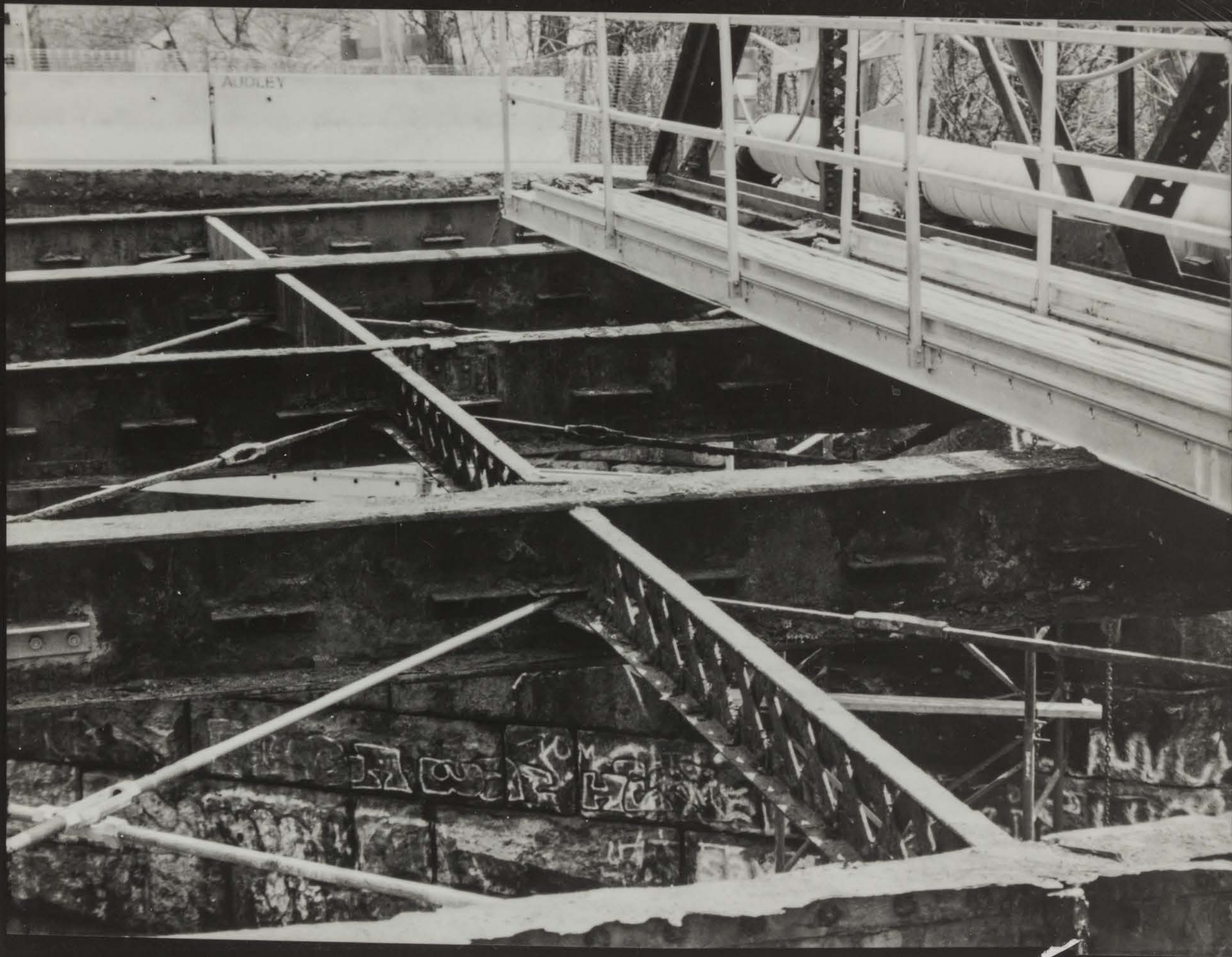
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