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RIVER STREET BRIDGE
(Bridge No. 4403)
River Street, spanning Moosup River
Plainfield
Windham County
Connecticut

HAER No. CT-179

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
Northeast Region
Philadelphia Support Office
U.S. Custom House
200 Chestnut Street
Philadelphia, Pennsylvania 19106

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Location: River Street, spanning the Moosup River
Plainfield
Windham County, Connecticut

USGS Plainfield Quadrangle
UTM Coordinates: 19.260420.4621880

Date of Construction: 1886

Fabricator: Berlin Iron Bridge Company

Present Owner: Town of Plainfield
8 Community Avenue
Plainfield, Connecticut 06374

Present Use: Vehicular bridge

Significance: River Street Bridge is significant as a well-preserved, representative example of 19th-century bridge engineering; its patented lenticular design, pinned connections, and wrought-iron material are typical of the period 1880-1900. It also has significance as one of relatively few bridges remaining in Connecticut that were made by the Berlin Iron Bridge Company, a major regional fabricator and the state's only large bridge-building firm in that period. The bridge was built following a disastrous flood that destroyed many bridges in Plainfield and other eastern Connecticut towns.

Project Information: This documentation was undertaken in 1998 in accordance with a pending Memorandum of Understanding among the Federal Highway Administration, the Connecticut State Historic Preservation Office, the Connecticut Department of Transportation, and the Advisory Council on Historic Preservation. As part of a replacement project, the bridge is to be dismantled and stored for possible re-use.

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Description

The River Street Bridge is a single-span wrought-iron lenticular through truss fabricated in 1886 by the Berlin Iron Bridge Company for the Town of Plainfield, Connecticut. It crosses the Moosup River immediately adjacent to the former Cranska thread mill, a complex of brick industrial buildings now used for the manufacture of rubber products. River Street links Main Street, the major thoroughfare through the village of Moosup, as this part of Plainfield is known, with a residential neighborhood on the east side of the river.

The truss is divided into 7 panels and has an overall length of 105'. It provides a roadway width of 18', with a vertical clearance of 11' 6". The depth of the truss at its greatest point is 16', and typically the bridge crosses at a level about 16' above the surface of the water in the river below. The original abutments of fieldstone rubble remain in place.

The connections between the bridge's components are made with 2" pins threaded at each end and secured by nuts. The upper chord and end posts take the form of a box girder, built up of plates, angles, and lacing bars, that measures 6" by 12" in section. The lower chord is a chain of paired 3" eyebars. Vertical members are all 4" by 7" lattice girders; a similar member is used as a diagonal stiffener running from the bottom of the end post to the first lower joint. Each panel has cross-bracing of 1 1/8" rods tensioned with turnbuckles; in addition, there is a longitudinal 5/8"-rod brace, running at a level midway up the truss and anchored at the second top joints. The two sides of the bridge are connected across the top with lattice-girder struts and tension-rod top cross-bracing, and there are diagonal angle-iron knee braces to provide sway bracing. One strut has been replaced with a rolled channel. There are no struts at the ends of the bridge connecting the portal joints, where they would infringe upon the vertical clearance.

The present corrugated-metal deck, carried on 4 1/2" x 10" I-beam stringers, is a replacement for the original, which was probably a wood-plank deck on timber stringers. The tapered plate-girder floor beams, varying in depth from 12" at the ends to 24" at the center, are original with added reinforcement to the top flange. The beams are hung from the lower joints by U-shaped pins, known as "hairpins," formed from 1" bars; the pins are secured by plates and nuts below the lower flange of the floor beams. Longitudinal tension-rod bracing runs the length of the bridge from the end posts through the ends of all the floor beams, and there is crossbracing between the beams beneath the roadway.

The present guardrail, a simple three-rail wooden bolted to the inside of the trusses, is similar to the railing that appears in early views of the bridge and probably represents a replacement-in-kind of the original.

Technological Significance

The River Street Bridge's lenticular truss was one of a myriad of patented designs that characterized the American bridge industry in its formative stage. In part, such designs were an attempt to improve the technology of bridge building, but they also served to distinguish the products of one fabricator from another. The Berlin Iron Bridge Company's design offered some savings of material over a comparably sized Pratt truss, though the savings were somewhat offset by the greater complexity in fabricating the curved top chord's multiple angles. Nevertheless, the design's unique profile provided something distinctive that Berlin agents could refer to when trying to convince local highway officials of their product's superiority. In an advertizement from 1885, the company prominently trumpeted its distinctive patented design, for which it claimed the highest economy of material; its slogan, "Every part acts to strengthen as well as support," also suggested technological innovation, though the slogan would seem to apply to every competent truss design. (*Proceedings of the Connecticut Association of Civil Engineers and Surveyors*, 1885).

In other respects, the River Street Bridge's truss is similar to the vast majority of its contemporaries. In the 1880s, steel had not yet superseded wrought iron for structural forms, so most bridges of the period were built with wrought-iron members. Similarly, pinned connections were only beginning to give way to riveted joints. Pinned connections were popular because they simplified the erection of the bridge, requiring only large wrenches to join prefabricated members instead of the more demanding technique of field riveting. Many engineers also claimed that pinned joints allowed forces to be transferred less ambiguously, though all agreed that riveted bridges were more rigid. A final characteristic of the period evident in the River Street Bridge is the use of complicated details such as the tapered floor beams, which achieved a minor savings in weight and material but at the cost of more complicated fabrication. Like the lenticular truss itself, such idiosyncratic details soon gave way to simpler, more standard forms.

The Berlin Iron Bridge Company was Connecticut's leading manufacturer of bridges in the 19th century. The business began when Roys and Wilcox, an East Berlin maker of tinner's tools and other metal-forming devices, set up a company in 1868 to market sheet-iron products made with its rolling machines. The Corrugated Metal Company, as it became known, produced roofing material and metal-clad fire doors and shutters; the company became involved in structural iron work when it began to provide trusses for roofs as well as the exterior material. The company was not particularly successful until a new investor in 1877, S. C. Wilcox, realized that the plant had the capacity to manufacture highway bridges. The following year, the Corrugated Metal Company purchased rights to William Douglas's patented "parabolic" truss and produced the first of the lenticular bridges that would soon dot

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the landscape of the Northeast. Douglas, educated as an engineer at West Point, joined the company as treasurer and executive manager and continued to refine his design; he was awarded a second patent in 1885 (for the end-panel struts seen in this bridge), by which time the company had changed its name to the Berlin Iron Bridge Company. Serving as chief engineer in this period was Charles M. Jarvis (1856-1921), who joined the company soon after graduating from Yale's Sheffield Scientific School in 1877. Jarvis became president in 1886 upon the death of S. C. Wilcox. He is credited with the company's design of specific bridges as well as with the business strategy that made the Berlin Iron Bridge Company a success.

The late 19th century was a good time to be in the bridge business. As the industry developed, the price of iron trusses steadily dropped until they were competitive with wooden spans, especially when their superior durability was figured in (wooden bridges had an average lifetime of about 25 years). The only other alternative, for shorter spans only, was building in stone, which remained very expensive. Throughout America, local highway officials opted to replace their wooden bridges with iron, and firms such as the Berlin Iron Bridge Company were happy to oblige.

At its height, the Berlin Iron Bridge Company was probably the largest structural fabricator in New England. Some 500 workers were employed at its East Berlin plant (no longer extant), with many additional workers in the field during the construction season. There is no definitive count of the company's bridges; at least 600 are known to have been completed during its first ten years, and the company calculated their ten-year total at over 1,000. Most were in the Northeast (where the company claimed to have built 90 percent of the region's iron highway bridges), but some were sent as far away as Texas and Hawaii. Many towns brought the company repeated business.

Although the company built multiple-span bridges as long as 1,000 feet, most were more modest, with through-trusses such as the River Street Bridge for lengths over 100 feet and pony trusses for shorter spans. The lenticular design accounted for the bulk of the company's output, though it is known to have produced several other truss types, sometimes to designs furnished by railroad or city engineers, as well as suspension bridges. The company also furnished ironwork for manufacturing buildings and specialized industrial structures such as cargo handlers.

The Berlin Iron Bridge Company was absorbed in 1900 by the American Bridge Company, a largely successful attempt by the J. P. Morgan interests to monopolize the country's structural fabricating industry. The American Bridge Company made only marginal use of its East Berlin plant, preferring to concentrate production at other sites. At the same time, a firm

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started by former Berlin Iron Bridge employees, the Berlin Construction Company, resumed the fabrication of bridges and recaptured much of its predecessor's influence in the Northeast market; the latter remains in business today under the name Berlin Steel.

Of the hundreds of bridges known to have been built in Connecticut by the Berlin Iron Bridge Company, no more than 20 trusses of all types survive, and only four of the large, through-truss lenticular spans. The four bridges differ in details, each preserving a unique set of the characteristic practices of the Berlin Iron Bridge Company. For example, this bridge and a similar span just upstream at Glen Falls are the only ones in Connecticut with the end-panel struts from Douglas's 1885 patent and the only ones with wooden railings (which the company illustrated in its catalog but did not recommend, instead promoting pipe rails as a low-cost alternative to its ornamental lattice railings). The bridge remains one of the larger examples from a dwindling pool of heritage resources that illustrate an important chapter in Connecticut industrial history.

Historical Background

The River Street Bridge was built following the destruction of its wooden predecessor by the disastrous freshet of February 13, 1886. That flood was one of the worst this part of the state had ever seen. Two days of constant rain, totaling some 8", swelled the rivers of eastern Connecticut and western Rhode Island (where the Moosup River has its source) and created a powerful surge of water and ice that broke through mill dams and carried off bridges, including nearly every bridge in Plainfield. According to one eye witness, "Moosup is in bad shape on account of the freshet. The bridges are most all gone, and the roads in that section, many of them, are useless." (Bayles, *History of Windham County*, 1889, p. 465). There were no trains, mails, or telegraph service for several days. Although the Cranska mill dam just above this site appeared to weaken, it remained intact; however, the mill race just below was washed away.

The Town of Plainfield, faced with replacing all of its major bridges at once, voted to raise \$20,000 through the sale of bonds that would mature within five years' time. River Street Bridge was one of three large bridges that were replaced with iron trusses purchased from the Berlin Iron Bridge Company. The Town spent \$1,758.00 on the bridge, which probably did not include the cost of the stone abutments built by local masons. This crossing was important to the town because it was one of only two highway bridges across the river in Moosup, and the only one at the north end of the village. Mill workers on the

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east side of the river, where the Cranska mill had some of its worker tenements, would have had difficulty getting to work, nor could supplies be as easily brought to the mill.

In turning to the Berlin Iron Bridge Company, the selectmen of Plainfield were patronizing a relatively local business that had already established close ties with town highway officials in the region, encouraging them to replace their older wooden bridges with stronger, more durable iron trusses. A bridge the company had erected in Jewett City (just south of Plainfield) was one of the few major spans to survive the flood, and this circumstance undoubtedly encouraged officials in Plainfield to look favorably upon their product. In any case, towns in eastern Connecticut and western Rhode Island bought numerous Berlin Iron Bridge Company bridges, usually several in each town, to replace the old wooden spans that had washed away in the flood.

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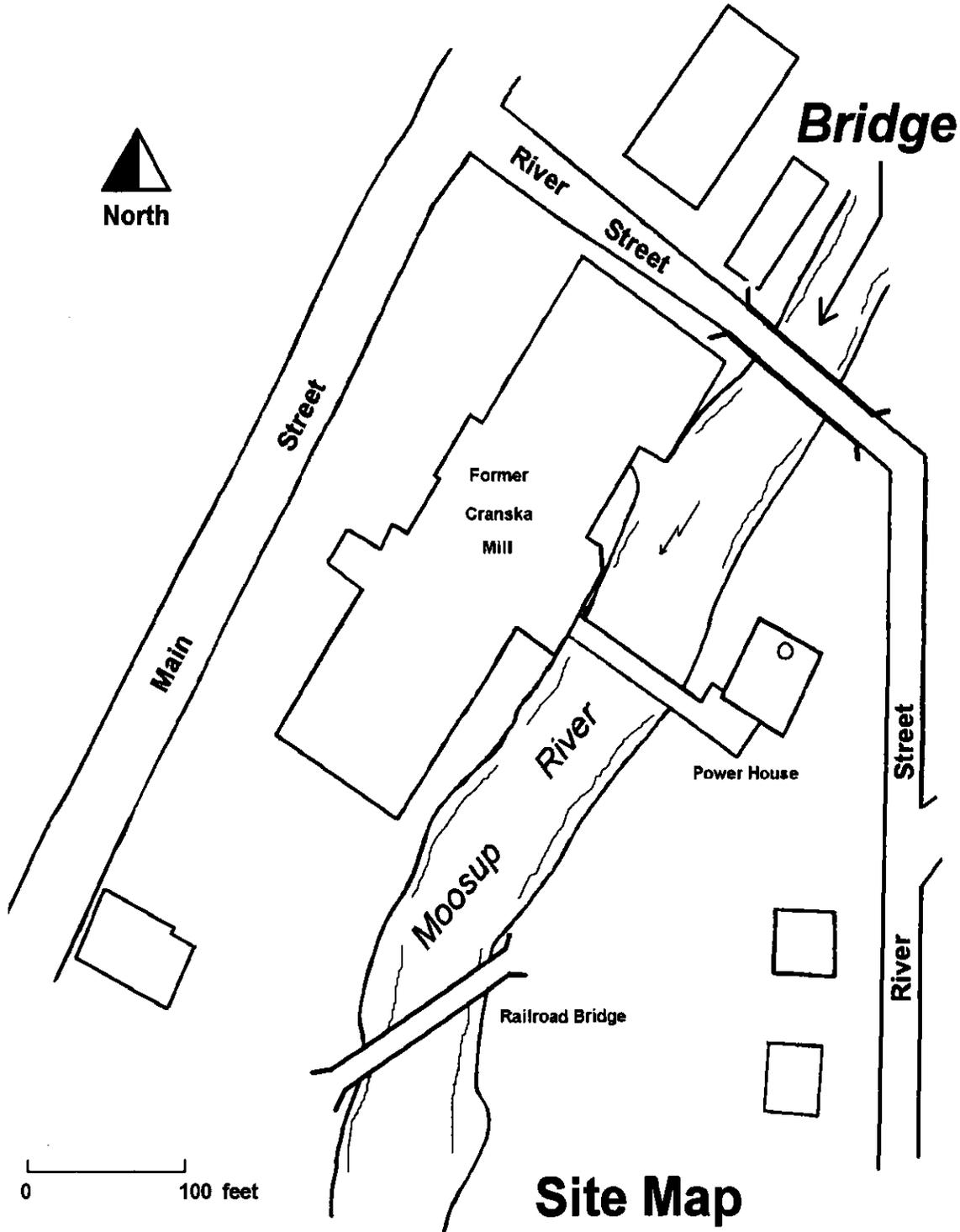
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Engraving of bridge, 1889, from "Moosup, Conn., Uniondale and Almyville" [bird's-eye view]. Downstream is a small bridge from the railroad siding to the mill's powerhouse, and further downstream, a wooden bridge carrying the New York and New England Railroad across the river.