National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations for individual properties and districts. See instructions in National Register Bulletin, *How to Complete the National Register of Historic Places Registration Form.* If any item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, architectural classification, materials, and areas of significance, enter only categories and subcategories from the instructions.

1. Name of Property

Historic name: ____________Milford Suspension Bridge____________
Other names/site number: ___ Milford Swing Bridge________________
Name of related multiple property listing:
N/A____
(Enter "N/A" if property is not part of a multiple property listing

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2. Location

Street & number: _East of the Eastern End of Bridge (formerly Maple) Street________
City or town: _Milford____ State: _____NH_____ County: _Hillsborough___________
Not For Publication: ☐ Vicinity: ☐

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3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act, as amended,

I hereby certify that this ___ nomination ___ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60.

In my opinion, the property ___ meets ___ does not meet the National Register Criteria. I recommend that this property be considered significant at the following
level(s) of significance:

___national ___statewide ___local
Applicable National Register Criteria:

___A ___B ___C ___D

____
Signature of certifying official/Title: Date

____
State or Federal agency/bureau or Tribal Government

In my opinion, the property ___ meets ___ does not meet the National Register criteria.

____
Signature of commenting official: Date

____
Title : State or Federal agency/bureau or Tribal Government

4. National Park Service Certification

I hereby certify that this property is:

___ entered in the National Register

___ determined eligible for the National Register

___ determined not eligible for the National Register

___ removed from the National Register

___ other (explain:) ______________________

Signature of the Keeper Date of Action

5. Classification

Ownership of Property

(Check as many boxes as apply.)

Private: ☐

Public – Local ☐

Public – State ☐

Public – Federal ☐

Category of Property

(Check only **one** box.)

Building(s) ☐

District ☐

Site ☐

Structure ☐

Object ☐

Number of Resources within Property
(Do not include previously listed resources in the count)

Contributing	Noncontributing	
0	0	buildings
0	0	sites
1	0	structures
0	0	objects
1	0	Total

Number of contributing resources previously listed in the National Register ___N/A_____

6. Function or Use

Historic Functions
(Enter categories from instructions.)
_TRANSPORTATION—Pedestrian-related

Current Functions
(Enter categories from instructions.)
_TRANSPORTATION—Pedestrian-related

7. Description

Architectural Classification
(Enter categories from instructions.)
_OTHER—Pedestrian suspension Bridge

Materials: (enter categories from instructions.)
Principal exterior materials of the property: ___METAL—Iron___________________

Narrative Description
(Describe the historic and current physical appearance and condition of the property. Describe contributing and noncontributing resources if applicable. Begin with **a summary paragraph** that briefly describes the general characteristics of the property, such as its location, type, style, method of construction, setting, size, and significant features. Indicate whether the property has historic integrity.)

Summary Paragraph

The Milford Suspension Bridge spans a southward-flowing reach of the channel of the Souhegan River just east of the downtown business district of Milford, New Hampshire. The structure is a pedestrian bridge built by the Berlin Iron Bridge Company of East Berlin, Connecticut, in 1889 to connect the district and its numerous business and manufacturing enterprises with a residential neighborhood that had developed beyond the eastern bank of the river. The bridge is reached from downtown by Bridge (formerly Maple) Street and connects to Souhegan Street on the east by way of a footpath that ascends a steep incline to reach the elevation of the street. Although not apparent to the observer, the eastern seats of the stiffening truss are about 2’-6” higher than the western seats. The bridge has a clear span of 200 feet between towers, and its total length between cable anchorages is about 275 feet. The towers of the bridge are fabricated from riveted angles and bars, and the paired towers at each end are linked at their tops by a riveted lattice girder capped with an ornamental cast iron cresting to form a portal that bears a cast iron builder’s plate. The stiffening trusses are composed of riveted angles with lower lateral bracing rods and the truss has a positive camber of about 2’-6”. Each suspension cable is composed of six plain-laid wire ropes wound around a core rope. The bridge forms a dramatic and unusual feature in the downtown district, and appears to be one of only two surviving pedestrian suspension bridges in the United States that were fabricated by the Berlin Iron Bridge Company.

The Milford suspension bridge retains integrity of location, design, setting, materials, workmanship, feeling and association.

Narrative Description

The Milford Suspension Bridge is supported by a pair of iron lattice towers standing above each of the two bridge abutments. The two abutments, built by local quarryman Newton Perham (1837-1909), are composed of irregular blocks of split granite. The western abutment is mortared or pointed with mortar, while the higher eastern abutment is laid dry. Both abutments are constructed of irregular slabs and blocks of split granite of varying dimensions.

The four towers that support the cables of the bridge are built of rolled wrought iron components, fabricated with riveted connections.[1] The towers take the form of truncated obelisks approximately 20 feet in height from the base plates to the bearings near their tops. The towers are about 3'-11" square at their bases, and each tower base is anchored to the granite abutments by four 1" diameter anchor bolts, one bolt at each corner of each tower. The tops of the towers are capped by 14" x 15" x ½" plates that support a bearing over which the bridge support cables pass. The bearing is covered and protected by a cast iron cap and finial.

Each tower is composed of four 3" x 3" x ⅜" iron angles that form the corners of the structure. These angles are connected by 2½" x ⅜" iron lacing bars that are riveted to the legs of the angles, creating an open latticed structure. As the outside dimensions of each tower diminish from bottom to top, the vertical spacing of the lacing bars diminishes proportionately.

The bearings at the tops of the towers are composed of single bridge pins over which the bridge cables pass. The ends of each pin pass through holes at the center of the web of a rolled 9-inch-deep iron channel, cut to a length of 12 inches. The pins are secured by 4" hexagonal nuts. Top and bottom iron plates are riveted to the upper and lower flanges of the channels, creating an open-ended box through which the cables pass.

Resting on the top plate of each cable box is a cast iron finial. The square base or plinth of the finial is composed of two sections: a battered bottom portion 5½ inches high, tapering from a base width of 9 inches to a top width of 8 inches; and a vertical-sided portion measuring 7½ inches square. Mounted atop the plinth is a globe finial composed of a round hemispherical base, a spool turning, a globe, and a wineglass terminal topped by a short spire.

[1]Details of the description are based on Hoyle, Tanner Associates, Inc., *In-Depth Inspection & Condition Report, Swing Bridge Over the Souhegan River, Milford, N. H.*, prepared for the Town of Milford, August 2015, and a supplemental record of tower dimensions compiled by David Palance of the Milford Historical Society and dated March 30, 2016. The inspection report does not differentiate between wrought iron and steel components in the bridge, but steel was not generally used for bridge construction until c. 1895. It is therefore assumed that all original components of the bridge are fabricated from wrought iron, and all later components or repairs are steel.

Spanning the interval between the tops of each pair of towers and creating a rigid portal is a riveted lattice girder about two feet in height and 13'-4½" long from tower to tower at the top chord of the girder. The top and bottom chords of the girder are composed of 3" x 2" x ¼" iron angles placed back-to-back. The web of the girder is composed of intersecting $2^{1}/_{16}$" iron bars applied at a 45° angle, spaced 12 inches apart horizontally and riveted at each intersection. The ends of the girders are firmly attached to the tops of the towers at the bottom flanges, which project through the towers and rest on horizontal plates to which they are riveted.

Mounted atop the top flange of each lattice girder is a cast iron cresting composed of linked open circles enclosed within a square grid. The vertical members of the grid project above the top of the cresting and terminate in fleur-de-lis finials.

At the center of the cresting at each portal is a cast iron builder's tablet bearing the words:

1889
BUILT BY
THE
BERLIN IRON BRIDGE CO.
EAST BERLIN CONN.
NELSON H. BROWN,
M. F. FOSTER, } SELECTMEN.
ARTHUR W. HOWISON,

The tablet has an arched top decorated as a molded cornice.

The two western towers are tied to the western backstay anchors (described below) by supplemental iron or steel rods that are attached to the bearing boxes at the tops of the two towers and follow the bridge cables downward to the anchors. These rods may have been provided because the bridge anchors on the western end of the bridge are so close to the towers that the backstay cables do not offer a horizontal stress component equal to that of the backstay cables on the eastern end of the bridge. Possibly the rods were added in response to some movement of the towers. There are no comparable ties on the eastern portal of the bridge.

Each suspension cable is composed of six plain-laid wire ropes wound around a core rope. The wires are presumed to be iron, not steel. The backstay portions of the cables pass from anchors beyond the two towers up thorough the bearings at the tops of the towers (described above). The cables then curve downward to the center of the span and ascend to the tops of the towers on the opposite shore. The cable anchors on the western end of the bridge lie about thirty feet to the west of the centerlines of the towers. The cable anchors on the eastern end of the bridge lie about forty-five feet to the east of the centerlines of the towers.

Where visible aboveground, the anchors at each backstay cable are composed of two forge-welded loops of heavy iron rods that rise from deadmen in the earth. These are connected to 2½" diameter eyebars composed of similar forge-welded loops of iron rod by a large bridge pin that passes through the eyes of the loops. The upper ends of the eyebars are threaded, and over the threaded ends of each pair of eyebars passes a short two-hole anchor girder, secured and tensioned by hexagonal nuts, with a central hole for the socket that holds the ends of the backstay cables.

The bridge has 39 iron ⅝" diameter hanger rods on each cable. The bridge inspection report identifies these hanger rods and their corresponding floor beams with numbers 0 through 40, starting at the western edge of the bridge. Each hanger rod has a forge-welded eye at its top and is bolted through this eye to a clevis or clamp that wraps around the suspension cable and secures each hanger rod in a fixed position on the cable. In this bridge, the hanger rods descend vertically from the suspension cables to the floor beams at their base when viewed transversely to the longitudinal axis of the bridge. When viewed along the longitudinal axis of the bridge, each hanger rod descends at an inward angle to connect to the ends of the floor beams, which are shorter than the cable-to-cable dimension above.

The existing floor beams are rolled steel wide-flange sections measuring 6" x 4", placed 5'-0" center-to-center. Each hanger rod has a forge-welded fork near its lower end, dividing the rod into two rods ⅝"in diameter; these paired rods pass through 1" holes in the upper and lower flanges of the floor beams. Originally, the bridge would probably have had built-up wrought iron floor beams with narrower flanges formed from iron angles, or rolled I-beams with narrow flanges, and the forked feet of the hanger rods would have bypassed the flanges rather than passing through them.

The two lower ends of each hanger rod are threaded and pass through holes in cast or forged iron fittings that lie under the lower flanges of the floor beams, where the hanger rods are secured against the lower flanges by threaded nuts. The iron fittings are formed with an angular bearing surface to compensate for the non-vertical inward slant of the hanger rods.

Extending between each adjacent pair of floor beams is a system of lower lateral bracing formed of two ¾" diameter rods arranged in a diagonal pattern in each panel. The ends of the rods pass through holes in angled fittings that are attached to the webs of the floor beams. These fittings were riveted to the webs of the original floor beams but are welded to the webs of the existing wide-flange floor beams. Rivets remain visible in the western sides of the angled fittings from floor beams 1 to 32; however, these are rivet stubs that do not pass through or connect to the floor beam webs. The two rods in each panel cross one another in the middle of the panel but are not connected at the intersection.

Resting atop the 39 floor beams of the bridge are two stiffening trusses that extend the full 200-foot length of the clear span. The center-to-center spacing of the two trusses is 8'-0". Each of the forty truss panels corresponds to the five-foot center-to-center spacing of the floor beams below. The trusses are 5'-0" high. There is a structural break at the center of each of the two trusses, composed of a small gap in the chords between the two middle truss panels. These gaps have been bridges by bolted steel plates, presumed to be modern (see *Changes to the Bridge*, below).

Top and bottom truss chord members are fabricated from 3” x 2” x ¼” angles placed back-to-back. Chord members are 20’-0” long, and extend through four truss panels. Adjacent chord members are linked by riveted splice plates (some now bolted were repairs have been made). Vertical and diagonal truss members are single or double 1¾” x 1¾” x ¼” angles. Gusset and splice plates are ¼” thick.

The lower chords of the trusses rest on the upper flanges of the wide-flange floor beams and are fastened to the floor beams by modern fillet welds; the original method of attaching chord lower trusses and floor beams, if any, is unknown. Each truss panel is bordered by two vertical members or posts that rise above the floor beams beneath them. Extending diagonally across each truss panel are two angles that are riveted to a gusset plate at the center of each panel. A horizontal angle runs through the center of each panel and is riveted to the central gusset plate and to the posts at each side of each panel. A vertical member connects the gusset plate to the bottom chord at the center of each panel, but has no floor beam below it.

The floor beams are longer than the 8’-0” center-to-center spacing of the stiffening trusses, and the ends of the floor beams form outriggers beyond the planes of the trusses. Diagonal braces extend from the projecting ends of each floor beam to the upper chord of the stiffening trusses, thus maintaining the verticality of the trusses.

The floor of the bridge is of wooden construction and is only lightly attached to the metallic members of the bridge. It is composed of four lines of pressure-treated 4” x 4” stringers that rest on the top flanges of the steel floor beams, and in some cases are slightly notched where they pass over the beams below them. Nailed to these stringers is a floor of 2” x 10” pressure treated planks, extending laterally across the bridge.

Changes to the Bridge:

The Milford Suspension Bridge was repaired at a cost of $11,904.21 in 1975 as a component of Milford’s celebration of the United States Bicentennial. Repairs were mostly carried out by the Milford Public Works Department, with materials purchased with federal revenue sharing funds. Repairs included replacement of the 39 floor beams with the existing wide-flange sections, and the installation of a preservative-treated wooden floor system, as described above. Russell Riddle, a local welder who was hired with his equipment on an hourly basis, performed the welding. The Structural Painting Corporation of Latham, New York, sandblasted the bridge and brush-painted the structure with three coats of paint. The Public Works Department installed the existing chain-link fencing inside the stiffening trusses for improved safety.[2] As noted above, the structural breaks at the centers of both the north and south stiffening trusses have been bridged by bolted steel plates. This is presumed to be a modern alteration not in keeping with the original design intent.

[2] *Thirtieth Annual Report of Milford Public Works Department for the Year Ending December 31, 1975*, in *Milford, New Hampshire, Annual Reports, 1975*, pp. 47-8.

8. Statement of Significance

Applicable National Register Criteria
(Mark "x" in one or more boxes for the criteria qualifying the property for National Register listing.)

- [X] A. Property is associated with events that have made a significant contribution to the broad patterns of our history.
- [ ] B. Property is associated with the lives of persons significant in our past.
- [X] C. Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.
- [ ] D. Property has yielded, or is likely to yield, information important in prehistory or history.

Criteria Considerations
(Mark "x" in all the boxes that apply.)

- [ ] A. Owned by a religious institution or used for religious purposes
- [ ] B. Removed from its original location
- [ ] C. A birthplace or grave
- [ ] D. A cemetery
- [ ] E. A reconstructed building, object, or structure
- [ ] F. A commemorative property
- [ ] G. Less than 50 years old or achieving significance within the past 50 years

Areas of Significance
(Enter categories from instructions.)
_TRANSPORTATION
_ENGINEERING____
____

Period of Significance
Criterion A: 1889-1967
Criterion C: 1889____

Significant Dates
1889

Significant Person
(Complete only if Criterion B is marked above.)
N/A

Cultural Affiliation
N/A

Architect/Builder
Berlin Iron Bridge Company

Statement of Significance Summary Paragraph (Provide a summary paragraph that includes level of significance, applicable criteria, justification for the period of significance, and any applicable criteria considerations.)

The Milford pedestrian suspension bridge possesses statewide significance as the only surviving suspension bridge in New England built by the Berlin Iron Bridge Company of East Berlin, Connecticut, one of the region's most prolific bridge-building companies in the late 1800s.[3] The structure was built in 1889, at the same time that the Berlin Iron Bridge Company constructed longer vehicular suspension bridges (now destroyed) over the Connecticut River between New Hampshire and Vermont, and over the Missisquoi River in Sheldon Springs, Vermont.[4] The

[3] A comparable pedestrian suspension bridge, approached by a Warren pony truss on one end and a stringer span on the other, was built across the Kennebec River between Waterville and Winslow, Maine, in 1903 as a private toll bridge. This bridge was designed by Edwin Dwight Graves, a former employee of the Berlin Iron Bridge Company, and built by the Berlin Construction Company, a firm founded by former officers of the Berlin Iron Bridge Company after the latter was purchased by the American Bridge Company in 1900. See National Register Information System ID: 73000132 (1973).
[4] A similar Berlin Iron Bridge Company pedestrian bridge of 1888 survives over the Ausable River in Keeseville, New York. See Swing Bridge [Ausable River Bridge] National Register nomination; National Register Information System ID: 99001322 (1999).

Milford bridge replaced two earlier and less sophisticated suspension bridges, one of them at the same crossing and another downstream near a textile mill that burned in 1872. All three spans were constructed to convey foot traffic across the Souhegan River from residential neighborhoods to manufacturing complexes on the opposite bank of the river, and to and from Milford's central business district.

The Milford Suspension Bridge is significant under National Register Criterion A for transportation and under National Register Criterion C for engineering.

Narrative Statement of Significance (Provide at least **one** paragraph for each area of significance.)

Criterion A (Transportation)

The central village of Milford, New Hampshire, lies at a bend in the Souhegan River, and the course of the stream borders the northern and eastern edges of the compact part of the village. Access between the central village and outlying residential districts to the north and east has always been constrained by the river. The town's name derives from its location, in an era before the construction of permanent bridges, near a shallow-water crossing, or ford, of the river. This crossing was below an early mill site and was long known as the "Mill Ford." Although the district had also been referred to as "The Falls" and "Mile Slip," the town took the name of "Milford" when it was incorporated in 1794.[5]

Although the principal vehicular river crossing lies north of the central village, and is today a double-arched granite bridge built in 1846 and widened in 1931, the simultaneous growth of industry in the village and of residential areas across the river to the east, and the consequent deepening and widening of the river by construction of an industrial dam east of the village, created a need for pedestrian access across the river at two points.
This need was met by two early suspension bridges. The simpler crossing was built c. 1850 and was known as the Lower Suspension Bridge. This insubstantial structure stood downstream of the stone dam and provided pedestrian access from Nashua Street across the Souhegan River to the large brick factory of the Souhegan Cotton Mill, built in 1848 on the opposite (north or east) side of the river; this mill burned in 1872. As seen in the photograph below, the bridge was a simple structure in which the wooden deck of the bridge was suspended atop the cables, which, in turn, were supported by wooden towers at each end of the span. Access to the tops of the towers was provided by staircases at each tower.[6]

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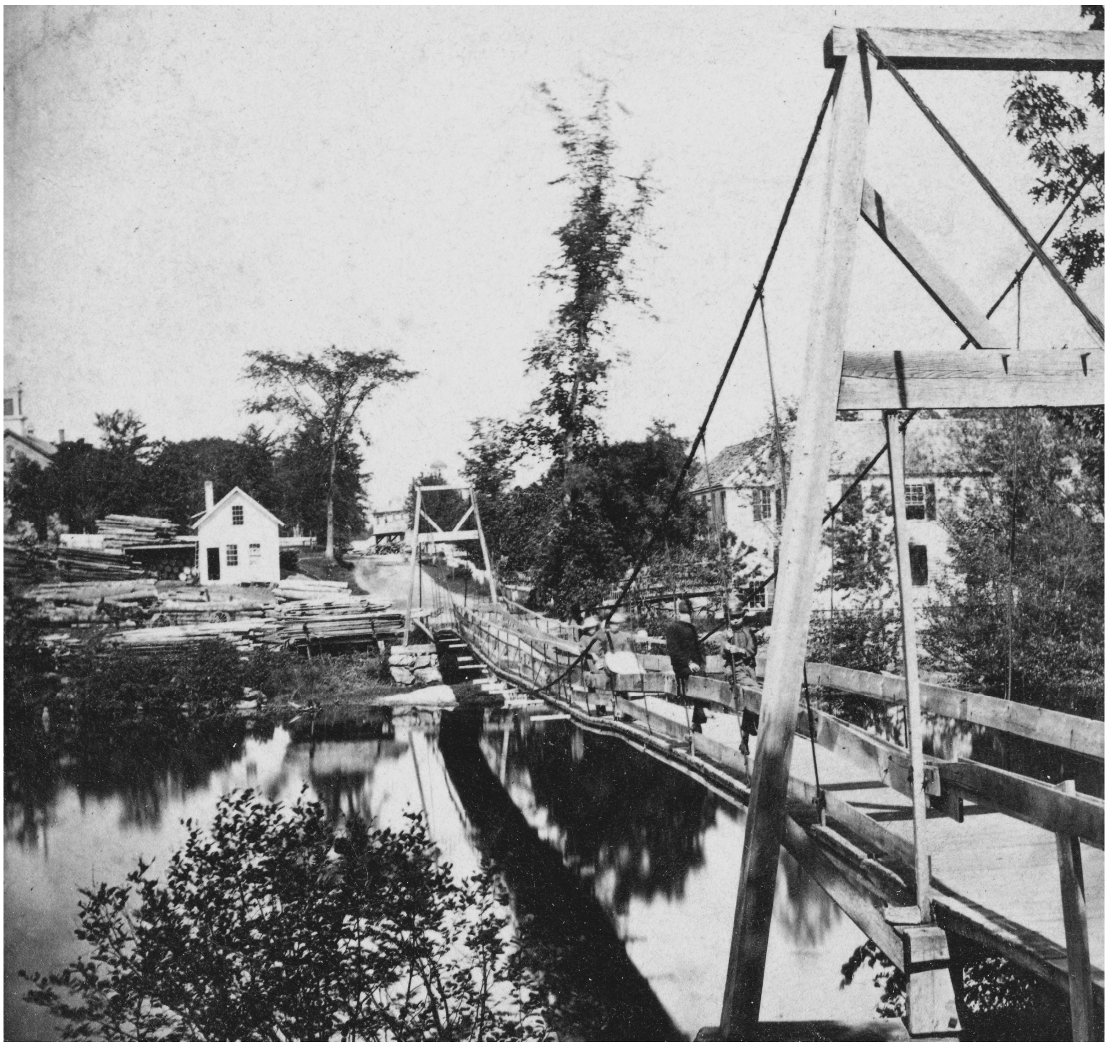
[5] Elmer Munson Hunt, *New Hampshire Town Names and Whence They Came* (Peterborough, N. H.: William L, Bauhan, 1970), pp. 142-3; *Laws of New Hampshire*, Volume 6, Second Constitutional Period, 1792-1801 (Concord, N. H.: Evans Printing Co., 1917), pp. 126-8.
[6]For a brief history of the Lower Suspension Bridge in Milford, see a post card with text and a photograph of this bridge in the collections of the New Hampshire Historical Society, published by Milford printer J. P. Melzer for the Milford Industrial Carnival in October 1911.

The Lower Suspension Bridge (1850). Photograph circa 1865, courtesy Milford, N. H. Historical Society.

The second pedestrian suspension was likewise built in 1850 at the site of the present iron suspension bridge.[7] Article 14 of the warrant for the town meeting of March 12, 1850, asked "if the town will appropriate one hundred dollars for aiding in the construction of a safe and suitable Foot bridge across the Souhegan River at or near the new Stone dam in said town, provided individuals shall subscribe sufficient [funds] to complete said Bridge."

[7] For details of Milford's central village in the mid-nineteenth century, see J. Chace, Jr., *Map of Hillsborough County, New Hampshire*. Boston, 1858. See also, "Downtown Milford Commercial, Civic, and Residential Historic District" (2010), New Hampshire Division of Historical Resources.

A heavy flood in early October 1869 damaged this upper bridge, but it was rebuilt quickly.[8] As seen in the photograph below, the upper bridge had wooden towers and a level floor that was suspended from the cables.



The Second Upper Suspension Bridge (1869). Photograph circa 1870, courtesy Milford, N. H. Historical Society.

The second upper suspension bridge served for about twenty years.

The warrant for the annual town meeting of March 1889, asked "if the Town will vote to build a carriage bridge across the Souhegan River where the foot bridge now is, and raise and appropriate money for the same."[9] Instead, the voters approved the replacement of the wooden

[8] George Allen Ramsdell, *The History of Milford* (Milford, N. H.: by the town, 1901), p. 235.
[9] *Annual Report of the Town of Milford, N. H. for the Year Ending February 28, 1889*, p. 27.

suspension bridge at an expense not to exceed $3,500, a financial limit that mandated another footbridge rather than a vehicular bridge.[10]

The town employed local quarryman Newton Perham (1837-1909) to build new granite abutments at a cost of $419.92. The superstructure was supplied by the Berlin Iron Bridge Company at a cost of $3,050.00. With incidental additional expenditures, the bridge was finished at a total cost of $3,492.72.[11]

At the opening of the iron suspension bridge in 1890, several substantial manufacturing facilities stood at its western end, made safely accessible by the new structure. The bridge also connected the residential neighborhood east of the Souhegan River to the Milford town hall, high school, and many business buildings and blocks near the town's central square on the western side of the river. Close to the western end of the bridge stood the furniture factory of Howard, French and Heald, soon to be renamed the French and Heald Company. Employing about one hundred workers and using mostly native hardwoods, this company became one of the largest manufacturers of bedroom furniture in New England. Just downstream from the French and Heald factory stood the manufacturing plant of John McLane, enlarged at about the time that the new suspension bridge was opened. Employing about forty workers, the McLane factory produced patented post office boxes that dominated the American market. The firm also employed another fifteen to twenty people to manufacture baskets of many varieties. West of the western end of the suspension bridge on Maple (now Bridge) Street stood the brick textile complex of the Morse and Kaley Manufacturing Company, founded in 1810 as the Milford Cotton and Woolen Manufacturing Company. By 1890, the firm employed about seventy-five workers and manufactured knitting and crocheting cotton yarns.[12] Access to these and other downtown businesses was largely provided by the suspension bridge in an age when foot travel was the norm within small villages.

The present iron suspension bridge has continued in nearly continuous use as a pedestrian crossing to and from the downtown district of Milford since 1889. Its significance both as a transportation facility and a historical landmark in Milford was affirmed in 1975 when the bridge was rehabilitated as one of Milford's principal efforts in celebration of the United States Bicentennial.[13]

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[10] Ramsdell, *The History of Milford,* pp. 252-3.
[11] *Annual Report of the Town of Milford, N. H. for the Year Ending February 28, 1890*, p. 7.
[12] Ramsdell, *The History of Milford,* pp. 286-7, 292-4.
[13] *Thirtieth Annual Report of Milford Public Works Department for the Year Ending December 31, 1975*, in *Milford, New Hampshire, Annual Reports, 1975*, pp. 47-8.

The Milford Suspension Bridge, showing the French and Heald Furniture Factory (right and center) and the McLane Company Post Office Box Factory (left) in the background. Photograph circa 1900, courtesy of the Milford, N. H. Historical Society.

Criterion C (Engineering)

The Milford pedestrian suspension bridge is the only surviving suspension bridge in New England built by the Berlin Iron Bridge Company of East Berlin, Connecticut, one of the region's most prolific bridge-building companies in the late 1800s. At about the same time that the Berlin Iron Bridge Company provided the Milford superstructure, the company constructed longer vehicular suspension bridges (now destroyed) over the Connecticut River between New Hampshire and Vermont (1889), and over the Missisquoi River in Sheldon Springs, Vermont (1888). A similar Berlin Iron Bridge Company pedestrian bridge of 1888 survives over the Ausable River between Keeseville and Chesterfield, New York.[14]

The Berlin Iron Bridge Company of East Berlin, Connecticut, was one of the first companies in the Northeast to provide economical highway bridges by combining mastery of structural analysis with the increasing availability and uniformity of wrought iron. Beginning in the 1880s, Berlin bridges, mostly pin-connected truss spans, began to appear in increasing numbers in New Hampshire, as elsewhere throughout the eastern United States.

[14] Swing Bridge [Ausable River Bridge] National Register nomination; National Register Information System ID: 99001322 (1999).

The Berlin Iron Bridge Company began as the Metallic Corrugated Shingle Company in 1870. It was reincorporated as the Corrugated Metal Company in 1873. Five years later, the company acquired an 1878 patent of Captain William Oscar Douglas (1841-1901), who joined the company as executive manager and treasurer. The Douglas patent described a distinctive parabolic bridge truss with curved upper and lower chords. The parabolic truss has an unusual appearance and required sophisticated structural analysis in its design, yet it became highly popular among municipal bridge purchasers during the 1880s and 1890s.[15]

Using its metal fabricating equipment, the company began to manufacture pin-connected bridge trusses of wrought iron, forging its own wrought iron eyebars for the bottom chords. In 1883, the company acknowledged its increasing success in the bridge business by renaming itself the Berlin Iron Bridge Company, and began to fabricate parabolic truss bridges in which the curved members followed the lines of true parabolas.

Despite its specialty of parabolic bridges, the Berlin Iron Bridge Company was versatile. The company fabricated many ordinary pin-connected iron Pratt trusses in New Hampshire, built a number of riveted bridges, and in 1889 constructed a suspension bridge between West Chesterfield, New Hampshire, and Brattleboro, Vermont. Many New Hampshire jails were equipped with prefabricated cells of riveted iron, made by the Berlin firm. The company never relinquished its early specialization in fabricating sheet iron components, offering a variety of fire resistant window shutters for commercial buildings and warehouses. Nor did it diminish its emphasis on fabricating complex and expansive fireproof iron roof systems, often covered with corrugated iron sheets. Its illustrated catalogues from the late 1800s describe and picture roof structures for large factories and shops of such companies as the Amoskeag Manufacturing Company and the Manchester Print Works in Manchester, New Hampshire; the Stanley Rule and Level Company, New Britain, Connecticut; the Winchester Repeating Arms Company, New Haven, Connecticut; the Ansonia Brass and Copper Company, Ansonia, Connecticut; and the Link Belt Machinery Company, Chicago, Illinois.

This versatility, undoubtedly aided by the distinctive appearance of the parabolic truss, allowed the Berlin Iron Bridge Company to dominate the metal bridge business in New England during the last two decades of the nineteenth century. In a catalogue of 1889, one of several that the firm issued in the 1880s and 1890s, the company claimed to have built over ninety percent of the iron highway bridges erected in New England and New York during the preceding decade.[16]

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[15] Victor C. Darnell, "Lenticular Bridges from East Berlin, Connecticut," *IA: The Journal of the Society for Industrial Archeology* 5 (1979): 19-32; Thomas Boothby, "Designing American Lenticular Truss Bridges, 1878-1900, *IA: The Journal of the Society for Industrial Archeology* 30 (2004): 5-17; Darnell, *Directory of American Bridge-Building Companies*, Society for Industrial Archeology Occasional Publication No. 4 (Washington, D.C.: by the Society, 1984); David Guise, *Abstracts & Chronology of American Truss Bridge Patents, 1817-1900*, Society for Industrial Archeology Occasional Electronic Publication No. 1 (2009).
[16] Darnell, "Lenticular Bridges from East Berlin, Connecticut," p. 24. Most or all of the available Berlin Iron Bridge Company catalogues bear no date of publication.

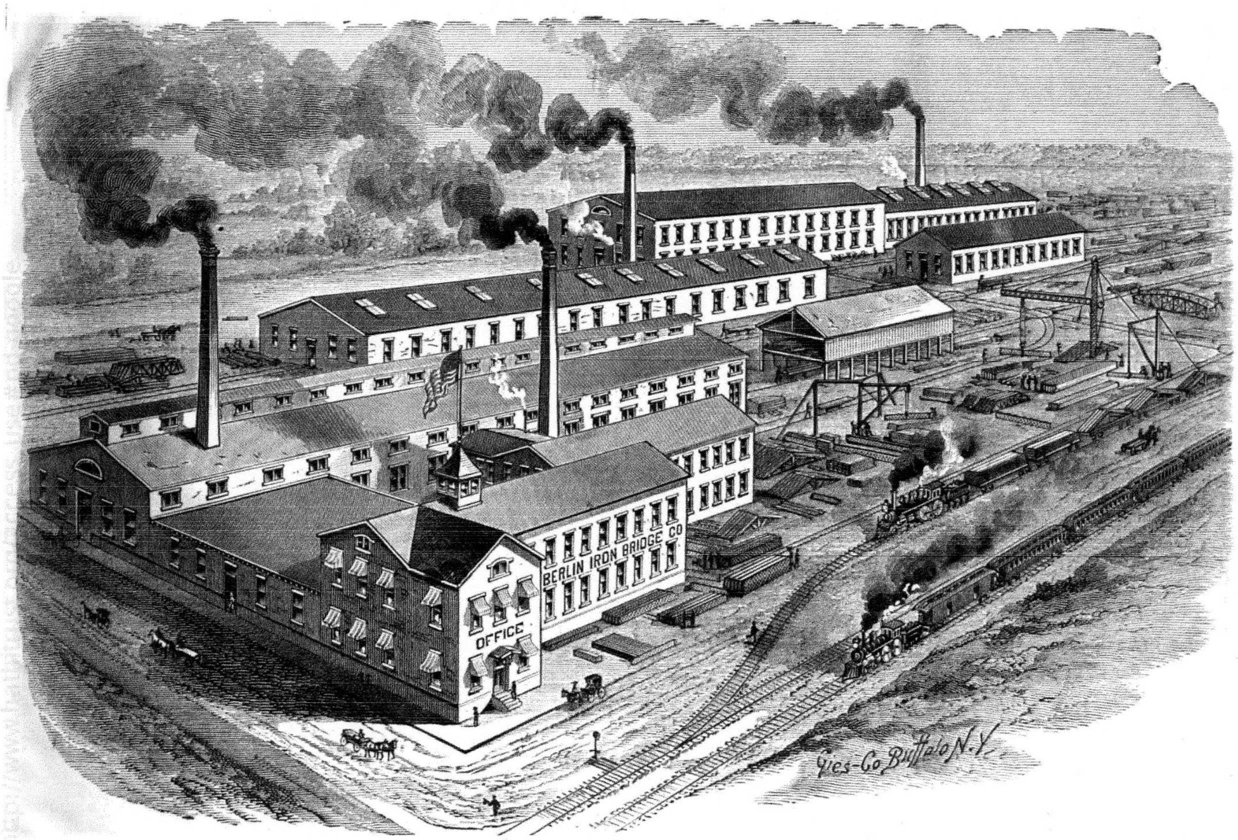
Although William O. Douglas, the patentee of the lenticular bridge truss, served for some years as executive manager and director of the company, others played key roles in the firm's growth and success. The Corrugated Metal Company was in failing condition by 1877, before the firm acquired the Douglas bridge truss patent. In that year, Berlin manufacturer Samuel Curtis Wilcox (1811-1886) assumed the presidency of the company. Using his personal credit, Wilcox rescued the company, acquired the Douglas patent, reorganized the firm, and in 1883 renamed it the Berlin Iron Bridge Company in recognition of its new specialization. After Wilcox's death in 1886, engineer Charles Maples Jarvis (1856-1921), an 1877 graduate of the Sheffield Scientific School at Yale, assumed the presidency of the Berlin Iron Bridge Company and remained in the office until the firm ceased its separate corporate existence in 1900. Burr K. Field took over as vice-president and treasurer until April 1890, when Frank Langdon Wilcox (son of Samuel) became treasurer.[17]

The corporate officers of the Berlin Iron Bridge Company directed a large professional staff. By the early 1890s, the company listed twenty-one civil engineers led by a superintendent of substructures, a superintendent of engineering, and a superintendent of shops. Their trade catalogue proclaimed that "we keep a large and experienced corps of Civil Engineers constantly in our employ, and are therefore able to prepare designs and estimates for all classes of Metallic Structures of every name and nature. Our work is to be found in nearly every State of the Union. We have designed some of the largest Railroad and Highway Bridges and Manufacturing Buildings to be found in the United States."[18]

The company also had some 450 artisans and laborers who by 1890 were working both day and night shifts.

[17] Berlin Iron Bridge Company Records 1871-1904: A Guide to the Collection at the Connecticut Historical Society. For a detailed discussion of the role of Charles M. Jarvis in refining the lenticular truss, see Thomas Boothby, "Designing American Lenticular Truss Bridges, 1878-1900, *IA: The Journal of the Society for Industrial Archeology* 30 (2004): 5-17.

[18] *The Berlin Iron Bridge Company, East Berlin, Conn.*, undated trade catalogue (c. 1890) at the Canadian Centre for architecture, available at: https://archive.org/details/TheBerlinIronBridgeCompanyIronRailroadBridgesIronRoofsWroughtIron, p. 3.



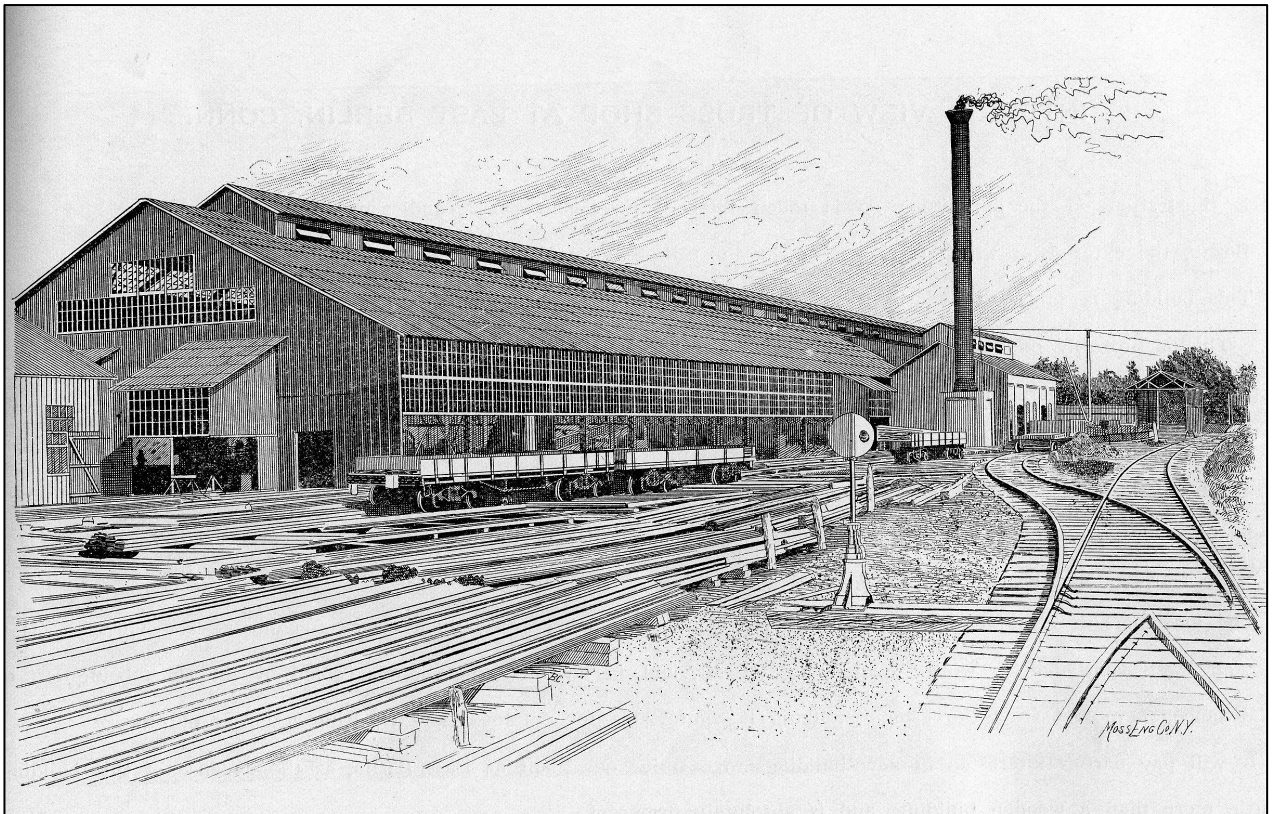
GENERAL VIEW OF WORKS AT EAST BERLIN, CONN.

From The Berlin Iron Bridge Company . . . General Iron Construction*, undated trade catalogue, c. 1890, University of Minnesota, available at* *https://babel.hathitrust.org/cgi/pt?id=umn.319510009301707;view=1up;seq=1*

In 1891, the company invested in a new fabricating plant, which it called the "Truss Shop." The original plant, seen above, stood on about five acres on the west side of the Mattabesset River in Berlin. The new plant was erected on the opposite bank of the river in the town of Cromwell, connected to the old complex by a heavy railroad bridge. It was described in a contemporary journal article as

> constructed entirely of brick, iron, and glass. It occupies a ground space 400 X 80 ft. The sides of the building are of glass for 10 ft. below the eaves, and below that they are constructed of iron sliding doors, so arranged that they can be opened and closed quickly in order to permit the entrance of material through the sides of the building when necessary. In summer these iron sides can be removed entirely, thus adding materially to the comfort of the employés. The roof is supported by iron trusses spanning the building from side to side. Each truss is designed to support a load of 10,000 lbs. at any point along the line of the lower chord, and these lower chords are utilized as tracks for trolleys and traveling cranes. . . . The works are lighted by a Thomson-Houston dynamo with 250

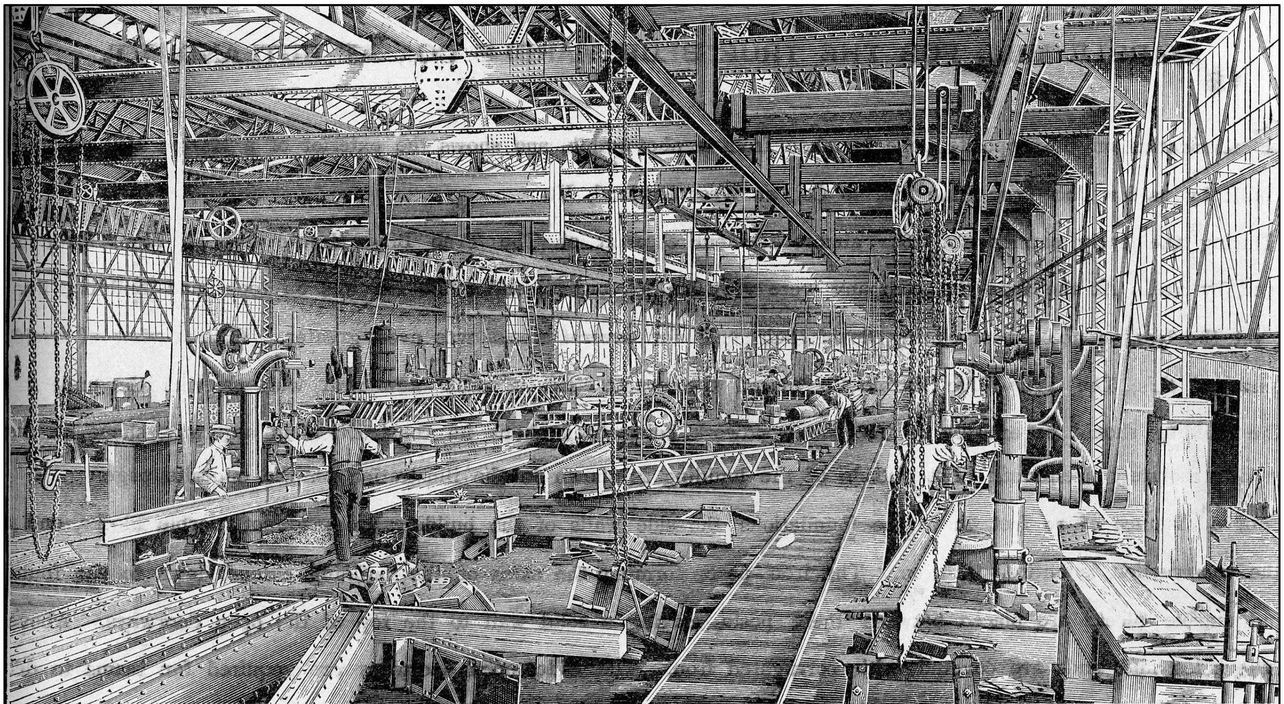
incandescent lamps and 12 arc lamps, all on the same circuit. The arc lamps are used to light the yard and give general light for the shops, while there are two incandescent lights at each machine.[19]



EXTERIOR VIEW OF IRON BUILDING KNOWN AS TRUSS SHOP, AT EAST BERLIN, CONN.

From Berlin Iron Bridge Co., Engineers, Architects, and Builders in Iron and Steel*, undated trade catalogue, c. 1895.*

[19] *Engineering News and American Railway Journal*, October 3, 1891, pp. 316-18.



INTERIOR VIEW SHOWING CONSTRUCTION OF OUR TRUSS SHOP AT EAST BERLIN, CONN.

From Berlin Iron Bridge Co., Engineers, Architects, and Builders in Iron and Steel*, undated trade catalogue, c. 1895.*

Also published as "View of Interior of New Shop," *in Engineering News and American Railway Journal*, October 3, 1891, p. 317.

The Berlin Iron Bridge Company ended its separate corporate existence in 1900 when it was acquired by the American Bridge Company. The American Bridge Company was incorporated in New Jersey by J. P. Morgan and Company on April 14, 1900. Clearly striving for dominance if not outright monopoly in bridge fabrication in the eastern United States during its first year of operation, American Bridge aggressively purchased twenty-four independent bridge companies that represented fifty percent of the nation's fabricating capacity. Among the companies acquired by American Bridge Company in 1900 was the Berlin Iron Bridge Company.

At the time of this purchase, the Berlin Iron Bridge Company had

> . . . about 450 men employed, 225 working 11 hours every day and 225 working 10 hours nightly, so that the works are practically in continuous operations. The Berlin Iron Bridge company was organized in 1881 and has grown from a small plant of one building to cover an area of 25 acres with many buildings and sheds and other large equipments. Its

> present capital is $500,000. The business was first started in a small way in the present locality shortly after the civil war. The company was then known as the Metallic Corugated [*sic*] Shingle company, and later became the Corrugated Metal company, taking its present name in the next change and enlargement of its manufacturing scope.[20]

Although the Berlin Iron Bridge Company ended its independent corporate existence in 1900, a number of its employees formed a new corporation, the Berlin Construction Company, and continued to design and fabricate structures in the same mode as had the original firm. An early example of the work of the Berlin Construction Company is another extant pedestrian suspension bridge in Maine. The Ticonic Footbridge, popularly called the "Two-Cent Bridge" for the toll that was originally collected from users, was built across the Kennebec River in 1903 to provide access between the city of Waterville and the town of Winslow, where a paper mill employed many people from the larger community.[21] Designed by Edwin Dwight Graves, a former engineer for the Berlin Iron Bridge Company who had established an independent practice in Hartford, Connecticut, the bridge strongly resembled the earlier Berlin Iron Bridge Company suspension spans of the late 1880s. The Ticonic Footbridge was fabricated by the new Berlin Construction Company.[22]

The Berlin Iron Bridge Company's influence in New Hampshire is shown by a partial list of the firm's highway bridges in the state, published in 1898. That list includes forty-three parabolic truss bridges, twenty-nine truss bridges of other patterns, and seven girder bridges. Many towns purchased several Berlin bridges, especially the distinctive parabolic trusses. Manchester had five of the latter; Franconia, four; Antrim, three; Lee, three; and dozens of towns had one or two.[23]

Of this impressive number, only four Berlin Iron Bridge Company truss bridges remain in New Hampshire. Depot Road Bridge in Chichester, New Hampshire, was bypassed and preserved in 1981.[24] Franconia, New Hampshire, has two low (pony) trusses; one of them, the Dow Avenue Bridge, was rehabilitated in 1999, and the second was moved for preservation as an outdoor exhibit. The spectacular Livermore Falls Bridge in Campton, New Hampshire, a two-span deck truss structure high above the Pemigewasset River, survives only as a ruin.

Although the Berlin Iron Bridge Company specialized in trussed structures such as roof systems and bridges, the firm advertised its capacity to design and fabricate suspension bridges. In a trade catalogue of 1889, the company noted that

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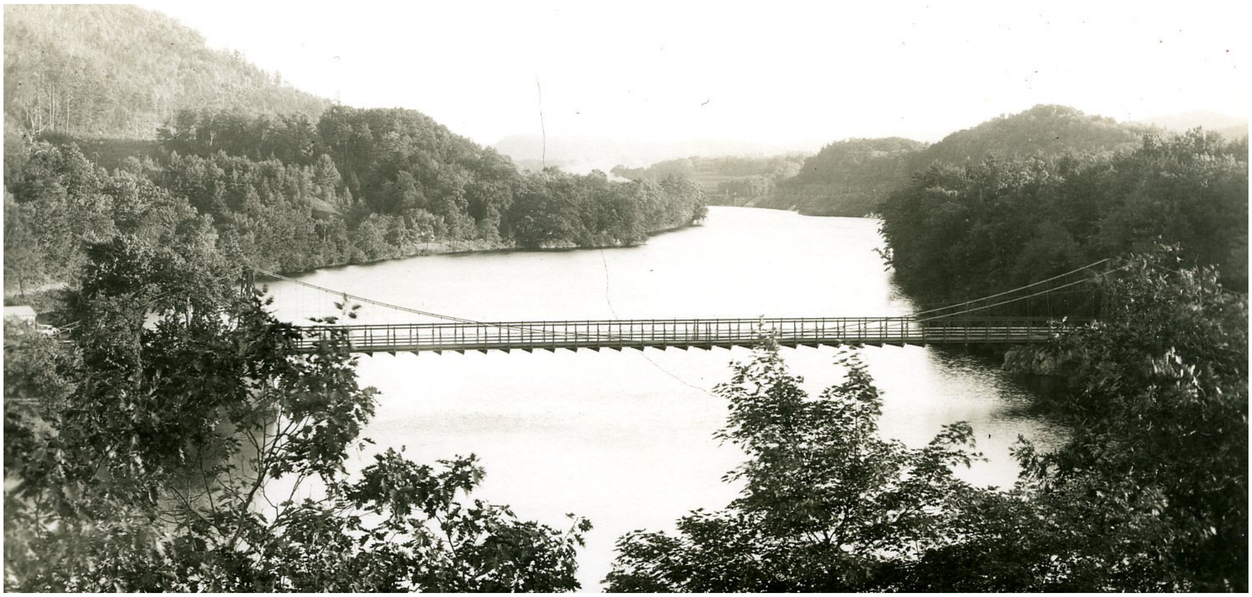
[20] "Exit Berlin Bridge Co.," *Naugatuck Daily News* (Naugatuck, Connecticut), May 14, 1900.
[21] Two-Cent Bridge National Register nomination; National Register Information System ID: 73000132.
[22] For biographical sketches of Edwin Dwight Graves, see George E. Wright, *Crossing the Connecticut* . . . (Hartford: Smith-Linsley Company, 1908), pp. 127-8; and Col. N. G. Osborn, *Men of Mark in Connecticut* (Hartford: William R. Goodspeed, 1907), III:253-5.
[23] "Partial List of Highway Bridges Built by the Berlin Iron Bridge Company in the State of New Hampshire," *Berlin Bridges and Buildings* 1, no. 7 (October 1898): 106-7. Courtesy of the late Victor C. Darnell.
[24] Pineground or Depot Road Bridge National Register nomination; National Register Information System ID: 04000149 (2004).

> . . . there are many locations to which none of the bridges shown heretofore are adapted, and where the peculiarities of the location demand a suspension bridge. The suspension bridge is especially adapted for long spans, where, either on account of insufficient foundation, or the danger of heavy ice carrying away the piers, it is found impracticable to put in any piers between the banks. There are also locations where a rock anchorage is readily found, and the expense of a suspension bridge is much less than an ordinary truss bridge. . . . The cables of a suspension bridge are not of sufficient stability to carry concentrated loads, and therefore it becomes necessary in order to stiffen the bridge, to put in what is known as a stiffening truss, which distributes a concentrated load over several points. . . . For long spans, and where the expense of piers is large, there is no bridge so economical and so well adapted as the suspension type. We are prepared to present plans and estimates for suspension bridges, having had a large experience in this class of work . . .[25]

The company built two large and notable vehicular suspension bridges in New England almost simultaneously with the Milford pedestrian bridge. The first of these, built in 1888, was the old Bancroft Falls Bridge, carrying a gravel road over the Missisquoi River in Sheldon, Vermont. This bridge had a clear span of 250 feet from tower to tower and a roadway sixteen feet in width, allowing horse-drawn travel in two directions. The structure was illustrated in several Berlin Company catalogues with a caption stating that "the bridge is not only firm and rigid vertically, but has great stability laterally, and is pronounced by the town authorities equal in rigidity and stability to any truss bridge which they ever saw."[26]

The second suspension bridge spanned the Connecticut River between West Chesterfield, New Hampshire, and Brattleboro, Vermont. Completed in June 1889, this bridge had a span of 325 feet between towers and a roadway width of sixteen feet. The span was supported by seven cables on each side. The cables on the New Hampshire shore, where no solid ledge was found, were anchored at stone and concrete deadmen deeply buried in the ground; on the Vermont side, the cables were anchored in holes that were blasted out of solid ledge and then filled with stones and concrete.[27] At the dedication of the bridge, Berlin engineer R. B. Hanna was credited with supervision of construction of the superstructure and C. V. Pendleton with the substructure.[28]

[25] Berlin Iron Bridge Company, *The Berlin Iron Bridge Company*, trade catalogue, 1889, p 46. Kenneth Franzheim II Rare Book Room, William R. Jenkins Architecture and Art Library, University of Houston, available at: http://digital.lib.uh.edu/collection/aapamphlets/item/621.
[26] *The Berlin Iron Bridge Company . . . General Iron Construction*, undated trade catalogue, c. 1890, University of Minnesota, available at
https://babel.hathitrust.org/cgi/pt?id=umn.319510009301707;view=1up;seq=1
[27] Letter, C. M. Brooks to John W. Storrs, February 9, 1914, Storrs Business Records, New Hampshire Division of Archives and Records Management, Concord, N. H. Inspection photographs of the Chesterfield-Brattleboro Bridge are in the Storrs photograph collection at the New Hampshire Division of Historical Resources, Concord, N. H.
[28] *Vermont Phoenix* (Brattleboro, Vermont), June 7, 1889, p. 2.



West Chesterfield, N. H.—Brattleboro Vermont Suspension Bridge (1889). Photograph by Lewis R. Brown, Brattleboro, Vermont.

The Chesterfield-Brattleboro Bridge was destroyed by the major regional flood of March 1936.[29] Its ruins lie on the bed of the Connecticut River near its replacement, a two-hinged steel arch bridge with a suspended highway deck.

Destruction of the two vehicular suspension bridges over the Connecticut and Missisquoi Rivers left only the pedestrian bridge in Milford as a New England representative of the Berlin Iron Bridge Company's suspension bridges.

[29]Waldo G. Bowman, "Bridge Building Follows Flood" (with photograph of the destruction of the suspension bridge), *Engineering News-Record*, July 8, 1937, p. 52.

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"Facts About the [Suspension] Bridge," *Vermont Phoenix* (Brattleboro, Vermont), June 7, 1889.

Maps:

Chace, J., Jr. *Map of Hillsborough County, New Hampshire*. Boston, 1858.

Hurd, D. H. *Town and City Atlas of the State of New Hampshire* (Boston: D. H. Hurd & Co., 1892).

Sanborn Map Company, "Milford, Hillsborough County, N. H.," 1886, 1892, 1901, 1907, 1912.

Previous documentation on file (NPS):

____ preliminary determination of individual listing (36 CFR 67) has been requested
____ previously listed in the National Register
____ previously determined eligible by the National Register
____ designated a National Historic Landmark
____ recorded by Historic American Buildings Survey #____________
____ recorded by Historic American Engineering Record # __________
____ recorded by Historic American Landscape Survey # ___________

Primary location of additional data:

____ State Historic Preservation Office
____ Other State agency
____ Federal agency
____ Local government
____ University
____ Other
Name of repository: _____________________________________

Historic Resources Survey Number (if assigned): ________________

10. Geographical Data

Acreage of Property _Less than one acre__

Use either the UTM system or latitude/longitude coordinates

Latitude/Longitude Coordinates (decimal degrees)
Datum if other than WGS84:__________
(enter coordinates to 6 decimal places)

1. Latitude: 42.836521° Longitude: -71.645731°
2. Latitude: Longitude:
3. Latitude: Longitude:
4. Latitude: Longitude:

Or
UTM References
Datum (indicated on USGS map):

☐ NAD 1927 or ☐ NAD 1983

1. Zone: Easting: Northing:

2. Zone: Easting: Northing:

3. Zone: Easting: Northing:

4. Zone: Easting : Northing:

Verbal Boundary Description (Describe the boundaries of the property.)

The nominated property is limited to the bridge, its abutments, and its approaches and cable anchorages. The total length of the nominated property, from anchorage to anchorage, is 300 feet. The overall width of the nominated property, embracing the footings of the towers and the full width of the granite abutments, is about 20 feet.

Boundary Justification (Explain why the boundaries were selected.)

This boundary includes all the structural features associated with the Milford suspension bridge.

---

11. Form Prepared By

name/title: James L. Garvin
organization:
street & number: 470 North Pembroke Road
city or town: Pembroke state: NH zip code: 03275
e-mail james@jamesgarvin.net
telephone: 603-856-4871
date: March 6, 2017

Additional Documentation

Submit the following items with the completed form:

- **Maps:** A **USGS map** or equivalent (7.5 or 15 minute series) indicating the property's location.

- **Sketch map** for historic districts and properties having large acreage or numerous resources. Key all photographs to this map.

- **Additional items:** (Check with the SHPO, TPO, or FPO for any additional items.)

Photographs

Submit clear and descriptive photographs. The size of each image must be 1600x1200 pixels (minimum), 3000x2000 preferred, at 300 ppi (pixels per inch) or larger. Key all photographs to the sketch map. Each photograph must be numbered and that number must correspond to the photograph number on the photo log. For simplicity, the name of the photographer, photo date, etc. may be listed once on the photograph log and doesn't need to be labeled on every photograph.

Photo Log

Name of Property: Milford Suspension Bridge

City or Vicinity: Milford

County: Hillsborough State: NH

Photographer: James L. Garvin

Date Photographed: March 5, 2017

Description of Photograph(s) and number, include description of view indicating direction of camera:

1 of _7_. Western portal of Milford Suspension Bridge. Camera facing east.

2 of _7_. Detail of northwestern tower of Milford Suspension Bridge. Camera facing east.

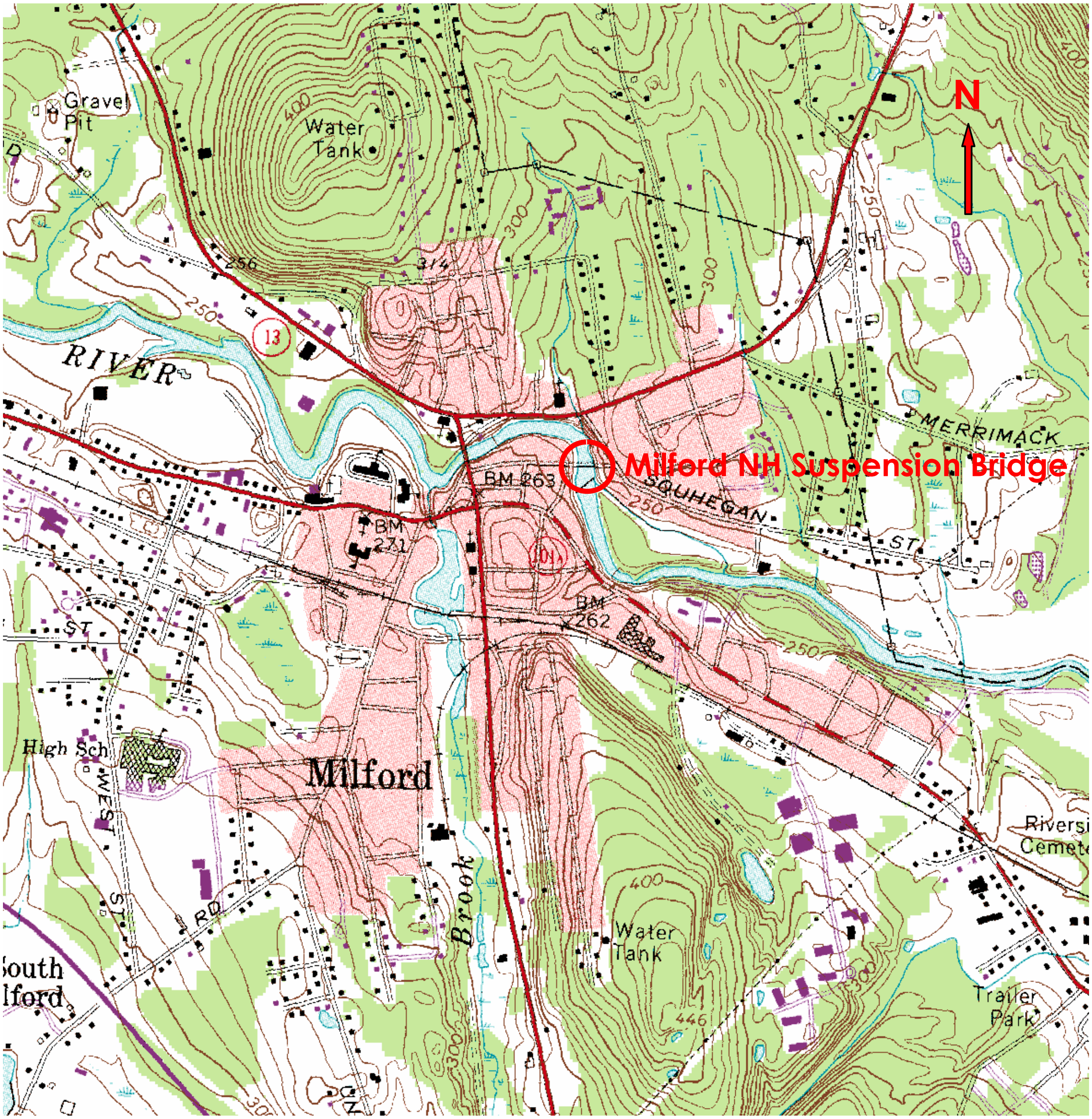
3 of _7_. Southern stiffening truss and suspension cable of Milford Suspension Bridge. Camera facing east northeast.

4 of _7_. Detail of northwestern backstay anchor of Milford Suspension Bridge. Camera facing north.

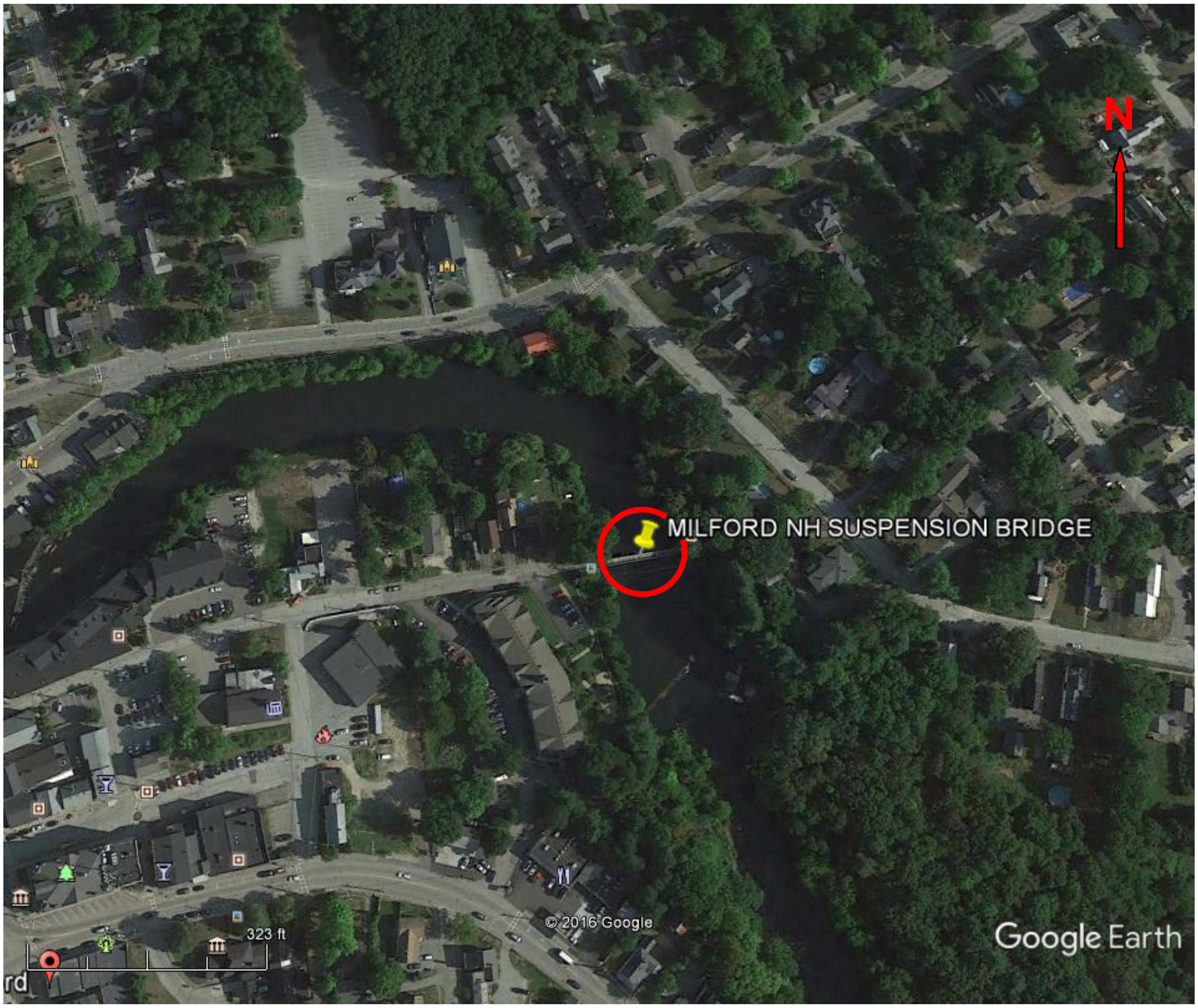
5 of _7_. Detail of northwestern cable bearing box and finial of Milford Suspension Bridge. Camera facing northeast.

6 of _7_. Detail of western cast iron builder's tablet of Milford Suspension Bridge. Camera facing east.

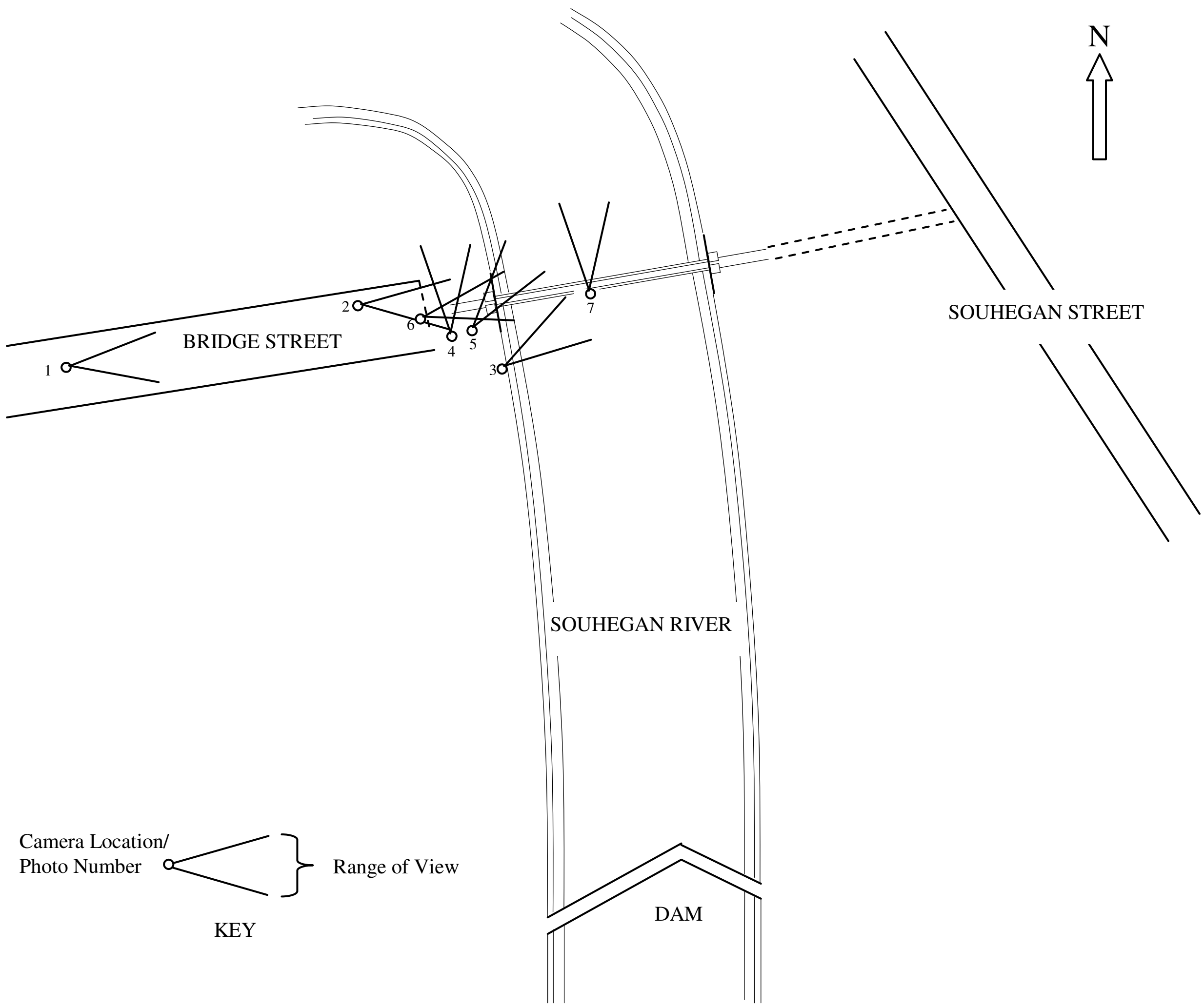
7 of _7_. Detail of a typical clevis or clamp that secures each hanger rod in a fixed position on the cable. Camera facing north.



MILFORD, NH, SUSPENSION BRIDGE.
USGS Milford NH Quadrangle, 1985, Hillsborough County, 1:24000.


N
MILFORD NH SUSPENSION BRIDGE
323 ft
© 2016 Google
Google Earth

Milford Suspension Bridge | Hillsborough NH
Name of Property | County and State



SKETCH MAP WITH PHOTOGRAPH KEY
No Scale