An Introductory Guide to COVERED BRIDGES



Prepared by: National Society for the Preservation of Covered Bridges, Inc.

AN INTRODUCTORY GUIDE TO COVERED BRIDGES

"We crossed this river by a wooden bridge roofed and covered in on all sides, and nearly a mile in length. It was profoundly dark, perplexed with great beams crossing and recrossing it at every possible angle, and through the broad chinks and crevices in the floor the rapid river gleamed far down below, like a legion of eyes. We had no lamps, and as the horses stumbled and floundered through this place towards the distant speck of dying light it seemed interminable. I really could not at first persuade myself as we rumbled heavily on, filling the bridge with hollow noises, and I held down my head to save it from the rafters above, but that I was in a painful dream, for I have often dreamed of toiling through such places and as often argued, even at the time, 'this cannot be reality."

Charles Dickens, American Notes, 1842



Camelback Bridge, Harrisburg, Pennsylvania Oscar Lane Collection, NSPCB Archives

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Introduction

The National Society for the Preservation of Covered Bridges (NSPCB), a non-profit organization incorporated in 1954 and dedicated to researching and preserving the historic wooden-truss covered bridges of the 1800s and early 1900s developed this guide. It is intended to provide some basic information to foster your interest, answer basic questions and offer some background on the variety of truss designs used to support the bridges. It also includes information on trip planning, things to look for during your visits and what is being done to help preserve them. Bridges mentioned within this document include footnotes listing their *World Guide* number and GPS coordinates.

When one first develops an interest in covered bridges, it is difficult to know where to start. On the facing page, Charles Dickens described his passage through one in Harrisburg, Pennsylvania during his visit to America in 1842. Multiple covered spans crossed the mile-wide Susquehanna River at the time and it is not certain which one he referred to. The **Camelback Bridge** on Market Street was in two sections separated by an island. A combination rail and carriage bridge stood further downstream.



Covered bridges appeal to people in many different ways. For some, they hold memories of childhood, summers swimming under the bridge or weekend drives in the country. For others, the quality of the construction that has allowed them to carry traffic for over 100 years is impressive. Photographers admire the artistic qualities of the landscape surrounding the bridge while others cherish the history that they represent. Michigan's **Fallasburg Bridge**² was built over the Flat River by Jared N. Bresee and is the last surviving historic covered bridge built with a Brown truss. *Bill & Jenn Caswell Photo*.

Like most other historic artifacts, they have something to teach us about our past. When they were originally constructed, they represented advanced technology in bridge construction. They were often built by local carpenters who were respected members of their community. Today, they offer us a glimpse of what life was like a century and a half ago. You can walk up to them, touch them, examine

them, and learn from them. Many areas promote their covered bridges as tourist attractions to bring visitors into the area which helps support the local economy. Each location has a story. The **Loys Station Bridge**, ³ pictured right, in Frederick County, Maryland was built in 1994 after the earlier covered bridge was lost to arson on June 27, 1991.

Like any other hobby, as you spend more time at it, you will find your interests gravitating in a particular direction. Each individual will discover what appeals to them and on what level they wish to pursue it. Is it the craftsmanship? The photographic potential? The historic aspect? Your interest will most likely be a combination of various factors.



Karl Young Photo

¹ PA/38-01-01, N39° 47.845' W77° 16.572'

² *MI*/22-41-02, *N*42° 58.825' *W*85° 19.604'

³ MD/20-10-03#2, N39° 36.521' W77° 21.081'

Background

Covered bridges are known to have existed in China for over 2,000 years according to archaeological



Ron Knapp Photo

evidence. The current numbers in China are unknown, but it is believed there are over 3,000. Chinese wooden bridges do not use truss designs like North American and European ones. Most in China are built on masonry bases of stone or brick. Many are constructed with a "woven-arch" design which has a collection of interlocking timbers to support the structure. Construction methods are passed down from one generation to the next. The simplicity of their design allows them to be quickly rebuilt if damaged by wind or flood. The **Rulong Bridge** in China's Zhejiang Province (shown here) is the country's oldest woven-arch bridge (langqiao in Chinese). It is believed to have been built in 1625, during the Ming Dynasty. Many of the existing Chinese covered bridges are footbridges only and have been rebuilt numerous times over the centuries.

In China, they are gathering places, not just a means to cross the river. The interior of the bridge may also include shrines, vendors and benches to sit on and socialize.

European covered bridges date back to the Middle Ages. Like in China, the oldest ones have typically been rebuilt over the years. A well-known European bridge is the **Kapellbrücke**⁴ (German for "Chapel Bridge") in Luzern, Switzerland. This 26-span stringer-supported structure is often reported as being built in 1333. However, it has been rebuilt a number of times, most recently after a fire destroyed about 2/3 of it in August 1993. The bridge is about 557' long and contained 158 historic paintings in the rafters. The 1993 fire destroyed all but 47 of the pictures and only 30 of them were completely restored.



One of the paintings from a postcard owned by Jo Buess



Philip Caston Photo

A more typical European truss-

supported covered bridge is the **Satteiser Bridge**⁵ over the III River in Frastanz, Vorarlberg Province, Austria. Although some designs are thought to have come to America from Europe, this bridge, built in 1921, is supported by a Howe truss developed in America and used for a number of existing and former covered spans throughout Europe.

In the early 1800s in America, horses and wagons typically crossed smaller streams at fords which were not safe during times of high water. Large river crossings often depended on ferries that could be very dangerous and unreliable due to flooding, storms and winter ice. Like their European predecessors, early

American bridges were usually constructed of stone or wood. Stone bridges were expensive to build, and the stones were difficult to transport and shape. Early wooden bridges were simple structures. Being uncovered, they only lasted a few years, at most a decade, before the wood deteriorated. Most of the early ones were designed by architects and built by local carpenters.

Timothy Palmer, a well-respected bridge builder from Newburyport, Massachusetts, built large uncovered bridges throughout New England using a trussed arch design. This was a significant development towards the truss designs that followed.

⁴ CH-11-01, N47° 03.079' E08° 18.428'

⁵ AT-09-21, N47° 13.521' E09° 37.607'

Background (continued)

In 1792, Palmer constructed two bridges over the Merrimack River in Massachusetts connecting Deer Island in the center of this image with Newburyport on the right and Salisbury on the left. The arched section of the bridge on the left was eventually covered.

Due to the expense, the first covered bridges were grand structures over large rivers which warranted the additional cost to extend their lifespan and protect the investment with a roof and siding. Eventually, even the smaller crossings would be covered as they became a common sight throughout much of the country.



Massachusetts Magazine, May 1793

The ever-expanding need to create longer spans and carry heavier loads encouraged development of better truss designs. The truss is an essential part of the bridge. Encyclopaedia Britannica describes it as "a stable form capable of supporting considerable external load over a large span with the component parts stressed primarily in axial tension or compression. The individual pieces intersect at truss joints, or panel points. The connected pieces forming the top and bottom of the truss are referred to respectively as the top and bottom chords. The sloping and vertical pieces connecting the chords



Bill & Jenn Caswell Photo

are collectively referred to as the web of the truss."

By the end of the 19th century, iron was more readily available and becoming the material of choice for larger bridge projects. As iron, and later, concrete, became more popular, wooden covered bridges were routinely replaced. In timber-rich areas like Oregon, Québec and New Brunswick they continued to be built until the 1950's. The **Morneault Settlement or Baker Brook #2 Bridge**⁶ in the northwest corner of New Brunswick was built in 1939.

With the emerging interest in preserving these humble structures, some saw the economic potential of building new covered bridges to attract visitors. Sometimes they were built as replicas of historic bridges they replaced while others were entirely new. Their appeal has also prompted examples on private property, in parks, on golf courses, etc. The 42' long **Shiloh Walking Trail Bridge**⁷ was built behind the Shiloh United Methodist Church in Carroll County, Georgia in 1993.



Bill & Jenn Caswell Photo

⁶ NB/55-07-04, N47° 20.307' W68° 32.946'

⁷ GA/10-22-a, N33° 34.590' W85° 12.371'





Diagram adapted from one created by Lola Bennett, Thomas Behrens, Charu Chaudhry, and Christopher H. Marston, 2006. Note that not all terms listed below are shown on the diagram.

Abutment: The foundation supporting the bridge at both ends.

Arch: A curved structural member spanning an opening and serving as a support.

- **Bed Timbers:** Timber components typically located between the top of an abutment or pier and the underside of the lower chord. Intended to serve as sacrificial components, they are easily replaced when deteriorated by rot, thus protecting truss components from similar deterioration.
- **Boxed Pony Truss**: A bridge supported by short trusses which are typically covered on both sides. Because of their shorter height, these structures do not have a roof.
- **Brace:** Diagonal member in a truss slanting upward toward the center or midpoint of the truss providing structural support.
- Camber: The vertical curvature of a bridge rising upward towards the center to help eliminate sagging.
- **Counter Brace:** A diagonal timber in a truss which slants in the opposite direction from the brace.
- **Dead Load:** The weight of materials that make up the bridge structure itself.
- **Floor Joist**: Timbers running across the bottom of the bridge supporting the floor planks. Sometimes referred to as deck beams.
- Flooring or Decking: Planks resting on or secured to the floor beams which form the bridge floor.

Floor Stringer: If used, they span between the floor beams with the flooring or decking on top of them.

- **End Post:** The outermost vertical post of a truss which transfers the load supported by the truss to the abutment.
- Lower Lateral Bracing: Cross bracing at the bottom of the trusses to resist excessive loads or wind pressure.
- Lower Chord or Bottom Chord: The timbers running the bottom length of the truss.

Terminology (continued)

Panel: A repeated section of the truss. Typically, the area between two adjacent vertical posts.

Pier: A support in midstream between the two abutments.

Portal: The entrance at each end of a bridge.

Post: A vertical timber connecting the lower and upper chords.

Rafter: Diagonal member supporting the roofing. In most examples they rest on the upper chord.

Roof: Structure atop the trusses to protect them from weather.

Shelter Panel: A short section of siding inside the ends of the bridge, to protect the truss ends from damage due to rain.

Siding: Vertical or horizontal exterior covering to protect the trusses from weather.

Span: The distance between adjacent supports, or a section of a bridge.

Tie rod: Metal rods connecting two upper or lower chords, or securing a bridge to an abutment.

Treenails: Pronounced "trunnels." The wooden pins driven into the holes in planks of a lattice truss to fasten them together. Treenails are made of hardwood, usually oak.

Upper Chord or Top Chord: The timbers running the top length of the truss.

Upper Lateral Bracing: Cross bracing at the top of the trusses to resist excessive loads or wind pressure.

Bridge Numbering System

All covered bridges are assigned numbers by the NSPCB. Since bridges may be known by more than one name, assigning each one a unique number avoids confusion regardless of which name may be used. The system was developed by John Diehl, a pioneer Ohio bridge preservationist, in the 1940s. It uses three sets of numbers and/or letters separated by hyphens. For example, the **West Cornwall Bridge** ⁸ in Litchfield County, Connecticut to the right is **CT/07-03-02**.



Karl Young Photo

A. The first set identifies the U.S. state, Canadian province or other country. U.S. states and Canadian

provinces were assigned numbers in alphabetical order. In this example, 07 is Connecticut. Some organizations use the state's two letter initials such as CT for Connecticut. So, this bridge's World Guide number may be seen as 07-03-02 or CT-03-02. The latest *World Guide to Covered Bridges* includes both systems, listing it as CT/07-03-02. World Guide numbers for bridges in other countries begin with the two-character country code.

- B. The middle two digits represent an alphabetical listing of the county or other equivalent subdivision within the state or province. In this example, 03 is Litchfield County.
- C. The next one or more characters can be numbers or letters. A number indicates that the bridge is now or was originally supported by its wooden truss. Letters indicate that the bridge was originally built on steel beams or supported by something other than a truss. A capital letter indicates that the bridge is large enough for a vehicle to drive through. A lower case letter indicates a smaller structure.
- D. Finally, if there is **#** after the letter or number it means the bridge is not the first covered bridge at this location. It could be the second (#2), third (#3) etc.
- E. Numbers ending with an "x" identify structures which no longer exist.

Common Questions

Why are they covered?

Many reasons are offered for covering bridges such as providing shelter during inclement weather or so horses wouldn't be afraid to cross the water. However, the true reason is much more practical – to protect the structure supporting the bridge. Without protection from the weather, the wooden timbers supporting the bridge would decay more rapidly and eventually collapse.

Where was America's first one?



"Permanent Bridge with Covering and Tollhouse Portals" Painting by William Strickland, 1815 The University of Memphis

America's first documented covered bridge, called the **Permanent Bridge**⁹, was constructed over the Schuylkill River in Philadelphia, Pennsylvania and opened to traffic on January 1, 1805. Timothy Palmer, who had been building uncovered structures throughout New England built it. The Permanent Bridge had three arch supported trusses, two of them were 150' long and the other was 195' long. It was built at a cost of \$300,000. Because of the high cost it was decided that the bridge would be covered to protect the city's investment. It was expected to last about 40 to 50 years. Expanded to accommodate a railroad in 1850, it remained in service until being destroyed by fire on November 20, 1875.

Where is America's oldest one?

Although there are some covered bridges whose construction dates are not known, it is believed that the oldest one remaining is the **Hyde Hall Bridge**¹⁰ in Glimmerglass State Park near Cooperstown, New York. The 53' long Burr truss, built in 1825, was originally part of the Hyde Hall Estate. There may be a fee to visit it in the summer months. The bridge was added to the National Register of Historic Places on December 17, 1998.



Todd Clark Collection

Which state has the most traditional covered bridges?

The 2021 World Guide to Covered Bridges lists 211 for Pennsylvania. Ohio is second with 144.

Which county has the most?

Parke County, Indiana with 31.

⁹ PA/38-51-02x, N39° 57.25' W75° 10.84'

¹⁰ NY/32-39-01, N42° 47.411' W74° 51.81'

Common Questions (continued)

Where is the longest covered bridge?

• The longest existing covered bridge is the **Hartland Bridge**¹¹ in Hartland, New Brunswick, Canada. Built in 1901, the seven-span, 1,282' long Howe truss structure was covered in 1922. *Bill & Jenn Caswell Photo.*



• The longest one in the United States is the **Smolen-Gulf Bridge**¹² over the Ashtabula River in Ashtabula County, Ohio. The four-span Pratt truss bridge was built in 2008 and is 613' long. *Michele Lee Victor Photo.*



• The longest historic American covered bridge depends on how the length is measured. The **Cornish-Windsor Bridge**¹³ over the Connecticut River between Cornish, New Hampshire and Windsor, Vermont and the **Medora Bridge**¹⁴ in Medora, Indiana can both claim this title. The truss of the Cornish-Windsor Bridge is longer than Medora's 449.5' vs. 434'. The span (distance between the faces of the abutments) of the Medora Bridge is greater than Cornish-Windsor's, 430.4' vs. 422'. The Cornish-Windsor Bridge is one of three covered crossings of the Connecticut River connecting New Hampshire and Vermont, the only places where covered bridges span two states. *Bill & Jenn Caswell Photos*.



Cornish-Windsor Bridge



Medora Bridge

¹¹ NB/55-02-07, N46° 17.800' W67° 31.820'

¹² OH/35-04-64, N41° 51.336' W80° 45.710'

¹³ NH/29-10-09#2 & VT/45-14-14#2, N43° 28.421' W72° 23.035'

¹⁴ IN/14-36-04, N38° 49.116' W86° 08.837'

Common Questions (continued)

What are double barrel bridges?

The term "double-barrel" refers to a bridge with an additional truss in the center separating two travel lanes. There are only six of these bridges, five historic and one modern, in the United States.

- Ramp Creek or Brown County State Park in Indiana, built in 1838 and moved in 1932. IN/14-07-02, N39° 11.728' W86° 12.990'
- **Blenheim** in Schoharie County, New York, built in 2018. NY/32-48-01#2, N42° 28.307' W74° 26.489'
- **Roberts** in Preble County, Ohio, built in 1829 and moved to its present location in 1991. OH/35-68-05, N39° 44.427' W84° 38.323'
- **Cambridge Village or Museum** in Chittendon County, Vermont built in 1845 and moved to its present location at the Shelburne Museum in 1951. VT/45-04-06, N44° 22.616' W73° 13.774'
- **Pulp Mill or Paper Mill** in Middlebury and Weybridge, Addison County, Vermont, completed in 1854. VT/45-01-04#2, N44° 01.477' W73° 10.645'
- Philippi in Barbour County, West Virginia; discussed in more detail later. WV/48-01-01, N39° 09.180' W80° 02.600'

Are there any covered railroad bridges?



Roberts Bridge David Simmons Photo

- There are presently seven fully-covered railroad bridges.
 - **Contoocook Railroad** in Contoocook, New Hampshire built in 1889. It is the oldest of the remaining covered railroad bridges. NH/29-07-07#2, N43° 13.384' W71° 42.832'
 - Pier Railroad or Chandler Station built near Newport, New Hampshire in 1907. NH/29-10-03#2, N43° 21.718' W72° 14.460'
 - Wright Railroad built near Newport, New Hampshire in 1906. NH/29-10-04#2, N43° 21.537' W72° 15.546'
 - Sulphite Railroad in Franklin, New Hampshire was built in 1896 and is the only known deck covered bridge. That is a bridge where the traffic crosses over the top of the structure rather than running through its center. NH/29-07-09, N43° 26.702' W71° 38.124'



Pier Railroad Bridge Scott Wagner Photo

- **Clark or Pinsley Railroad** in Lincoln, New Hampshire. Built in Barre, Vermont in 1904 and moved to Clark's Trading Post in 1965. NH/29-05-14, N44° 03.093' W71° 41.267'
- East Shoreham Railroad in Addison County, Vermont was built in 1897 and abandoned in 1951. VT/45-01-05, N43° 51.558' W73° 15.343'
- Fisher Railroad or Chubb was built in 1908 near Wolcott in Lamoille County, Vermont. VT/45-08-16, N44° 31.938' W72° 25.658'

Finding Information

There are numerous sources of information which can easily be found on the Internet with a Google or Bing search. However, there are some websites and books which are particularly helpful resources.

Round Barns & Covered Bridges

One of the most comprehensive websites on existing American and Canadian covered bridges is maintained by Dale Travis, *www.dalejtravis.com*. The site includes information and photos associated with traditional and non-traditional covered bridges.

Nu	mber	County	Name	Water	Spans	Length	Built	Truss	GPS	Description
<u>38</u> -	- <u>01-01</u>	Adams	Sachs	Marsh Creek	1	102'	1854	Town	N39 47.846	SW of Gettysburg, Cumberland/Freedom Township. Bus. Bus.US15 S. 2.3 miles from jct with US30 in Gettysburg, W. (curves SW) on Millerstown Rd. (becomes Pumping Station Rd.) 1.7 miles, E. (left) on Water Works Rd. 0.15 miles to the bridge. Closed to motor traffic. Restored 1997.

NSPCB

The NSPCB has developed a website as an extension of its *World Guide to Covered Bridges*. Although the website is available to everyone, NSPCB members have access to additional features such as the ability to record their bridge visits, prepare lists of bridges and develop driving routes based on their bridge lists. NSPCB members also have access to a corresponding cell phone app. Visit the site at *abhdemo.com* for more details. Note that the site only includes structures listed in the current *World Guide to Covered Bridges*. Once registered, you can use the search functions to find information about the bridges. You can search a specific area or search all bridges based on name, feature crossed, truss type and other attributes.



Covered Spans of Yesteryear

The Covered Spans of Yesteryear website, *www.lostbridges.org*, not only contains information on existing covered bridges, but extensive archival information on those of the past. Searches can include a specific area or all bridges based on name, feature crossed, truss type and other attributes. Search results include some basic information plus photos and historical information when available.

World Guide to Covered Bridges

The NSPCB publishes the *World Guide to Covered Bridges* that contains some background information plus listings of all known truss-supported covered bridges throughout the world. The most recent edition was released in 2021. Visit their website listed at the end of this document for more information and details on how to purchase a copy.



More Terminology

At this time there are around 828 traditional covered bridges in the country (about 2/3 of them historic) while there are over 2,700 non-traditional bridges. While some prefer to focus their attention on the historic structures, others are also interested in the modern designs and others will also travel to visit the non-traditional structures. As previously mentioned, you will eventually find your interests evolving in a particular direction. Individuals will discover what appeals to them and on what level they wish to pursue it. This section will explain some of the terms used.

Historic

The term "historic" generally refers to those structures supported by wooden or mostly wooden trusses and built during the time when the use of wood was the most economical choice. That included most of the 19th century and, depending on the region, may have extended to as late as the 1950's. However, from the historic preservation standpoint, any structure over 50 years old is often referred to as "historic." Pictured right is Wisconsin's **Cedarburg Bridge**¹⁵, a Town lattice bridge built in 1876.



Gloria Smedley Photo



Karl Young Photo

Modern

The term "modern" generally refers to wooden structures using truss designs developed during the waning years of the 1900s and early 2000s. While some may be constructed with solid wooden timbers, many use engineered wood such as glulam (glued laminated timber) to provide better support for heavy truck loads. The **Cannon Bridge**¹⁶ in Wyoming County, New York, shown here, is supported by a variant of the Pratt design. It opened to traffic during the summer of 2022.

Non-Traditional

"Non-traditional" or "stringer" bridges are ones which were not constructed with a load-bearing truss and are instead supported by wood beams, steel beams or a concrete deck. Some also use these terms to refer to historic bridges that have had steel beams or a concrete deck added underneath rendering the trusses non-functional. An example is the **Bob Dunning Memorial Bridge**¹⁷, a 60' long pedestrian bridge over Willett Brook in Pondicherry Park in Cumberland County, Maine. Friends of Bob Dunning, a preservationist, craftsman and an environmental advocate, built it in 2010.



Karl Young Photo

Authentic

In oversimplified terms, "authentic" refers to a span supported by wooden or mostly wooden trusses regardless of age. Some people follow a stricter definition where the structural timbers must be natural wood while others will also refer to bridges containing glulam as "authentic."

¹⁵ WI/49-46-01, N43° 20.260' W88° 00.298'

¹⁶ NY/32-61-07#2, N42° 49.114' W78° 26.749'

¹⁷ ME/19-03-g, N44° 03.174' W70° 42.518'

More Terminology (continued)

Pony Trusses

Once quite common, examples of boxed pony truss bridges are rare now. The term refers to the short trusses which are fully covered with siding. Similar to full-height examples, the trusses providing the

structural support for the bridge are covered to protect them from the weather. An example is the **Trout Brook Bridge**¹⁸ in Alna, Maine which was originally built for the Boston & Maine Railroad near Gorham, New Hampshire in 1918. After being a victim of arson in May 2004, the charred remains were given to the NSPCB. Using a grant from the National Park Service, the trusses were reconstructed by Barns and Bridges of New England and used for Howe truss research at Case Western Reserve University in Cleveland, Ohio. Once testing was complete, they were returned to Gorham to serve as a public exhibit. Unable to find a suitable location, an offer was accepted to rebuild it on the Wiscasset, Waterville and Farmington



Doug Turner Photo

Railway in Alna, Maine where it now carries rail traffic again. The 2021 *World Guide to Covered Bridges* lists six other pony truss bridges: one in Connecticut, three in New Hampshire and two in Pennsylvania.

Some Annual Events

Other Event	
Parke County Covered Bridge Festival	Rockville, Indiana
Madison County Covered Bridge Festival	Winterset, Iowa
Euharlee Covered Bridge Fall Festival at Frankie Harris I	ParkEuharlee, Georgia
Columbia-Montour County Covered Bridge and Arts Fest	tivalBloomsburg, Pennsylvania
Blount County Covered Bridge Festival	Oneonta, Alabama
Ashtabula County Covered Bridge Festival	Jefferson, Ohio
October	
Washington & Greene Counties Covered Bridge Festival	Washington & Greene Cos., Pennsylvania
Roann Covered Bridge Festival	Roann, Indiana
Elizabethton Covered Bridge Days	Elizabethton, Tennessee
Cumberland Covered Bridge Festival	Matthews, Indiana
September	
Dinner on the Medora Covered Bridge	Medora, Indiana
August	
Big Bridge Dinner	Smolen-Gulf Bridge, Ashtabula County, Ohio
July	
Westport Covered Bridge Festival	Westport, Indiana
Virginia Covered Bridge Festival	Woolwine, Virginia
June	

Other Events

There are many other events which are not specifically about covered bridges, but include them such as bicycle races, foot races, walk-a-thons, motorcycle tours, car club tours, etc. All of these activities help preservation efforts by highlighting structures and showing their importance to the community.

¹⁸ ME/19-08-P06, N44° 06.209' W69° 37.073'

Truss Designs

One of the approaches to categorizing these spans is by the type of truss supporting them. Some designs saw extensive use over a large geographical area while others are limited to a specific region. To keep it simple, this section will contain a brief description of the design. In the line sketches, timbers are shown by full lines, and iron or steel rods by dotted lines. There are many examples of variations, modifications, and refinements to these designs.

Kingpost

The most basic truss design, is the **Kingpost** which has been used since the Middle Ages. It is based on an equilateral triangle with a central post, known as the kingpost. The two diagonal timbers are braced on the ends of the lower chord and transmit loads from the center of the bridge towards the abutments. It is used for short bridges up to about 40' in length.

Queenpost

The second basic design is called the **Queenpost**. The design has been in use at least as far back as

the Italian Renaissance. The Queenpost truss is an expansion of the Kingpost design adding a rectangular panel in between the two triangles. It is often reinforced by placing vertical and diagonal timbers or rods in the open

center panel (shown by the dashed lines). It was typically used to span distances up to 75'.

Multiple Kingpost

The Multiple Kingpost truss is an expansion of the Kingpost design. The diagonal timbers carry the load from the center of the bridge outward to each successive vertical Kingpost which transfers it to the next diagonal timber. Used for spans up to about 100' long. Most have an even number of panels. With an odd number of panels, the center one may be open or have crossed braces as shown by the dashed lines in the lower image.

Burr

Theodore Burr (1771–1822) was an inventor from Torrington, Connecticut who patented his first bridge

design in 1806. On April 4, 1817 he received another patent for his arch and truss bridge design. The patent drawing shows a Multiple Kingpost truss resting on stone abutments, superimposed with an arch whose ends are seated against the abutments below the lower

chords. Today, about one-quarter of the remaining historic covered bridges use this design.

Town

Ithiel Town (1784–1844) was an architect who made a significant contribution to the field of engineering when, in 1820, he patented a truss bridge consisting of two layers of overlapping planks forming a

lattice fastened together with wooden pins or treenails at each intersection. Town trusses are erected with sawn planks instead of heavy hewn timbers making the timbers somewhat easier to work

with. As Town explained, it was designed to be "the most simple, permanent, and economical, both in erecting and repairing." Québec employs a variation of the design. Some railroad bridges had double lattices to carry the heavier loads.







Truss Designs (continued)

Long

Col. Stephen H. Long (1784–1864) became an army engineer in 1814. He undertook surveys for the U.S. Army Topographical Engineers of canals and led expeditions in the West. As a consulting engineer for the Baltimore & Ohio Railroad, Long became interested in the design and construction of

bridges patenting his Long truss design in 1830. A key to the design was driving wedges between the counterbraces and chords, which prestressed the structure, and added substantially to its capacity. Very few **Long** truss bridges remain, primarily in Maine and New Hampshire.



Howe

William Howe (1803–1852) designed the Howe truss and patented it in 1840. By substituting adjustable iron rods for the wooden posts of the Long truss, Howe's design was much stronger. He simplified the process of erecting and repairing them making the design well suited for railroads. In

1878, the American Society of Civil Engineers called it "the most perfect wooden bridge ever built." Those in the eastern states typically have wooden diagonal braces in both directions forming an "X". Those in western states typically only have braces angled upward towards the center of the bridge. With an odd number of panels, the center one may have braces in both directions or none at all. Adaptations of the design are found in New Brunswick. Howe



trusses became popular in parts of Europe where some still stand in Austria, Germany and Switzerland.

Smith

Robert W. Smith (1834–1898) was the son of an Ohio cabinet maker. On July 16, 1867, he received a patent for a design which reduced the amount of timber in the structure. Smith received a second bridge patent in 1869. He continued to modify and refine his designs without applying for additional patents. As a result, many Smith truss bridges do not exactly follow the patented designs. The variety makes categorizing them somewhat challenging. These descriptions are intended to follow the designs and drawings used by Smith when promoting his bridges.

- Single web resembles a series of inverted Vs. Three examples remain in Ohio.
- Double web the second web was an offset copy of the first giving the appearance of Xs.
- Triple web a third web duplicating the first added for additional strength in longer spans.

Paddleford

A local New England builder, Peter Paddleford (1785–1859), developed the Paddleford truss. Although Paddleford never patented the design, it dominated construction throughout northern New England for over half a century. Examples of this design are found in northeastern Vermont, northern New Hampshire and northwestern Maine.







Some Paddleford bridges also include arches which may have been added later for additional support.

Other Trusses

Many more designs exist beyond those described in this limited space. Hopefully, this short section kindled your interest and prompts you to learn more about the designs and builders.

Planning Your Trip

Before You Go

First, determine how long your trip will be. Are you going out for an afternoon? One day? Two days? A week? How many bridges do you wish to visit? Develop a preliminary itinerary for the trip. Be sure to look for other interesting sites to visit along the way. Don't forget about potential meal locations or overnight accommodations if planning a multi-day trip.

Here are some tips to remember while planning.

- Type an itinerary and estimate the times you will be at each stop. This will be helpful in case you need to make adjustments due to unexpected delays. Plan at least 20 minutes at each location. Often you will need much more time depending on the bridge's length, setting and distance from the parking area. Allow time for traffic congestion, construction and the types of roads you will be traveling (highway, city, rural, hilly, etc.). Identify potential rest stop locations and include that time in your estimate. It is best to over-estimate your time than under. Print a copy to take with you so you can check off each stop along the way and make notes about your visit.
- Because many sites can be in remote areas and cell phone reception can be questionable, it is a good idea to have a GPS or vehicle navigation system which can store the locations to be visited without being hindered by the potential lack of reception.
- If you are driving a camper or other large vehicle where height or weight restrictions might be a factor, make sure to check that out before leaving home.
- Double check directions and coordinates of each bridge before leaving home.
- Look for the most recent information on the bridge to be aware of ongoing repair work or even to confirm that it still exists. For example, it would be very disappointing to travel to eastern Washington state to visit the **Colfax Bridge**,¹⁹ a railroad bridge converted to roadway use, only to discover that it was lost during a wildfire on September 7, 2020.



Bill & Jenn Caswell Photo

Using a GPS

A GPS can be very helpful when traveling although there are some tips to keep in mind. First and foremost, a GPS is only a tool and, like any other tool, is most effective when used properly. These tips will help reduce surprises along the way.

- While traveling, have a second source of road information available such as a paper map, one printed from Google or other online map or a cell phone to check the route offered by your GPS for potential problems such as impassable roads, one way streets or roads unsuitable for your vehicle. You won't be able to predict every possible complication in advance of your trip, but some research can identify a few things to watch for.
- If a detour comes up or the GPS takes you on an impassable road, most GPS's include a "Detour" function to provide an alternate route. In most cases this will correct the issue. If not, stop and ask. Most locals are happy to help.

¹⁹ WA/47-38-01x, N46° 55.702' W117° 24.918'

Planning Your Trip (continued)

Off-Road Locations

When planning your trip, note that you will need to walk to some locations and the coordinates for those bridges may not get you to the correct place for parking your vehicle. A good example is the **Thomas Mill Bridge**²⁰ in Philadelphia, Pennsylvania. This Howe truss structure is the only historic covered bridge in a major city in the United States. The road it served, Thomas Mill Road in Fairmount Park, no longer carries motor vehicle traffic. The bridge was restored by the Work Projects Administration in 1939.





Karl Young Photo

or cell phone will likely lead you to Thomas Mill Terrace, a road close to the bridge but not close enough to see it or walk to it. By locating the parking lot at N40° 04.698' W75° 13.650', you can get close



° 04.698' W75° 13.650', you can get close enough to park and walk about 15 or 20 minutes to the bridge.

When planning to visit bridges on driveways or in parks, check to see if you will also need an address or parking lot location for your visit. Check Internet resources or your *World Guide to Covered Bridges* for directions to the bridge. If you need help while in the area, ask someone for directions. If you have cell service and can access a map on your phone, you may be able to identify where you need to go.

Using Google Maps

There are numerous options for route planning on the Internet. Although Google is used in this example, you may find that you prefer a different option.

Start at **maps.google.com.** In the **Search** box, enter the desired location. Note that many covered bridges can be found by entering their name. If the name does not appear, you may need to type in the coordinates found while looking up information on the bridge.





Once the bridge is located, click on the option to get directions.

Enter the starting point of your journey.

The map will show one or more suggested routes with distances and travel times. You can click on "Add destination" and continue adding destinations to the route.



²⁰ PA/38-51-01, N40° 04.312' W75° 13.535'

During Your Trip

Safety Tips

Be sure to dress properly for whatever weather you might experience. With many bridges in remote locations, be prepared for potentially icy roads in winter and muddy ones in the spring. During summer months, be sure to carry extra water to stay hydrated. Watch your fuel level, especially in rural locations where there may not be services nearby.

Be careful and be aware of your surroundings. If you are alone be extra careful. Remember, phone service can be very spotty or not available if you have an accident.

Find a safe place to park off the road whenever possible. Traffic can be busy at many locations so be sure to watch for vehicles before entering a bridge. Some are just too busy to walk through and you may need to stand at the edge of the portals to get photos of the interior. It may be necessary to drive through the bridge and park on the other side for more pictures.

Wear comfortable shoes (not open ones) as some places can be wet, muddy or rocky. Be careful



Karl Young Photo

when climbing over rocks, using uneven stairs, and walking on steep terrain or loose gravel. While walking inside, watch for holes in the flooring or raised boards.

Wear long pants when walking through bushes and check for ticks or other unwanted passengers when finished. The area around the **Sheffield Bridge**²¹ can be overgrown and prime territory for small critters that might like to hitch a ride. This 93' long bridge over the Housatonic River in western Massachusetts, was built in 1998 after the original 1854 bridge was lost to arson in 1994.

Most importantly, have fun.

Privately Owned Bridges

With a few exceptions, most private bridge owners welcome visitors to their bridges and only ask that you notify them prior to your visit. At all times, please respect the owner's right to privacy.

Photography Tips

Before leaving your vehicle, look around for ideas of where to take pictures. Plan to take pictures inside and outside the bridge. If you have two cameras use both. One may be better in strong light, low light, shaded situations, etc. Fog, rain and sun can cause problems when taking pictures, but they can also create unique images.

Keep track of the order the bridges were visited and have a method of distinguishing where photos of one ends and the next one begins such as taking a photo of the ground in between stops. If two consecutive bridges are similar, it can be difficult to figure out where one set of photos ends and the next one begins.

Photograph nearby signs and historical markers for future reference. Look for special views that include nearby buildings, farm animals, flowering trees, hills or mountains such as having the portal of Fleming County, Kentucky's **Goddard Bridge**²² frame the nearby church.



Bill & Jenn Caswell Photo

²¹ MA/21-02-01#2, N42° 07.433' W73° 21.280'

²² *KY*/17-35-06, *N*38° 21.740' *W*83° 36.931'

During Your Trip (continued)

More Photography Tips

Look for unusual places to take pictures. Like the picture on the right taken between a split rail near the **Green River Bridge**,²³ a 104' long Town truss in a remote section of Guilford, Vermont. It can be challenging to get to in any season.



Karl Young Photo



Karl Young Photo

Nighttime is an opportunity for special photos. For example, the interior of the **Pumping Station Bridge**²⁴ in Greenfield, Massachusetts, which was lit by the car's headlights. The bridge was built in 1972 to replace a previous covered bridge lost to arson on Halloween 1969. It was damaged by Tropical Storm Irene in August 2011 and repaired during the summer of 2014.

Some communities decorate their bridges for holidays, especially Christmas and the Fourth of July. Look for these opportunities for special photos such as this shot of Conway, New Hampshire's **Jackson or Honeymoon Bridge**²⁵ taken at night and decorated with Christmas lights.



Bob Watts Photo



Watch for unexpected opportunities such as seeing this deer at the **Hyde Hall Bridge**²⁶ in New York.

Karl Young Photos.



 ²³ VT/45-13-04, N42° 46.522' W72° 40.041'
²⁴ MA/21-06-02#2, N42° 38.789' W72° 37.215'
²⁵ NH/29-02-01, N44° 08.495' W71° 11.178'
²⁶ NY/32-39-01, N42° 47.412' W74° 51.809'

During Your Trip (continued)

While at the Bridge

Note the overall condition of the bridge. Do you see any damage or evidence of recent repairs? Look under the bridge if it is safe to do so. Is the floor supported by a wooden truss, steel beams or another method?

Notice the portal design. Some builders had a particular style while other styles might be common to a particular geographical area. For example, the **Smith or Ewbank Bridge**²⁷ in Rush County, Indiana has portals typical of bridges built by the Kennedy family who lived in that area. It includes the builder's name, date and ornate scrollwork.



Bill & Jenn Caswell Photo



Bill & Jenn Caswell Photo

What type of truss is it? Compare with the samples in this booklet to see if you can figure out which it is. Variations of truss designs are quite common. As a builder became more experienced, he may have found ways to improve on the design he used. The trusses in some structures are not always easy to identify and some do not match any known design. The **Zumbrota Bridge**²⁸ in Goodhue County, Minnesota is a perfect example. This bridge was originally built over the Zumbro River in 1869 and has been moved three times since then. Its truss is often mis-identified as a Town truss. The true origin of its design is not yet known.

"Safaris"

One of the best ways to expand your knowledge and meet new people is to join a trip hosted by one of the societies often referred to as safaris. Many of the groups plan one or more each year which typically last from one to three days. They travel together to see several bridges and often visit other local sites. There may be a modest price to participate to cover the costs of group meals and/or admission fees. The upper photo was at the **Riverdale Road Bridge**²⁹ during the NSPCB's 2018 trip to Ashtabula County, Ohio. The lower photo was at the **Mosby Creek Bridge**³⁰ in Lane County, Oregon during the NSPCB's 2017 Oregon tour.

One day trips gather at a pre-defined location. Multi-day events usually meet the night before where the leader shares details of the trip and often provides written directions of the planned routes and details of each stop. This is a great time to meet and get acquainted. Check society's websites for upcoming trips.

During the tour, the lead car and last vehicle, often referred to as the caboose, communicate with each other to keep the group together. About 20 minutes is spent at each bridge. Upon arrival, wait for folks to get photos of the bridge before approaching it.





Bill & Jenn Caswell Photos

²⁷ IN/14-70-01, N39° 38.010' W85° 24.987'

²⁸ MN/23-25-01, N44° 17.780' W92° 40.226'

²⁹ OH/35-04-22, N41° 40.400' W80° 52.300'

³⁰ OR/37-20-27, N43° 46.690' W123° 00.292'

Preservation

Of the more than fourteen thousand covered bridges which once dotted the North American landscape, less than eight hundred remain in the United States. About 2/3 of them are historic bridges and the others are modern truss-supported structures. At the end of the 19th century and beginning of the 20th century, iron, steel and concrete bridges began replacing wooden covered spans.

In the late 1940's and early 1950's, some individuals, being concerned about the rapid loss of these structures, formed preservation societies to save those remaining. Thanks to their efforts, along with an overall change in historic preservation policies, more covered bridges were being repaired, bypassed or relocated to save them from destruction. The **Owens Bridge**³¹ originally stood near Carlisle, Iowa. In 1939, the road was relocated and channel straightened leaving the old bridge abandoned without a road or river. The Carlisle High School Class of 1959 undertook a class project to restore the bridge and interested the Polk County Conservation Board in saving the bridge. In 1968, it



Bob Hamilton Photo

was moved to a park in Des Moines when its location was to be flooded for a reservoir project.



Karl Young Photo

While most are in rural or remote locations, some still remain in more populated areas and one still serves on the federal highway system. The **Philippi Bridge**³² in Barbour County, West Virginia is a 304' long, double barrel, Burr truss bridge built by Lemuel Chenoweth (1811–1887) in 1852. It carries US-250 over the Tygart Valley River. In 1938. a concrete bridge was built under it making the original trusses obsolete. Though vehicles are limited in height to 10'-3" the bridge carries many heavy vehicles daily. According to the nearby historical marker, on June 3, 1861, Union Troops overtook Confederate Troops who had occupied the bridge as the first land battle of the Civil War.

While the addition of steel I-beams or concrete to accommodate modern vehicles does help save the structure from being replaced, these practices are not preferred historic preservation techniques since the trusses no longer function in their original role. This compromises the bridge's authenticity and historic value. To inform bridge owners and contractors of preferred preservation practices, the National Park Service published two excellent books.



Covered Bridges and the Birth of American Engineering, published in 2015, is an indepth study of the development of American covered bridges and their place in the nation's history. *Guidelines for Rehabilitating Historic Covered Bridges*, published in 2019, showcases eleven covered bridge repair and restoration projects providing excellent guidelines for future projects.

Both books can be downloaded from the National Park Service's website. For more



details, visit https://www.nps.gov/hdp/project/coveredbridges/publications.htm.

³¹ IA/15-77-01, N41° 32.428' W93° 33.606'

³² WV/48-01-01, N39° 09.180' W80° 02.600'

Preservation (continued)



On average, arson claims two or three covered bridges per year. The **Watson Settlement Bridge**³³ in Aroostook County, Maine, a 170' long Howe truss bridge built in 1911 was by-passed in 1984. It burned on July 19, 2021 in a fire that is suspected to have been arson. Efforts to outfit the bridges with fire alarms, fire retardant and fire suppression systems help reduce the potential for destruction by arson. The NSPCB has a program to donate fire retardant. Visit their website for more details.

Karl Young Photo.

Natural phenomena such as floods, hurricanes, tornados, and forest fires continue to destroy these spans. On September 8, 2011, the **Siegrist's Mill Bridge**³⁴ in Pennsylvania's Lancaster County, was destroyed by Tropical Storm Lee. The 101' long bridge was rebuilt in 2013.



Karl Young Photos



Oversized vehicles driven by careless drivers are also responsible for damaging bridges. Steel beams, often referred to as "headache bars", can be placed near bridge entrances to help there. Even though the **Concord Bridge**³⁵ in Cobb County, Georgia is outfitted with multiple warning devices and signs, the headache bar is still hit by oversize vehicles multiple times a year.

Video cameras help reduce incidents of vandalism. Blount County, Alabama, saw a significant reduction in vandalism once cameras were installed in the county's three historic covered bridges. One of them was the **Swann Bridge**,³⁶ a 305' long Town truss bridge built in 1933. It is currently the longest covered bridge in Alabama. *Bill & Jenn Caswell Photos*.



You can help preserve our remaining historic covered bridges by notifying local authorities of vandalism or damage that you see during your visits.



³³ ME/19-02-01x, N46° 12.596' W67° 48.018'
³⁴ PA/38-36-37#2, N40° 04.565' W76° 28.258'
³⁵ GA/10-33-02, N33° 50.953' W84° 33.535'
³⁶ AL/01-05-05, N33° 59.855' W86° 36.089'

Covered Bridge Societies and Websites

National Society for the Preservation of Covered Bridges

Membership includes quarterly publications *Covered Bridge Topics* and *The Newsletter*. Membership year begins July 1. \$20 individual or family, \$350 life. Website: coveredbridgesociety.org

Indiana Covered Bridge Society

Membership includes the quarterly *Indiana Crossings*. Dues are for the calendar year. \$15 for individual/family, \$250 life. Website: indianacoveredbridges.org

New York State Covered Bridge Society

Membership includes *The Empire State Courier* and a Newsletter each published three times per year. Membership year begins March 1. \$15 individual, \$20 family, \$235 life. Website: www.nycoveredbridges.org

Ohio Historic Bridge Association

Membership includes the quarterly *Bridges & Byways*. Dues are for the calendar year. \$10 individual, \$15 family, \$250 life. Website: oldohiobridges.com/new

Theodore Burr Covered Bridge Society of Pennsylvania

Membership includes *Wooden Covered Spans*, issued once a year and newsletter, *Pennsylvania Crossings*, issued three times a year. Membership year begins October 1. \$15 individual, \$20 family, \$250 life. Website: www.tbcbspa.com

Vermont Covered Bridge Society

Membership includes the quarterly *Bridger* newsletter. Dues are for the calendar year. \$10 individual, \$15 family. Website: www.vermontbridges.org

Covered Bridges Conservation Association of New Brunswick

Membership includes the Association's annual newsletter. Membership year begins June 15. \$15 for individual or family membership.

Website: www.facebook.com/groups/CoveredBridgesConservationAssociationNB/



Marion Bonnet (1917–1996) NSPCB President 1972–1989

In Closing...

"When a group of people arrive, get out of their cars, examine and photograph the bridge, what seems so commonplace to the local residents, becomes impressive. ... The local residents begin to realize that the bridge must be very important and they begin to feel proud of it. They tell their friends and neighbors. This is the beginning of successful preservation, educating people to know the value of the structure, awakening them to its aesthetic and historical worth, as well as its practical function as a means of crossing the stream."

Prepared by



Help Preserve Our Heritage www.coveredbridgesociety.org

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