



# Balls Bridge and Truss Bridges: A Brief Historical Overview

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*Foreword: I composed this brief and informal overview of truss bridges and Balls Bridge to put this beautiful historic bridge's history and significance into context. A version of*

*this document with full-color photos is available on my website's Balls Bridge Page located at [www.historicbridges.org/ontario/balls/index.htm](http://www.historicbridges.org/ontario/balls/index.htm) which also has more information and photos. The general truss bridge information in this document was adapted from a formal research paper I composed. This paper, which cites the many different sources I used to produce the history of truss bridges, is available at [www.historicbridges.org/info/intro/trusshistory\\_c.pdf](http://www.historicbridges.org/info/intro/trusshistory_c.pdf) in PDF format.*



A bowstring truss bridge. | A pin connected truss bridge. | A rivet connected truss bridge.

The metal truss bridge features a network of metal beams arranged in a pattern based on triangles that work to support the bridge. The metal truss bridge was essentially the result of the transition from wood to metal for use in bridge building. Although experiments in metal bridges had been going on for many years, it was not until the 1870s that metal bridges began to take off and

began to be the preferred material over wood. During the 1870s, the bowstring truss became the preferred metal bridge structure type. By the early 1880s however, the bowstring truss bridge fell out of favor to the stronger and more easily designed pin-connected Pratt truss bridge. Pin connections allowed for easy assembly of the truss parts at the construction site, and required little skill to erect. From roughly 1880 through 1910, the pin-connected truss bridge was the most common bridge type built. The numerous bridge companies around at the time designed truss bridges to market to townships and municipalities. These companies, mostly free to design their bridges as they wished, would often develop their own style of truss bridge, which resulted in a wide variety of appearances from bridge to bridge. Some were simple, and relatively plain, while others were infinitely unusual and complex. Some companies added decorative builder plaques and decorations to their bridges to make them more appealing. By 1910 however, the increasing demand for standardization of bridge design by government entities caused the variety of design to decrease. Truss bridges were still complex and attractive structures, but the variety of design features decreased. In addition, availability of portable riveting machines caused pin-connected truss bridges to give way to truss bridges with the more reliable rigidity of riveted connections being preferred. Moreover, simple steel beam bridges, concrete girder, and arch bridges became viable and effective alternatives to truss bridges in many cases. After 1915 in Michigan, the state rarely built truss bridges of any kind. Ontario differed in that while it also began to build concrete and steel beam bridges, it also continued to build truss bridges on occasion, using riveted connections and later switching to bolted connections. These riveted truss bridges enjoyed popularity in the United States in many Midwest and eastern states (excluding Michigan) through the 1930s, particularly with larger crossings, although the truss bridge was no longer the only structure type constructed during this period in any state. The pin-connected truss bridge however fell from favor in construction in both the United States and Canada.



Pinned connection. | Riveted connection.



In 2004, this bridge | was demolished and replaced | by this bridge.

Today, the metal truss bridges that remain on today's roads face a complex and often-tragic situation. Most owners of these bridges, with their worries of safety, desires for minimal maintenance, and efficient roadways, see an old metal truss bridge as a structure that has been around on a road for far too long and usually recommend their replacement. For them,

the only purpose a bridge serves is a utilitarian function of serving traffic, usually vehicular in nature. These owners usually choose to replace historic metal truss bridges with modern bridges that have the appearance of little more than a slab of concrete. In addition, owners rarely leave an abandoned bridge standing when they construct a replacement bridge at a different location because of fears of liability. However, at the same time, many people have realized the value of the metal truss bridge as a historic artifact and a beautiful structure that

is so much more intricate and complex than the simple concrete or steel bridges built today. Currently in most cases, government response to this growing public demand has been minimal and is mostly limited to initiating surveys of historic bridges to determine which bridges are historic. With some exceptions, government does very little with their historic bridges beyond these assessments however. In Ontario, these bridges have and continue to face demolition, however in many cases Ontario repairs bridges as part of a routine maintenance, but rarely for the reasons of saving history. In the United States, where replacement is the preferred option over repair when dealing with deficient structures, these bridges face demolition even more frequently.



V-lacing on built-up beam | Lattice on portal bracing.

A number of factors make pin-connected truss bridges historically significant as a whole. Truss bridges represent a period in the development of bridge technology. Significant experimentation and developments occurred during this period as bridge design moved toward a general standardization. During the 1860s and 1870s, bridge companies received numerous patents in the United States, testifying to this period of development. The classic pin-connected Pratt truss bridge is what essentially came out of this by the 1880s. Pin-connected truss bridges are also a snapshot of materials used in

the period. A truss bridge may be made of wrought or cast iron, steel, or a combination of these. Most truss bridges make use of built-up beams that feature rivets and v-lacing, lattice, or battens which hold metal parts together to form a larger, complete beam. Some truss bridges may feature American Standard Beams, traditional i-beams that the wide flange beam has essentially replaced today. As a result, truss bridges are historically important to preserve as representative examples of technology used in a period of history.



Historic Balls Bridge

Specifically, there are elements that make an individual truss bridge such as Balls Bridge historic as well. With bridge inventories in the United States, as well as those done in Ontario, there is a specific set of criterion used for determining the historic significance of a bridge. Some of the important items that are considered are length of bridge, age of bridge, and historic integrity of bridge, documentation of its history, and association with events and people. Balls Bridge is significant in all of these categories. Balls Bridge, with its 1885 construction date, falls quite early into this period of metal truss bridges. Older bridges are usually rarer on today's roads. One reason is that they are older and thus fell into disrepair first. In addition, the bridge's builders designed these early bridges to handle

less weight since the load needs were not as high at the time, long before motor vehicles were even a thought. Balls Bridge has been a part of the Maitland River landscape for over 120 years! Balls Bridge appears to retain an excellent degree of historic integrity. Modifications to the structure due to of any repairs over the years have been minimal and have not affected the overall historic design of the structure. Many newer bridges in Ontario retain less historic integrity than this bridge! Although the amount of complete and easily accessed information available on bridges in Ontario is limited, there do not appear to be many pin-connected truss bridges remaining in the province. Other examples do exist, with varying ages and historic integrity. However, in my opinion, there are few enough pin-connected truss bridges at least in this region of Ontario, that every remaining example should be considered significant and worthy of preservation. Moreover, Balls Bridge, as a two span structure, is exceptionally rare, and stands out as a significant example among Ontario's remaining pin-connected truss bridges. Multi-span truss bridges are much rarer than single span structures, for various reasons. There are only five multi-span pin-connected highway through truss bridges in the entire state of Michigan! Between rarity of pin-connected through truss bridges in Ontario, further rarity of multi-span examples, coupled with early construction date and good historic integrity, the high degree of historic significance of Balls Bridge is clear, and preservation of the bridge is essential. Finally, although the bridge has no nationally significant individual yet attributed to it, many individuals have fond memories or associations with the bridge. Even the construction of the bridge back in 1885 resulted in a marriage between the bridge engineer and a member of the Ball family. More recently, a couple had wedding photos taken on the bridge in 2005. Many people have memories tied to this bridge, and preserving this bridge will help keep their memories alive and present an opportunity for future generations to have a memorable experience on the bridge.



The small pile of steel seen here is all of the steel in this bridge.



In Ontario, historic bridge inventories also take into consideration the aesthetic value of the structure in addition to its historical significance, something not usually done in the United States. Evaluating the aesthetic significance is extremely important as well. Beauty is an opinion that can vary from person to person, however there are certain elements of a bridge like Balls Bridge that I think explains the visual value a pin-connected truss bridge has. First, a truss bridge in itself is a complex bridge. Rather than a simple slab of concrete, a truss bridge, with its easily noticeable structure

creates an exciting climax that lets people know they are crossing a river. The truss structure, which geometrically is composed of different triangles, forms a unique geometric art that is in no other bridge type so clearly revealed.

This complex geometric beauty is only furthered by the presence of lattice and v-lacing on the members, chords, and bracing on the bridge, which further adds to the depth and complexity of the geometric pattern. With a through truss like Balls Bridge, one also experiences an exciting tunnel effect when crossing the bridge. Despite their complexity, and what might seem like many materials, the truss bridge actually uses fewer materials, and it uses them very efficiently compared to other bridge types. Visually, depending on one's mental perspective and physical location, people interpret truss bridges as large and imposing like a monument, or at the same time may describe them as a lightweight and delicate structure. Modern bridges typically cannot invoke such a wide variety of interpretations as a historic truss bridge can. Finally, Balls Bridge is a bridge that compliments, and is complimented by, its surrounding landscape of the Maitland River. This is especially noteworthy for Balls Bridge because the bridge is a part of the Maitland Trail, which means it is important for there to be something special for trail users to see, and suggests the value of the bridge as a tourism asset. The network of trusses that compose the bridge lend themselves well visually to the network of branches on the trees which surround the bridge. The truss bridge itself is a noticeable structure, yet it is not gaudy or overpowering. It is not a flat piece of steel or concrete that blocks the view of the river. A visitor's eyes can easily spot the trusses of the bridge, yet the open design of a truss bridge also allows one to look beyond the bridge to the scenic river that gives the bridge its purpose.



This bridge is noticable and impressive, yet also blends in.



Historic Balls Bridge

I firmly believe that the preservation of Balls Bridge is essential for the reasons have presented. In conclusion, there is one more asset that Balls Bridge has that offers further reason to preserve it - community support. Demolition of historic bridges in rural areas occurs all too frequently because few people live near the bridge, know about the bridge, or understand why it is important. Balls Bridge is a special case where, despite the bridge's rural location, there is significant community awareness and concern regarding the bridge. People are aware of Balls Bridge and a real community desire to preserve the bridge is present. Balls Bridge is truly rare and truly significant. For history, for beauty, and for community, Balls Bridge deserves a full restoration!