



bridge news

Spring 2007

Contents

The Preservation of Historic Bridges **1**

By Pat Sparks

Adventure In Saving Indiana's Cultural Heritage, Part 2 **6**

By Paul Brandenburg

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The c. 1889 Lampasas River Bridge in Bell County collapsed on February 4, 2006, when a vehicle struck the northwest end-post during a police chase. It was one of a handful of wrought-iron Whipple through-trusses remaining in Texas. Photo by Trent Jacobs.

The Preservation of Historic Bridges

By Pat Sparks

Introduction

Historic bridges constitute an important cultural, technological, and functional link to our past. Sadly, in spite of growing awareness of historic bridges and cultural

resources in general, we continue to lose historic bridges at an alarming rate, more than fifty-percent over the past twenty years, according to one estimate. Still, as many as 30,000 bridges nationwide

may be eligible for National Register designation. However, almost all of these bridges are considered structurally deficient or functionally obsolete, and pressure to replace them is mounting.



2: A 1930s WPA stone arch bridge, Austin, Texas. Photo by Patrick Sparks



3: The Broad Street Bridge in Mason, Texas, is an example of a rare concrete truss bridge. Photo courtesy of Historic American Engineering Record.

The physical risks to historic bridges include deterioration, impact damage from vehicles or barges, flood, and overload. Sometimes these conditions lead to collapse, as in the example of the Lampasas River Bridge in Bell County, Texas (see the Summer 2006 issue of *Bridge News* for a related story). Fortunately, the risk of collapse can usually be minimized with a modest investment in proper maintenance and repairs.

While a loss to neglect and physical forces is tragic, an even greater risk to historic bridges is planned replacement, resulting from a lack of awareness of alternatives, and scarcity of funding for preservation.

This article addresses several areas that are fundamental to the preservation of historic bridges: significance, risk factors, alternative uses, funding, and advocacy.

Significance

The nation's preservation community does not have a clear idea of how many historic bridges there are, and which ones are the most significant. Although each state is required to have an inventory of their historic bridges, many of the inventories are incomplete

or inaccurate. Also, most local preservationists are not familiar with, and have no access to, the inventory databases.

Historic bridges comprise a wide range of types and materials. Most people are familiar with the metal truss bridges that were common in the late nineteenth and early 20th century, but there are also many types of masonry and concrete bridges.

In evaluating the significance of a historic bridge, the usual National Register criteria apply, but additional factors should be considered as well. Most historic bridges were designed by engineers or builders, not architects. Often the engineers worked for manufacturers, contractors, or governing authorities (e.g., the railroad). Structure type, materials, methods of design, and technological advances are key elements in establishing significance, as opposed to aesthetics. The graceful beauty of a bridge derives primarily from its mathematical and geometric expression of structure. Decorative features do not affect significance to the extent they do in architectural heritage. For these reasons, it is important for historians or others evaluating the significance of a

bridge to understand the history of engineering technology.

For example, in early concrete bridges, much of the engineering significance may be in the steel reinforcement system, which is not visible, and for which documentation is rare. In metal truss bridges, the kind of metal becomes a consideration due to rapid technological change. Whether a bridge is made of wrought iron, of which few remain, may determine if it is more or less significant than a similar bridge of steel. Another example is the combining of multiple types of metal in one structure, such as the Hays Street Bridge in San Antonio, an 1881 Whipple through-truss that has cast-iron joint blocks, wrought-iron chord members, and steel pins.

Although the National Historic Preservation Act (NHPA) specifically identifies some categories that are usually not eligible, such as reconstructed or relocated structures, this rule does not necessarily apply to truss bridges, which were routinely moved, re-erected, or even combined with parts of other bridges. Engineers generally see these activities in themselves as contributing to significance.

Note that characteristics of condition, traffic volume, and maintenance difficulty should not be considered in determining historic significance.

Preservation Alternatives

Another key aspect of preservation is the identification of alternative ways of preserving historic bridges. Selection of a preservation alternative depends on many factors, including the condition of the bridge, site considerations, traffic conditions, cost, government regulations, legal liability considerations, commercial conditions, and local interest in preservation.

The following is a generally preferred hierarchy of choices:

1. Continued vehicular use in its present location. If widening, repair or strengthening is needed, it should be done discreetly.
2. Continued vehicular use as part of a one-way pair in its present location, with a new adjacent span.
3. Continued vehicular use at another site.
4. Reuse as a pedestrian or bicycle bridge.
5. Architectural adaptive use, such as a restaurant.



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Photos

Acceptable file types: jpeg, tiff, pdf, eps

Resolution: 300 dpi

Dimensions: at least 3 inches tall by 3 inches wide

Email files: histbrdg@gte.net

Mail: Historic Bridge Foundation
PO Box 66245
Austin, Texas 78766

4: A top-chord pin connection from the 1881 Phoenix Whipple truss on the Hays Street Bridge in San Antonio. The bridge contains three distinct materials: wrought-iron, cast-iron, and early steel. Photo by Patrick Sparks

6. Salvage and store for reuse. It should be match-marked, carefully disassembled, and stored, with the intent that at some future time and place it could be rebuilt.

7. Set off as a historic ruin, making provisions to minimize the rate of decay.

8. Salvage selected components of the bridge that would be otherwise destroyed. These components could be made into exhibits, or used for engineering research.

9. Demolish after documentation with drawings and photographs to HAER standards.

As an example of alternatives, consider the case of similar Parker trusses. Bridges of this type from the 1920s and 1930s tend to be well-constructed robust structures. They often have less width and vertical clearance than is now required in new construction, but rarely do they have major structural deficiencies. The Llano River Bridge in Texas is likely to remain in service because citizens rallied to save it and engineering studies validated its structural capacity. The U.S. 90 Bridge over the Nueces River in west Texas was continued in service as part of a one-way pair.

Similar bridges on U.S. 377 and on SH 29, both over the Colorado River, were bypassed with new bridges. The U.S. 377 Bridge was cut-off entirely from vehicular and pedestrian access. The SH 29 Bridge is accessible to pedestrians, but is enclosed in a historically inappropriate chain-link fence.

Strategies for Preservation

Along with the realization that the nation's bridges are in disrepair has come a growing awareness among preservationists that bridges need attention as legitimate objects of preservation. At the same time, almost all historic bridges are seen as liabilities by transportation authorities and are considered *de facto* candidates for replacement.

Local Support

As with any preservation effort, success is determined largely by the momentum of local citizens and organizations. The key is to identify an area's most important bridges as soon as possible, and begin to create public awareness—not only of the significance, but also of the feasibility of restoration. It is particularly important to bring civic leaders into agreement with

the idea of saving the bridge. While most historic buildings are privately owned, essentially all historic bridges are owned by a city, county, or state government.

Actual implementation must occur at the state and local levels. In fact, most bridges of historic significance are on county or municipal road systems, rather than part of the federally-funded highway system.

It is also common for local citizens and other interested parties to learn about replacement plans only after those plans are fully developed and have gained momentum, making it harder to rally support or to change the governing authority's intent. Engaging the city or county engineers, and the DOT district staff early on will help.

Section 106 and Section 4(f) Processes

Because many transportation projects use federal money, it is usually possible for preservation advocates to make use of the available review processes required by federal laws. When federal funds are involved, then the National Historic Preservation Act (NHPA)

Section 106 review process is required. This is the same review process as required when federal actions affect historic buildings and sites.

Another federal law concerning historic preservation of bridges is the U.S. Department of Transportation Act of 1966, Section 4(f), which bars federal transportation programs from using land from a publicly-owned park, recreation area, or wildlife and waterfowl refuge, or any significant historic site unless a determination is made that there is no feasible and prudent alternative to the use of land from the property; and the action includes all possible planning to minimize harm to the property resulting from such use.

It often seems that the Section 106 and 4(f) reviews are just a formality, with replacement being a foregone conclusion. Nevertheless, the time bought by the process, and the opportunity for public involvement, have been crucial in saving historic bridges. While some efforts have been made by DOTs at "streamlining" the process to avoid delays, for those who wish to save a bridge, it is better to buy time, which means using the process to its full intent.



Three similar Parker through trusses with different outcomes: (a) Llano River Bridge was once slated for removal but will be rehabilitated and kept in vehicular service, (b) The US 90 Bridge over the Nueces River was successfully kept in service as part of a one-way pair, and (c) the Colorado River bridge on SH 29 was bypassed and converted to pedestrian use, albeit with an inappropriate chain-link fence. Photos by Patrick Sparks

There are a number of things that can be done locally to strengthen the preservationist's position in the review process. Seek nomination to the National Register for Historic Places for the bridge and nearby structures. In an urban area, try to include the bridge as a contributing element to a historic district. Identify existing parklands, recreation areas, refuges, and historic sites in your area and their relation to significant bridges. Ideally, try to proactively establish such areas in proximity to the most important bridges, before replacement plans have been developed, so the Section 4(f) review will be triggered and the chances for preservation will be greater.

Engineering

Typically, the DOT will assert that a historic bridge is structurally

deficient and/or functionally obsolete. While it is true that many older bridges are deficient or obsolete, these two things do not necessarily mandate replacement. Obviously, all bridges that are not "up to code" should be replaced, nor do they need to be. Therefore, it is important to query the authority about the specifics of their assessment.

It is possible to rehabilitate a historic bridge in a manner that maintains the historical integrity of the bridge. However, most DOTs insist on rigid adherence to design standards for new bridges and roadways, which may not be appropriate for historic bridges. Although there are provisions under which the standards may be relaxed, they are rarely invoked.

An independent engineering evaluation is often needed to

determine whether the bridge is structurally deficient or if its functional characteristics can be improved short of replacement.

All bridges in the U.S. must be inspected biannually, with the results of that inspection being recorded in the condition ratings for the superstructure, substructure, etc. The condition rating numbers are then used in a complicated formula to arrive at the sufficiency rating, a single number that is used by the state DOTs and the FHWA to decide which bridges are to be replaced or rehabilitated. When attempting to save a historic bridge, it is crucial to review the inspection reports and the condition ratings to see what factors are affecting the sufficiency rating. In most cases, the sufficiency rating of the bridge declines over time, as expected, because the condition of the

structure deteriorates. Generally, however, structural deterioration is a slow process, so a rapid lowering of the scores indicates a need for closer examination.

Closer examination of the design and planning assumptions, structural condition, and cost estimates may help to understand which measures are necessary, and which might possibly be relaxed. Here are a few examples:

1. Rather than widening or replacing the bridge it may be possible to dramatically improve safety simply by reducing the posted traffic speed, improving the lighting and signage, adding guide rails, and providing traffic-calming features to the roadway.

2. Often repairs and maintenance are a much lower cost than replacement: repair damage to members, seal deck joints, upgrade the railing, install lighting, and perform maintenance painting.

3. Consider alternative routes for heavy traffic. A truck spur around the heart of a historic city can remove heavy vehicles from downtown, increase the traffic volume of the roadway, and improve safety of the downtown area.

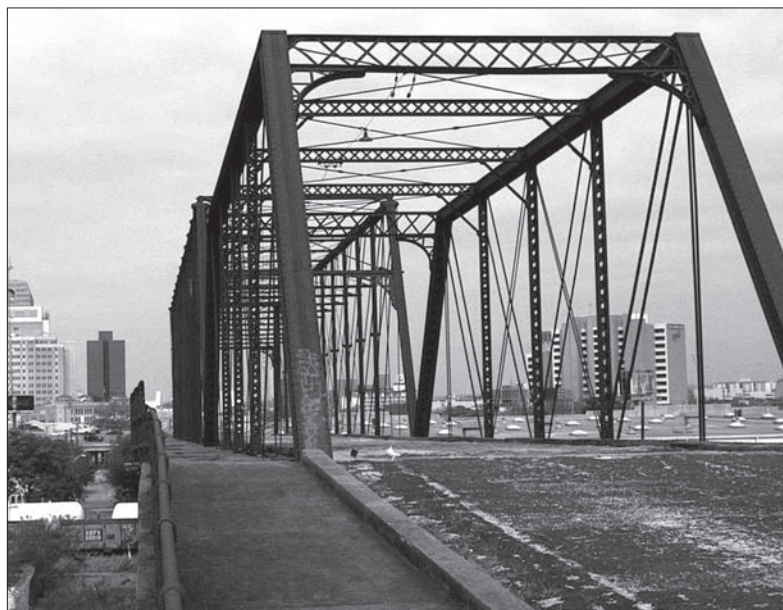
Advocacy Groups

A number of organizations focus on saving historic bridges. The Historic Bridge Foundation (HBF) provides a clearinghouse of information and helps local entities develop strategies for saving bridges. The National Trust for Historic Preservation (NTHP) has supported local advocacy actions, legal advice, and emergency engineering studies of endangered bridges. HBF and the NTHP often work together. Examples of this partnership include the U.S. 83 Bridge in Collingsworth County, Texas and the Amelia Earhart Bridge in Atchison, Kansas.

The American Society of Civil Engineers (ASCE) supports the maintenance, repair and rehabilitation of historic bridges, preferably in continued vehicular use, and when that is not possible, in an alternative transportation means such as a pedestrian or bicycle bridge. ASCE's support includes nominations for Civil Engineering



6: 1887 Faust Street Bridge, New Braunfels, Texas, rehabilitated to pedestrian and bicycle use in 1998, using Transportation Enhancement funds. Photo by Patrick Sparks.



7: 1881/1910 Hays Street Bridge in San Antonio, rehabilitation as a pedestrian and bicycle bridge using Transportation Enhancement funds, scheduled for completion in early 2008. Photo by Patrick Sparks.

Landmarks, and local/regional chapter involvement in direct efforts to save bridges, as occurred with the Hays Street Bridge in San Antonio.

Funding

Bridge rehabilitation is, like building preservation, a sometimes costly endeavor. Costs are generally in proportion to bridge size, running approximately \$500 per linear foot to over \$2,000 per linear foot, depending on type, condition, complexity, and location. Unfortunately, there are few sources of funding specifically for historic bridges.

Since most historic bridges are on local road systems, funding is scarce unless provided or matched by federal-aid, but these funds are focused almost entirely on new construction and replacement projects, and rarely on saving historic bridges. State maintenance funds go mostly to routine pavement overlays, sealing, and minor repairs to bridge railings.

The establishment of the Transportation Enhancement Program in 1991 offered broad opportunities and federal dollars to undertake unique and creative actions to integrate transportation into our communities and environment, including historic preservation.

Ten percent of each state's

Surface Transportation Program (STP) funds were set aside for enhancements. By federal law, these funds were to be used for transportation enhancements and for no other purpose. Over the history of the program, the Texas Department of Transportation (TxDOT) awarded an estimated \$466 million to a total of 505 enhancement projects.

The enhancement program naturally became the largest funding source for historic bridge preservation in the United States. Two notable examples in Texas to receive enhancement grants were the 1887 Faust Street Bridge (1998) and the 1881/1910. Unfortunately, the Texas Transportation Commission has recently halted all enhancement spending, which is a devastating blow to bridge preservation and other worthwhile projects.

Conclusion

Over half the historic bridges of the United States have been destroyed during the last twenty years. Although many historic bridges can remain in service given appropriate repairs and maintenance, they remain at risk due to overly rigid transportation standards and lack of funding.

Vehicular use is the best preservation alternative because it keeps the bridge in highway

maintenance, inspection and funding programs. When not possible to continue in vehicular use on primary roads, consideration should be given to relocating historic bridges to roads receiving lighter volumes of traffic, or converting to pedestrian use.

Saving historic bridges means rallying local support, engaging the responsible authorities, and using established regulatory processes to advantage. It also means finding money, at task made much more difficult in Texas by the retraction of the Transportation Enhancement program.

As the preservation community grows in its awareness of the importance of historic bridges, so do the opportunities for saving these engineering icons.

Patrick Sparks, P.E. is currently board president of the Historic Bridge Foundation and is also president of Sparks Engineering, Inc., an engineering firm specializing in evaluation and rehabilitation of existing structures. He is a Professional Fellow of the Center for Heritage Conservation at Texas A&M University, and is a member of the Association for Preservation International, the American Society of Civil Engineers, and the Structural Engineers Association of Texas.

Resources

Historic Bridges: A Heritage at Risk: A Report on a Workshop on the Preservation and Management of Historic Bridges, <http://www.srifoundation.org>

Historic American Engineering Record – HABS/HAER Collection, Library of Congress, http://memory.loc.gov/ammem/collections/habs_haer/

Digital Bridges - A collection of representative 19th century American bridge engineering monographs, manuals, and documents from the Lehigh University Libraries' Special Collections, <http://bridges.lib.lehigh.edu/>

Chamberlin, William P, *Historic Bridges-Criteria for Decision Making*, Synthesis of Highway Practice 101, Transportation Research Board, October 1983.

Texas Department of Transportation – *Historic Bridge Manual*, <http://manuals.dot.state.tx.us/docs/colbridg/forms/his.pdf>

Zuk, William and Wallace T. McKeel, Jr., *Adaptive Use of Historic Metal Truss Bridges*, Transportation Research Record 834, 1981.



Adventure In Saving Indiana's Cultural Heritage, Part 2

By Paul Brandenburg

Photos are by Paul Brandenburg

In Part 1 of his article (published in the Fall/Winter 2006 edition of Bridge News), Paul discussed how efforts to preserve the Wilson Bridge, a 1898 Pratt through-truss, led to an alliance with local, state, and national entities to force correct application of the Preservation Act of 1966 and the Transportation Act of 1966. This alliance progressed to the creation of the Indiana Historic Bridge Task Force and the Historic SPANs Task Force to develop a historic bridge rehabilitation program for Indiana.

"You amble down an Indiana country road and suddenly come upon a site as cherished as the first firefly of summer, as nostalgic as a 4th of July picnic. It's a historic bridge, and whether made of stone, metal or wood, it has stood the test of time...until recently."

This statement began the listing of Indiana's historic bridges to the National Trust for Historic Preservation's 2002 list of America's 11 Most Endangered Historic Places. The challenge was to the point: "Indiana needs a

bridge preservation plan that takes a comprehensive look at these endangered resources throughout the state and sets clear priorities for preservation, with funding to allow for rehabilitation." While Indiana preservationists applauded the listing, this was only the beginning of a journey requiring focused coordination across the state. Within a few short months of the listing, Historic Landmarks Foundation of Indiana announced the formation of the Indiana Historic SPANs Taskforce to safeguard the cultural heritage represented by Indiana's historic bridges by developing a comprehensive historic bridge rehabilitation program for Indiana.

Influencing entrenched public policy is not easy. Looking to the future, SPANs reviewed existing policy and developed the Indiana Historic Bridge Framework, with a range of strategies that include:

- Establishing comprehensive and consistent historic review criteria
- Conducting a statewide historic spans survey and review

- Recognizing the need for early involvement of local & state preservation advocates in transportation projects involving historic bridges
- Establishing the necessary oversight to ensure consistency and quality of 106 / 4(f) management by consulting engineers
- Providing greater oversight of Section 106 / 4(f) process by FHWA-IN--especially in the area of defining the Purpose &

Need for transportation projects involving historic bridges

- Establishing funding for the rehabilitation of historic bridges
- Encouraging the adoption of AASHTO Guidelines for Low-Volume Local Roads in Indiana's bridge inspection and funding process
- Providing greater support for local transportation planning and context sensitive design

While this framework served as the basis for advocacy with the Federal Highway Administration (FHWA), Indiana Department of Transportation (INDOT), the State Historic Preservation Office (SHPO), and the Advisory Council on Historic Preservation (ACHP), SPANs recognized the need to maintain pressure on the existing system to follow federally-mandated review guidelines and to make sure local preservation interests were included when dealing with historic structures. Representative of this struggle was the problem that occurred when FHWA-IN established a task group to develop a Programmatic Agreement for Historic Bridges. A variety of organizations outside the agency were engaged initially, but representation from the preservation community was deliberately excluded. In





response, SPANs identified threatened structures for inclusion in a “Watch List,” ultimately working with the National Trust and legal counsel in the role of “Consulting Parties” for twenty-three distinct transportation projects. This has required SPANs members to conduct a detailed analysis of each project in preparation for engagement at “Consulting Party” meetings and activities. Furthermore, certain projects were identified as legal test cases for potential litigation regarding the enforcement of federal law under Section 106 of the National Historic Preservation Act and Section 4(f) of the Transportation Act of 1966. In an effort to encourage more effective communications with federal/state agencies and the preservation community, SPANs took the approach of “transparent” communications with FHWA-IN. For example, SPANs shared concerns and plans for legal action. In addition, federal and state agency representatives were invited to participate in SPANs meetings in an effort to bridge communication and find common ground for moving forward. This direct engagement approach has resulted in a noticeable shift among the transportation agencies in their attention to preservation interests, with Historic Landmarks and SPANs eventually being asked work

with the group developing the Programmatic Agreement.

The strategy of focusing on the Indiana Historic Bridge Framework while maintaining pressure on existing projects has yielded results. In late 2006, a Programmatic Agreement regarding the management and preservation of Indiana’s Historic Bridges was signed between the Federal Highway Administration, the State Historic Preservation Office, the Advisory Council on Historic Preservation, and the Indiana Department of Transportation. The first major provision of the Programmatic Agreement was the completion of a survey detailing the status of all potential historic bridges constructed prior to 1966. Currently underway by Mead & Hunt, the first phase will survey over 6000 public bridges to determine National Register eligibility based on criteria specific to the context of Indiana’s transportation history (see the Indiana Bridges Historic Context Study at <http://www.in.gov/dot/programs/bridges/pubs/INBridgesStudy.pdf>).

In the second phase, each National Register eligible span will be identified as either “Select” or “Non-Select.” The Programmatic Agreement defines “Select” bridges as those most suitable for preservation and are excellent examples of a given type of historic bridge. Since the criteria to be used to make these determinations will

be developed as a part of the survey process, SPANs, along with Historic Landmarks, is mobilizing the preservation community to engage in the public involvement process as the decision criteria is developed and applied for each bridge. With the completion of the survey in 2008, all new transportation projects involving historic bridges will follow the processes outlined in the Programmatic Agreement with the exception of National Historic Landmarks.

The second major provision of the Programmatic Agreement defines the process necessary to satisfy the historic review requirements of Section 106 and to ensure designs are reviewed for context sensitivity once a bridge is determined to be “Select” or “Non-Select.” As a compromise between preservation interests and bridge owners, “Select” bridges would not be demolished if part of a transportation project involving federal or local funding. Instead, preservation for continued use, bypassing, or relocation would be the only acceptable alternatives. “Non-Select” bridges would be demolished if it were shown that the preservation options listed above are not feasible and prudent after a streamlined historic review process with limited public engagement is conducted. In addition, INDOT is required to develop standards for rehabilitation of bridges on low volume roads for inclusion

in the Indiana Design Manual. Since these standards will be used in determining if rehabilitation is feasible and prudent, SPANs is conducting extensive research in order to provide guidance consistent with current historic bridge engineering practice, 4(f) language, and interpretation of court decisions recently followed in Indiana.

With the signing of the Programmatic Agreement, SPANs asked what remains of the original Indiana Historic Bridge Framework that requires focused activity. Without a doubt, affecting public policy to ensure the availability of funding sources for the rehabilitation projects identified during the survey process tops the list. A close second is the commitment to context sensitive solutions and transportation planning. Finally, even with a Programmatic Agreement that may serve as a model for other states struggling with the issue of historic bridges, there continues to be a need for a “watchdog” function to ensure consistency and quality of Section 106 / 4f process management by consulting engineers.

A copy of the programmatic agreement may be found at <http://www.in.gov/dot/programs/bridges/inventory/index.html>

Paul Brandenburg is chair of the Indiana Historic SPANs Task Force.





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