Washington Avenue Bridge, Waco, Texas

Location and Description of Setting:

The Washington Avenue Bridge spans the Brazos River in downtown Waco, McLennan County, Texas. It is located 200 yards west of the Waco Suspension Bridge (built in 1870 and listed in the National Register in 1970). Built for two-way traffic, both traffic lanes on the Washington Avenue Bridge now run in one direction (southwesterly), carrying vehicular traffic. Pedestrian traffic continues in both directions.

The area surrounding the Washington Avenue Bridge is predominately flat, with a sharp drop at the riverbank. The bridge is level with the elevation of the surrounding roads. The river, on average, is approximately 380 feet wide and 20 feet deep. A public park encompasses the riverbanks in the vicinity of the bridge.

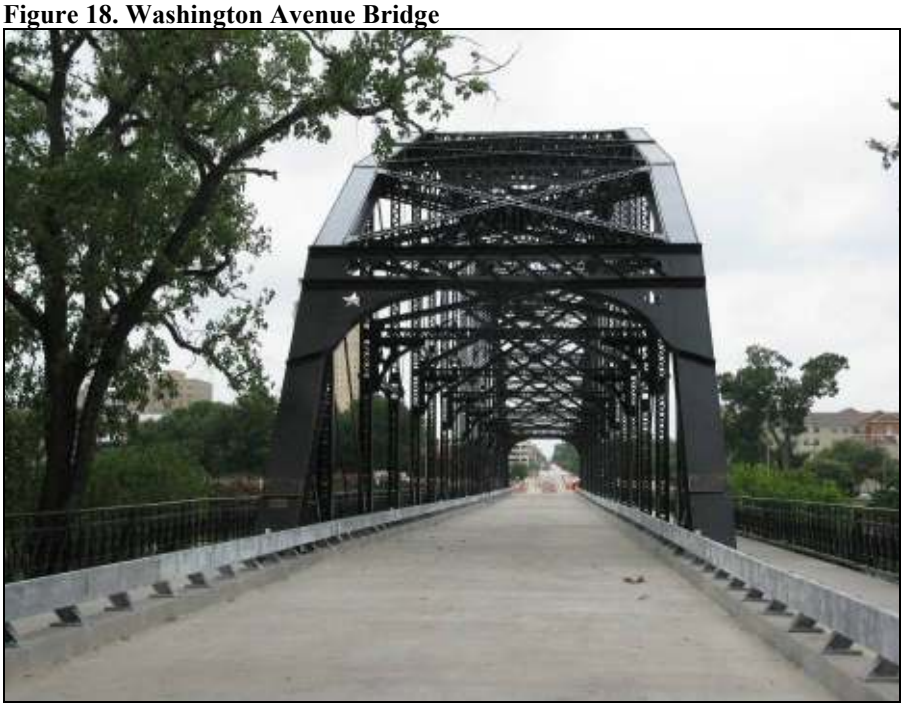
Description of Bridge:

The Washington Avenue Bridge, built in 1902, is a pin-connected, steel Pennsylvania through-truss. The length of the main span is 450 feet. Two approach spans measure 67 feet on the east side and 40 feet on the west, resulting in a total length of 557 feet. The total width, including roadway and sidewalks, is 41.5 feet. At its highest point, the truss is 60 feet above the road surface. The bridge was listed in the National Register in 1996.

Currently in excellent condition, the Washington Avenue Bridge maintains a high degree of historic integrity. The bridge derives its significance as an excellent example of pin-connected, Pennsylvania truss bridge in the State of Texas. At the time of its construction, the Washington Avenue Bridge was the longest single-span truss bridge in the southwest. Today, the bridge is the longest and oldest single-span vehicular truss bridge still in use in the United States. The bridge contains a high percentage of original material and is still used for its intended purpose.

Figure 17. Washington Avenue Bridge

Figure 18. Washington Avenue Bridge



Rehabilitation Project Information

Date/Cost for Rehabilitation:

Rehabilitation took place in 2009, at a cost of $4,791,712.

Project Designer:

The design for the rehabilitation was done by the Texas DOT (TxDOT) in-house Bridge Division team.

Bridge Owner/Client:

The City of Waco, Texas

Source for Additional Information:

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Project Information

1. **Significant issues associated with project (e.g., bridge condition, reasoning behind decision to rehabilitate versus replacement, reasoning behind selected maintenance activity).**

   The condition of the bridge prior to rehabilitation was "Fair condition – minor deterioration of structural elements (extensive)." The weakest element of the bridge was the superstructure, which was rated as being in fair condition. The main problems were fractured eyebars in the main truss, as-built capacity of several truss members significantly understrength for the required operating loading, and extensive corrosion of metal below the level of the deck.

2. **Project description, including purpose and need.**

   In 2009, the City of Waco and the TxDOT rehabilitated the Washington Avenue Bridge for continued vehicular and pedestrian use. The purpose of the project was to provide a safe and efficient crossing of a vital link between two city streets. The need for the project included the safety concerns for the deterioration of steel members and concrete approaches of the bridge. A paint analysis determined the bridge historically was black, so it was returned to its original color.

   The rehabilitation included:
   - removing the traffic railing and replacing it with a new crash tested rail,
   - removing the concrete deck and sidewalk and replacing them with a new concrete deck and sidewalk,
   - repairing or replacing steel bridge members (less than five percent of original materials replaced),
   - cleaning and painting all material (metal painted black; concrete washed), and
   - reinstalling and painting the existing pedestrian bridge rail.

3. **Traffic levels, loading needs, and other related issues.**

   In the final recommendations after the most recent inspection, the Washington Avenue Bridge was approved for continued use with a gross loading limitation of 32,000 lbs., and a maximum axle or tandem load of 21,000 lbs.

4. **Section 106 effects finding (no adverse, adverse). Major issues discussed with State Historic Preservation Officer, and how issues were resolved.**

   TxDOT, in consultation with the Texas SHPO, determined that the rehabilitation resulted in No Adverse Effect. A major issue was the proposed lighting for the bridge. The issue was resolved by replacing existing cobra fixtures with new bell-shaped fixtures and arms in the same locations at the same wattage. This approach is similar to what was done on other historic bridges in Texas that required lighting.

5. **Lessons Learned.**

   To achieve the best results for historic preservation, informal coordination and on-going consultation between all parties is extremely important. TxDOT continually consulted with the city and SHPO both before work began, and as unexpected design needs occurred during construction.

For example, early in the project an issue arose over the procedure and detail for replacing the existing sub-tie eyebars. The original design specified cutting the eyebar from the upper pin and installing the replacement with a welded detail. At the lower connection, however, the eyebar was to be extracted by unstacking the pin pack, followed by restacking the pin pack using a new eyebar having a conventional eye detail. The project contractor proposed using a welded detail for the lower connection similar to the upper connection detail, but modified to adapt to the specific problems of the unprotected lower connection. By avoiding unstacking and restacking the pin, the potential for damaging adjacent members was reduced. After much discussion, the contractor, TxDOT, and the SHPO determined that this work would replace the historic details in a sympathetic manner and in accordance with the *Secretary of the Interiors Standards for the Treatment of Historic Properties* (Weeks and Grimmer 1995). The visual difference was minor since the detail is about 40 feet above the deck of the bridge. The proposed approach was therefore suitable for both engineering and preservation goals.

As a result of the close access afforded by construction scaffolding, other conditions were discovered during construction that warranted changes to the work as planned:

- After blast cleaning, excessive corrosion of several pin-bearing plates was discovered. Analysis for a retrofit of the corroded plates also revealed that some of the uncorroded pin plates were understrength as originally designed. Retrofits were designed and installed for both conditions.
- After cleaning and installation of the sub-ties was completed, close inspection of all mid-pins was carried out. This revealed that the eyebars of the mid-span counters had slipped from the pin shoulders and were bearing on the pin threads. Using the procedures developed for detensioning the sub-tie eyebars, the project contractor was able to reset the counters. Another change involved installing a retainer clip detail to secure the connection.

The main lesson learned is that rehabilitation on a project of this complexity requires on-going engineering inspection, analysis, and design to detect and address conditions that may not be detectable until after cleaning and deconstruction have begun. Cooperation between the design engineer, the construction engineer, and the project contractor is essential to take full advantage of the construction process and maximize the long term preservation potential for the structure.