The Tacoma Bridge, Past to Present

Raquel Escatel
May 12, 2003
1.011 Presentation

Tacoma Narrows

• For years it had been clear to Washington State officials that the Tacoma Narrows would have to be bridged in order to open up the thinly populated Peninsula.

Solution:

• Washington State Legislature created the Washington Toll Bridge Authority in 1937 with a mandate to finance, construct and operate toll bridges.

Olympic Peninsula

First Tacoma Narrows Bridge

• The first Tacoma Narrows Bridge, linking Gig Harbor to Tacoma, was open to the public on July 7, 1940 after two years of construction.
• The bridge would cut at least fifty-nine miles off the trip between Tacoma and Bremerton.

Safety versus Appearance

• Since the turn of the century, suspension bridge construction valued structural grace and slenderness to achieve an artistic appearance.
• With its shallow stiffening trusses and slender towers, the Tacoma was the epitome of artistry in bridge construction. These features, however, led to its destruction just four months after its completion.
The Collapse

- The failure of the bridge on November 7, 1940 brought engineers world-wide that to the realization that aerodynamics phenomena in suspension bridges was not adequately understood and in this case, completely neglected.

Reconstruction

- For the next ten years, Tacoma and the Olympic Peninsula were once again unconnected.
- Due to WWII, the salvaging of the 1940 bridge, an earthquake and a fire, the construction of the bridge began in 1948 and was opened to the public on October 4, 1950.

Existing Bridge

- Although the bridge was designed to carry a maximum of 60,000 cars a day, it now carries nearly 90,000.
- Three to four hour backups along connecting highways are common during rush hour.

Efficiency

- There are currently 85,000-90,000 vehicles that use the bridge. This number is expected to increase to 120,000 in the year 2020.
- In order to accommodate these changes, a new suspension bridge is being built parallel to and south of the existing bridge.

Improvements

- New bridge will include a separate path for bicycles and pedestrians, emergency stops, as well as seismic improvements.
- The new span will increase the capacity of the bridge by 70%.

Costs

<table>
<thead>
<tr>
<th>Total Cost</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Galloping Gertie</td>
<td>$6, 400, 000</td>
</tr>
<tr>
<td>Present Bridge</td>
<td>$14,000,000</td>
</tr>
<tr>
<td>Improved Bridge</td>
<td>$800,000, 000</td>
</tr>
</tbody>
</table>
Externalities

• Native American Tribes were consulted concerning the Unanticipated Discovery Plan, which includes a provision for the discontinuation of working upon the discovery of possible archaeological or human remains.

Benefits

• In comparison, it would 5.56 Titanics to occupy the space that Galloping Gertie now occupies, making it the largest man structure ever lost at sea.
• In addition, the current swept bottom of the Narrows has now become the largest single man made reef supporting an abundance of marine life.

Summary

• The remains are also a permanent record of man’s ability to build structures without fully understanding the implications of design and the forces of nature.
• So the failure of the bridge was not a complete loss. The failure of the bridge led to aerodynamic testing as a standard procedure for structural analysis of all suspension bridges.

References

• In the Wake of Tacoma, ASCE Press, Scott, Richard, 1956
• Tacoma Narrows Bridge Failure, ASCE, 1947
• www.wsdot.wa.gov
• www.expedia.com