Program: Bridge Accidents and Repair
Speaker: Michael Wenning, PE
Introduced by: Vic Wenning
Attendance: 86
Guests: Donna Holl, Melanie Harmon, Salim Najjar
***Scribe*:** John Peer
Editor: Bonnie Carter

Today's presenter was Michael Wenning, PE, son of Club member Victor Wenning. Mike graduated from Purdue in 1981 in Civil Engineering. He also served in the Coast Guard. Currently he is Director of Transportation Services for the Midwest for GAI Consultants and is the "on call" PE for bridges for the Indiana Department of Transportation. Mike has 36 years of bridge experience including 300+ new bridges and 425+ bridge rehabilitation projects. Co-presenter, Jeremy Hunter, PE, with INDOT, was not able to make it today.

There are 614,400 bridges in the US, of which 9.1% are structurally deficient in some way. This equates to one bridge every 6.7 miles. On average, 1 in 4700 bridges collapses each year, giving you the likelihood of driving over a bridge about to collapse about once every three years (driving 12K mi/yr).

Bridges are designed for both "Dead Loads" (its own static structure) and "Live Loads" (trucks, cars, and special vehicles). Design Loads include water and ice flows, temperature extremes (thermal expansion of up to a foot in long spans) and high winds including hurricanes. Design philosophy includes safety, durability (was 50 years, now 75 years) and economy. Bridges are designed for 100year floods, legal truck loads and legal truck sizes (14' 6", but often16+ ft).

Causes of bridge damage include earthquakes, floods, fire, poor maintenance, impact (collisions) and construction problems. Over 500 bridge failures occurred from 1989 – 2000, with bridge ages varying from <1 per year to 157 years of service (52.5 years on average). Fifty three percent were caused by flood and scour (erosion of river bed by turbulent water). Twenty percent were caused by overload and lateral impact.

The Schoharie Creek bridge (NY State Thruway) collapsed in 1987 due to scour.

The I-35 bridge over the Mississippi River in St. Paul, MN collapsed due to "Dead Load" overload. The trusses were under-designed, but were still within the normal safety factor. However, construction material was stored on the bridge and overloaded the trusses.

In Pennsylvania in 2005, pre-stressed concrete box beams, commonly used for interstate overpasses, failed when the steel strengthening cables rusted from water trapped between the beams (where the damage could not be seen).

The Hoan Memorial Bridge in Milwaukee failed in 2000 due to stress and extreme temperature.

In 2006 in Hays, Kansas an I-70 overpass was essentially bisected by the boom of a backhoe that was in a raised position.

Similarly, in 2017 in Indianapolis, the Rockville Rd. overpass on I-465 was heavily damaged when a mobile car crusher towed on a flatbed was inadvertently in a raised position and slammed into the bridge. The debris was cleared in 48 hours so I-465 could reopen, but it took months for the east- bound lanes of the overpass to be rebuilt. Even that was a fast-paced schedule due to use of special contracting procedures used by INDOT with federal approval.

In Webber Falls, OK in 2002, a barge collided with the bridge collapsing two sections. An alert truck driver stopped in time and blocked the road.

In 2012 in Benton, KY, a river freighter took out a truss bridge and wrapped it around the bow. There was minimal damage to the freighter, but the bridge was totally wiped out. Mike commented that truss designs are very strong in the main direction, but very weak for lateral collisions.

Finally, not all bridges collapse. There is a railroad trestle in Durham, NC, with a clearance of 11’ 8”. So many vehicles have hit the bridge without damaging it that a local video camera was set up to capture the incidents. These are visible at the website 11foot8.com. Many collisions occur despite ample warning beforehand. Enjoy.

Thanks to Mike for an informative and entertaining talk.


Mike Wenning & Vic Wenning