Twyckenham Drive over St. Joseph River, South Bend, Ind.

by Leslie Benson, American Structurepoint

When the Twyckenham Drive Bridge was constructed over the St. Joseph River in 1929, it was conceived as more than part of the transportation system. The beautiful concrete open spandrel arch was also intended to honor those who gave their lives in World War I, represented by decorative pylons along the bridge. The bridge originally had 16 deck expansion joints and inadequate drainage that caused significant damage as water leaked through to the substructure. When it came time for repairs, the St. Joseph County Board of Commissioners turned to the project team to restore the structure to its original condition.

By analyzing the bridge using finite element analysis, the number of expansion joints was reduced to one joint at each end of the bridge. The reduced number of joints and improved drainage systems are intended to keep roadway salts away from the concrete, increasing the bridge's service life. To protect the bridge from future deterioration, zinc galvanic protection was placed at the interface of the new and original concrete throughout the bridge.

The concrete open spandrel arches of the Twyckenham Drive Bridge. Photo: Susan Fleck Photography.

The spandrel arch bridge was restored to its original appearance using modern materials. Photo: American Structurepoint.

Additional structural improvements for the deteriorating bridge included repair of concrete elements and replacement of non-original aluminum railings with concrete ones that closely resemble the original. While some key portions of the bridge had to be replaced, one of the project's goals was retaining as much of the existing structure as possible in order to retain the aesthetically pleasing look of the historic bridge. This also resulted in a savings of time and money for the county.

Unique features of the bridge are its plaza areas. These were constructed to allow pedestrians a place to rest and enjoy the view of the river from the bridge. The historic plazas at the four corners of the bridge were restored by placing new sidewalk and concrete railing and lighting for night-time safety. A newspaper photograph from the opening of the original bridge was used to match the standards and lanterns along the roadway. Eight ornamental streetlights and 36 ornamental lanterns were installed across the bridge and plazas.

The design scope also addressed removing and replacing all transverse beams and spandrel columns under the existing expansion joints, as roadway salts had saturated these. In addition, the existing concrete deck and sidewalk were removed and replaced with concrete deck panels, a 6-in.-thick concrete sidewalk, and a 12-in.-thick concrete curb. A coating was applied to all concrete sections of the bridge.

This project honored the structure's original engineers by restoring the monument to last well into its second century. American Structurepoint used the lessons learned and new materials developed over the last century to produce a tighter, more durable bridge. Since its completion, the Twyckenham Drive Bridge has been recognized with the 2011 Award for Outstanding Achievement in Concrete in the Special Structures–Concrete Restoration from the American Concrete Institute, Indiana Chapter, as well as the 2012 Concrete Bridge Award from the Portland Cement Association.

Leslie Benson is a public relations specialist with American Structurepoint, Indianapolis, Ind.

Getting Connected: Dearborn Island Bridge

Salvaged beams reused to link island to mainland

by Karl Wieseke, Oregon Department of Transportation

When the Oregon Department of Transportation (ODOT) built a temporary Interstate 5 detour bridge over the Willamette River in 2004, the design was permitted for only 10 years. In 2009, construction would begin on a permanent replacement, the Whilamut Passage Bridge, erected as part of the Oregon Transportation Investment Act (OTIA III) State Bridge Delivery Program.

Yet the materials used to construct the temporary bridge—in particular, more than 200 concrete beams, 93 to 115 ft long—were well able to safely serve motorists for decades to come. As part of its environmental stewardship, ODOT was prepared to offer the beams at a minimal price to keep them in circulation, salvaged to their highest use.

"ODOT's primary motivation was to get the beams reused, so we essentially cut the price to what it would cost to move and store them," said Bert Hartman, ODOT Bridge Unit manager. "For end users, it was a really good deal: A new beam would cost more than $17,000, yet buyers paid just $2,500 for beams that are good for at least another 50 years."

In September 2011, crews prepared to dismantle the temporary bridge to make room for the replacement. Meanwhile, the near-

Four 115-ft-long beams from a temporary freeway detour bridge were salvaged to replace a severely load-limited bridge over Oregon's McKenzie River. All photos: Oregon Department of Transportation.

With the new bridge in place, larger vehicles such as delivery trucks and emergency equipment can directly serve the island's 14 residences.

by Dearborn Water District was looking for a way to replace the sole aging bridge that connected Dearborn Island's 14 residences to the mainland beyond the surrounding McKenzie River.

For more than two years, only residents' cars had been allowed access to the island. The original truss bridge connecting it with Oregon 126 had been saddled with a 3-ton weight limit because of structural deficiencies. No emergency vehicles, cable company trucks, maintenance equipment, or other vehicles weighing more than 6000 lb could get to the island.

Gayle Harley, executive vice president of OBEC Consulting Engineers, connected the beams looking for a home with the island looking for some beams. Harley, now retired, knew the salvaged beams would be available because his firm had designed the new I-5 bridge. OBEC had also performed the inspection on the Dearborn Island Bridge that identified safety concerns. As soon as the salvaged beams were available, Harley laid claim to four 48-in.-deep by 48-in.-wide by 115-ft-long box beams to cut the cost of rebuilding the Dearborn Island Bridge. To replace their bridge, island residents had themselves raised $400,000 to cover all design, permitting, and construction costs.

"The original bridge was 125 ft long," said Harley. "We shortened the new bridge span length so that the 115-ft-long beams from the Willamette River Bridge's temporary structure would fit perfectly and not need to be reshaped."

OBEC has designed customized bridge abutments to accommodate salvaged beams for other agencies in Oregon, including Lincoln, Jackson, and Lane counties. The project team replaced the bridge in one week, limiting inconvenience to the island's residents. Because of the salvaged beams, the new bridge will safely and economically carry traffic for at least a half century.

Karl Wieseke is the Willamette River Bridge project manager for the Oregon Department of Transportation in Springfield, Ore.