Plate Power

SPS technology—used for the first time in creating a deck for the Shenley Bridge in Quebec, Canada—promises to be science's fountain of youth for bridge preservation.

By Richard B. Vincent and Annie Boilard

The Sandwich Plate System (SPS), which was utilized in the fall of 2003 during construction of the Shenley Bridge in Quebec, Canada, is the first major innovation in the field of heavy engineering since pre-stressed concrete was ushered into the North American market nearly 50 years ago. A bridge featuring a durable steel/elastomer/steel construction and boasting a 70% lighter weight than its concrete counterpart promises to be science's latest answer to the challenge of increased road traffic and deteriorating bridges facing North American governments.

Not only is SPS bridge deck technology up to 70% lighter than concrete, it is also 30% lighter than steel. It reduces bridge dead loads to a considerable extent and significantly increases the life expectancy of the entire structure. "This technology has the potential to solve many of the problems that bridge builders will face in the next few decades," said Marcel Bouchard, P.E., of Transports Quebec. The patented technology—recently introduced into North America—arrives on the transportation scene at a time when government leaders, in view of the aging bridge inventory, recognize that a growing number of repair or replacement projects will be necessary over the coming years.

Hit the Deck

When floodwaters swept away a number of bridges in Quebec, Canada during the summer of 2003, Transports Quebec and the municipality of St. Martin opted to use SPS to rebuild one of the bridge decks. The technology, supplied by Solicor (a business unit of The Canam Manac Group, Inc.), cut the project schedule for a concrete-deck alternative by a significant amount of time. Despite adverse weather conditions, it took only 14 days to build, erect, complete and test the Shenley Bridge.

The Shenley Bridge SPS deck is 74′ long by 23′ wide and is composed of 10 SPS panels (eight measuring 7.87′ by 23′ and two measuring 5.4′ by 23′) supported by three girders. The new bridge is roughly 60% lighter than its concrete counterpart (37 tons vs. 96 tons). Its sandwich plate system consists of two ¼″ steel plates separated by a 1½″ elastomer core. The flexural stiffness and strength of its sandwich plate was tailored to meet its particular static and dynamic structural requirements by selecting an appropriate thickness for the sandwich elements.

"The use of SPS allowed a weight reduction of more than 40% compared with the original design," said Richard B. Vincent, vice president of research and development for Canam. "Concrete formwork was not required, allowing a faster bridge erection than with traditional methods. We are thrilled by the results of this project. It also allowed us to complete testing on vibration modes, absorption coefficients and dynamic loading."

Roger Dorton, P.E., works with Buckland & Taylor Ltd., a bridge engineering firm in British Columbia, Canada, and praised the technology. "The speed with which this bridge was erected is impressive. SPS has the potential to create considerable savings by using pre-fabricated panels and simply bolting and/or welding them together on site. The success of the Shenley Bridge project argues well for the application of SPS decks to long-span bridges, where the weight savings will have an even greater impact."

All Rise!

Solicor recently launched their SPS Stadia Riser System in July 2004. SPS risers—using SPS steel-polyurethane composite technology— represent a modern day alternative to conventional precast concrete risers for permanent and telescopic stadia. The risers weigh 70% less than concrete and deliver improved static and dynamic behavior.

SPS technology consists of two steel plates bonded to a solid elastomer core. Continuous support to the plates is provided by the elastomer, which precludes local plate buckling and helps minimize the need for stiffeners.

The risers are protected with factory-applied coatings and are prefabricated to ensure a high quality finish. Although the technology is new, standard steelwork practices continue to ensure high tolerances and an uncomplicated manufacturing process.

While SPS technology was originally developed for maritime applications such as ice strengthening on Arctic drill platforms, it is now available for use on stadia, bridges, floors and blast walls. This patented technology will be available throughout Canada, the United States, Mexico and the Caribbean.

Testing the Waters

Extensive tests were conducted on the SPS bridge deck in the field before two independent specialists, Transports Quebec and the Ontario Ministry of Transportation, to prove the static and dynamic behavior of SPS technology. Similar new bridge designs are currently the subject of a detailed test program at the Virginia Polytechnic Institute and Virginia State University. This test program is scheduled to end in late summer and preliminary indications are excellent.

Another equally promising test program for bridge repair using SPS technology is underway at Rheinisch-Westfälischen Technische Hochschule, a technical institute in Germany. Solicor is currently promoting the benefits of SPS technology for bridge projects across North America.

SPS Technology

SPS consists of two steel plates bonded to a solid elastomer core. The elastomer provides continuous support to the plates, precludes local plate buckling and minimizes the need for stiffeners. Intelligent Engineering developed this patented technology over a 10-year period, under the guidance of Lloyd's Register and in close collaboration with BASF AG. Canam has signed an agreement with Intelligent Engineering to fabricate and market this patented product for bridge-deck construction, as well as other civil engineering applications throughout North America.

SPS has a strong track record in maritime construction. Intelligent Engineering, to date, has completed 39 SPS commercial projects across four continents. Around the globe, there are now more than 2.5 million square feet in service. ★

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