NEWS

TRANSPORTATION RESEARCH BOARD
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Transportation Research Board's IDEA Program Delivers Innovation in Award-Winning Hybrid Composite Beam

On March 21, 2013, HC Bridge will receive the Charles Pankow Award for Innovation from the American Society of Civil Engineers (ASCE) for development of the hybrid composite beam (HCB®) for bridges. The HCB improves the speed of construction and is well suited to accelerated bridge construction projects. Its service life is estimated at more than 100 years.

The ASCE award recognizes the contributions of organizations working collaboratively to advance the design and construction industry by introducing innovation into practice.

John Hillman, president of HC Bridge, credits the success of his technology to TRB's Innovations Deserving Exploratory Analysis (IDEA) programs. Developed under the High-Speed Rail and National Cooperative Highway Research Program IDEA Programs, the HCB is a high-strength, lightweight, corrosion-resistant beam for bridge construction.

Hillman noted that "The TRB IDEA Program is truly a unique mechanism in the world of infrastructure research. I don't know of any other program where an inventor can go with an unsolicited idea and secure the seed money to transform vision into reality and still get to hold on to their intellectual property."

The HCB comprises three main subcomponents: a shell, compression reinforcement, and tension reinforcement. The shell is a fiber-reinforced plastic (FRP) box beam. The compression reinforcement consists of concrete, pumped into a profiled conduit—generally an arch—within the beam shell. The tension reinforcement consists of carbon, glass, or steel fibers anchored at the ends of the compression reinforcement. The HCB combines the strength and stiffness of conventional concrete and steel with the light weight and corrosion resistance of advanced composite materials.

According to Hillman, “the harsh reality is that without the IDEA program, HCB technology would not even warrant a footnote in history. As it stands, the success of this IDEA project has validated a technology that has now won every major award available in North America and is being sought out by engineers and contractors worldwide. As a profession, I don't think we can do enough to recognize and support this kind of program. It is truly a powerful catalyst for positive change."

TRB Executive Director Robert E. Skinner, Jr., who will be on hand for the presentation of the award, noted that “HC Bridge’s receipt of the Charles Pankow Award for Innovation not only confirms the value of the IDEA program, but also underscores the importance of transportation research more generally. In developing the HCB, John Hillman worked collaboratively with TRB, the University of Delaware, and the Association of American Railroads. Such collaborations accelerate the development and use of technologies that are smarter, faster to deploy, and less costly—at the very time that our country needs these qualities the most.”

An HCB weighs approximately one-tenth of a typical precast concrete beam of the same span length. The lighter weight reduces shipping and erection costs—for example, six HCBs can be shipped on a truck that would carry one beam of precast concrete. HCBs require a 30-ton crane instead of the large 150- to 200-ton cranes for precast concrete beams. The first cost of construction for HCBs—which includes transportation, installation, preparation for service, and other initial capital expenditures—is competitive with that for conventional methods using prestressed concrete beams. Costs will decrease, however, as demand for HCBs increases, creating economies of scale. With its longer service life, HCB is superior in terms of life-cycle costs. The American Association of State Highway and Transportation Officials’ Technology Implementation Group selected the HCB as a focus technology for implementation in 2011.

Examples of structures with HCBs include the Lockport Township High Road Bridge over Long Run Creek in Illinois, the Route 23 Bridge over Peckman’s Brook in Cedar Grove, New Jersey—both constructed in 2009—and the Knickerbocker Bridge built in 2011 over Back River in Boothbay, Maine.

The U.S. Army Corps of Engineers recently used HCBs in Bridge No. 4 at Fort Knox, Kentucky. Virginia DOT is installing HCBs to replace Tide Mill Bridge in Fredericksburg. Missouri’s “Safe and Sound Project” has constructed three HCB bridges with a grant from FHWA Highways for LIFE.

In addition, Burlington Northern and Santa Fe (BNSF) Railway is conducting live load tests of a full-scale HCB rail bridge at the Transportation Technology Center, Inc., near Pueblo, Colorado. Having successfully endured over 250 million gross tons of Class 1 Rail traffic, this structure is now being placed in revenue service this summer.

In addition to the Charles Pankow Award for his invention of the HCB, Hillman has received the *Engineering News Record* 2010 Award of Excellence, the American Council of Engineering Companies' 2009 Grand Award for the Lockport Township High Road Bridge, the ACE Award for Composite Excellence from the American Composite Manufacturing Association and the 2010 NOVA Award from the Construction Innovation Forum.

The TRB IDEA programs seek proposals with potential to advance the construction, safety, maintenance, and management of highway, railroad, and transit systems. The programs are managed by TRB and sponsored by the member states of the American Association of State Highway and Transportation Officials, through the National Cooperative Highway Research Program; the Federal Railroad Administration; and the Federal Transit Administration through the Transit Cooperative Research Program. The programs are guided and advised by committees of experts who volunteer their time and service. The committees review proposals and select the most promising of those that meet program criteria.

Organized in 1920, TRB is one of six major divisions of the National Research Council— a private, nonprofit institution that is the principal operating agency of the National Academies in providing services to the government, the public, and the scientific and engineering communities. The National Research Council is jointly administered by the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

The mission of TRB is to provide leadership in transportation innovation and progress through research and information exchange, conducted within a setting that is objective, interdisciplinary, and multimodal. TRB's varied activities annually engage more than 7,000 engineers, scientists, and other transportation researchers and practitioners from the public and private sectors and academia—all of whom contribute their expertise in the public interest by participating on TRB committees, panels, and task forces. The program is supported by state transportation departments, federal agencies including the component administrations of the U.S. Department of Transportation, and other organizations and individuals interested in the development of transportation.

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