Innovative Bridges: Engineering At Its Best

The New I-35 Bridge. Designed and built in just 11 months, this modern concrete bridge is an example of innovation. Photo courtesy of FIGG.

By Thornton J. Williams, Williams McMillian P.A.

The nation's roads, highways and bridges are the backbone of the U.S. transportation system, providing Americans with approximately three trillion miles of travel annually. In the architectural arena, bridges are a symbol of technology at its finest. Bridges are seen as the superstars of the engineering world. By combining technology and design, engineers and architects are now able to create bridges that are not only structurally sounder but visually more esthetic than ever before. In fact, some of the most interesting engineering and architectural wonders of the 20th Century involve the building of bridges.

Better Roads' 2010 Annual Bridge Inventory, an original research project conducted annually reveals that the nation has 600,513 total bridges. For example, the state of Florida is a peninsula with many bridges. Florida has the eight-largest bridge in the United States known as the Seven Mile Bridge located in the Florida Keys. The Seven Mile Bridge runs over a channel between the Gulf of Mexico and the Florida Strait, connecting Key Vaca (the location of the city of Marathon) in the Middle Keys to Little Duck Key in the Lower Keys. Among the longest bridges in existence when it was built, it is one of the many bridges on U.S. 1 in the Keys, where the road is called the Overseas Highway.

Similarly, the Golden Gate Bridge, built in 1937 as the masterwork of architect Joseph B. Strauss, has become an internationally-recognized symbol of San Francisco and California. Since its completion, the span length has been surpassed by eight other bridges as mastermind engineers continue to improve on the nations' infrastructure through increased technological advancements.

Designs of bridges vary depending on the function of the bridge, the nature of the terrain where the bridge is constructed, the material used to make it and the funds available to build it.

One company that is pioneering the way in the design of state of the art bridges is FIGG. Their exclusive focus on bridge design and construction engineering inspection has resulted in ground-breaking, artistic bridges that have improved the nation's infrastructure, while encapsulating safety, quality and innovation in every design.

For example, with FIGG's re-design and re-build of Minnesota's I-35W bridge after the tragic collapse of the bridge during rush-hour traffic on August 1, 2007, FIGG introduced a new era in groundbreaking technology.

The innovative design-build approach utilized cutting-edge improvements and enhanced safety enhancements. High-strength, high-performance concrete was utilized. FIGG employed a self-cleaning, pollution-eating cement material called photo-catalytic titanium dioxide, which accelerates the decomposition of organic material in the bridge construction. The cement has a nanotechnology in it such that when UV light hits the surface of the concrete, it creates a photo-catalytic reaction that cleans pollution out of the air. The new I-35W is the only bridge in the U.S. to employ the pollution-eating technology to date.

The new bridge also has the world's largest anti-icing system and uses smart bridge technology, including 323 sensors that will generate a record of how the bridge manages the stresses of traffic. This state-of-the-art sensor system allows for comprehensive structural and traffic monitoring throughout the bridge's lifetime.

Because of its innovative engineering

and state-of-the-art technology, the I-35W bridge replacement project was selected as one the nation's 10 best transportation projects for 2009 by the American Automobile Association, the American Association of State Highway and Transportation Officials and the U.S. Chamber of Commerce. By simultaneously building and engineering the bridge, this 10 lane interstate bridge which spans the Mississippi River was designed and built in an amazing 11 month time span. Minnesota's I-35W bridge was completed in September 2008, three months ahead of schedule, at a cost of $234 million. It was built using the design-build process, which allowed it to be completed in 339 days.

Because the I-35W Mississippi River bridge provided direct access to downtown Minneapolis, the University of Minnesota, area businesses and north suburban destinations for more than 140,000 vehicles each day, the loss of the bridge was costing $400,000 per day in lost revenue, increased commuter expenses and burden on surrounding roads.

Other features of the 1-35W bridge include:

- 100-year life span;
- 10 lanes of traffic, five in each direction—two lanes wider than the former bridge;
- 189 feet wide—the previous bridge was 113 feet wide;
- 13 foot wide right shoulders and 14 foot wide left shoulders, the previous bridge had no shoulders;
- Light Rail Transport-ready which may help accommodate future transportation needs.

Undoubtedly, building a bridge is a monumental undertaking. While safety considerations are always paramount, the skill involved in designing and engineering truly innovative bridges that are a work of art is no small feat. These innovative bridges, such as the ones mentioned above are just a few examples of engineering at its best. ■

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