Perspectives on Future Highway Bridge Design

Highway Bridges of the Future

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There is a great deal of interest within the bridge engineering research community as to what will constitute the highway bridges of the future. Significant attention is justifiably being focused on high-performance materials, including steel, concrete, composites, aluminum, and other materials with enhanced properties involving strength or durability. Efforts are also being directed to smart bridges that provide automated and integrated condition assessment reporting, as well as to passive and active control devices, activated by on-board sensors, that respond to changing loads. All these topics are valid subjects for current and future investigations, and doubtless over the long term we will see the introduction of reengineered existing materials, new materials, and adaptive bridges. However, for the next generation we are likely to find that most of tomorrow's bridges incorporate many of the features of today's or even yesterday's bridges. A large part of the inventory will not be so much new as renewed. Continued research expenditures are therefore warranted in the areas of life extension through remediation, improved analysis, and understanding of loads and load effects on existing structures. While it is tempting to divert resources to glamour topics, much basic work remains to be done.

The design and operations communities are more skeptical about the concept of passive control of structural response than about materials per se, and are even more skeptical about active control. Engineers are concerned about the durability and cost-effectiveness of hardware. Many practicing engineers need to remember that we have had bridges utilizing some type of control system for more than 100 years. Movable bridges have had various types of sensing devices for the position of wedges and locks, the skew and alignment of components, positioning of the moving elements, public safety features, motors, and brakes. Microcomputer logic and process-control features have been implemented on these structures through programmable logic controllers. Although there is an axiom that a movable bridge is a bridge requiring maintenance, this relates mostly to wear and tear on mechanical elements, not control and sensor features. In sum, it is necessary to maintain an open mind with regard to future possibilities.

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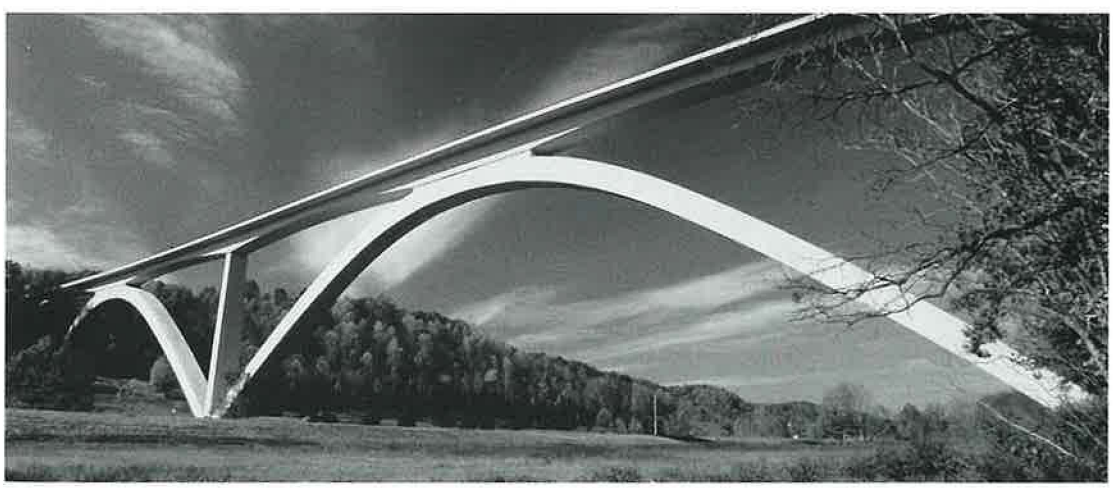

FIGG ENGINEERING GROUP

Completed Natchez Trace Parkway Arches, designed by Figg Engineering Group, with 582-foot arch span, and measuring 155 feet from Tennessee Route 96 to top of bridge. Predominant span is 246 feet variable depth. Piers are tapered, and arch varies in depth.