

The Bridge Design Technology Evolved and Development to Meet Tomorrow Challenges

By

W. Phillip Yen, Ph.D., P.E.

Chair, International Bridge Seismic Engineering Committee

The public relies on highways for the safe transport of goods and people across the country. Because roads serve as critical lifelines in the delivery of basic daily needs, they need to function even in the face of adverse weather and natural hazards. Among the transportation infrastructure, bridge structures are the most vulnerable component and the very first step to protect bridge structure is the bridge design. Bridge design has been improved from the technology improved from the lessons learned from past performance, new or advance material development, large laboratory experimental tests and innovative design concepts. Bridge design codes are also being changed and improved based on technology advanced.

As the main purpose of bridge design codes is to ensure bridge safety such that minimum resistances or capacities, in terms of strength, stiffness, and stability of each bridge component and the whole bridge structural system exceed the potential maximum demands or force effects due to various loads during its design life. Design specifications have been used from a more general Allowable Stress Design to current be more specific in the material strength – Load and Resistance Factors Design. These changes were based on the technology learned from material science and bridge performance in each extreme event. Bridge types were also evolved based on the new material and innovation concepts. There were from trusses, arches, suspension, boxed girders, prestressed to current cable-stayed and extra-dosed bridges. As the transportation demands have been significant increased, traveling time expectation are decreased, and the requirement of safety is getting higher, it is critical for us to envision what we need of bridge technology for the future bridges. Besides all those changes, the environmental changes due to global warming and extreme events, the future bridge structure need to accommodate the challenges from robustness, sustainability to the resilience.

This presentation briefly introduces the bridge design technology evolved in the past decades and discusses the expectations of the future design technology needed to meet the challenges of tomorrow. A Q&A session will be provided after this presentation.

