Design and Construction of Multi-Span Extradosed Bridges

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Abstract

Extradosed bridges combine the advantages of prestressed concrete boxgirders and cable-stayed bridges. In contrast to traditional cable-stayed bridges with one main span and two relatively short side spans they do not require anchor cables and anchor piers to establish equilibrium for unbalanced live load conditions. Extradosed bridges are self-anchored suspended beam structures that activate the superstructure's bending stiffness instead of relying on counterweight. This advantage makes them a very competitive choice for multi-span bridges with spans of up to 250 m.

Extradosed bridges are an excellent solution for long bridges with lengths over 1 km. They permit boxgirder cross sections with constant dimensions over the entire bridge length. Compared to haunched prestressed boxgirders, external tendons of extradosed bridges offer larger leverarms and better dead to pay load ratios for spans over 100 m; especially in seismic regions lighter superstructures combined with larger spans permit significant substructure savings.

Fast paced fabrication and erection techniques are design governing for long bridges. Repetitive components are ideal for segmental bridge construction. The external tendons of extradosed bridges can be easily adjusted in order to maintain geometry and simplicity of segments if spans and demands vary. In combination with proven superstructure erection methods extradosed bridges offer construction cost and time advantages.

The potential of extradosed bridges is not nearly exhausted. On the contrary, we can expect that a new type of bridge architecture will take over the field of medium spans. Although we find in every extradosed bridge at least two systems competing for the load, even more advanced combinations with frame structures and other integral systems are possible and recommended. But these hyperstatic systems will require a thorough investigation of governing design scenarios and excellent detailing skills.

Extradosed bridges offer a fantastic opportunity to develop innovative solutions leading the way to cheaper and better bridges that are easier and faster to construct. Special attention should be paid to multi-span extradosed bridges and how cost efficient methods, such as assembly-line fabrication and construction processes, can be utilized to achieve practicable solutions that appropriately address modern design criteria, the overall return on investment, and aesthetics.

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