

# **Designing the Future: Precast Concrete Bridge Advances in Canadian Bridge Design Codes and Field Applications**

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## **Abstract**

Canada's bridge infrastructure continues to evolve through advances in design standards, innovative materials, accelerated construction techniques, and research-driven solutions. This keynote presentation highlights the evolution of Canadian Bridge Design Codes and their role in advancing the analysis, design, construction, rehabilitation, and durability of precast and prestressed concrete bridges. Particular emphasis is placed on developments related to load distribution and transverse shear in shear-connected precast beam bridges, including research supporting provisions incorporated into recent Canadian bridge design standards. The presentation connects code development with experimental research and field implementation of innovative bridge technologies. Topics include durable connections for side-by-side precast box girders, ultra-high-performance concrete (UHPC) closure joints, moment-transferring connections for bulb-tee girders, and glass fibre-reinforced polymer (GFRP) reinforcement for precast bridge decks and accelerated bridge construction. Laboratory investigations, analytical modelling, and field applications demonstrate how these technologies can improve structural performance, constructability, durability, and service life. The keynote also examines rehabilitation of damaged precast and prestressed concrete girders using externally bonded carbon fibre-reinforced polymer (CFRP) systems. Collectively, these developments illustrate how collaboration among researchers, transportation agencies, standards organizations, and industry can translate engineering innovation into practical design provisions and resilient bridge infrastructure.