



Macdonald Bridge Suspended Spans Deck Replacement: Construction Engineering Challenges and Solutions

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Abstract

The Angus L. Macdonald Bridge, a major suspension bridge that crosses Halifax Harbour in Halifax, Nova Scotia, opened to traffic in 1955. The bridge deck has reached the end of its service life, and the design of the new bridge superstructure and its replacement sequence were completed in 2014. The entire suspended structure and hangers are now being replaced sequentially during night and weekend closures while the bridge is opened for traffic during the daytime. The erection sequence is supported by sophisticated automated erection analysis models which take into account the geometry of the existing bridge, positioning of the erection equipment on the deck, and hanger and strand jack adjustments that are required during construction. Significant wind tunnel testing and analysis have been performed to ensure aerodynamic stability of the bridge during erection and in its final condition.

Keywords: Suspension bridge; rehabilitation; deck replacement; deck erection, span raising.

1 Introduction

The Angus L. Macdonald Bridge, shown in Figure 1 and Figure 2, opened in 1955 and connects Dartmouth and downtown Halifax, Nova Scotia. The suspension bridge is 762 m long and the overall length, including approaches, is 1,347 m. The deck of the suspended spans has reached the

end of its functional life and is being replaced segment-by-segment. The design of the bridge and erection sequences engineering was completed in 2014 by Buckland & Taylor (B&T), now COWI Bridge North America (COWI). Subsequently, the Owner, Halifax Harbour Bridges (HHB) awarded the contract for construction to American Bridge Canada Company (ABCC).



Figure 1: Angus L. Macdonald Bridge, Halifax, Nova Scotia, Canada (Pre-Replacement Condition)