



Replacement of the Macdonald Bridge Suspended Spans: Fabrication and Field Construction Works

Dusan Radojevic, Ph.D., P.Eng. and Keith F. Kirkwood, M.A.Sc, P.Eng.

COWI Bridge North America, North Vancouver, BC, Canada

Contact: durc@cowi.com, kfk@cowi.com

Abstract

The Angus L. Macdonald Bridge, completed in 1955, connects Dartmouth and downtown Halifax, Nova Scotia, Canada. This suspension bridge is 762 m long, with a 441 m long main span. The deck of the suspended spans reached the end of its functional life and the entire superstructure was replaced segment-by-segment during full weekend and evening closures of the bridge, with traffic using the bridge during weekdays. The new deck segments were fully prefabricated, including an initial thin layer of wearing surface, and erected in a way that allowed traffic to use the bridge immediately following the replacement of an existing deck segment. This paper describes some aspects of the complex fabrication of the bridge superstructure. It further describes how the deck segments were replaced and explains unique challenges encountered during segment replacement and how they were addressed.

Keywords: suspension bridge; superstructure replacement; erection; fabrication; steel; deck segment replacement.

1 Introduction

The Angus L. Macdonald (ALM) Bridge, shown in Figure 1, opened in 1955 to connect Dartmouth and downtown Halifax, Nova Scotia, Canada. The suspension bridge is 762 m long and the overall length, including approaches, is 1,347 m. The main span is 441 m long. The deck of the suspended spans reached the end of its functional life and the Contractor (American Bridge Canada Company, ABCC) replaced it segment-by-segment. Cross-sections of the existing and new superstructures are shown in Figure 2.

Buckland & Taylor (B&T), now COWI Bridge North America (COWI), assisted by local subconsultant Harbourside Engineering Consultants (HEC), completed the design of the bridge and its erection sequences in 2014. Subsequently, the Owner,

Halifax Harbour Bridges (HHB), awarded the contract for construction to ABCC.

The fabrication of deck segments began in 2015 April, and was completed 2016 August. The deck replacement field work started in 2015 October and the Contractor performed it during bridge closures at nights (with traffic running during the day) and during full weekend closures. Because the public was using the bridge during the daytime, the Contractor was allowed to close the bridge at 7:00 pm, but was required to open it no later than 5:30 am following the night of segment replacement.

This paper describes main fabrication and erection aspects of the project. Background information regarding the general scope of the project is in [1] and [2].