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The Existing Champlain Bridge – Developing a Customized Inspection and Assessment Methodology

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Abstract

A bridge at the end of its lifespan tends to deteriorate at an exponential rate. Given the unique challenges of the Champlain Bridge located in Montréal, a customized inspection program was developed to monitor the condition and behaviour of the bridge approach spans. The cornerstone of this program is a set of customized inspection criteria to assess the degraded superstructure elements and the installed strengthening systems. An Integrated Grading System (IGS) rating the overall performance of a reinforced superstructure element was also developed. The IGS rating is based on an algorithm that feeds on inspection data from each individual component and considers the complexity of the interactions between the original structure and the added strengthening systems. This paper presents an example of the inspection criteria and IGS rating system developed specifically for the approach spans of the Champlain Bridge.

Keywords: corrosion; degradation; inspection criteria; defect; strengthening; integrated grading system; evaluation.

1 Introduction

The Champlain Bridge, opened in 1962 in Montreal, Canada, is 3.4 km long and comprises 50 simply supported approach spans (approximately 53 m in length) with an elevated truss structure over the Saint-Lawrence Seaway. The approach spans, in Sections 5 and 7, consist of seven, 3 m high, precast post-tensioned (PT) girders with cast-in-place concrete deck infill strips in-between supporting six lanes of traffic.

The deck slabs and the diaphragms are post-tensioned in the transverse direction. This transverse PT, combined with the longitudinal PT in the girders, results in a structure that is highly integrated in both the longitudinal and transverse directions. A general view of the bridge is shown in Figure 1. The girder internal PT cables and the deck cross section are shown in Figure 2.

Due to the advanced degradation of the structure and the unique nature of various strengthening systems used, customized inspection criteria were developed to gather detailed information about the structural behaviour of the girders, deck infill strips, diaphragms, and various strengthening systems. For each bridge element or strengthening system, potential defects, critical and non-critical, are identified and graded considering their impact on the structural integrity. Inspection templates and criteria tables

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