

The Existing Champlain Bridge - Assessment of Structural Deficiencies

Andrew Griezic, Alejandro de la Puente

COWI North America Ltd., North Vancouver, BC, Canada

Jean de Gaspé Lizotte, Gustavo Lasheras

Stantec, Montreal, QC, Canada

François Demers

Jacques Cartier and Champlain Bridges Inc., Montreal, QC, Canada

Contact: angg@cowi.com

Abstract

The 50 approach spans of the Champlain Bridge each consist of seven precast post-tensioned girders. Deterioration of the PT tendons is observed in the girders at multiple locations, raising concerns about the integrity of the remaining tendons. Due to the uncertainties involved in determining the number of tendons that have become ineffective due to corrosion, multiple inputs are used in a comprehensive assessment program to determine the condition of the girders and establish the load carrying capacity of the Bridge. The assessment allows the corporation managing the bridge to plan rehabilitation and strengthening programs to ensure user safety and that will ensure the structure remains open to traffic. The comprehensive assessment program includes visual inspections, exploratory openings, monthly load tests and daily monitoring. The program represents a proactive and preventative approach using multiple inputs identify critical deficiencies and address them through a comprehensive rehabilitation program.

Keywords: post-tensioning; concrete; girders; corrosion; deterioration; condition assessment; bridge; monitoring

1 Introduction

The existing Champlain Bridge opened to traffic in 1962. Its 3.4 km long structure comprises a cantilever steel truss main span over the Seaway, flanked by two truss spans on each side, and 50 approach spans. See Figure 1 for an overview of the entire bridge. The approach spans consist of seven, 3.07m deep precast post-tensioned girders with diaphragms and cast-in-place infill deck slabs, both post-tensioned transversely, resulting in an

integrated deck structure. Figure 2 shows a typical approach span.

Because of the type of construction and the use of de-icing salts, all approach spans have been highly affected by deterioration. Evidence of corrosion of the girder post-tensioning was identified only 20 years after completion of construction, which prompted the beginning of a rehabilitation program that involved design and installation of strengthening measures to retrofit the structure.