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The Existing Champlain Bridge – Instrumentation, Monitoring and Load Tests

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Abstract

This paper describes the instrumentation and monitoring of the 50 spans of the Champlain Bridge in Montreal using optical sensors at mid-span for recording flexural strains on the exterior post tensioned girders. These girders were subjected to structural degradation due to corrosion of the strands. Presently over 320 optical sensors are installed on the bridge to record data on a continuous basis at 50Hz. Such data contains invaluable information for monitoring the bridge response and condition after each monthly Load Test. In addition, the daily dynamic traffic loading is analysed to detect any sign of degradation in the post tensioned girders.

Keywords: Bridges, monitoring, instrumentation, load tests, flexural strain, traffic loading, trends.

1 Introduction

The Champlain Bridge, opened in 1962, is 3.4 km long and consists of 50 simply supported spans (approximately 53 m long) plus an elevated truss structure over the Saint-Lawrence Seaway (see Fig. 1). The cross sections of the spans are made of seven, 3.07 m high, precast post-tensioned girders, spaced 3.72 m apart and supporting a cast-in-place concrete deck between the top flanges of the girders. The bridge deck carries six lanes of traffic (see Fig. 2). The typical span has a diaphragm at each support and two intermediate diaphragms within the span. Each girder has 24 inclined post-tensioned tendons and each tendon is made of 12 strands of 7 mm in diameter.

Post-tensioning of the deck slab and the diaphragms in the transverse direction has resulted in an integrated structure. Corrosion of some of the post-tensioning strands in the exterior girders, due to de-icing salt on the deck, as well as structural degradation prompted several strengthening measures coupled with instrumentation and monitoring of the bridge.

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