

# Seismic Retrofit of the McIlraith Bridge

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## Abstract

The McIlraith Bridge is a 202 m long six-span variable depth steel plate girder structure located in Ottawa, Ontario, with in-span joints in each girder at the second span from each end separating the structure into three segments. The seismic evaluation and retrofit design was completed to the newly adopted CSA S6-14 and based on the Seismic Performance Category of the structure, Performance Based Design was required. To decrease the demand on the substructure elements and increase the durability of the structure, seismic isolation bearings and flexible link slabs were selected as the preferred seismic retrofit scheme. Time History Analysis was performed to verify the results of the Elastic Dynamic Analysis.

**Keywords:** seismic, evaluation, retrofit, isolation, link slab, durability, performance based design

## 1 Introduction

The McIlraith Bridge is a 202 m long six-span variable depth steel plate girder structure located in Ottawa, Ontario. Constructed in 1964, the bridge spans over the Rideau River and Riverside Drive, providing a critical link to hospitals, including the Ottawa Hospital General Campus and Children's Hospital of Eastern Ontario, from Downtown Ottawa.

The overall objective of the project was to seismically retrofit the structure using a method which is feasible, practical, and economical in accordance with current standards, thus ensuring that this important structure withstands the design seismic event and remains open to emergency vehicles following an earthquake. Additionally, the seismic retrofit was to be completed at the same time as the previously engaged structural repair/rehabilitation and deck reconfiguration.

This paper will focus on the seismic analysis requirements for the project, the seismic evaluation of the existing structure, retrofit options, and seismic analysis / design of the

selected retrofit option. Construction began in 2016, and was substantially completed early in 2017.

## 2 Structure Description

The McIlraith Bridge is a six-span structure built in 1964 with an overall span length of 202 m, an overall width of 21 m, and a skew of 18°. The bridge consists of three variable depth steel plate girders structure with a reinforced concrete deck, carrying two traffic lanes in each direction, and accommodates a sidewalk with a concrete parapet wall along each side of the deck and a centre median. The bridge is supported on reinforced concrete abutments and piers, all founded directly on bedrock, except for the west abutment which is founded on end bearing steel H-piles; the first three piers from the west abutment are situated within the Rideau River. The reinforcing steel in the piers was detailed in such a way that steel confinement was not provided to the longitudinal reinforcing. Three of the piers have fixed steel bearings while the remaining two piers and abutments have steel rocker bearings to account for the expansion and contraction of the bridge.