

Burlington Bay Skyway Hanger Fail-Safe System

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1 Abstract

The Burlington Bay Skyway was built in 1954 and rehabilitated in the 1980s. A continuous three span truss rises from below the deck up over the roadway across the 151 m central span over a navigational channel into Hamilton Harbour. The deck system hangs from the truss and the consequences of a hanger impact could be severe and include prolonged closure, impediment of the navigation channel, and could trigger a progressive collapse of the suspended deck system arising from simply supported stringers and floor trusses. The regional economic impact of bridge closure on one of Ontario's major arteries is considerable.

The Ontario Ministry of Transportation (MTO) is adding redundancy trusses to transfer the load from the deck system to adjacent hangers in the event of hanger loss. Each truss runs longitudinally below the edge of the deck through the main span, within the depth of the existing transverse floor trusses. The proactive retrofit improves redundancy of the deck system and keeps the bridge serviceable and safe after hanger loss, in-line with current code requirements.

Keywords: redundancy truss; cable impact; hanger loss; single load path; resilience.

2 Introduction

The Burlington Bay Skyway was built in 1954 and rehabilitated in the 1980s, alongside a highway twinning project, to carry four lanes of traffic on the Queen Elizabeth Way Toronto bound from Niagara. A continuous three span truss rises from below the deck up over the roadway to cross 151 m, at a height of 36 m, above a navigational channel from Lake Ontario into Hamilton Harbour that connects Ontario's steel industry to the St. Lawrence Seaway. Today, the twin bridges have an annual average daily traffic of 271,300 vehicles.

In 2014, an MTO regional office identified a risk associated with hanger impact through this section

of the bridge, where hangers support the deck system and transfer load to the truss, and asked the MTO's Bridge Office to study the vulnerability in greater detail. The existing barrier wall conforms only with TL4 standards and would not be capable of restraining the truck from impacting the hangers, which are offset only 200 mm from the back face of the barrier.

While the probability of a damaging impact is low, the consequences are severe. The bridge would be closed for an undetermined timeframe, the bridge would be in a critical state where repairs are unsafe, and the deflection of the deck system could impede navigation below the bridge. The regional economic impact of bridge closure is considerable.