

Two Outstanding Aluminum Pedestrian Bridges in a National Historic Site

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Benoit holds a Master's degree in structures and has seven years of experience in bridge design and evaluation. He has a great interest in special designs relying on innovative materials.

1 Abstract

In 2017, WSP undertook the challenge of designing two non-conventional aluminum multifunctional walkways for Parks Canada at the Lachine Canal National Historic Site. The designer retained the geometry of the early 19th railway bridges to recall the rich heritage of the industrial era that marked the site. Choosing aluminum for the structures emphasizes Parks Canada's vision: walking towards the future and using innovative, maintenance-free materials. The 27 m x 4.5 m pony truss aluminum structures are completely welded, thus requiring no assembly on site. This is a feat given the constraints of this material. With nearly 5,000 pedestrian and cyclist crossings per day, the works were planned to limit the duration of the building site to only three weeks.

This article focuses on the design of the non-redundant chords of the structures and the vibration issues due to pedestrian crossing. Explanations are provided regarding how the designer applied the provisions that have mainly been prepared for steel and concrete structures to aluminum structures. In the context of a non-redundant single span, it was still possible to obtain a nearly constant demand over capacity ratio for the compressed top chord over its entire length. Moreover, it describes how it is possible to quantify the performance of a footbridge with regards to vibration behavior at the serviceability limit state.

Keywords: aluminum, pedestrian, vibration, pony, truss, stability, compression, optimization

2 Introduction

Located on the island of Montréal in Canada, the Lachine Canal is an important piece of heritage from the industrial era. It is owned and operated by the federal agency named Parks Canada. The canal was built at the beginning of the 20th century so commercial navigation could avoid the rapids located in the St-Lawrence river South of Montréal. At the time, most structures over this canal were rotating movable bridges that allowed the crossings

of vehicles and trains as well as passage for boats in their rotated state. Around the 1970's, many pedestrian bridges were added to complete the bike paths surrounding this National Historic Site. Amongst these, the Hall and Wellington pedestrian bridges stand at the source of this project.

In 2017, Parks Canada requested WSP's services to first evaluate the bearing capacity of these two footbridges. After onsite measurements, original plans study and proper calculations, it turned out that the original design could not sustain the actual loads imposed by the Canadian Highway Bridge

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