



Challenges in the Evaluation of Existing Concrete Structures: Margaret Avenue Bridge

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Abstract

The De la Concorde Overpass in Laval, Quebec, Canada failed in 2006 and cost the lives of five people. The failure initiated in the half-joint of the thick cantilever slab that supported the drop-in span. Following this failure, a number of owners across Canada evaluated non-redundant half-joint connections of concrete bridges, including the Margaret Avenue Bridge in Kitchener, Ontario, Canada. This paper describes the evaluation of the half-joint detail of the structure including review of existing information and a discussion of uncertainties that led to the closure and demolition of the structure. The paper critically compares observations during the demolition of the structure with the assumptions made during the evaluation. The findings during demolition confirmed the majority of the assumptions and validated the decision to demolish the structure.

Keywords: bridge; reinforced-concrete; half-joint; load evaluation.

1 Introduction

In September 2006, the De la Concorde Overpass collapsed in Laval, Quebec, Canada due to a shear failure in a thick reinforced concrete cantilever slab that initiated in the half-joint. The collapse claimed five lives. The failure was attributed to several factors [1] including:

- Inadequate code provisions at the time for concrete shear and as-built reinforcing bar arrangement diverging from what was shown on drawings. This led to reliance of

the structure on the load carrying capacity of concrete in tension.

- Previous bridge rehabilitation weakened reinforcing bar anchorage and created weak planes in the concrete at critical locations.
- Deterioration in the half-joint and cantilever concrete leading to the formation and growth of cracks, which compromised the structure load path.

The De la Concorde Overpass collapse triggered review of structures all over Canada of a similar age and structural configuration, including the