

Hidden Valley Road Bridge Replacement

Frank Vuk, Project Coordinator,
City of Burlington

Phil Campbell, P.Eng.,
Project Manager, CIMA+

Sammy Wong, P.Eng.,
VP Engineering & Quality
Con Cast Pipe

Con Cast Pipe manufactured and supplied a precast, three-sided box and wingwall units for a rapid bridge replacement project in the fall of 2017. The original bridge, a 1.5m (rise) x 7.3m (span) x 6.7m (platform width) concrete rigid frame bridge structure on spread footings with concrete wingwalls and precast concrete block retaining walls, was constructed in the 1950s over Grindstone Creek on Hidden Valley Road in Burlington, Ontario, immediately north of the tunnel underpass of Highway 403. Hidden Valley Road is a rural two-lane, dead-end roadway with approximately 25 residential properties beyond the bridge structure. A January 2014 inspection report provided a recommendation to replace the existing Hidden Valley Road bridge structure within one to three years. This recommendation was based on the consideration of the structure's age, concrete condition, undermining of the abutments, unstable retaining walls, inadequate railing systems and poor orientation of the structure abutments with the watercourse.



Three-sided precast box units being installed

In October 2015, the City of Burlington retained the engineering services of CIMA Canada Inc. to commence a Schedule 'B' Municipal Class Environmental Assessment (EA). The options included: a) a two-phase replacement, b) new alignment of the road/bridge, c) rapid bridge replacement or d) replacement with temporary road/bridge access. Upon consideration of public comments and the specific criteria, option "d" was selected as preferred and progressed to detailed design.

Subsequent to the completion of the EA, CIMA commenced a detailed design of the bridge replacement with a temporary diversion road/bridge. Tendering included the details of a new 2.0m (rise) x 9.1m (span) x 8.0m (platform width) concrete bridge structure, with consideration for many temporary/working constraints associated with the site's unique location and physical properties, natural environment, roadside environment and adjacent properties. Maintaining continuous access for residents, emergency services and other services (i.e. waste collection, mail services etc.) during construction was paramount, understanding that even short duration road closures were not viable. This involved establishing a temporary road alignment and temporary bridge criteria. A 5.0m wide single lane temporary gravel roadway was designed immediately east of the existing bridge and an approved area for the temporary bridge was established to provide suitable separation from the new bridge construction. In consultation with pre-fabricated, modular steel structure suppliers, the criteria for the temporary bridge was established. The temporary roadway and bridge were designed to accommodate fire pumper truck and garbage collection trucks. The temporary single lane width was designed to be controlled by temporary traffic signals at each end of the project site for the duration of construction.

The design process saw a collaboration of many aspects of the engineering and construction community, including a precast concrete and modular bridge supplier to ensure the design was constructible and that scheduling was respectful of the limitations of

Hidden Valley Road Bridge Replacement



Completed Bridge in Service

manufacturing. Coordination with the precast manufacturer was particularly sensitive given the project's expectations for success within the timing window provided. By allowing Lancoa Contracting Inc., the contractor, to develop their own temporary/working schemes, a cost-effective project was delivered on time and on budget.

The manufacturing of the new three-sided box units took place during the summer of 2017 in a certified precast plant at Con Cast Pipe. Unlike typical three-sided boxes, the combination of a skewed end face,

special joint details, post tension hardware, and the limitations of lifting and handling points created a uniquely complex situation. The fabrication of these precast units was controlled under CSA A23.4 requirements and successfully carried out by Con Cast Pipe. A tight quality control and assurance process was put in place to ensure the required precision was achieved during the installation.

In conclusion, the completion of the project ensures the City of Burlington and the residents on Hidden Valley Road will have a reliable bridge structure in this access-constrained location. With the city's proactive replacement of the existing structure before the end of its useful life, the threat of requiring emergency work has been avoided. This project also showcased the use of precast concrete bridge elements in accelerated bridge construction to minimize the social impact and to provide high quality, sustainable, resilient infrastructure to the public. This project has received the 2018 civil engineering project of the year award from the Hamilton-Halton Engineering Week committee, which is a subcommittee of the Ontario Society of Professional Engineers.