



Keystone Bridge Management Corp.

Keystone News

Keystone Bridge Management Corp. offers:

- Specialized bridge asset management services
- Municipal bridge inspections
- Bridge management software solutions
- Training in bridge asset management and bridge inspection
- Bridge rehabilitation or replacement planning and design services
- Bridge load testing
- Quality Verification Engineering
- Bridge and large culvert risk assessment

Inside this issue:

Keystone Bridge Management System **3**

New Office for Keystone **4**



Mike Carrocetto/Ottawa Citizen. Reprinted by Permission.

Corrugated Drainage Structures

An innovative new concept in water conveyance? No! This headline refers to common construction practices of the 1970's and 80's when tens of thousands of corrugated steel pipes (CSP's) were installed throughout Ontario. A former County Engineer in the Peterborough area referred to them as "wrinkly tin" pipes.

On September 4, last year a 3.6 metre diameter corrugated pipe failed on the very busy Hwy 174 in east Ottawa. The 30+ year old storm water sewer culvert had failed from severe corrosion that lead to large scale perforation of the pipe. The perforations allowed the fill around the culvert to leak into the pipe resulting in a sink-

hole large enough to swallow a car. See image above. Very fortunately the sole occupant of the vehicle was not seriously hurt and there were no other injuries.

The City of Sudbury was not as fortunate a few years earlier when a young woman lost her life in a similar scenario.

The City of Ottawa replaced their failed CSP with a concrete pipe of similar diameter. It cost them a reported \$4.5M This was almost three times the budget committed for relining the pipe. The City of Sudbury has aggressively implemented a program of replacing their CSP's with precast concrete box culverts.

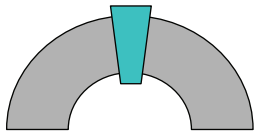
The immediate reaction to these failures is always what can we do

to ensure no repeats? Secondly, how did we not see this coming?

The simple answer is that an effective asset management system must be in place. The Ottawa City Manager, Kent Kirkpatrick recognized that "people need better training, better tools, better information...."

One of the challenges of assessing CSP's is they are often long, dark, filled with muck or loose sediment, partly submerged, and on a bent alignment. What's more they are claustrophobic for some personnel. To make matters more challenging, some municipalities declare their culverts as confined spaces. The cost of a confined space entry

(Continued on page 2)



Keystone is your Bridge Asset Management Specialist!

“Ottawa is now requiring physical inspections.”

Corrugated Drainage Structures, Cont'd

(Continued from page 1)
inspection of a culvert is about ten times the cost of a more conventional inspection.

It is not surprising that the City of Ottawa inspected their failed culvert robotically. However a two dimensional video image viewed from the comfort of an office is a poor substitute for a qualified inspector seeing the severity and extent of deterioration with their own eyes. Hence Ottawa is now requiring physical inspections.

Keystone Bridge Management staff have inspected several thousand CSP culverts with spans exceeding 3.0 metres. Unless the water depth exceeds the freeboard of hip waders, we wade and walk through every open ended culvert. In almost all instances where there is two square metres cross section of air, we deem the structure not to be a confined space.

Our technician, Steve Reid, C.E.T. is one of the foremost culvert inspectors in Ontario. His thoroughness helps ensure that our client's culverts are properly inspected, and their condition properly reported.

Our reporting provides detailed images of CSP damage as shown in the images to the right. We utilize a very sophisticated estimating tool to advise our clients of the cost of CSP replacement, as compared to the replacement cost of an equivalent precast concrete box culvert.

Keystone strives to help you get the most from your bridge and large culvert assets!



Bolt line cracking in newer CSP inspected by Keystone in 2012



Perforation at mud line of 22 year old CSP inspected by Keystone in 2012

Large CSP Culvert Management Tips

- ◆ Inspect CSP's every two years
- ◆ Insist on physical walk-through inspections
- ◆ Insist on engineer lead inspection follow-up when:
 - * Perforations are noted
 - * Distortion resulting in reverse curvature
 - * Excessive distortion
 - * Uplift of inlet components
- ◆ Encourage drainage of otherwise standing water inside culvert
- ◆ Never install CSP's in deep fills or under high volume roads
- ◆ Perform a life-cycle cost analysis before replacing a CSP with another CSP
- ◆ Line new CSP inverts with concrete before placing them into service

Keystone Bridge Management System

Navigation Form

BRAMPTON
Flower City

Bridge and Culvert Inventory Management System

Forms Reports Print

Historical Data
Culvert Estimator

Structure 1 of 14
Roadway bridge without trail/underpass

Structure Find

BCI 74.6

Prev Img Next Img Zoom Bridge ID I5RBNTN127

Bridge ID I5RBNTN127 Previous Next First Last

Bridge Name Tomken Over Etobicoke Creek

Crossing Etobicoke Creek

Route Name Tomken Road

Location 0.49 km South of Hwy 407

Road Class Collector Speed km/hr 70

Latitude 43.677025 Longitude -79.690379

Span Arrangement 11, 16, 11

Description Slab on Prestress Girder

Direction N - S Bridge Spans 3

Skew ° 9 Bridge Length 38.90

Year Built 1984 Deck Width 21.75

Open Lanes 4 Girder Lines 10

Next inspection due Dec 31 2014

AAADT 15320

Structure Environment City

Aesthetic Value Average

Heritage Value Low

Main Feature Through Water

Secondary Feature Through Trail

Filter On

Bridges Culverts Ped Bridges Park Structures Works Structures

Clear Filter

Continuity

Simply Supported Semi-Continuous Fully Continuous

South elevation

Image 1 of 40

Keystone Bridge Management Corp.

Keystone Bridge Management has invested a very significant effort in the last few months creating a client-centric front end for our proprietary bridge management system. The City of Brampton will be our first client to benefit from a highly customized front end that will permit them instant access to all of their bridge, large culvert, and park structure inventory information.

A screen shot of the menu system as the application opens is displayed above. The application permits the client to print individual inspection reports for each structure, view all of the images associated with the structure, look up maintenance needs, capital needs, and per-

formance deficiencies. There is also a large selection of summary reports available. Among the summary reports is a report providing the Bridge Condition Index for each structure, and a report that describes the level of overall depreciation of each structure.

The Ministry of Transportation is presently soliciting vendors for a new Ontario Bridge Management System. We are one of six consultants that responded to the MTO's Request for Information for a new BMS. Keystone Bridge Management has a novel approach to structure asset management, that is world class in its elegance and simplicity. Keystone utilizes an element based depreciation

model to describe the overall condition of any bridge. This approach eliminates the subjectivity of more traditional rating systems such as Excellent, Good, Fair and Poor.

We call our approach the Triple-D method, for Depreciation, Damage and Defects. The inspection of bridge components identifies Defects and Damage, together with performance deficiencies. Depreciation, Damage and Defects can be reliably forecast to advise the client their actual dollar value rate of depreciation.

The result is a highly reproducible indication of a bridge's condition, needs, and outlook.

"...the Depreciation, Damage and Defects can be reliably forecast to advise the client their actual dollar value rate of depreciation."

Eagle pedestrian bridge on the Trans Canada Trail over the Onaping River Falls in the City of Greater Sudbury. Keystone inspected this bridge in 2008, 2010 and 2012.





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**Check out the web site at:
www.keystonebridge.ca**



A picturesque waterfall in the City of Greater Sudbury downstream of their Onaping River Bridge northeast of Highway 144

New Office for Keystone

Keystone Bridge Management Corp. relocated to a larger office environment in the Reddendale Plaza of Kingston in May 2012. Our new address is above.

The new office has over 85 square metres of space and adequate storage for a plethora of bridge inspection equipment.

As the business continues to prosper we look forward to crowding the floor space with more staff.

Fresh coffee brewed every morning! Drop in.



Harold, student Nick Richardson, and Steve Reid cutting the official opening cake on May 10, 2012.

**“WE BUILD TOO MANY WALLS
AND NOT ENOUGH BRIDGES.”**

Sir Isaac Newton