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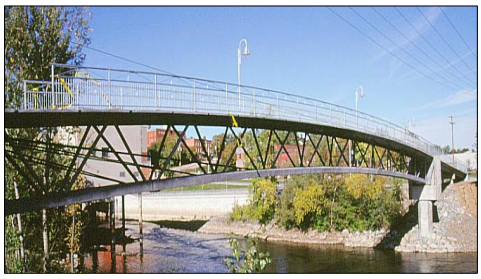
October, 2009

EXECUTIVE SUMMARY: COMPLETED NORTH AMERICAN DUCTAL® BRIDGES

The **Sherbrooke Pedestrian Bridge**, Quebec (1997) is the first Ductal® bridge world-wide, spanning 60m with a space truss, 6 precast segments (10 m long x 3 m high) and a top deck just 30 mm thick. With no passive reinforcement, this revolutionary bridge provided important validation of Ductal® as a superior, "ultra-high performance concrete" material and opened the door to innovative new possibilities in the world of bridge design and construction. This project won a Precast/Prestressed Concrete Institute (PCI) Design Award.



*The **Federal Highway Administration** (FHWA), *Virginia* installed a Ductal® pi-girder for long-term and destructive testing at their laboratory in Virginia in 2003. The girder includes a deck without rebar (corroding rebar is a major problem with thousands of existing bridges). FHWA's ongoing R&D demonstrates the use of Ductal® for bridges, generates comparative case studies, validates designs without rebar and gives confidence to transportation engineers. To date, numerous related papers have been published by FHWA including (in 2006): "*Material Property Characterization of Ultra-High Performance Concrete*" and *"Structural Behaviour of Ultra-High Performance Concrete Prestressed I-Girders".*

*The **Wapello/Mars Hill Bridge**, Iowa (2005) is the *first* North American Ductal® highway bridge; a collaboration involving the FHWA, Iowa DOT, ISU and Lafarge. It is a simple, single-span with a 3-beam cross section and three 33.5 m Ductal® girders without rebar for shear stirrups. This project won a Portland Cement Association (PCA) Concrete Bridge Award.

The **Rainy Lake Bridge**, Ontario (2006) is the world's first Ductal® Joint Fill ("JS1000") project; part of an innovative field cast joint solution for a bridge superstructure/precast deck panel system specially developed for the Ministry of Transportation of Ontario. Through its design, testing and construction, this project validated a precast bridge deck with a 200 mm wide joint (conventional design is 600 mm wide) and led the way to other, repetitive joint fill projects.

*The **Glenmore Trail/Legsby Pedestrian Bridge**, Alberta (2007) is a single span, 53 m bridge that crosses 8 lanes of traffic, consisting of 2 cantilevered, high performance concrete abutments and a 33.6 m drop-in, T-section Ductal® girder. The girder required 40 m^3 of material and the largest, single monolithic pour of Ductal® in the world to date. This project won a Precast/Prestressed Concrete Institute (PCI) Special Jury Award for Innovative Technology and 2 American Concrete Institute (ACI) Awards of Excellence in Concrete**.**

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The **Current River Bridge,** Ontario (2007) utilized Ductal® Joint Fill for precast curb sections under bridge railings.

The **Sunshine Creek Bridge,** Ontario (2007) is a single span, box girder bridge with Ductal® Joint Fill along the length of the girders. It is built with 10 box girders (600 mm thick) side-by-side and 9 Ductal® joints. Ductal® was also used in the approach slabs and curbs.

- Length: 21 meters (69 feet)
- Deck surface area: 250 m^2 (2,690 ft^2)
- GFRP rebar is used throughout for reinforcement.
- Riding surface: asphalt overlay.

Hawk Lake Bridge, Ontario (2008) is another successful Ductal® Joint Fill project with an advanced precast bridge deck system. Advantages and benefits include: simplified fabrication and installation processes, superior freeze/ thaw resistance, extremely low porosity, improved flexural strength, superior toughness with resistance to harsh climates and continuous flexing from truck loadings across the joints.

*The **Jakway Park Bridge,** Iowa (2008) is North America's first highway bridge built with a new generation of three Ductal® pi-girders; the first North American highway bridge to incorporate batching of Ductal® in a ready-mix truck and; the second highway bridge in Iowa and North America with Ductal® girders. This project won an Iowa Quality Initiative Structures Research Merit Award and a Precast/ Prestressed Concrete Institute (PCI) Design Award.

*The **Country Hills Pedestrian Bridge**, Alberta (2008) has a 33.5 m Ductal® drop-in girder. This 49 m clear span bridge crosses over 6 lanes of traffic, providing the two adjacent communities with an aesthetically pleasing, durable curved-linear link. This is the first pedestrian bridge project where Ductal® was batched in a ready mix truck.

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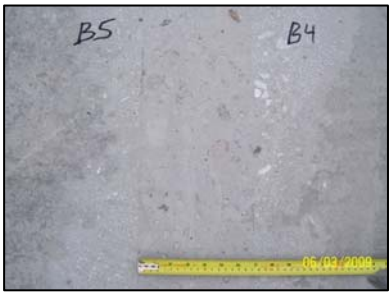
The **Cat Point Creek Bridge,** Virginia (2008) has five, 24.3 m Ductal® bulb-tee girders and a conventional cast-in-place deck; another excellent example of Ductal's ability to create longer, thinner bridge girders with reduced weight and improved durability.



The Village of Lyons Bridge, New York (2009) is a side by side, single Bulb-Tee girder project. The photo (left) is a close-up of the finished joint, showing the surface aspect and quality of the joint. The bridge consists of 8 – 26 meter long, side by side Single Bulb-Tee Girders with Ductal® JS1000 Joint Fill.

Oneonta, New York (2009) is built with 22 precast slabs jointed on top of 5 steel girders (slab thickness: 200 mm).

- Length: 38.8 meters (127 feet)
- Deck surface area: 504 m^2 (5,425 ft^2)
- Joint cross-section: 152 mm wide by 200 mm thick.
- Galvanized bars are used throughout for reinforcement.
- Riding surface: concrete overlay.

The following bridges, "**Buller Creek**" and "**Log River**", were completed for the Ministry of Transportation of Ontario (MTO) in 2009. Each bridge is constructed with precast concrete and joined together with Ductal® Joint Fill -- resulting in extremely durable, advanced bridge deck systems that will last, through harsh climates and heavy traffic loads for many decades ahead.

Buller Creek

- 10 precast box girders (900 mm thick) side-by-side, 9 Ductal® joints.
- Ductal® was also used in the approach slabs and curbs.
- Length: 27.8 meters (91 feet)
- Deck surface area: 343 m^2 (3,692 ft^2)
- GFRP rebar is used throughout for reinforcement.
- Riding surface: asphalt overlay.

Log River

- 8 box girders (610 mm thick) side-by-side with 7 Ductal® joints.
- Ductal® was also used in the approach slabs and curbs.
- Length: 21 meters (69 feet)
- Deck surface area: 216 m^2 (2,325 ft^2)
- GFRP rebar is used throughout for reinforcement.
- Riding surface: asphalt overlay.

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The **Eagle River Bridge** is another Ductal® Joint Fill project currently underway for the MTO. It will be the first multiple span box girder bridge using Ductal® Joint Fill. Phase 1 has been completed. It has 36 box girders (12 side-by-side over 3 spans) requiring 33 Ductal® joints to join the girders together and 3 Ductal® joints joining the spans together. Ductal® will also be used in the approach slabs and the curbs.

- Length: 87 meters (285 feet)
- Deck surface area: 1195 m^2 (12863 ft^2)
- GFRP rebar is used throughout for reinforcement.
- Riding surface: asphalt overlay

To date, North American Ductal® bridge projects have won 6 awards, thereby strengthening Lafarge's position as the leader in ultra-high performance concretes.

**Precast Ductal elements were produced by Lafarge Precast (Winnipeg and Calgary).*

For additional information, please contact:

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