

Choice of Major Culvert Material Based On Proven Performance

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Use of precast concrete box units under the TransCanada Highway was based on the proven performance of concrete and the expected service life of precast reinforced concrete box culverts. At two crossings of the highway, one kilometer apart, cast-in-place double cell concrete box culverts were installed in 1955 to carry the flow of Hartell Creek. The culverts, located east of Calgary, Alberta, near the Town of Strathmore, were extended across new eastbound lanes with arched structural plate corrugated steel pipe (SPCSP) when this section of the highway was twinned in 1974.

Soon after completion of the highway widening, the SPCSP culverts experienced excessive deflection and had to be supported with steel struts between wood beams at the crown and invert of the pipes. The SPCSP continued to deteriorate, developing excessive corrosion and ring cracking while the cast-in-place concrete box culverts continued to perform well. The TransCanada

Highway is the world's longest national highway, stretching 7821 km (4660 miles). It is vital to Canada's economy that the highway be maintained without disruption and premature structural failures.

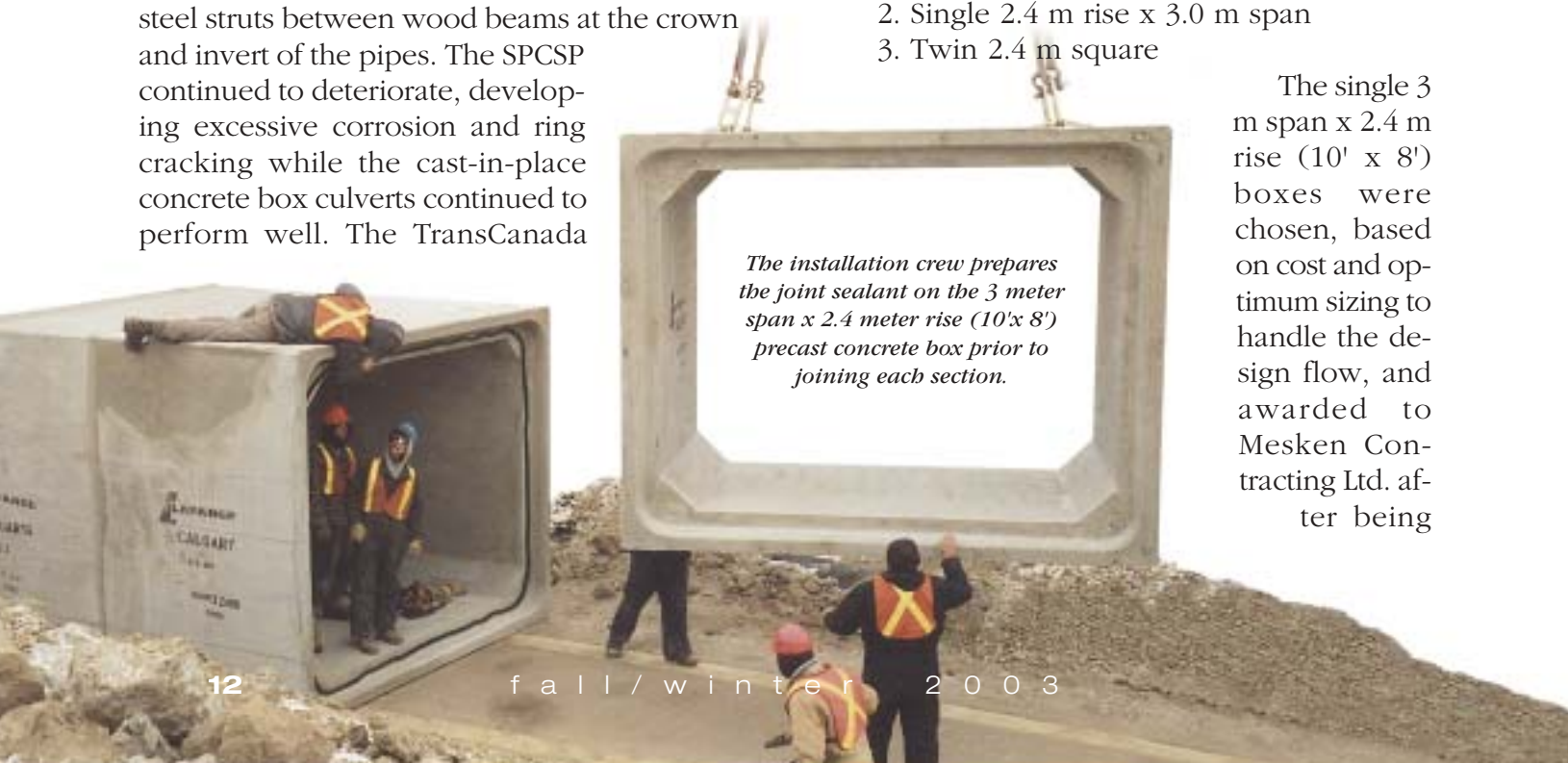
Alberta Transportation initially considered a liner installation inside the SPCSP arches to minimize disruption to traffic. This option was quickly discarded, as the largest usable liner was undersized for the design flows. Once a liner was no longer an option, only pre-cast concrete boxes were considered. This decision was based on the good performance of the nearly 50-year old cast-in-place twin boxes as compared to less than 20-year old SPCSP arches. The replacement culverts had to meet a 75-year design life as specified in the Canadian Highway Bridge Design Code (CHBDC). The other advantages of precast box culverts were better fit with the existing cast-in-place culvert, and superior results in past installations of concrete box culverts with regard to cost and construction method.

Khaled Nasery, E.I.T. of Mish Engineering designed the culvert replacements under the supervision of Ash Morjaria, P.Eng. Mish Engineering presented Alberta Transportation with three different size pre-cast concrete box alternatives:

1. Twin 2.4 m rise x 1.8 m span
2. Single 2.4 m rise x 3.0 m span
3. Twin 2.4 m square

The single 3 m span x 2.4 m rise (10' x 8') boxes were chosen, based on cost and optimum sizing to handle the design flow, and awarded to Mesken Contracting Ltd. after being

The installation crew prepares the joint sealant on the 3 meter span x 2.4 meter rise (10'x 8') precast concrete box prior to joining each section.



tendered in December, 2002. Lafarge Canada, Inc. supplied the box units from their Calgary pipe operation after designing the units in accordance with CHBDC for CL-800 truck loading and cover ranging from 0.2 m to 2.65 m (7.5" to 8') above the top of the culvert. The 44 box units, each 2 m long (6 1/2" feet), were produced from February 10 to 18, 2003 with AMEC Earth and Environmental inspecting the production. The west culvert required 19 units and the east culvert 25.

Construction took place in two stages. First, eastbound traffic was reduced to one lane and moved onto the south shoulder. The failed SPCSP was removed and 10 sections were installed at the west culvert and 11 at the east culvert. The first box units were cast with exposed reinforcing to facilitate an easy field connection to the existing culverts. After the first stage installation was backfilled, the contractor moved the traffic to the north shoulder over the newly installed boxes and installed the remaining box units at each site.

The roadway was surfaced and the eastbound lanes opened to two-lane traffic. The westbound lanes were unaffected by the construction, however, eastbound traffic was reduced to one lane for 16 days at the west end, and 18 days at the east end. The contractor

worked at both sites simultaneously on a 24-hour basis in extreme cold conditions. Construction was complete in 22 days at both sites. A steel strut was placed at the upstream end of the new culvert sections to block large debris, not for structural support.

Installation of the precast concrete box culverts provided minimal disruption



Steel struts and wood beams were used to support the excessively deflected SPCSP...

...until precast concrete box sections could be installed while maintaining traffic flow...



...and provide an attractive and structurally sound culvert solution under the TransCanada highway.



tion to traffic and an economical, long-lasting product that will stand up to the existing environmental and load conditions. With a 75-year design life, the new culvert sections will unquestionably outperform the previous structurally reinforced SPCSP that lasted only 29 years. The new sections should also outlast the cast-in-place sections. Time is now on the side of Canadian taxpayers. ☺

Project:	Hartell Creek Culverts Replacement Town of Strathmore, Alberta
Owner:	Government of Alberta, Canada
Consulting Engineer:	Mish Engineering Airdrie, Alberta
Contractor:	Mesken Contracting Ltd. Okotoks, Alberta
Quantities:	44 (3 meter span x 2.4 meter rise) precast reinforced concrete box units
Producer:	Lafarge Canada Inc. Calgary, Alberta

The Lafarge Canada Inc. plant in Calgary is a key component of Lafarge North America's concrete pipe operations in Canada. Products include reinforced concrete pipe ranging in size from 300 mm to 3000 mm, jacking and tunnel pipe, manholes, catch basins, precast concrete box units and associated drainage products. Lafarge plants in Calgary, Edmonton and Winnipeg provide precast concrete pipe and an assortment of drainage products throughout western Canada. See www.lafargepipe.com for details.