



CASE STUDY

INFRASTRUCTURE



Choinière Dam and tunnel concrete repair

Granby, QC, Canada



Project Information

Project category:
Infrastructure

Subcategories:
Concrete Restoration Systems,
Waterproofing Systems, Products for
Underground Construction (UTT)

Years of construction:
1975-1977

Years of MAPEI involvement:
2019-2021

MAPEI coordinators:
Baltazar Basabe, Michel Lafortune and
Hamza Ouziame

MAPEI distributor:
Geroquip Inc.

Project owner:
Government of Quebec

General contractor:
Inter-Cité Construction Ltd.

Engineer/designer:
Grazia Toma



Project Overview

After four decades in service, the Choinière Dam and its drainage tunnel were experiencing water infiltration from cracks and failing joints. Specialized products and expertise from MAPEI got the repairs done to keep the water out.



Products Used

Epojet™ LV [NA]

Foamjet T

MapeWrap® 11

Resfoam® SS 75



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Repairing a dam and drainage tunnel against leaks

The city of Granby, Quebec, is about an hour's drive from Montreal and is even closer to the United States border. Nestled in the hills where the St. Lawrence Lowlands meet the Appalachian Mountains, the landscape is a major draw for cyclists and nature lovers alike.

Granby's famous zoo and adjacent Yamaska provincial park lie along the Yamaska River. There is also a dam dating from 1975 that channels overflow from the Choinière Reservoir into the river just east of the city.

As with much of Quebec's concrete infrastructure built at that time, the dam and its connected drainage tunnel had developed significant cracking over their four decades of service. Sizable gaps had also developed at the joints of the tunnel's segments.

Engineers in charge of maintaining the dam and drainage tunnel realized that intervention would be needed to repair and waterproof the structure to prevent continued water ingress from compromising its structural integrity.

MAPEI at the ready

The structure's provincial-government owner, as well as main contractor Inter-Cité Construction Ltd., turned to MAPEI for answers. Both parties knew the technologies that have been developed in part by MAPEI's R&D Center of Excellence for Concrete Restoration Systems in nearby Laval, Quebec.

"The engineer, Grazia Toma, approached us to find a polyurethane product with good tensile strength and waterproofing properties for the joints," explained Hamza Ouziame, engineering and architectural sales representative for MAPEI.

The environment, of course, also called for use of products that could hold up against the deep winter cold and the expansive pressure that water naturally exhibits upon freezing.

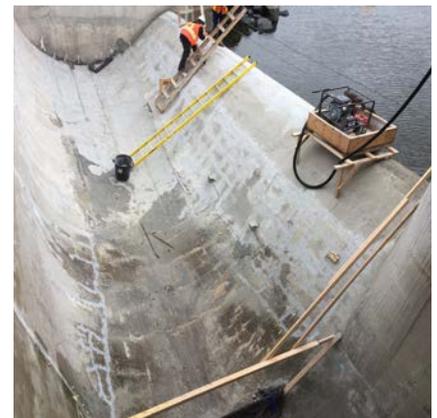
"The challenge was in executing the injection of quick-setting polyurethane resins in order to stop the various ingresses of water throughout the roughly 10-foot [3.05-m]-diameter, 528-foot [161-m] long drainage tunnel," noted Michel Lafortune, MAPEI sales representative for underground construction.

"Crews of between 6 to 12 installers worked on the site, depending on the complexity of the different phases of execution to complete all the various phases of repairs," Lafortune added.

A plan with three phases

For the areas requiring structural crack reinforcement, installers applied **Epojet LV**, a moisture-tolerant, very low-viscosity, epoxy injection resin that deeply penetrates as well as seals dry and damp hairline, non-dynamic cracks in concrete.

For less-severe cracks requiring only a waterproofing resin, **Resfoam SS 75** rigid, hydrophobic polyurethane



Repairing a dam and drainage tunnel against leaks

grout was applied. The low viscosity of *Resfoam SS 75* provides effective penetration into the substrate, adding structure and stabilization by encapsulating the granules and subsequently forming a rock-like mass.

Before either of these interventions, the substrates were first prepared using **MapeWrap II** 100%-solids, moisture-tolerant, structural epoxy adhesive to seal cracks.

In the tunnel, where the joints were experiencing water ingress, the more heavy-duty **Foamjet T** was used. This specialty product from the MAPEI UTT (Underground Technology Team) line is a high-viscosity, ultra rapid-setting, polyurethane resin that is designed for consolidating and waterproofing structural elements that are subject to high-pressure water ingress in environments such as dams and tunnels.

The two components that make up *Foamjet T* must be mixed together by a special pump for two-component resins. To carry out an injection, *Foamjet T* Part A and *Foamjet T* Part B – in the ratio of 1:1 by volume – must first be separately conveyed through the pump and into the nozzle that was previously placed on the injector. Both parts are then mixed by a helicoidal mixer that is placed within the nozzle.

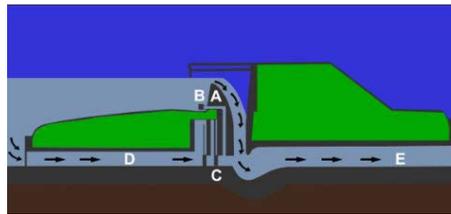
After mixing, *Foamjet T* must be injected continuously through the crack. When the two components are mixed, the viscosity of the mixture increases substantially; therefore, the injected mixture will not separate or be washed out by the water pressure.

The increase in volume of the foam and its fast reaction stops the water ingress within a few minutes. In the absence of water, *Foamjet T* hardens without increasing in volume and rapidly seals the crack.

Meanwhile, the many cycling enthusiasts drawn to the area's natural beauty never stopped pedaling alongside the dam as the restoration work below was being so mindfully carried out.

Once the work was completed in 2021, the structure was given a new lease on life through an effective waterproofing solution that was applied to all the joints and cracks throughout.

"All these repairs took place as planned to the great satisfaction of the contractor and the customer," Lafortune concluded.



MAPEI Inc.

2900 Francis-Hughes Avenue
Laval, Québec H7L 3J5
(450) 662-1212

Technical Services

1-800-361-9309 (Canada)

Customer Services

1-800-42-MAPEI (1-800-426-2734)