THE RESTORATION OF THE MASONRY PILLARS OF THE JACQUES-CARTIER BRIDGE

HERITAGE BUILDING SOLUTIONS

Luc Genest
Sales Manager

HOW TO GET ACCESS TO MONTREAL?

TRAIN

TUNNEL

SUBWAY

BRIDGE
AGENDA

- History of the bridge
- The problems, the solutions and the challenges
- Products selection and application
- Overview of the completed work

HISTORY OF THE BRIDGE

Designer of the bridge: Philip Louis Pratley

Monsarrat and Pratley of Montreal, and J.B. Strauss of Chicago doing business under the name of Monsarrat Pratley & Strauss are retained as consulting engineers for the construction of the Jacques Cartier Bridge

- Construction started in 1925
- Officially opened in 1930
- Total cost of works: $20 Millions

JACQUES CARTIER BRIDGE

- CLEAR HEIGHT:
  - 49 Meters (161 feet)
- TOTAL HEIGHT:
  - 104 Meters (342 feet)
- LENGTH:
  - 2,687 Meters (1.7 miles)

The majority of the pillars are in concrete covered by limestone. 13,380 cubic meters of natural stone have been used for the original construction.

At its opening, the bridge will be called the Harbor Bridge. In 1934, on the occasion of the 400th anniversary of the discovery of Canada, the bridge was named Jacques-Cartier in honor of the man who discovered America.
Since its inauguration, users had to pay to cross the Jacques Cartier Bridge.

Tolls existed for decades and were abolished in 1962.

The toll charges were as follows:

- Pedestrian: 15 cents
- Cyclist: 15 cents
- Automobile (for vehicle and driver), 25 cents and 15 cents per passenger
- Truck: 25 cents to $1.50
- Oil tank pulled by two animals: 60 cents
- Vehicle pulled by a dog or goat: 15 cents
- Wheelbarrow: 15 cents

Today the total number of vehicles using the bridge is estimated at 34 million per year.

In 2014, the federal government announced $117 millions investment for the restoration of the bridge.

The problems
SOLUTIONS

- Pour new concrete in some specific areas
- Use of grout for cracks in the stones and to fill voids behind stones
- Rebuild the damaged stones in place
- Repoint the pillars
THE SELECTED MORTAR

- Specifically designed for the restoration of limestone:
- Contains no synthetic polymer:
- Has the same coefficient of thermal expansion as limestone:
- No curing:
- No special surface preparation is needed. Can be feather edged:
- Compressive strengths:
  - 24 hours: 15 MPa
  - 7 days: 30 MPa
  - 28 days: 35 MPa

THE TRAINING

COLORS SELECTION
PROTECTION

FINAL WORK

THE REPOINTING

MORTAR SELECTION

inches beyond the line of pitching.

10. After completion of the masonry facing, all face beds and joints must be raked out to a depth of 1/2 inches, washed, and pointed with mortar composed of part of cement and one part of fine aggregate, driven with a caulking iron, as dry as can be properly worked, and the surface of the joint struck with a round tool. All pointing must be sprinkled, kept wet at the surface, and sheltered from the sun for at least 24 hours.
Contrary to the ASTM standard, the CSA standard only recognize the types S & N mortars.

**ASTM C270**

<table>
<thead>
<tr>
<th>TYPE</th>
<th>PORTLAND CEMENT</th>
<th>HYDRATED LIME</th>
<th>AGGREGATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>1</td>
<td>%</td>
<td>1</td>
</tr>
<tr>
<td>S</td>
<td>1</td>
<td>½ to ¾</td>
<td>3½ to 4½</td>
</tr>
<tr>
<td>N</td>
<td>1</td>
<td>¾ to 1½</td>
<td>4½ to 6</td>
</tr>
<tr>
<td>O</td>
<td>1</td>
<td>1½ to 1½</td>
<td>–</td>
</tr>
</tbody>
</table>

**CSA A179**

<table>
<thead>
<tr>
<th>TYPE</th>
<th>PORTLAND CEMENT</th>
<th>HYDRATED LIME</th>
<th>AGGREGATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>1</td>
<td>½</td>
<td>3½ to 4½</td>
</tr>
<tr>
<td>N</td>
<td>1</td>
<td>1</td>
<td>4½ to 6</td>
</tr>
</tbody>
</table>

The Engineer has decided to select a type S mortar, specified by proportions (2-1-9).
COMPLETED WORK

MERCI- THANK YOU!

Luc Genest
lgenest@kpmindustries.com

HERITAGE BUILDING SOLUTIONS