

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

HERITAGE
BUILDING
SOLUTIONS

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HOW TO GET ACCESS TO MONTREAL?



TRAIN



TUNNEL



SUBWAY



BRIDGE



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AGENDA

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



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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



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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.



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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.



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- ❖ Since its inauguration, users had to pay to cross the Jacques Cartier Bridge.
- ❖ Tolls existed for decades and were abolished in 1962



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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



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- ❖ 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.

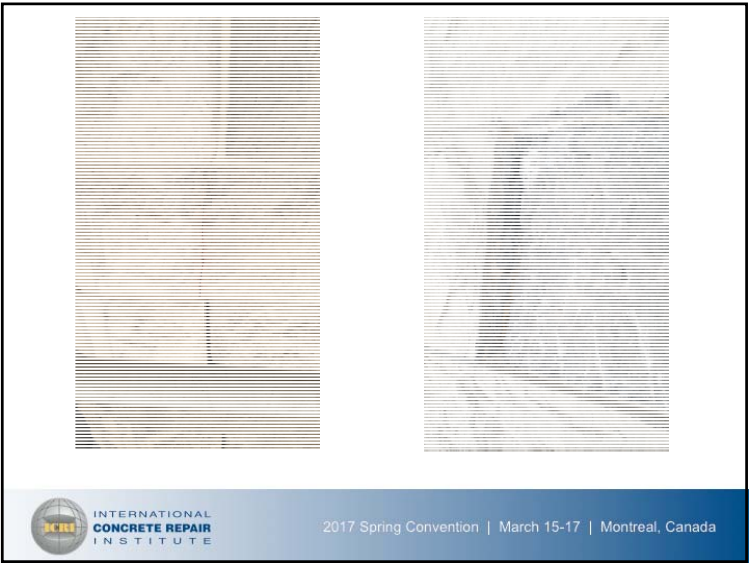
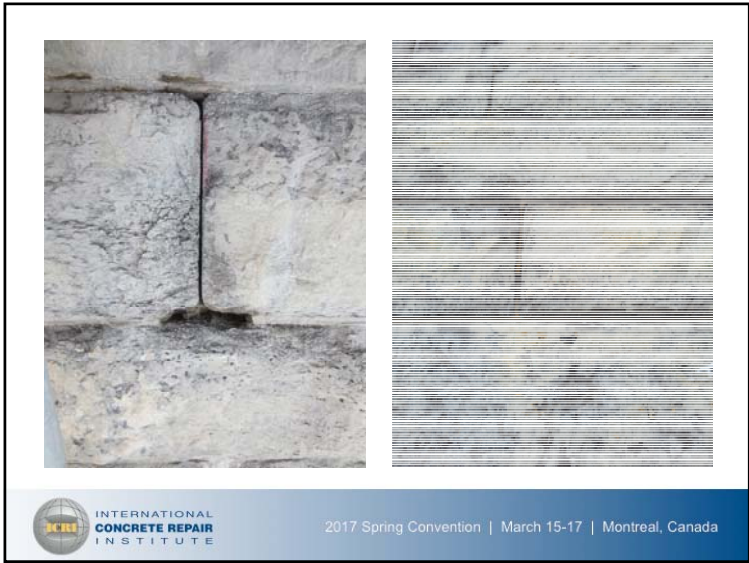


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THE PROBLEMS



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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



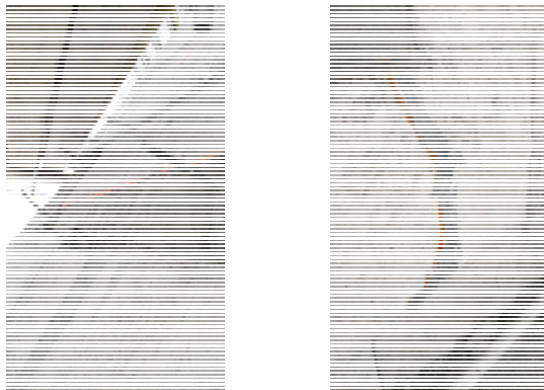
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POUR NEW CONCRETE IN SOME SPECIFIC AREAS



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INJECTION GROUT FOR CRACKS AND VOIDS



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REBUILD THE DAMAGED STONE IN PLACE



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THE SELECTED MORTAR

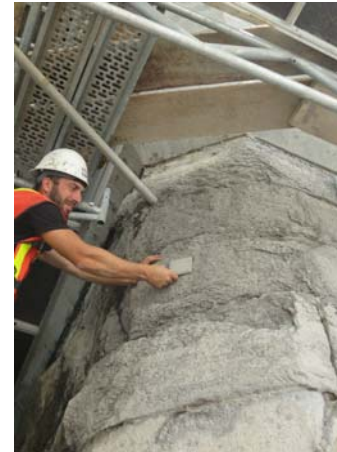
- ❖ Specifically designed for the restoration of limestone:
- ❖ Contains no synthetic polymer:
- ❖ Has the same coefficient of thermal expansion as limestone:
- ❖ No curing:
- ❖ No special surface preparation is needed. Can be feather edged:
- ❖ Compressive strengths:

24 hours	15 MPa
7 days	30 MPa
28 days	35 Mpa



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COLORS SELECTION

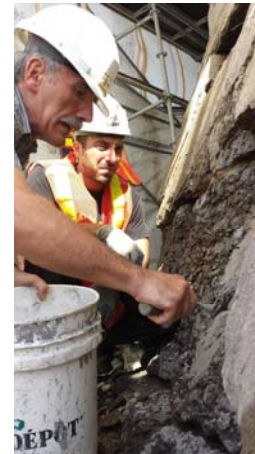


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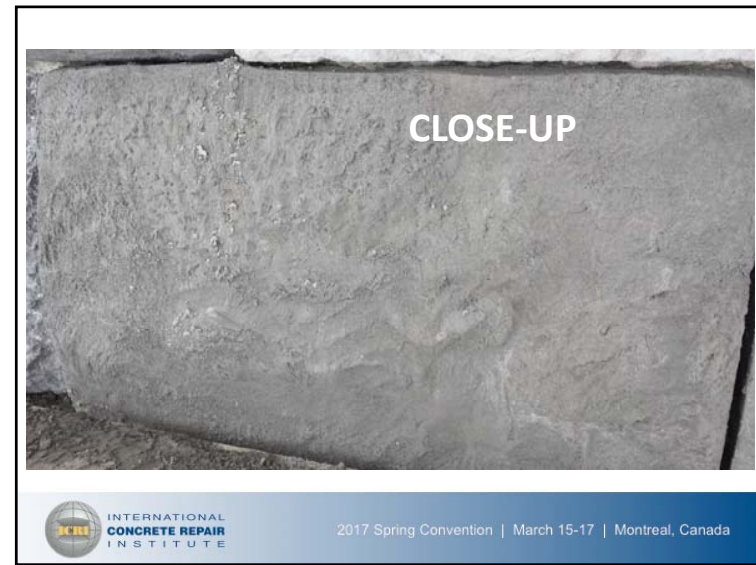
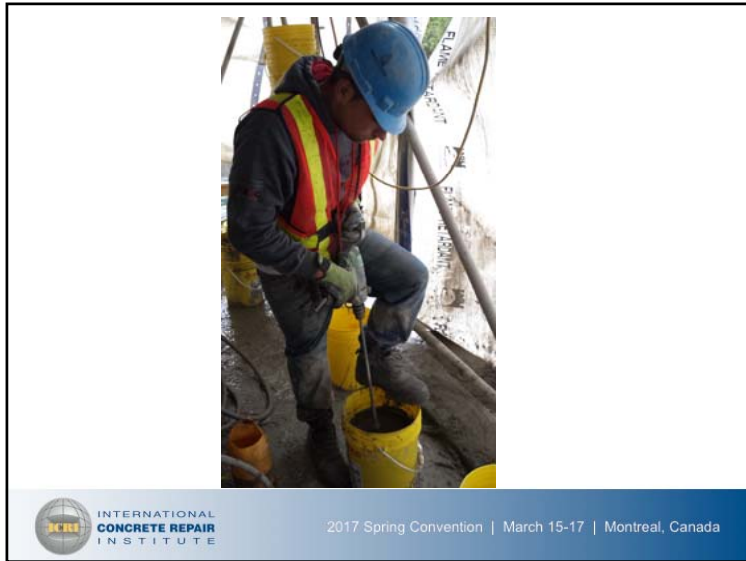
THE TRAINING



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PROTECTION



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FINAL WORK



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THE REPOINTING



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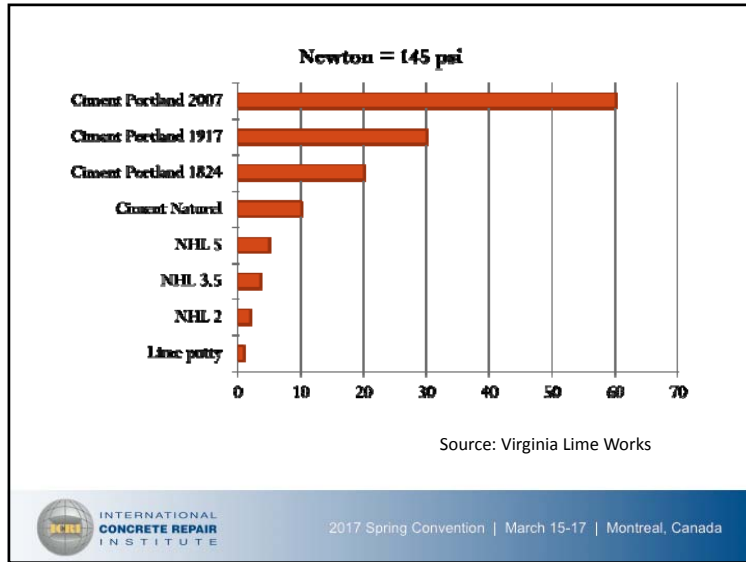
MORTAR SELECTION

inches beyond the line of pitching.

70. After completion of the masonry facing, all face beds and joints must be raked out to a depth of 1 1/2 inches, washed, and pointed with mortar composed of one 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 wet with a round tool. All pointing must be sprinkled, kept wet at the surface and sheltered from the sun for at least eight



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CSA A 179 vs ASTM C270

Contrary to the ASTM standard, the CSA standard only recognize the types S & N mortars

ASTM C270

TYPE	PORTLAND CEMENT	HYDRATED LIME	AGGREGATE
M	1	¼	Not less than 2 % and not more than 3 times the sum of cementitious materials
S	1	¼ to ½	-
N	1	½ to 1¼	-
O	1	1¼ to 1½	-

CSA A179

S	1	½	3 ½ to 4 ½
N	1	1	4 ½ to 6

CSA A 179 vs ASTM C270

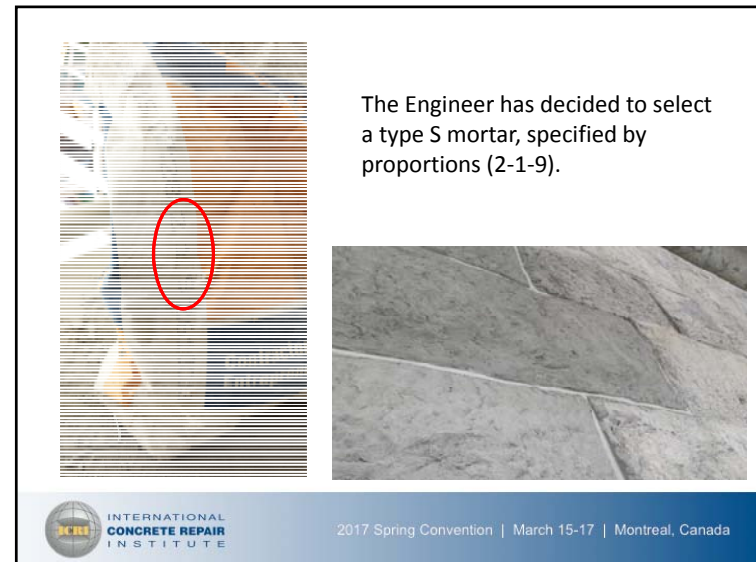
Minimum compressive strengths and air content

ASTM C270


TYPE	7 DAYS	28 DAYS	Max Air %
M	-	17.2 Mpa (2500 psi)	12%
S	-	12.4 Mpa (1800 psi)	12%
N	-	5.2 Mpa (750 psi)	14%
O	-	2.4 MPa (350 psi)	14%


CSA A179

S	7.5 MPa	12.5 MPa	18%
N	3MPa	5MPa	18%





COMPLETED WORK



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MERCI- THANK YOU!

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