



Pointe de la Prairie Light House, L'Isle-Aux-Coudres, QC

By Simon Reny & Scott Rand

The Pointe de la Prairie light house is located on the North shore of the Île-aux-Coudres Island across from Baie-St-Paul in the St. Lawrence River. Since its construction in 1972, the lighthouse and has been exposed to extremely severe environmental conditions. Exposure to salt water, continuous freeze-thaw cycles and impact from ice flows, have contributed over the years to severe deterioration of the concrete that makes up the base of the light house. A 7 mm (1/4") thick steel plate surrounding the concrete base was designed to provide added protection against impact from ice flows. In several areas, these plates were completely destroyed. The extent of the concrete deterioration behind these plates was so severe that in some areas it reached nearly 1 meter (3 ft) in depth.

In the summer of 2004, The Public Works and Government Services Canada elected to tender a project to conduct a much needed, major rehabilitation of the lighthouse. The consulting engineers, BPR Inc. recognized the need to come up with a system that would meet the challenges associated with the difficult access while providing protection against the severe environmental conditions.

Working with engineers from King Packaged Materials Company, BPR Inc. specified a dry-mix shotcrete containing silica fume, steel fibers, a granite based coarse aggregate, air entraining admixture and a set time accelerator. The air entraining admixture was specified to provide improved durability, the steel fiber and granite stone were incorporated to provide resistance to impact from ice and the set time accelerator and the silica fume were specified to reduce the risk of wash out created by the rapidly moving tides and waves. The new structural design of the base of the light house did not include the use of steel plate to guard against impact damage. It was agreed that this protection would be offered by the impact resistant properties of the shotcrete.

In July of 2004, The Public Works and Government Services Canada awarded the contract to complete the rehabilitation of the lighthouse to Yves Germain Construction of Quebec City, Quebec and the shotcrete portion of the contract was sub-contracted to Cimota Inc, also of Quebec City. Cimota elected to have the pre-blended shotcrete mix supplied in 1000 kg (2200 lb) re-usable bulk bags and worked with personnel from Yves Germain Construction to schedule the shipment of the material to the worksite by barge. As in all dry mix shotcrete applications, potable water was added at the nozzle. Cimota elected to use a hydromix nozzle to pre-dampen the dried shotcrete material.

Before beginning the shotcrete portion of the project, test panels were shot and mechanically finished to provide a representative sample of the finished product. The panels were left on site for 24 hours after which time cores were taken to evaluate the compressive strength and quality of the shotcrete placement.

The concrete base of the lighthouse was divided into 14 triangular sections, each separated by a vertical construction joint. Each section was shot from the bottom of the section (at the base of the lighthouse) to the top to maximize the amount of material that could be applied before the action of the rising tides threatened to wash out the applied shotcrete. As the tide retreated, cleaning and prep work was completed on the next section and the next shooting session began.

To ensure the project would be finished in time to meet the fall, 2004 deadline, Cimota Inc. elected to use two Aliva AL 246 shotcrete machines, supplied by King Packaged Materials' Minequip division. Cimota also utilized two ACI certified nozzelman. This challenging shotcrete rehabilitation project was successfully completed on time despite the difficult weather conditions that constantly disrupted shooting schedules. The skill of the Cimota certified nozzelmen and the quality of the specially designed King shotcrete mix were evident by the overall quality of the completed project. After two years, the performance of the shotcrete has met all expectations and the Public Works and Government Services Canada has expressed complete satisfaction with the performance of the product and the installation.





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