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Performance Evaluation of Hydrophobic Concrete Slabs of the Laurier-Taché Parking Structure in Gatineau, QC

Objectives

To evaluate the field performance of reinforced concrete structures made with hydrophobic concrete under the combined effects of mechanical loads and reinforcement corrosion.

Background

A number of deteriorated elevated concrete slabs of the Laurier-Taché parking structure in Gatineau Quebec were rebuilt in the fall of 2004 using hydrophobic concrete as a means to reduce and delay corrosion of the reinforcement. The NRC was invited by the owner to evaluate the field performance of these slabs using remote monitoring with embedded sensors.

Statement of Work

Instrumented structural concrete slabs and ramps made with and without hydrophobic concrete, monitored their strain, temperature, relative humidity and corrosion potential; and assessed them periodically for cracking and corrosion.

Results

- Water and chloride permeability values measured after two years were found to be low in uncracked hydrophobic concrete, and similar to those measured in normal concrete.
- Drying shrinkage measured after two years was found to be 40% larger in the hydrophobic concrete sections compared to the normal concrete sections.
- Deep transverse cracks were observed within 6 months of rehabilitation in all monitored concrete slabs and ramps.
- Hydrophobic concrete was not effective at preventing moisture migration through the floor cracks, even after repair with epoxy injection.
- Risk of reinforcement corrosion after two years was low, except in few small areas.
- Hydrophobic concrete showed no significant improvement over normal concrete regarding strength and durability.

Outcomes

PWGSC was advised to undertake further monitoring to track the corrosion resistance of the reinforcement until a waterproofing membrane is installed on the hydrophobic concrete floor sections.

Partners

Public Works and Government Services Canada (PWGSC)

Start/Expected Completion Dates

This project began in 2004 and was completed in March 2007.

Project Manager

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For more information see, http://irc.nrc-cnrc.gc.ca/ui/cs/concreteslabs_e.html

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Underside of concrete slabs at the Laurier-Taché parking garage before rehabilitation



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