



Bringing quality
to the
built environment

Sustainability and Durability of Reinforced High-Performance Concrete Structures

Objective

To investigate and demonstrate the mechanical performance, durability and sustainability of reinforced concrete structures built with high-performance concrete (HPC).

Background

Much of Canada's aging infrastructure consists of concrete structures built with conventional steel reinforcement. The safety and durability of these structures can be substantially compromised by corrosion. Moreover, concrete production is a major source of carbon dioxide emissions. High-performance concrete can offer advantages over normal concrete, including greater strength, lower permeability and longer service life. HPC formulations that include supplementary cementing materials (SCMs) derived from industrial waste products are also more environmentally sustainable. This project aims to encourage greater use of HPC in Canada by demonstrating some of these benefits.

Statement of Work

- Develop five HPC mix designs for sustainability, durability and strength, by using SCMs, internal curing and special admixtures.
- Conduct laboratory tests on these mixes to collect physical, thermal and mechanical performance data required for later structural analysis.
- Build five instrumented HPC slabs on the NRC campus, subject to environmental conditions and restrained shrinkage. Various types of corrosion-resistant reinforcing steel will be used.
- Assess the performance of these HPC slabs with regard to cracking and corrosion with continuous remote monitoring and periodic field surveys.
- Develop and validate analytical models.

Expected Outcomes

- Test results on the mechanical performance and durability of each HPC slab
- Numerical models to predict shrinkage, creep, time-to-corrosion, and risk of cracking
- Recommendations for use of these HPC technologies in concrete structures.

Partners

The Federal House in Order initiative, Public Works and Government Services Canada, Ministère des Transports du Québec, Northeast Solite Corp. and W.R. Grace & Co.

Start/Expected Completion Dates

This project began in December 2005 and will be completed in March 2008.

Project Manager

Dr. Daniel Cusson: 613-998-7361, Daniel.Cusson@nrc-cnrc.gc.ca

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

Factsheet 73, June 2006



Preparation of test slabs on the NRC campus.