case study
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Ontario Cast-In-Place Concrete Development Council

York University – Parking Structure III (PS3) and the Student Centre (SSC)

The new, fifty million dollar Student Services (SSC) at York University, including the 5-level, 1300-car Parking Structure (PS3) incorporated innovative environmentally friendly concrete technology by effectively using supplementary cementing materials in the reinforced concrete structures.

In the SSC structure, 50% of the Portland cement was replaced with Type C fly ash. This is a waste product that originated from coal-fired electrical generation plants but which has beneficial effects to concrete. During cold weather conditions, the replacement was reduced to 25% to offset the longer concrete set time encountered during cold weather months.

In the case of the Parking Structure the Designer specified the replacement of 25% of the Portland Cement with slag cement. Slag is a byproduct of steel manufacture. Both fly ash and slag are waste products that would otherwise have to be non-productively disposed. These two products radically improve various properties of the concrete when used in proportions of 25% or more of the total cementing material. Since the manufacturer of Portland cement produces one tonne of green house gas for each tonne of Portland cement, any reduction of the amount of Portland cement used in the concrete would result in a reduction of green house gas generated during the construction of the these structures.

To ensure a successful project while maximizing the use of supplementary cementing materials, the Designer required pre-construction trial slabs with various concrete mixes, all of which containing 50% fly ash were tested to establish the following – initial set, ease of finishing of the concrete, quality of concrete, rate of strength gain, and surface hardness. Various tests were also executed on the trial slabs to evaluate the effectiveness of different curing procedures.

Owner: York University

Architects: A joint venture of:
- Hariri Pontarini Architects
- Robbie Young + Wright Architects

Engineers: Carruthers & Wallace Limited, Consulting Structural Engineers

Construction Team Members:

Project Manager:	Vanbots Construction Company
Concrete Supplier:	Dufferin Custom Concrete Group
Concrete Consultant:	John A. Bickley Associated Limited
Formwork Contractor:	Structform/Hardrock (joint venture)

Additional Participants:
- Aluma Systems Canada Inc.
- Carpenters Local 27
- LIUNA Local 506
- Ironworkers Local 721
- Harris Rebar

Project Facts:

Type of Project:	5 Level Parking Garage & Student Centre
Size:	3,235m² (PS3) / 7,860m² (SSC)
Start Date of Project:	May 2001
Project Completion Date:	October 2003

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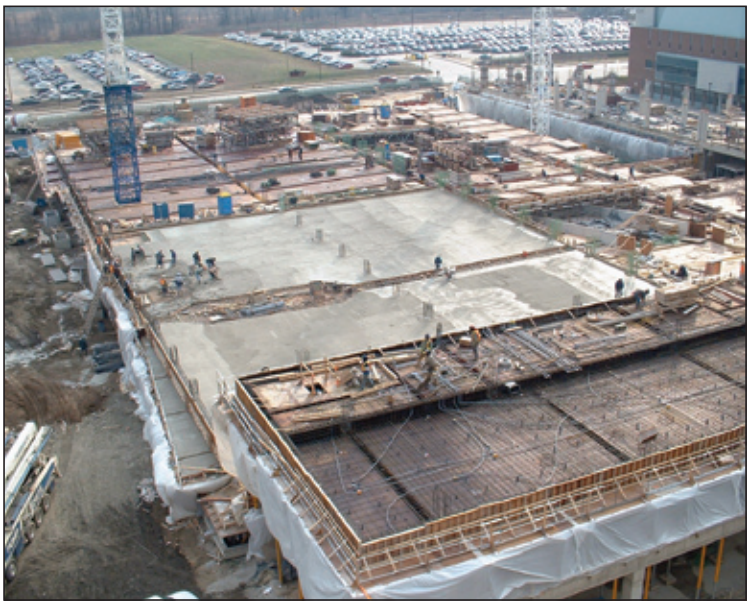
The different curing techniques that were tested included sprayed-on curing agent, 7-day wet cure, and covering with polyethylene sheet. Special curing measures not usually seen on a construction site were also implemented.

For corrosion protection measures, the parking garage slabs exceeded the minimum requirements of the CSA S413 Parking Structures Standard. The parking garage slabs were specified to have 40 MPa CSA Exposure Class C-1 concrete with 10 litres/m^3 of calcium nitrate corrosion inhibitor and 25% replacement of Portland cement with slag cement. Columns, balustrades and walls were specified to have 15 litres/m^3 of corrosion inhibitor and other elements not protected by a waterproofing membrane (stair flights, curbs, islands and sump pits) were specified to have 20 litres/m^3 of corrosion inhibitor.

This well thought-out project demonstrated that with pre-construction investigations and cautious attention to quality control, innovation can be safely and successfully carried out. This innovation improved the quality of the structure by the use of what would otherwise be waste products while contributing to the reduction of green house gas.



2004 Ontario Concrete Award winning project for Sustainable Concrete Construction

In 2000, the Ontario Cast-In-Place Concrete Development Council (OCCDC) was formed to aid the owner/ developer, architect/engineer and design-build contractor in the decision-making process of choosing the best construction material for the framing system of new cast-in-place structures.

OCCDC promotes the benefits of reinforced concrete as the construction material of choice based upon the following advantages:

- *fast-track construction*
- *costs savings*
- *structural advantages*
- *environmental considerations*
- *local economy benefits*

The Members of the OCCDC incude (alphabetical order):

Aluma Systems Inc.
Carpenters District Council of Ontario
Concrete Forming Association of Ontario
Ironworkers District Council of Ontario
LIUNA–Ontario Provincial District Council
Ontario Formwork Association
PERI Formwork Systems Inc.
Ready Mixed Concrete Association of Ontario
Reinforcing Steel Institute of Ontario

365 Brunel Road, Unit #3
Mississauga, Ontario L4Z 1Z5
Tel: 905-507-1122
Fax: 905-890-8122
Email: buildings@occdc.org