CASE STUDY

VOLUME 7, ISSUE 1

Ontario Cast-In-Place Concrete Development Council

Engineering Technology Building, McMaster University

The new, stand-alone Engineering Technology Building (ETB) represents a major expansion to the Engineering Faculty at McMaster University. In addition to classrooms and workshops, the ETB features high-level research labs in Nanotechnology, Photonics, Medical Robotics and Biomedical Engineering. Thus, there was a requirement for a robust and vibration-free structural system best served by reinforced concrete.

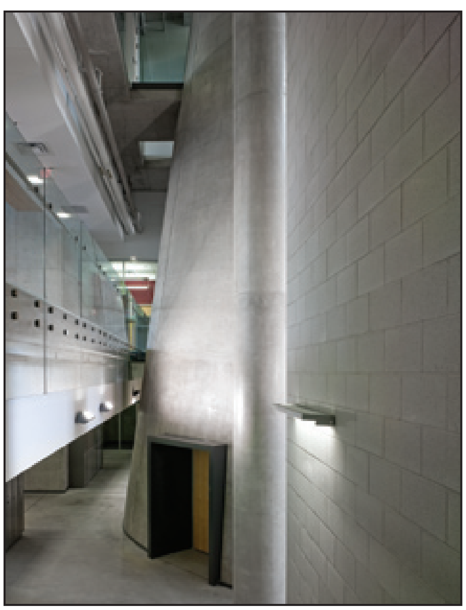
The Engineering Technology Building was designed with 3 underlying objectives:

i) Design using "Building as a Learning Tool" concept;
ii) Sustainability focusing on Quality and High Performance, using LEED Canada Gold as the target measurement;
iii) Create a new gateway to the university campus from Main St. with a landmark building.

Building as a Learning Tool

As a facility for future engineers, the ETB at McMaster University was designed to be a learning tool as well as a facility to support learning. To this end, systems and elements are intentionally left exposed to view, from the poured in place concrete structural frame to the HVAC, plumbing and lighting systems. The lesson embedded in the structure is as much about what is not there as by what is visible. Lateral shear resistance for the 5-storey structure is provided almost entirely by the 2-elevator/stair service towers, with only one additional dedicated shear wall on the main level.

The simplicity of the 4-sided prism, poised on a stone clad plinth, is supported by a 2-way concrete flat slab supported by exposed, round columns. The flat slab also enables mechanical and electrical services to be run efficiently in a clear, well-organized layout. The notable departure from this system is the teaching presentation rooms. The series of stacked elliptical classrooms gently tilt outward, creating a balcony along the western skin of the envelope. Reinforced concrete transfer beams carry the loads from the second floor columns to the elliptical walls at ground level, and down to the basement level below grade. The concrete finishes on the building's exposed elements reflect the forming process that made them: smooth, steel forms for the columns, coated formwork for the underside of floor slabs, and rotary cut Douglas Fir plywood formwork for the elliptical walls. Rough sawn pine boards provide the finish for the concrete retaining wall at the service ramp to the lower level.



Owner:	McMaster University
Architect of Record:	Vermeulen Hind Architects
Engineer of Record:	Halcrow Yolles
General Contractor:	Bird Construction Company
Material Supplier:	Lafarge
Additional Participants:	• AGF Albrecht Reinforcing Steel • Aluma Systems Canada Inc. • Belmont Concrete Finishing • Carpenters Local 18 • Enermodal Engineering • Ironworkers Local 736 • LIUNA Local 837 • National Concrete Accessories • Reimar Forming Construction
Project Facts:	• Located in Hamilton, Ontario • Use: research labs, academic classrooms / lecture halls, administration offices • Construction from August 2007 to August 2009 • Building gross floor area: 125,600 sq. ft. (11,670 m^2) • Height: 22 m (grade to parapet) • Typical floor area: 22,000 sq. ft. • Five (5) floors, plus basement + penthouse

OCCDC

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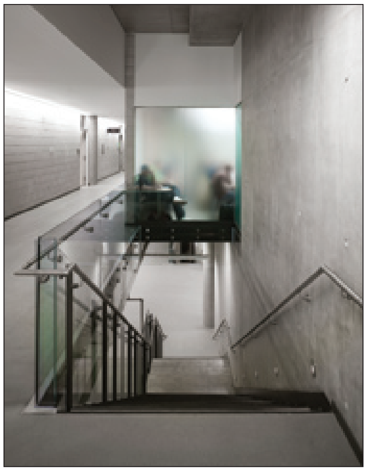
Sustainability / Targeting Leed Canada Gold



A building's total environmental footprint is determined by many choices throughout the design and construction. Concrete was chosen as the structural framing system for the ETB for its inherent stiffness, durability and aesthetic qualities. The global warming potential in the manufacture of cement was offset with the use of pelletized Slag as a Supplementary Cementing Material (SCM), with between 20% to 50% slag used in lieu of Portland cement. Overall, over 300 Tonnes of CO_2 was offset by the use of SCMs; a fact that will be accessible through an interactive touchscreen kiosk in the building's entrance lobby.

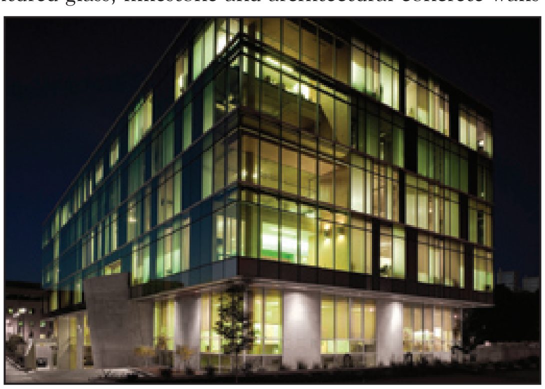
Other initiatives to reduce the building's environmental footprint are:
- reusable steel column forms;
- recycled aggregate in the concrete mix;
- recycling formwork that could not be re-used as part of an overall construction waste diversion level of over 97%;
- water based, zero VOC sealers for the exposed concrete finishes throughout the building.

Although difficult to quantify, a benefit of exposing concrete slabs and walls to the interior spaces is that the material stores energy from both heating and cooling and reduces temperature swings. From the foundation to the roof slab to the concrete landscape paving, concrete is a major element in the Integrated Design Process and the building's LEED Canada Gold candidate status.

Create New Gateway with Landmark Building

Situated on a prominent site fronting on the city's busy Main Street West, the ETB creates a new 'front door' to the campus. Creating a landmark structure for McMaster University was achieved by no singular element, but by a synthesis of ideas supporting the shared aspect of openness, engagement and transparency. The integration of building sitting and orientation, the underlying structural system, building form and fabric comprised of multi-textured glass, limestone and architectural concrete walls all contribute to the final design solution.

As a new, state of the art teaching and research facility, the Engineering Technology Building demonstrates the crucial role engineering plays in addressing our society's needs for innovative and responsible design solutions.



2009 Ontario Concrete Award winning project for Architectural Merit

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

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