DOUGLAS PAUL GAUVREAU

1 ACADEMIC HISTORY

1.1 Contact Information

University of Toronto
Department of Civil Engineering
35 St. George Street
Toronto, Ontario M5S 1A4

Phone: 416 978 3105
E-mail: pg@ecf.utoronto.ca

1.2 Degrees

DR.SC.TECHN.	1993	Federal Institute of Technology (ETH), Zurich, Switzerland Dissertation: *Ultimate Limit State of Concrete Girders Prestressed with Unbonded Tendons*
M.S.E.	1983	Princeton University, Princeton, New Jersey, USA
B.SC.	1981	University of Victoria, Victoria, British Columbia

1.3 Employment

JULY 2014 TO PRESENT	University of Toronto, Department of Civil Engineering *Professor (tenured)*
JULY 2004 TO JUNE 2014	University of Toronto, Department of Civil Engineering *Associate Professor (tenured)*
FEB 2002 TO JUNE 2004	University of Toronto, Department of Civil Engineering *Associate Professor (tenure stream)*
DEC 1997 TO JAN 2002	J. Muller International New York, New York, USA *Principal*
SEPT 1996 TO NOV 1997	VSL Corporation Raleigh, North Carolina, USA *Senior Structural Engineer*
JAN 1993 TO JUL 1996	Buckland & Taylor Ltd. North Vancouver, British Columbia *Senior Engineer*

OCT 1990 TO DEC 1992	Federal Institute of Technology (ETH) Zurich, Switzerland *Research Associate of Professor Christian Menn*
FEB 1990 TO JUL 1990	Ministry of Infrastructure and Public Utilities Suva, Fiji *Senior Engineer (Structures)*
JUL 1987 TO JUL 1989	Federal Institute of Technology (ETH) Zurich, Switzerland *Research Associate of Professor Christian Menn*
NOV 1985 TO JUN 1987	Morrison Hershfield Ltd. Toronto, Ontario *Project Engineer*
SEP 1983 TO OCT 1985	T. Y. Lin International San Francisco, California, USA *Design Engineer*

1.4 Special Appointments

NOV 2012 TO OCT 2014	Shanghai Institute of Technology Shanghai, China *Overseas Chair Professor*
JUL 2011	Department of Bridge Engineering, Tongji University Shanghai, China *Visiting Professor*
OCT 2010	Department of Bridge Engineering, Tongji University Shanghai, China *Kwang-Hwa Fellow*
SEP 2008 TO JUL 2009	Department of Bridge Engineering, Tongji University Shanghai, China *Visiting Scholar*
SEP 2005 TO AUG 2011	University of Toronto, Faculty of Applied Science and Engineering *NSERC Chair in Design Engineering*

1.5 Professional Licenses

Licensed Professional Engineer in Ontario (since 1986), British Columbia, Québec, and California (since 1985)

1.6 Languages

Fluent:	English, French, German
Working knowledge:	Chinese (Mandarin), Spanish

2 RESEARCH GRANTS

APR 2014 TO MAR 2019	*NSERC Discovery Grant* FRP/UHPFRC Composite Structural Systems for Elevated Rail Transit Structures $110,000
JAN 2014 TO DEC 2015	*University of Sao Paolo, Brazil* High performance concrete applied to hydroelectric power plants: numerical analysis, experimental investigation and recommendations for design $206,500 With Professor Frank Vecchio
JUN 2012 TO MAY 2013	*NSERC Strategic Network on Innovative Wood Products and Building Systems* Project enhancement fund $6,000
JAN 2012 TO DEC 2014	*NSERC Strategic Network on Innovative Wood Products and Building Systems* Diaphragm action in heavy-frame systems $93,000 With Professor Ian Smith, University of New Brunswick
SEP 2010 TO JAN 2015	*NSERC Strategic Network on Innovative Wood Products and Building Systems* Innovative post-tensioned composite systems for long-span floor construction $150,000 With Professor Paul Cooper, U of T Faculty of Forestry
MAY 2010 TO APR 2012	*MTO HIIFP Grant* Controlling cracking in high-performance concrete bridge decks

	$62,500 (includes industry contribution) With Professor R. D. Hooton
APR 2008 TO MAR 2013	*NSERC Discovery Grant* Design of efficient concrete bridge deck slabs $105,000
APR 2007	*NSERC Research Tools and Instruments Grant* High-performance mixer for fibre-reinforced concrete $134,000 With Professor F. Vecchio
SEP 2005 TO AUG 2011	*NSERC Chair in Design Engineering for the Urban Environment* $2,000,000 (includes contributions from university and private sector partners)
JAN 2005 TO DEC 2009	Ministry of Transportation of Ontario *Memorandum of Understanding for Strategic Bridge Research* $250,000
JAN 2005 TO DEC 2008	*CFI Infrastructure Operating Fund* $119,400 With Professor C. Christopoulos, University of Toronto
JAN 2004 TO DEC 2008	*CFI New Opportunities* (includes contributions from Ontario Innovation Trust and industrial partners) Mobile platform for full-scale in-situ testing and monitoring of structures $1,000,000 With Professor C. Christopoulos, University of Toronto
JAN 2004 TO DEC 2007	Cement Association of Canada *High-performance systems for high-performance concrete bridges* $280,000 With Professor F. Vecchio, University of Toronto
JUN 2003 TO MAY 2004	CDEN Canadian Design Engineering Network *Intelligent case studies for bridge design* $35,540 With Professor E. Bentz, University of Toronto
APR 2003 TO MAR 2008	NSERC Discovery Grant *High-performance systems for high-performance concrete bridges* $110,000
FEB 2002 TO JAN 2004	University of Toronto Connaught Fund *High-efficiency post-tensioning anchors for concrete bridges* $10,000

3 SCHOLARLY WORK

Names of students and post-doctoral fellows supervised or co-supervised by me are indicated in **bold** type.

3.1 Refereed Articles Published

Zhang, C. and P. Gauvreau. 2015. Modeling of Timber-Concrete Composite Systems with Ductile Connections. *Journal of Structural Engineering* 04014179.

Salonga, J. and P. Gauvreau. 2014. Comparative Study of the Proportions, Form, and Efficiency of Concrete Arch Bridges. *Journal of Bridge Engineering* 19 (3) 04013010.

Susetyo, J., P. Gauvreau, and F. J. Vecchio. 2013. Steel Fiber-Reinforced Concrete Panels in Shear: Analysis and Modeling. *ACI Structural Journal* 110 (2): 285-295.

Susetyo, J., P. Gauvreau, and F. J. Vecchio. 2011. Effectiveness of steel fiber as minimum shear reinforcement. *ACI Structural Journal* 108 (4): 488–496.

Mostafaei, H. , F. J. Vecchio, P. Gauvreau, and **M. Semelawy**. 2011. Punching shear behavior of externally prestressed concrete slabs. *Journal of Structural Engineering* 137 (1): 100–108.

Habel, K. and P. Gauvreau. 2009. Behavior of Reinforced and Posttensioned Concrete Members with a UHPFRC Overlay under Impact Loading. *Journal of Structural Engineering* 135: 292–300.

Habel, K. and P. Gauvreau. 2008. Response of Ultra-High Performance Fiber Reinforced Concrete (UHPFRC) to Impact and Static Loading. *Cement and Concrete Composites* 30: 938-946.

Habel, K., J.-P. Charron, S. Braike, R.D. Hooton, P. Gauvreau, and B. Massicotte. 2008. UHPFRC Mix Design in Central Canada. *Canadian Journal of Civil Engineering* 35: 217-224.

Vecchio, FJ., P. Gauvreau, and **K. Liu**. 2006. Modeling of Unbonded Post-Tensioned Concrete Beams Critical in Shear. *ACI Structural Journal* 103:57-64.

Menn, C., and P. Gauvreau. 1990. Externally Prestressed Concrete Slab Bridges: Model Test Results. *External Prestressing in Bridges*, pp. 289-304. ACI Special Publication SP-120. Detroit: American Concrete Institute.

3.2 Refereed Articles Submitted for Publication

Salonga, J. and P. Gauvreau. 2013. Shallow Arch Systems: Simplified Analysis, Design Forces, and System Efficiency. Submitted to *Journal of Structural Engineering*.

Salonga, J. and P. Gauvreau. 2013. Slender UHPFRC Members I: Material Studies and General Method of Analysis. Submitted to *ACI Structural Journal*.

Salonga, J. and P. Gauvreau. 2013. Slender UHPFRC Members II: Load Tests and Simplified Method of Analysis. Submitted to *ACI Structural Journal*.

Wu, S. and P. Gauvreau. 2013. Rational Modeling of Arching Action in Laterally Restrained Concrete Beams. Submitted to *ACI Structural Journal*.

Susetyo, J., P. Gauvreau, and F. J. Vecchio. 2013. Fiber Reinforcement for Control of Shrinkage Cracks: Experimental Program. Submitted to *Journal of Materials in Civil Engineering*.

3.3 Refereed Articles in Preparation

Susetyo, J., P. Gauvreau, and FJ. Vecchio. Steel Fibres as Crack Control Reinforcement: Analytical Modeling. To be submitted in 2015.

Elhami-Khorasani, N. and P. Gauvreau. Live load models for bridges that have sustained major damage. To be submitted in 2015.

Zwerling, N., **Y. E. Li**, and P. Gauvreau. Precast segmental double-T system for short span bridges. To be submitted in 2015.

Mermigas, K. and P. Gauvreau. Comparative Study of the Proportions, Form, and Efficiency of Concrete Extradosed Bridges. To be submitted in 2015.

3.4 Refereed Conference Papers

Susetyo, J., P. Gauvreau, and FJ. Vecchio. 2010. Effectiveness of steel fibers as a crack controller: assessment using shear panel tests. *Fracture Mechanics of Concrete and Concrete Structures–High Performance, Fiber Reinforced Concrete, Special Loadings and Structural Applications*. Ed. B. H. Oh, et al. Seoul: Korea Concrete Institute.

Salonga, J. and P. Gauvreau. 2010. Span-to-rise ratios in concrete arches: threshold values for efficient behaviour. *ARCH'10 6th International Conference on Arch Bridges*. Fuzhou, China.

Habel, K. and P. Gauvreau. 2006. Impact Behaviour of Concrete Bridge Deck Slabs with Composite Ultra High-Performance Fibre Reinforced Concrete Overlay. *7th International Conference on Short and Medium Span Bridges, Montreal*. Montreal: Canadian Society for Civil Engineering.

Habel, K. and P. Gauvreau. 2006. Static and Impact Behaviour of Concrete Bridge Decks Rehabilitated with UHPFRC Overlay. *Second Edition of the Symposium on Advances in Concrete Through Science and Engineering, Quebec*.

Gauvreau, P. 2005. Engineering and Urban Design: Who Leads Whom? *1st CSCE Specialty Conference on Infrastructure Technologies, Management and Policy*. Montreal: Canadian Society for Civil Engineering.

Ligozio, C. A., A. B. Mehrabi, P. Gauvreau, and D. N. Bilow. 2003. Design, Construction, and Testing of a Quarter Scale Model Precast Segmental Concrete Shelf Pylon for WMATA. 20 pp. In *Proceedings of the National Concrete Bridge Conference*. Skokie, Ill.: National Concrete Bridge Council.

Gauvreau, P. 2002. The Three Myths of Bridge Aesthetics. In *Developments in Short and Medium Span Bridge Engineering* 2002, pp. 49-56. Ed. P. H. Brett, N. Banthia, and P. G. Buckland. Montreal: Canadian Society for Civil Engineering.

Gauvreau, P., and T. E. Kelly. 2002. Segmental Construction in the Inner City: The BQE Connector Ramp to Williamsburg Bridge. In *Developments in Short and Medium Span Bridge Engineering* 2002, pp. 1199-1205. Ed. P. H. Brett, N. Banthia, and P. G. Buckland. Montreal: Canadian Society for Civil Engineering.

Gauvreau, P. 1995. Seismic Analysis of Concrete Bridge Piers: Practical Considerations. In *Proceedings of the Seventh Canadian Conference on Earthquake Engineering*, pp. 755-62. Montréal: Ecole Polytechnique.

Menn, C., and P. Gauvreau. 1987. Scale Model Study of an Externally Prestressed Concrete Slab Bridge. In *Cable-Stayed Bridges, Experience and Practice*, pp. 919-26. Bangkok: Asian Institute of Technology.

Menn, C., and P. Gauvreau. 1987. The Chandoline Bridge Over the Rhône at Sion, Switzerland. In *Cable-Stayed Bridges, Experience and Practice*, pp. 1103-10. Bangkok: Asian Institute of Technology.

3.5 Invited Articles

Gauvreau, P. 2012. Design Education for the 21st Century. *Festschrift Billington: Essays in Honor of David P. Billington*. Ed. E.M. Hines, S.C. Buonopane, and M.E. Moreyra Garlock. Princeton: International Network for Structural Art.

Gauvreau, P. 2012. World-Class: The Armoury's Lamella Roof. *The Fife and Drum* 16: 2-3.

Gauvreau, P. 2007. Innovation and Aesthetics in Bridge Engineering. *Canadian Civil Engineer* 23.5 (Winter 2006-2007): 10-12.

Gauvreau, P. 2003. Teaching Bridge Design in the Grand Tradition of Modern Engineering. *Teaching and Scholarship in the Grand Tradition of Modern Engineering*, pp. 130-39. Princeton: Department of Civil and Environmental Engineering, Princeton University.

Menn, C., and P. Gauvreau. 1988. Slab Concrete Bridges Prestressed from the Outside (in Serbo-Croatian). *Ceste i mostovi*, 1988, no. 9: 339-343.

3.6 Books

Menn, C. 1990. *Prestressed Concrete Bridges*. Translated and edited by P. Gauvreau. Basel: Birkhäuser Verlag. 535 pp.

3.6 Books in Preparation

CPCI. 2015. *Design Manual*. 5th ed. Editor in chief P. Gauvreau. Ottawa: Canadian Precast-Prestressed Concrete Institute.

3.7 Chapters in Books

Gauvreau, P. 2006. Bridges. Chapter 12 (pp. 195-240) of *Post-Tensioning Manual*. 6th ed. Phoenix: Post-Tensioning Institute.

3.8 Non-Refereed Reports

Gauvreau, P. 2006. *A comparison of stay design specifications from the PTI Recommendations and the SETRA Recommendations*. Fédération internationale du béton, Task Group 1.2 (Bridges).

Gauvreau, P. 2006. *Incrementally Launched Post-Tensioned Concrete Bridge Design*. Toronto: Ministry of Transportation of Ontario.

Gauvreau, P. 1992. *Load Tests of Concrete Girders Prestressed with Unbonded Tendons*. Institute of Structural Engineering, Swiss Federal Institute of Technology, Report No. 194. Basel, Boston, Berlin: Birkhäuser.

Gauvreau, P. 1993. *Ultimate Limit State of Concrete Girders Prestressed with Unbonded Tendons*. Institute of Structural Engineering, Swiss Federal Institute of Technology, Report No. 198. Basel, Boston, Berlin: Birkhäuser.

3.9 Invited Addresses

Gauvreau, P. 2012. *A New Look at Arch Bridges*. Presentation at Hong Kong University of Science and Technology, September 2012.

Gauvreau, P. 2012. *Improving the Aesthetic Quality of Bridges through Education*. Presentation to Transportation Research Board Bridge Aesthetics Subcommittee, June 2012.

Gauvreau, P. 2011. *Bridge Aesthetics: An Introduction*. Presentation at McMaster University, October 2011.

Gauvreau, P. 2010. *High-Performance Systems for High-Performance Concrete Bridges*. Presentation to Chongqing Communication Research and Design Institute. Chongqing, China, October 2010.

Gauvreau, P. 2010. *Sustainable Education for Civil Engineers*. Third Kwang-Hua World Forum on Sustainable Civil Engineering, Tongji University. Shanghai, October 2010.

Gauvreau, P. 2010. *Recent Bridges in China*. Presentation to Bridge Engineering Managers of the Ministry of Transportation of Ontario. Toronto, August 2010.

Gauvreau, P. 2010. *Recent Bridges in China*. Presentation to Bridge Engineering Staff of the Ministry of Transportation of Ontario, Eastern Region. Kingston, June 2010.

Gauvreau, P. 2010. *Recent Bridges in China*. Presentation to Structural Engineering Staff of Morrison Hershfield Limited. Toronto, June 2010.

Gauvreau, P. 2010. *The Craft of Bridge Design*. Presentation to the Faculty of Engineering, University of Victoria. Victoria, January 2010.

Gauvreau, P. 2009. *Recent Bridges in China*. Presentation to the Portland Cement Association. Skokie, Illinois, August 2009.

Gauvreau, P. 2009. *High-Performance Systems for High-Performance Concrete Bridges*. Presentation to Highway Planning and Design Institute. Beijing, China, July 2009.

Gauvreau, P. 2009. *Bridge Engineering at the University of Toronto*. Presentation to the Department of Bridge Engineering, Changsha University of Science and Technology. Changsha, China, June 2009.

Gauvreau, P. 2008. *Bridge Engineering at the University of Toronto*. Presentation to the Department of Bridge Engineering, Tongji University. Shanghai, October 2008.

Gauvreau, P. 2008. *Bridge Research at the University of Toronto*. Presentation to Ministry of Transportation of Ontario Bridge Research Seminar. St. Catherines, February 2008.

Gauvreau, P. 2008. *Learning from Laval*. Chalmers Design Lecture, U of T Department of MIE, January 2008.

Gauvreau, P. 2007. *Design philosophy: A personal perspective*. Presentation to the Fourth Canadian Design Engineering Conference. University of Manitoba, Winnipeg, July 2007.

Gauvreau, P. 2006. *Concrete Bridges for the 21st Century*. Seminar presented to the Department of Civil Engineering, Johns Hopkins University, April 2006.

Gauvreau, P. 2005. *The Role of New Materials in the Development of Form in Bridge Design*. Lecture presented at the Technical University of Hamburg-Harburg, as part of the series *Ringvorlesung: Die Entstehung von Form*, December 2005.

Gauvreau, P. 2005. *Bridge Design and Construction: A Canadian Perspective*. Presentation to ACI International Forum. Kansas City, November 2005.

Gauvreau, P. 2004. *Design Issues in Prefabricated Concrete Bridges*. Cement Association of Canada/Ontario Ministry of Transportation Technology Exchange Forum, March 2004.

Gauvreau, P. 2003. *Prefabricated Bridges for the 21st Century*. Ontario Ministry of Transportation Knowledge Transfer Symposium, June 2003.

Gauvreau, P. 2002. *Post-Tensioned Bridges for the 21st Century: Design Considerations*. Presented at the Post-Tensioning Institute Conference, San Antonio, Texas, May 2002

3.10 Other Presentations

Gauvreau, P. 2009. *Recent Bridges in China*. University of Toronto Bridge Engineering Seminar Series. Toronto, November 2009.

Gauvreau, P. 2008. Aspects historiques et esthétiques de la conception des nouveaux ouvrages d'art de l'autoroute 400. (Historical and aesthetic aspects of the design of the new bridges for Highway 400). *15e Colloque sur la progression de la recherche québécoise sur les ouvrages d'art*, Quebec City.

Gauvreau, P. 2007. L'emploi efficace du béton et de l'acier de précontrainte dans les ponts de courte portée (Efficient use of concrete and prestressing steel in short-span bridges). *14e Colloque sur la progression de la recherche québécoise sur les ouvrages d'art*, Quebec City.

Gauvreau, P. 2001. Seismic Design of Long Jointless Bridges. At *American Concrete Institute Spring Convention*, Philadelphia.

Gauvreau, P. 2000. BQE Connector Ramp to Williamsburg Bridge, NY. At *American Segmental Bridge Institute Annual Convention*, Brooklyn, NY.

Gauvreau, P. 1999. Design of the Approach Ramps to the Williamsburg Bridge. At *American Segmental Bridge Institute Annual Convention*, Amelia Island, FL.

Gauvreau, P. 1997. Design of Post-Tensioning for the World's First Reactive Powder Concrete Bridge. At *American Segmental Bridge Institute Annual Convention*, Austin, TX.

3.11 Op-ed Articles

Gauvreau, P. 2012. Toronto's crumbling Gardiner: Bring on the engineering innovation. *The Globe and Mail*. December 14, 2012.

4 CREATIVE PROFESSIONAL WORK

4.1 Original engineering designs

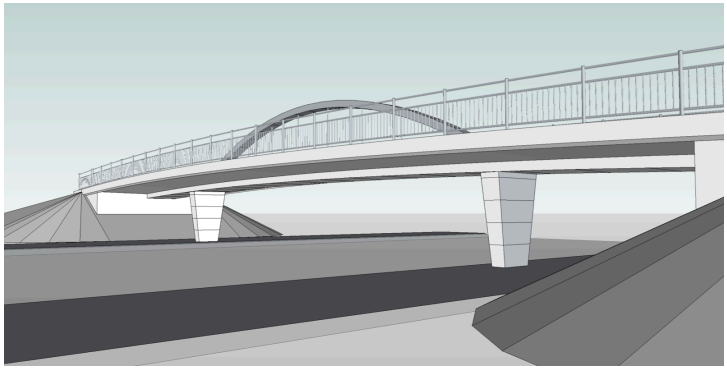
This section presents a selection of bridges that I have designed as an employee of engineering firms prior to joining the U of T and as an independent consultant since 2002. For each project, the years given in the heading refer to the period of my participation. Total period of design and construction is generally longer than the period indicated.

FORT YORK PEDESTRIAN BRIDGE (2011)

I was retained by the Friends of Fort York on a pro-bono basis to advise them on matters related to the proposed Fort York Pedestrian Bridge. A design that had been prepared by others had been tendered and then abandoned due to excessive cost. As part of my work, for the Friends of Fort York, I developed a preliminary design concept for this bridge, to demonstrate that it could be built for substantially less cost, yet at a higher aesthetic standard, than the previous design.

The concept eliminates the three primary features of the previous design that contributed to its excessive cost: (1) unnecessarily long spans of 100 m, (2) inclined arches, and (3) complex steel fabrication. The bridge consists of two curved suspension bridges that maintain the given antisymmetrical alignment. The deck is a simple, thin concrete slab. Stiffness is provided by inclined suspenders. The geometry of the main cables was laid out to provide equilibrium under dead load on the basis of a novel application of three-dimensional graphic statics. The cable profile shown in the image above is a true representation of this three-dimensional state of equilibrium and not just a pretty picture.

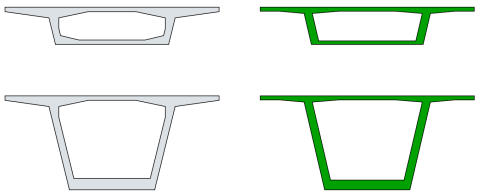
CENTENNIAL PARK PEDESTRIAN BRIDGE, BARRIE (2011)



I was retained by the IBI Group to develop preliminary design concepts for a pedestrian bridge to be constructed over a canal to be constructed in Centennial Park in Barrie. The primary requirements were to provide a high standard of aesthetics as well as a reasonable construction cost.

Three concepts were developed: the tied arch shown here, a deck-stiffened arch arranged below the pathway, and a suspension bridge. Aesthetic impact as well as economy of materials are achieved through a clean, efficient, and direct structural system.

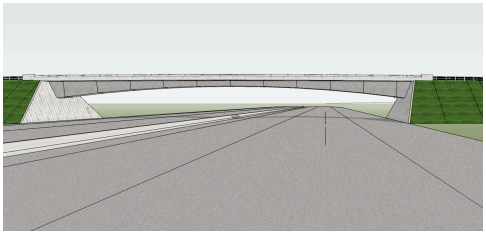
FAIRWAY ROAD BRIDGE, ONTARIO (2010)



In collaboration with Brown and Company Ltd. of Toronto, I redesigned a 247 m long cast-in-place concrete segmental bridge. The original design was prepared by firm retained by the Owner, the Region of Waterloo. The Owner allowed bidders to submit redesign proposals in the interest of obtaining a lower construction cost.

The figure shows typical cross-sections for the original design (left) and the proposed redesign (right). The redesign, which took advantage of the most recent knowledge of post-tensioned bridge technology, succeeded in reducing the quantity of concrete in the superstructure by 15% and the quantity of longitudinal post-tensioning steel by 28% relative to the original design.

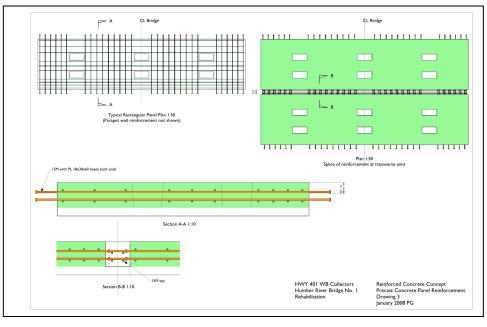
HIGHWAY 400 CORRIDOR BRIDGE REPLACEMENT STUDY, ONTARIO (2008)



I was retained by the prime consultant at the specific request of the Ministry of Transportation of Ontario to develop design concepts for sixteen bridges over the 100 km long Highway 400 corridor between Toronto and Barrie. These bridges will replace structures built in the 1940s and 1950s, which prevent the highway from being widened from six to ten lanes.

This is the first study undertaken by MTO that required integrated consideration of historical, aesthetic, and structural factors in the development of design concepts. The historical and aesthetic significance of the existing bridges that will be replaced has been reflected in the new structural concepts, not by simple mimicking or by applying external ornamentation, but by developing modern structural systems that extend the rigid-frame structural system used in the existing bridges through the use of post-tensioning, high-performance materials, and minimum-impact methods of construction.

HUMBER RIVER BRIDGE NO. 1, TORONTO (2007-2008)



I was retained by the prime consultant at the specific request of the Ministry of Transportation of Ontario to develop a preliminary design for the replacement of the concrete deck slab of this bridge. The Ministry required that construction on the deck be limited to nightly closures from 10:00 PM to 6:00 AM. This led to a solution based on full-depth precast concrete

deck panels. Two alternatives were developed, one which connected adjacent panels by means of longitudinal post-tensioning, and the other which used narrow cast-in-place closure pours with short splices of reinforcing steel made possible through the use of headed bars, the first known use of this technology for such an application.

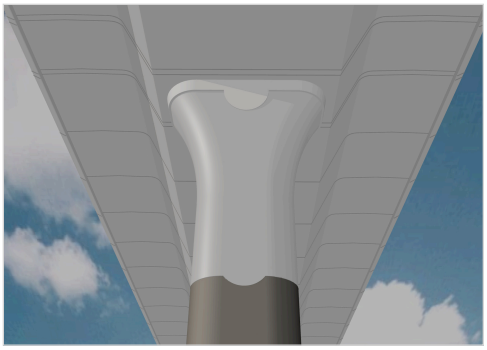
AUTOROUTE 30, MONTREAL (2006-2007)

I was retained by the prime consultant to the Ministère des transports du Québec to develop the preliminary design for a 2.5 km long bridge consisting of a 160 m crossing of the St. Lawrence Seaway and approach spans on both sides. The Seaway span is a precast concrete segmental extradosed bridge. The approach spans are precast concrete segmental box girders built using the balanced cantilever method. This design was used as a benchmark for evaluating the technical feasibility and cost of designs prepared by design-build proponents within a public-private partnership framework.

PONT LAVIOLETTE REDECKING FEASIBILITY STUDY, TROIS-RIVIÈRES TO BÉCANCOUR, QUÉBEC (2001-2003)

I was retained by the prime consultant to the Ministère des transports du Québec to develop preliminary concepts for replacement of the concrete deck slab on a 2 700 m long, four-lane crossing of the St. Lawrence. Work on the deck was limited to the closure of two lanes between 9:00 PM and 6:00 AM every night. This led to solutions based on large precast post-tensioned concrete panels that could carry full live load immediately after they had been erected. The development of structural concepts for the deck panels was carefully integrated with the planning of construction methods and traffic management.

MISSISQUOI BAY BRIDGE, ALBURG TO SWANTON, VERMONT, USA (2000-2001)



I was Principal in Charge of this project, responsible for all major design decisions and oversight of project staff. Work consisted of preliminary and final design of a 1100 m long precast segmental bridge crossing Lake Champlain. Concerns for durability led to the decision to provide expansion joints at the abutments only. This required detailing the connections between piers and girder to provide flexibility to accommodate shortening of the superstructure as well

as adequate sharing of seismic loads among the piers. Foundations consisted of single 3.0 m diameter concrete shafts that penetrated through a deep layer of lacustrine deposits to bedrock and were designed to resist severe ice load.

BQE CONNECTOR RAMP TO WILLIAMSBURG BRIDGE, BROOKLYN, NEW YORK, USA (1998-2000)

I was Principal in Charge of this project, responsible for all major design decisions and oversight of project staff. The scope of work was to replace an aging four-lane, 400 m long viaduct passing through a dense urban neighbourhood. Because the structure is on a primary commuter route, the design needed to minimize the total duration of lane closures during construction. This was done by building the new structure in two parallel halves, which maintained two lanes of traffic during construction, and through the use of precast segments, which allowed the superstructure to be built at a rate of one complete span per week. Transversely post-tensioned pier diaphragms are used to link the two parallel box girders, allowing the superstructure to be supported on piers located away from the centres of the individual girders. This innovative response allowed the design to overcome severe constraints on the locations of piers and maintenance of traffic during construction. This bridge is the first precast segmental highway bridge to be built in New York city, and one of the most severely constrained by existing site conditions.

JACQUES CARTIER BRIDGE REDECKING, MONTRÉAL, QUÉBEC (1999)

I was Principal in Charge of this project, responsible for all major design decisions and oversight of project staff. The scope of work was preliminary design and preparation of a detailed technical proposal in support of a design-build tender for a 60 000 square metre redecking of the Jacques-Cartier Bridge. This bridge is part of a major commuter route linking Montréal to suburban communities on the south shore of the St. Lawrence. The owner limited work on the deck to night closures only. In response to this constraint, the design incorporated large precast high-performance concrete deck panels, post-tensioned in both directions. Although the design-build tender was not the lowest bid, the technical proposal was rated highest among all bidders. Had this concept been built, it would have been the first significant application of match-cast segmental technology to a bridge rehabilitation project, providing the speed

and durability of a solution with a concrete deck surface consisting practically of one hundred percent precast concrete.

I-287 CROSS-WESTCHESTER EXPRESSWAY, WHITE PLAINS, NEW YORK, USA (1998)

I was Project Manager and Lead Engineer in charge of construction engineering for this project. The scope of work was to construct a composite concrete deck slab for two steel box-girder viaducts, using full-depth precast concrete panels, post-tensioned in two directions. The total area of deck is approximately 30 000 square metres. The primary engineering task consisted of an extensive re-analysis of the structure and design of remedial measures in response to an insufficient level of longitudinal post-tensioning in the deck in the "as-built" condition.

WINFIELD LOCKS AND DAM, WINFIELD, WEST VIRGINIA, USA (1997)

I was Lead Designer for this project, and made all major design decisions. The scope of work was to design temporary structures and develop methods of erection required to lift twelve 500 ton precast concrete beams from barges onto concrete piers. The beams form a guide wall delineating the navigable channel at the upstream entrance to a lock on the Kanawha River, an important commercial waterway. Due to difficulties in obtaining large barge-mounted cranes, the contractor elected to erect the beams using prestressing strand-based lifting technology. I designed the structures shown in the figure to the right (everything rust-brown in colour), which allowed the load to be lifted, translated inward, and lowered into place. After one beam had been erected, the structures were moved a new location to erect another beam.

LOWER BUFFALO BRIDGE, WEST VIRGINIA, USA (1997)

I was Lead Designer for this project, and made all major design decisions. The scope of work was to design temporary structures and methods of erection to lift two 350 ton steel bridge girders from barges. The contractor elected to use strand-based lifting technology instead of large barge-mounted cranes.

BRIDGE ACROSS ROCKY CREEK, MONTEREY COUNTY, CALIFORNIA, USA (1996)

I was Lead Designer for this project, and made all major design decisions. The scope of work was to design a seismic retrofit of a reinforced concrete arch bridge originally built in the 1930s. Technical challenges included the proximity of the bridge to a major fault, which resulted in peak rock accelerations in excess of 0.7g, as well as the vulnerability of the relatively slender arch ribs. The solution was based on the provision of an alternate load path which ensured that inertial forces from the deck were not transferred to the arch. This was accomplished by post-tensioning the deck longitudinally to increase its stiffness and strengthening the abutments to ensure that they had adequate capacity to the higher seismic forces that would be imposed on them by the stiffened deck. This major increase in seismic capacity was achieved with only minimal impact on the visual character of this historic bridge.

MOSQUITO CREEK BRIDGE, NORTH VANCOUVER, BRITISH COLUMBIA (1995)

I was Lead Designer for this project, and made all major design decisions. The scope of work was to design a seismic retrofit of a reinforced concrete arch bridge built in 1959 and to provide engineering services to the bridge owner during construction of the retrofit measures. The primary technical challenge involved the transfer of thrust from the arch ribs to the foundations through existing cast steel rocker bearings. Analysis showed that these bearings would fail under seismic action. The solution was to provide a robust alternative load path that would become active after failure of the existing bearings. This was accomplished by expanding the arch foundations to accommodate new elastomeric bearings located on both sides of the arch ribs, and reinforced concrete collars around the arch ribs to transfer thrust towards the new bearings.

ROYSTON ROAD UNDERPASS, VANCOUVER ISLAND, BRITISH COLUMBIA (1995)

I was Lead Designer for this project, and made all major design decisions. The scope of work was to design a new overpass crossing a new four-lane highway. Because maintenance of traffic during construction was not an issue, a reinforced concrete post-tensioned rigid frame bridge was proposed. Compared to conventional solutions (two-span structures with precast concrete I-girders), the proposed solution offered the following advantages: (1) greater safety for motorists due to the absence of a pier in the median of the mainline highway, (2) enhanced durabil-

ity due to a smaller surface of concrete exposed to salt spray, and (3) a higher standard of aesthetic design.

4.2 Expert Services

PONT MERCIER, MONTREAL

I was retained by the prime consultant to provide expert services relating to the redecking of this aging structure. The primary design challenges are to minimize the impact of construction on traffic using the bridge and to ensure a high standard of durability once the redecking is complete. My contribution to this project will begin in 2014.

HERB GRAY PARKWAY, WINDSOR

I was retained by Hatch Mott Macdonald to provide peer review of their submissions to their client related to alleged deficiencies in 500 precast prestressed bridge girders.

AUTOROUTE 30, MONTREAL

I was appointed by the Deputy Minister of Transportation of Quebec to an expert panel that evaluated the technical qualifications and the technical proposals for the 42 km long Autoroute 30 project on the South Shore of Montreal. The recommendations of this panel were the basis for selection of the private developer who would finance, design, build, and operate this highway. The project includes several major bridges, including a long-span crossing of the St. Lawrence Seaway. Total investment will exceed 1.5 billion dollars. I maintained an on-going involvement with this project to provide expert advice to the Ministry regarding matters related to design of the bridges by the developer's engineers.

PONT D'ÉTAGEMENT DE LA MONTÉE FASSET

I was appointed by the Director of Structures of the Ministère des transports du Québec to assess the as-built structural capacity of a bridge that had experienced significant irregularities during construction. This represents one of the rare instances of the MTQ seeking expert advice from outside the province of Quebec. I have been retained by the MTQ to be their expert witness in upcoming court proceedings related to this matter.

LLOYD'S OF LONDON

I was retained by solicitors representing Lloyd's of London in three cases relating to claims against structural design engineers related to alleged engineering errors and omissions. In this capacity, I have reviewed design documents, construction specifications, as well as the condition of structures in service, and have performed structural analyses, to assess the validity of the claims made against the design engineers.

BATHURST STREET BRIDGE

I was retained on a pro-bono basis by the Friends of Fort York to advise them and act as their advocate on the design of a bridge to replace the existing structure. My recommenda-

tions were instrumental in determining the primary features of the concept that will be advanced to final design.

5 TEACHING

Every aspect of my teaching has been informed by the years I spent in bridge design practice. Having practiced design, I understand its nature and importance. My approach to teaching puts design at the centre and reflects the conviction that the sole purpose of an engineering education is to prepare designers to create value for society through competent, creative design work. I have endeavoured to bring this approach to all my teaching, including traditional lecture courses that would not normally be associated with design. In this sense, therefore, I make no distinction between "design education" and "engineering education".

My philosophy of design education is described in detail in the article "Design Education for the 21st Century", listed in this CV in Section 3.5. It holds that the primary elements of design education are knowledge, skills, and values. Knowledge is the conceptual raw material that is used in the creative process. The most important type of knowledge for design engineers is knowledge of completed works of engineering, which provides starting points for the creative process as well as a means of rapidly validating new ideas. Skills are what enables engineers to create new ideas and bring them into reality. My educational endeavours have focused on drawing as the most important engineering skill. Values are the basis by which designers decide whether or not a design is good, in the face of design requirements that are complex, contradictory, and often impossible to express quantitatively. I introduce students to the aesthetic aspects of structural engineering as a way of opening their minds to the need to develop their own set of values as engineers.

Throughout my teaching career, I have been fortunate to have had several opportunities to create entirely new courses or to undertake major overhauls of existing courses. In this way, I have sought to incorporate new elements of knowledge, skills, and values as appropriate for the content of the course, thus taking advantage of every opportunity to link each course I teach to design.

5.1 Undergraduate Courses Taught

CIV 100F MECHANICS

I taught this course once in the fall term of 2009. Because this is a multi-section course that must maintain common standards of content, I did not contribute to the development of this course.

CIV 214S STRUCTURAL ANALYSIS I

I assumed responsibility for this course in the winter term of 2003 and taught it again in 2004, 2005, and 2006. This course presented classical

methods for calculating forces and deformations in structures due to loads and imposed deformations. Statically determinate and indeterminate structures were considered. Content was limited to methods that can be performed without the use of computers.

I adapted the content and delivery of the course to enable students to accomplish the following goals: (1) understand the physical basis of the methods of structural analysis, (2) become proficient in the use of these methods, (3) learn how to create workable analytical models of real structures, and (4) understand how to use structural analysis as a tool in generating new design concepts.

The course included a significant treatment of graphic statics as a means of accomplishing these pedagogical objectives.

Because there was no English-language textbook currently in print that followed the approach I wished to take in this course, I prepared an extensive set of lecture notes that were made available to the students on a course website.

CIV 235S CIVIL ENGINEERING GRAPHICS

I taught course for the first time in the winter term of 2011, and again in 2012 and 2013. I completely redeveloped this course to reflect the importance of drawing as the primary tool in the design process. The course contains roughly equal amounts of freehand drawing, hand drawing with instruments, and CAD drawing.

The course is based on an approach to creating engineering drawings that is common to all three media, and is reflective of the design process used by engineers in practice. This is to draw so that each line provides the greatest increment of definition to the drawing, just as decisions made in design should be sequenced so that each decision conveys the greatest possible increment of definition to the design concept. This approach to teaching drawing helps unify the three seemingly disparate media presented in the course, and should also help to provide a more meaningful link between drawing and design.

Exercises are based extensively on real examples taken from civil engineering rather than the “useless widgets” that fill current textbooks on engineering graphics.

The content and delivery of this course is continually modified and enhanced based on lessons learned in the previous year. Important changes are planned for the 2015 delivery of this course.

CIV 356F INFRASTRUCTURE DESIGN PROJECT

I taught this course from 2002 to 2007. From 2002 to 2005, my duties included overall coordination of the course and definition of the design project, delivery of approximately three-quarters of the contact hours (the other quarter was provided by Professor E. Miller), and review of all project submittals from students. In 2006 and 2007, I delivered the entire course on my own as a structural design project. As my understanding of how students learn to design matured, I gradually transformed this course from a lecture course with a practical period to a full studio course with no lectures.

In this course, students completed a major design project that involved elements of structural engineering. (From 2002 to 2005, the project also included a component of transportation engineering.) The primary pedagogical objectives of the course were for students to: (1) acquire knowledge to be used as conceptual raw material in the design process, (2) develop skill in generating, validating, and communicating design concepts, and (3) understand the values that govern major decisions in infrastructure design, in particular with regard to social, environmental, and aesthetic issues.

I selected the projects and defined the scope of work to ensure that there was sufficient complexity and challenge to provide opportunities for students to achieve the objectives defined above. In each year, I have incorporated a field trip into the course. Where appropriate, the destination of the trip was the actual project site. This allowed students to understand site constraints and to visualize possible solutions in ways that would not be possible working only with paper documents. Students were required to apply the knowledge gained from these observations in developing their own design concepts.

From 2002 to 2005, the students in CIV 356F were concurrently enrolled in ESC 300F WRITTEN AND ORAL COMMUNICATION. In those years, I worked with the instructors of ESC 300F, Professors Peter Weiss and Alan Chong, to coordinate writing assignments between these two courses. This interaction has created opportunities for meaningful writing assignments for the students and has enabled the students to gain an understanding for the use of writing as a tool in the design process.

CIV 357S STRUCTURAL DESIGN II

I first taught this course in the winter term of 2010 and have continued to teach it every year since then. This is a core course for students in the Infrastructure Option and is their only required course devoted exclusively to concrete structures. Before teaching this course for the first time, I undertook a major redevelopment effort to transform it from a code-based approach focused on rules for dimensioning of reinforcement to an approach that emphasized understanding of underlying engineering principles as well

as competency in common design situations that included both selection of concrete dimensions as well as dimensioning of steel. To accomplish this, I expanded the scope of the course to provide a unified treatment of structural concrete including plain, reinforced, and prestressed concrete. I made extensive use of reference works of engineering as vehicles for teaching the content of the course, which not only made the course more interesting for the students, but also gave students a rudimentary but systematic body of knowledge of important aspects of concrete structural design such as preliminary selection of concrete dimensions not adequately covered in conventional concrete courses. I also incorporated a large-scale demonstration tests of structural components in the Structures Laboratory as well as a small design project. The content and delivery of this course is continually modified and enhanced based on lessons learned in the previous year.

CIV 425Y DESIGN PROJECT

I developed this course as it was taught from 2005 to 2008 and coordinated it in the 05-06, 06-07, and 07-08 academic years. I also led a design studio for this course in 05-06 and in 07-08. The development of this course was based extensively on my own years of design practice and mentoring young engineers, experiences gained in the delivery of civ 356f and civ 513s, and studies of how design has been taught in other schools of engineering as well as in related disciplines such as architecture.

The course had a unique structure, in which students undertook a critical study of one or more reference works of engineering (which addressed similar design requirements to the project the students would complete) in the first term of the course and then created and demonstrated the validity of a design concept in the second term. The study of references addressed a deficiency in the current curriculum, namely, that students are not adequately exposed to complete works of engineering but rather are taught to calculate and to apply calculations to closed-end problems. Through the study of references, students would gain the means to get started in generating and validating concepts of their own.

Delivery of the course was an adaptation of the studio method used in schools of architecture and some European schools of engineering. Students worked individually, but were free to discuss any aspects of their projects with fellow members of the studio.

CIV 451S INFRASTRUCTURE RENEWAL

This course covers the mechanisms of deterioration of structures, strategies for rehabilitation of structures, and the design of new structures to ensure long-term durability.

I taught this course jointly with Professor D. Hooton in 2004 and 2005. Each of us was responsible for 50% of the course content and delivery.

CIV 513S COLLABORATIVE DESIGN STUDIO

I taught this course in the winter term of 2005, together with Professor Terence Van Elslander of the Faculty of Architecture. This course brought together students from Civil Engineering and the Faculty of Architecture, who collaborated on a building design project. Together, Professor Van Elslander and I developed a project statement and assembled the necessary project materials. In addition, we incorporated a novel mini design/build project that was intended to provide the engineer/architect partnerships with a vehicle for understanding culminated in the structures being tested to failure in the Structures Laboratory.

ESC 101F ENGINEERING SCIENCE PRAXIS I

I taught the design component of the first course in this sequence, Praxis I, in 2005, 2006, and 2007. At that time, Praxis was part of the core program of the Division of Engineering Science. It was a four-term series of courses covering the first two years of study. Its intent was to provide students with a counterpoint to a highly theoretical curriculum, by focusing on experimentation, design, and communication. Praxis was inaugurated in the 2005-2006 academic year.

Praxis I gave Engineering Science students their first formal exposure to design. Located as it was in their first term of university studies, the course sought to define the initial direction of their journey towards the goal of becoming good designers, and also to create a design-centered context for their entire undergraduate program.

The primary objectives of the course were as follows:

1. Give students a realistic perspective on what engineering design is and what it can do in society
2. Give students a basic conceptual framework for doing design
3. Introduce students to a set of fundamental design skills
4. Establish a design-centered context for the the remainder of the curriculum, to enable students to understand the links between their other courses and their apprenticeship as designers

There was significant interaction between the design and communication components of the course.

5.2 Graduate Courses Taught

CIV 1164S BRIDGE ENGINEERING

I assumed responsibility for this course in fall term 2003 and have taught it every year since then. I completely redesigned this course, transforming it from a review of the bridge code into a vehicle for understanding the behaviour, design, and construction of modern bridge systems.

This course deals with advanced topics in modern bridge design. Actual course content varies from year to year, and can include topics such as concrete segmental bridges, cable-supported bridges, arches, precast concrete systems for rehabilitation of existing bridges, and innovative composite systems.

The aim of this course is to enable students to accomplish the following objectives for the types of bridge considered in a given year: (1) understand performance requirements, (2) become familiar with structural systems, components, and critical details, and (3) understand and develop competence in the use of analytical methods for dimensioning and validation. I emphasize the interaction between design and construction and rely strongly on the critical analysis of complete structural systems.

CIV 1199S SPECIAL STUDIES: PLASTICITY IN CONCRETE STRUCTURES

I taught this course in 2011 and in 2012.

The primary objective of this course was for students to gain a sound understanding of the theory of plasticity as it relates to concrete structures and to develop proficiency in the application of this knowledge to realistic situations in the analysis and design of concrete structures.

The primary topics covered in the course were as follows: (1) Fundamentals of the theory of plasticity, (2) Plasticity in beam and frame structures, (3) Truss models, (4) Strip method for concrete slabs, and (5) Yield line method for concrete slabs. The course covers both reinforced and prestressed concrete structures.

5.3 Graduate Theses Supervised

SEP 2014 TO PRESENT Luca Nagy, PH.D. candidate
General principles governing efficient structural systems

SEP 2011 TO PRESENT David Hubbell, PH.D. candidate
Efficient systems for transit viaducts using ultra high-performance fibre reinforced concrete

JAN 2005 TO SEP 2010	Jason Salonga, PH.D. *Innovative systems for arch bridges using ultra high-performance fibre-reinforced concrete*
SEP 2007 TO MAY 2010	Davis Doan, PH.D. candidate (deceased, degree not completed) *Arching action in bridge deck slabs*
MAY 2004 TO JUN 2009	Jimmy Susetyo, PH.D. (Co-supervised with Professor F. Vecchio) *Fibre reinforcement for shrinkage crack control in precast, prestressed segmental bridges*
SEP 2013 TO PRESENT	Samantha Hinz, M.A.SC. candidate *Behaviour and design of post-tensioned concrete slab bridges*
SEP 2013 TO PRESENT	Rami Mansour, M.A.SC. candidate *Simplified design of concrete bridge deck slabs considering arching action*
SEP 2013 TO PRESENT	Bingyue Shao, M.A.SC. candidate *Cellular post-tensioned system for short-span bridges constructed of UHPFRC*
SEP 2012 TO PRESENT	Mengyuan Chen, M.A.SC. candidate *UHPFRC/Cross-laminated timber composite sections for bridge decks*
SEP 2011 TO JAN 2014	Robert Botticchio, M.A.SC. *Characterization of in-plane restraint of bridge deck slabs*
SEP 2011 TO JAN 2014	Alex Kuzmanovic, M.A.SC. *Comparative study and efficiency of concrete bridge piers*
SEP 2011 TO JAN 2014	David Wang, M.A.SC. *Stress fields for ultra high-performance fibre reinforced concrete*
SEP 2010 TO JAN 2013	Sissy Wei, M.A.SC. *Effect of bonded reinforcement on the behaviour of concrete beams post-tensioned with unbonded tendons*
SEP 2010 TO JAN 2013	Angela Wu, M.A.SC. *Arching action in axially restrained beams*
SEP 2010 TO JAN 2013	Cathy Hsiang-Chen Chen, M.A.SC. *Cracking in high-performance concrete bridge deck slabs*
SEP 2010 TO JAN 2013	Chao Zhang, M.A.SC. *Innovative systems for post-tensioned wood/concrete composite floor and roof systems in buildings*

SEP 2009 TO JAN 2013	Nick Zwerling, M.A.SC. *Large-scale experimental study of a single-span double-T segmental concrete bridge*
SEP 2009 TO JAN 2012	Andrew Lehan, M.A.SC. *Development and validation of post-tensioned wood/concrete composite systems for short-span bridges*
SEP 2009 TO JAN 2012	Jeff Smith, M.A.SC. *Two-span double-T segmental bridge concepts*
SEP 2008 TO SEP 2010	Negar Elhami-Khorasani, M.A.SC. *System-level structural reliability of bridges*
SEP 2007 TO JAN 2010	Yang Eileen Li, M.A.SC. *Bridge system with precast concrete double-T girder and external unbonded post-tensioning*
SEP 2007 TO SEP 2009	Sandy Poon, M.A.SC. *Optimization of span to depth rations in high-strength concrete girder bridges*
SEP 2006 TO SEP 2008	Kris Mermigas, M.A.SC. *Behaviour and design of extradosed bridges*
SEP 2005 TO SEP 2008	Graham Potter, M.A.SC. *Efficient, minimum impact structural system for short and medium span overpass bridges using UHPFRC*
SEP 2005 TO DEC 2007	Billy Cheung, M.A.SC. *Characterization of strength and stiffness of polyurethane in joints between precast concrete and steel*
SEP 2005 TO DEC 2007	Jamie McIntyre, M.A.SC. *Development and validation of rational models for the flow of forces in beams and slabs prestressed with external unbonded tendons*
SEP 2005 TO DEC 2007	Brent Visscher, M.A.SC. *Efficient systems for overpass bridges built of high-performance concrete*
SEP 2004 TO DEC 2006	Talayeh Noshiravani, M.A.SC. *Shear capacity of concrete beams prestressed with unbonded tendons*
SEP 2004 TO DEC 2006	Carlene Ramsay, M.A.SC. *Shear Resistance of a Polyurethane Interface in Concrete-Steel Composite Beams*
SEP 2004 TO DEC 2006	Mohamed el Semelawy, M.A.SC. (Co-supervised with Professor F. Vecchio)

	Effects of axial prestressing on the punching resistance of plain and fibre reinforced concrete slabs
OCT 2003 TO AUG 2004	Karen Jinsong Liu, M.A.SC. (Co-supervised with Professor F. Vecchio) *Modeling of unbonded post-tensioned concrete beams critical in shear*
SEP 2010 TO AUG 2013	Alisam Ghawe, M.ENG. candidate *Simplified models for calculating secondary moments in prestressed concrete continuous girders (project)*
MAY 2007 TO MAY 2008	Silviu Ban, M.ENG. *Economic comparison of rehabilitation and replacement of conventional and high-performance bridge systems (project)*
JAN 2003 TO AUG 2004	Andreas Kikites, M.ENG. *Use of high-performance concrete in the design of arch bridges (project)*
SEP 2002 TO MAY 2003	Hongxing Xin, M.ENG. *Design and analysis of curved bridge superstructures with highly eccentric load (project)*
APR 2002 TO DEC 2003	Jeffrey J. Yee, M.ENG. *Improving the efficiency of high-performance concrete in precast segmental bridge construction (project)*

5.4 Undergraduate Theses Supervised

Since 2002, I have supervised 30 undergraduate theses.

5.5 Other Supervision

SEP 2011 TO MAY 2012	Serguei Bagrianski, M.S.E. candidate, Princeton University Co-supervised with Professor Sigrid Adriaenssens *Segmental system for thin-shell concrete structures*
OCT 2010 TO SEP 2011	Post-doctoral fellow Jason Salonga, PH.D. *Development of course materials for civil engineering graphics*
JAN 2005 TO DEC 2006	Post-doctoral fellow Katrin Habel, DR.SC.TECHN. *Behaviour of ultra high performance concrete overlays under impact loading*

JUN 2003 TO AUG 2004 Professsional Experience Year student
Angela Yen-Yen Lo, B.A.SC.
Intelligent case studies for bridge design

I have also supervised an average of four undergraduate students per year as summer research assistants.

5.6 Other Teaching

2013 *Short course on the aesthetics of structural engineering*
This course was delivered to undergraduate students at the Shanghai Institute of Technology. It is an introduction to the contributions structural engineers have made to the creation of works of aesthetic significance. The major theme explored, through the detailed study of a small set of bridges and buildings, is the relation between the way the bridge looks and the way it carries load.

2012 *CPCI Professors' Seminar*
This was the initial offering of what is likely to become an annual two-day seminar for young professors and prospective professors of structural engineering. The seminar covered fundamental aspects of the design, detailing, and construction of precast concrete structures that are generally not covered in the standard curriculum but which are of critical importance to a proper approach to teaching the subject.

2009 TO PRESENT *U of T Bridge Engineering Seminar Series*
This is a series of public lectures on bridge engineering that brings together students, faculty, as well as practicing engineers from both the public and the private sector. It is the only such forum for bridge engineering anywhere in Canada. The goal of this series is to inspire both students and practicing engineers to go beyond tried and true solutions by exposing them to leading edge designs that they would not otherwise have a chance to see. Although I delivered the inaugural lecture in this series in the fall of 2009, my role since then has been as the organizer of the series. I invite leading bridge designers from around the world to come to the U of T to describe a recent bridge they have designed. Attendance at these lectures has been excellent. In the winter of 2013, we had an audience of over 130 (a standing room only crowd), evenly divided between the university and practice. The receptions we hold after the lectures have become a social event that brings together Toronto's bridge engineering community.

2008 *In-house training in advanced bridge engineering, Delcan Corporation*
I developed and taught a seminar as part of the professional development program of one of Canada's leading bridge engineering firms.

2005 TO 2009 *Portland Cement Association's Bridge Professors' Seminar*
This is an annual course that provides information on the latest concrete industry developments to professors from across the US and Canada, to assist them in introducing new or updating existing courses in concrete bridge design. I presented the sessions on post-tensioned concrete design and post-tensioned concrete bridge design.

2005 TO PRESENT *Bridge Engineering Research Group Field Trips*
During the summer months, I take a group of graduate and undergraduate students on a field trip to a major bridge construction site. An example of a recent trip was a visit to the A30 crossing of the St. Lawrence Seaway near Montreal, a major incrementally-launched long-span steel girder bridge.*6* administrative positions and committee memberships

6.1 Administrative positions within the University

2010 TO 2011 Department of Mechanical and Industrial Engineering
Member of Selection Committee for Chalmers Chair in Design Engineering

NOV 2010 TO PRESENT University of Toronto Faculty Association
Departmental representative on UTFA Council
Member of Membership Committee
Member of Nominating Committee

SEP 2009 TO MAY 2012 Department of Civil Engineering
Structures Section Coordinator

2007 TO 2008 Faculty of Applied Science and Engineering
Member of Teaching Methods and Resources Committee

2007 Department of Mechanical and Industrial Engineering
Member of Selection Committee for Chalmers Chair in Design Engineering

JULY 2005 TO JUN 2008 Division of Engineering Science
Design Advisor to Division Chairman and Member of Engineering Science Curriculum Committee

NOV 2003 TO JUNE 2008	Department of Civil Engineering *Member of Departmental Executive Committee*
NOV 2003 TO OCT 2005	Department of Civil Engineering *Chairman of Departmental Academic Planning Committee*
JUL 2002 TO DEC 2007	Department of Civil Engineering *Member of Academic Planning Committee*
JUL 2002 TO JUN 2005	Department of Civil Engineering *Structures Section Coordinator*

Since 2002, I have also served on two Departmental Teaching Evaluation Committees, two Departmental Faculty Search Committees, one Probationary Review Committee, and one Tenure Committee.

6.2 Outside the University

2008 TO PRESENT	Transportation Research Board *Member of Bridge Aesthetics Subcommittee*
2008 TO PRESENT	Canadian Precast/Prestressed Concrete Institute *Member of Technical Committee*
2008 TO 2010	Conference on Short and Medium Span Bridges, 2010 *Member of Technical Committee*
2008 TO 2009	IABSE Workshop on Recent Major Bridges, 2009 *Member of Technical Committee*
2007 TO PRESENT	CSCE Pratley Award *Chairman of jury*
2006	CSCE Pratley Award *Member of jury*
2006	Third Canadian Design Engineering Conference *Chairman of Organizing Committee*
2004 TO 2010	Canadian Journal of Civil Engineering *Member of Editorial Board and Associate Editor*
2003 TO 2006	Canadian Design Engineering Network *Member of Steering Committee*
2003 TO PRESENT	Canadian Highway Bridge Design Code (CSA Standard S6) *Chairman of Technical Subcommittee 8, Concrete Structures and Associate Member, Technical Committee*
2003, 2004, and 2008	Consulting Engineers of Ontario *Member of Jury, Annual Consulting Engineering Awards*

2001 TO 2006	Fédération internationale du béton *Member of Task Group 1.2 (Bridges)*
1994 TO 1997	Concrete Canada (a National Centre of Excellence) *Member of Board of Directors*

6.3 Other Service

2009 TO PRESENT	U of T Bridge Engineering Seminar Series *Organizer* See Section 5.6 for a description
2005	Art Exhibition: The Art of Structural Design, A Swiss Legacy *Organized this exhibition (originally curated at Princeton University) in collaboration with the U of T Art Centre*

7 HONOURS

2012	Canadian Precast/Prestressed Concrete Institute *Fellow*