CURRICULUM VITAE

NEGAR ELHAMI-KHORASANI

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RESEARCH INTERESTS

My primary areas of research include (a) fire engineering and steel structure-fire interaction, (b) performance-based design and reliability analysis of steel structures at high temperatures, (c) resiliency of communities under extreme hazards, and (d) cascading multi-hazard analysis (such as post-earthquake fires) and their effects on steel structures and communities. Although there has been progress in the field of fire engineering in the United States since the early 2000s, there are still many unanswered questions on performance of individual structures and communities. My primary contribution to the field has been development of new probabilistic models for analyzing steel structure-fire interaction within performance-based fire engineering and investigating the effect of post-earthquake fires on structures and communities.

EDUCATION

Ph.D. Civil Engineering – Structural Engineering 2010-2015
Princeton University, Princeton, NJ, USA
Thesis: A Probabilistic Framework for Multi-Hazard Evaluations of Buildings and Communities Subject to Fire and Earthquake Scenarios
Supervisor: Maria Garlock

M.A.Sc. Civil Engineering – Structural Engineering 2008-2010
University of Toronto, Toronto, ON, Canada
Thesis: System-level Structural Reliability of Bridges
Supervisor: Paul Gauvreau

B.A.Sc. Civil Engineering (Honors) 2004-2008
University of Toronto, Toronto, ON, Canada
Thesis: Structural Reliability and Robustness in Probabilistic Design
Supervisor: Paul Gauvreau

APPOINTMENTS

Assistant Professor, University at Buffalo, Department of Civil, Structural and Environmental Engineering, January 2016 – present.

Postdoctoral Research Associate, Princeton University, Department of Civil and Environmental Engineering, July 2015 – December 2015: developed fragility curves for steel buildings under fire; worked with Hazus & Ergo programs to study community resiliency under post-earthquake fires;

Research Assistant, Princeton University, Department of Civil and Environmental Engineering, September 2010 – June 2015: developed a probabilistic assessment of parametric temperature-time curves for office building fires; modified the source code of the OpenSees software for fire and fire following earthquake analyses of steel structures; performed risk analysis of steel office buildings under fire and fire following earthquake.

Research Assistant, University of Toronto, Department of Civil Engineering, Sept. 2008 - Aug. 2010: developed a working definition and mathematical characterization for reliability of a bridge system; evaluated safety index

of a conventional bridge system (three span twin girder steel bridge); evaluated safety index of a new bridge system (double-T high performance concrete bridge).

National Scholarship Research Student (NSERC-USRA), University of Toronto, Department of Civil Engineering, May 2008 - August 2008: prepared an annotated bibliography of available literature on robust structural systems.

Summer Intern (Engineer), TWD Roads - Carillion Canada, Toronto, Canada, June 2007 – August 2007: conducted weather analysis for material estimation; performed project evaluation and review of the progress with respect to tender values; researched Anti-Icing and Road Weather Information System (RWIS) technologies; created Hwy maintenance work schedule with Microsoft Project; created/updated labor/material reconciliation spread sheets.

Senior Structure Drafter, Ministry of Transportation Ontario (MTO), Toronto, Canada, May 2006 – August 2006: prepared bridge inspection Request for Proposal (RFP) documents; arranged location maps; bridge inspection data sheets and drawings; inspected bridges in Central Region, Ontario; created and updated Ontario Bridge Management System (OBMS) files.

Summer Intern (Engineer), Delcan Corporation, Toronto, Canada, May 2005 – August 2005: inspected bridges to identify erosion problems; obstructions to water flow and other general defects; prepared report of bridge inspection to be submitted to the City of Toronto; performed quantity estimating; moving coordinator of the structural department.

TEACHING EXPERIENCE

Instructor – University at Buffalo
CIE500/CIE522 Design of Structures for Fire, Spring 2017 (# students: 33), Spring 2018 (# students: 17)
CIE428 Steel Design, Fall 2016 (# students: 94), Fall 2017 (# students: 51)
CIE324 Structural Engineering II, Spring 2016 (# students: 48)

Instructor - Princeton University
MATLAB Workshop, Fal1 2014

Assistant Instructor - Princeton University
CEE262 Structures and the Urban Environment – Course administrator, Spring 2015
CEE366 Reinforced Concrete Design, Fall 2011, 2012, 2014
CEE 461 Design of Large Scale Structures – Buildings, Spring 2013, 2014, 2015
CEE 361/MAE 325 Matrix Structural Analysis and Introduction to Finite-Element Methods, Fall 2012

Teaching Assistant – University of Toronto
CIV357 Building Design, 2010
CIV100 Mechanics, Fall 2009
CIV313 Design of Reinforced Concrete Structures, Spring 2009
CIV102 Structures and Materials, an introduction to design, Fall 2008

HONORS AND AWARDS

University at Buffalo
ASCE ExCEEd Fellow, July 2016

Princeton University
Nominated by the Dept. of Civil and Env'l Eng. for the Graduate School Teaching Award, Spring 2013
Recipient of the Sherrerd Foundation Fellowship in the Dept. of Civil and Env'l Engineering, Fall 2013
Recipient of the Norman J. Sollenberger Fund, January 2012

Gordon Wu Fellow – Princeton University, Sept. 2010 - 2015
NSERC Post Graduate Scholarship (PGSD2), Sept. 2010 - Sept. 2012

University of Toronto
NSERC Post Graduate Scholarship (PGSM), Sept. 2008 - Sept. 2010
Beatty Fellowship Award, 2008 - Sept. 2009
Faculty of Applied Science and Engineering R.A. Downing Scholarship in Civil Engineering, Sept. 2007
Yolles-Bergmann Scholarship for 3rd year (Steel and Concrete) Structural Design Projects, Aug. 2007
Greater Toronto Sewer and Watermain Contractors Association Award in Civil Engineering, Aug. 2007
Nominated for Halsall Scholarship in Building Engineering, July 2007
Faculty of Applied Science and Engineering R.A. Downing Scholarship in Civil Engineering, Aug. 2006
Faculty of Applied Science and Engineering UMA Scholarship in Civil Engineering, Aug. 2006
Faculty of Applied Science and Engineering James Franceschini Foundation Scholarship, Aug. 2005
Rank 2 of the civil engineering class at University of Toronto for seven semesters, 2004-2008
University of Toronto Admission Scholarship, Aug. 2004
Successfully attended Mathematics and Computer Olympiads and moved to national level in high school, 2002

JOURNAL PUBLICATIONS (8 published, 5 submitted)

Google Scholar Citations as of July 2018: **123** (https://scholar.google.com/citations?user=2zvRsWMAAAAJ&hl=en)

Underlined: student at UB

[13] Gernay, T., Van Coile, R., Elhami Khorasani, N., Hopkin, D. "Efficient uncertainty quantification method applied to structural fire engineering computations." Submitted to *Engineering Structures*.

[12] Gernay, T., Elhami Khorasani, N., Garlock, M.E.M. "Fire fragility functions for steel frame buildings: Sensitivity analysis and reliability framework." *Submitted to Fire Technology* (under revision).

[11] Sarreshtehdari, A., Elhami Khorasani, N., Coar, M. "A stream-lined approach for evaluating post-earthquake performance of electric networks." *Submitted to Sustainable and Resilient Infrastructure* (under revision).

[10] Elhami Khorasani, N., Gernay T., Fang, C. "Parametric study for performance-based fire design of U.S. prototype composite floor systems" *Submitted to Journal of Structural Engineering.*

[9] Max, C., Elhami Khorasani, N., Garlock, M.E.M. "Effects of water network and electric network dependency on post-earthquake fire suppression." *Submitted to Sustainable and Resilient Infrastructure* (under revision).

[8] Elhami Khorasani, N., Gernay, T., Garlock, M.E.M. (2017). "Data-driven probabilistic post-earthquake fire ignition model for a community." *Fire Safety Journal*, 94:33-44. (Impact factor: 1.165)

[7] Gerasimidis, S., Elhami Khorasani, N., Garlock, M.E.M., Pantidis, P, Glassman, J.D. (2017). "Resilience of a tall steel moment resisting frame building with multi-hazard post-event fire consideration." *Journal of Constructional Steel Research*, 139: 202-219. (Impact factor: 2.028)

[6] Elhami Khorasani, N., Garlock, M.E.M. (2017). "Overview of fire following earthquake: historical events and community responses." *Int'l Journal of Disaster Resilience in the Built Environment*, 8(2): 158-174. (Impact factor: 0.72)

[5] Elhami Khorasani, N., Garlock, M.E.M., Gardoni, P. (2016). "Probabilistic performance-based evaluation of a tall steel moment resisting frame under fire following earthquake." *Journal of Structural Fire Engineering*, 7(3): 193-216. (Impact factor: 0.50)

[4] Gernay, T., Elhami Khorasani, N., Garlock, M.E.M. (2016). "Fire fragility curves for steel buildings in a community context: a methodology." *Engineering Structures*. 113: 259-276. (Impact factor: 1.893)

[3] Elhami Khorasani, N., Garlock, M.E.M., Quiel, S.E. (2015). "Modeling steel structures in OpenSees: enhancements for fire and multi-hazard probabilistic analysis." *Journal of Computers and Structures*, 157: 218-231. (Impact factor: 2.425)

[2] Elhami Khorasani, N., Gardoni, P., Garlock, M.E.M. (2015). "Probabilistic fire analysis: evaluation of steel structural members." *Journal of Structural Engineering,* 141(12). (Impact factor: 1.63)

[1] Elhami Khorasani N., Garlock M.E.M., Gardoni P. (2014). "Fire load: survey data, recent standards, and probabilistic models for office buildings." *Engineering Structures*, Elsevier, 58: 152-165. (Impact factor: 1.893)

CONFERENCE PUBLICATIONS (bold indicates presenting author) (22 published)

Underlined: student at UB.

[22] Kumar, D., Deshpande, A.A., **Ranade, R.**, Elhami Khorasani, N. (2018). "Effects of elevated temperatures on residual bond strength of steel rebar with strain hardening cementitious composite." *Proceedings* of the 3rd R.N. Raikar Memorial International Conference and Gettu-Kodur International Symposium on Advances in Science and Technology of Concrete, Mumbai, India, December 14-15.

[21] Stephani, A., **Van Coile, R.**, Elhami Khorasani, N., Gernay, T., Hopkin, D. (2018). "Probabilistic model for steel yield strength retention factor at elevated temperatures, Influence of model choice on structural failure fragility curve." *Proceedings* of the 16th International Probabilistic Workshop (IPW), Vienna, Austria, September 12-14.

[20] Qureshi, R., **Elhami Khorasani, N.** (2018). "Instantaneous stiffness correction for hybrid fire testing." *Proceedings* of the 10th International Conference on Structures in Fire, Belfast, U.K., June 6-8.

[19] **Van Coile, R.**, Gernay, T., Elhami Khorasani, N., Hopkin, D. (2018). "Evaluating uncertainty in response of steel-composite members and assemblies under standard fire exposure – application of the ME-MDRM." *Proceedings* of the 10th International Conference on Structures in Fire, Belfast, U.K., June 6-8.

[18] **Elhami Khorasani, N.** Billittier, J., Stavridis, A. (2018). "Structural performance of a railway tunnel under different fire scenarios." *Proceeding* of the ASME Joint Rail Conference, Pittsburgh, PA, U.S.A., April 18-20.

[17] **Atefi Monfared, K.**, Elhami Khorasani, N. (2017). "A novel assessment of geomechanical and fire hazard in offshore platforms." *Proceedings* of the 70 Years of Canadian Geotechnics and Geoscience – GeoOttawa. Ottawa, Canada, Oct. 1-4.

[16] **Elhami Khorasani, N.**, Fang, C., Gernay, T., (2017). "Performance-based fire design and the U.S. prescriptive guidelines: a comparative study." *Proceedings* of the 39th IABSE Symposium. Vancouver, Canada, Sept. 19-23.

[15] Elhami Khorasani, N., Fang, C., **Gernay, T.**, (2017). "Comparative fire analysis of steel-concrete composite buildings designed following performance-based and U.S. prescriptive approaches." *Proceedings* of the Applications of Structural Fire Engineering Conference. Manchester, U.K., Sept. 7-8.

[14] **Gernay, T**., Elhami Khorasani, N., Garlock, M. (2017). "Fire risk assessment of multi-story buildings based on fragility analysis." *Proceedings* of the 2nd Int. Fire Safety Symposium - IFireSS. Naples, Italy, June 7-9

[13] **Coar, M.**, Elhami Khorasani, N., and Garlock, M.E.M. (2016). "Integrating water and electric systems in post-earthquake fire analysis." *Proceedings* of the International Symposium on Sustainability and Resiliency of Infrastructure. Taipei, Taiwan, Nov. 9-12.

[12] **Elhami Khorasani, N.**, Gernay T., and Garlock, M.E.M. (2016). "Probabilistic measures of earthquake effects on fire performance of tall buildings." *Proceedings* of the Sixth International Conference on Structural Engineering, Mechanics, and Computation. Cape Town, South Africa, Sept. 5-7.

[11] **Gernay, T.**, Selamet, S., Tondini, N., Elhami Khorasani, N. (2016). "Urban infrastructure resilience to fire disaster: an overview." *Proceedings* of the World Multidisciplinary Civil Engineering-Architecture-Urban Planning Symposium, Prague, Czech Republic, June 13-17.

[10] **Elhami Khorasani, N.**, Gernay T., and Garlock, M.E.M. (2016). "Fire fragility functions for community resilience assessment." *Proceedings* of the 9th International Conference on Structures in Fire, Princeton, U.S.A., June 8-10.

[9] **Gernay T.**, Elhami Khorasani, N., and Garlock, M.E.M. (2016). "Critical parameters in deriving fire fragility functions for steel gravity frames." *Proceedings* of the 9th International Conference on Structures in Fire, Princeton, U.S.A., June 8-10.

[8] Gernay T., Elhami Khorasani, N., and **Garlock, M.E.M.** (2015). "Tools for measuring a city's resilience in a fire following earthquake scenario." *Proceedings* of IABSE Conference – Structural Engineering: Providing Solutions to Global Challenge*s,* Geneva, Switzerland, September 23-25.

[7] **Garlock, M.E.M**., Bhatia, A., Elhami Khorasani, N. (2015). "Introducing modern teaching into a classic course on structural art." *Proceedings* of IABSE Conference – Structural Engineering: Providing Solutions to Global Challenges, Geneva, Switzerland, September 23-25.

[6] **Gernay T.**, Elhami Khorasani, N., and Garlock, M.E.M. (2015). "Fragility analysis of a steel building in fire and fire following earthquake." *Proceedings* of the First International Conference on Structural Safety under Fire & Blast (CONFAB), Glasgow, Scotland, September 2-4.

[5] **Elhami Khorasani, N.**, Garlock, M.E.M., and Gardoni, P. (2015). "Probabilistic evaluation of a 9-Story MRF subject to post earthquake fires." *Proceedings* of PROTECT2015, East Lansing, Michigan, June 28-30.

[4] Elhami Khorasani, N., **Garlock, M.E.M.**, and Gardoni, P. (2014). "Reliability-based approach for evaluation of buildings under post earthquake fires." *Proceedings* of the 8th International Conference on Structures in Fire, Shanghai, China, June 11-13.

[3] Elhami Khorasani, N., **Garlock, M.E.M.** (2014). "Using Opensees for analyzing a 9-Story steel building under post- earthquake fires." *Proceedings* of the Tenth U.S. National Conference on Earthquake Engineering, Frontiers of Earthquake Engineering, Anchorage, Alaska, July 21-25.

[2] **Elhami Khorasani, N.**, Garlock, M.E.M., and Gardoni, P. (2013). "Application of a Bayesian-based methodology in performance evaluation of a steel perimeter column under fire." *Proceedings* of the 11th International Conference on Structural Safety & Reliability, New York, U.S.A., June 16-20.

[1] **Elhami Khorasani, N.**, Garlock, M.E.M., and Gardoni, P. (2012). "Reliability analysis of steel perimeter columns under fire." *Proceedings* of the 7th Int'l Conf. on Structures in Fire, Zurich, Switzerland, June 6-8.

BOOK CHAPTER

Underlined: student at UB

[2] Elhami Khorasani, N., Coar, M., Sarreshtehdari, A., Garlock, M.E.M. (2018). "A holistic framework to evaluate water availability for post-earthquake firefighting." To be published in *Handbook on Sustainable and Resilient Infrastructure*, Routledge.

[1] Elhami Khorasani, N., Garlock, M.E.M., and Gardoni, P. (2016). "Probabilistic evaluation framework for fire and fire following earthquake." *Multi-hazard Approaches to Civil Infrastructure Engineering,* edited by P. Gardoni, J.M. Lafave, and Y. Hashash, Springer International Publishing.

OTHER PUBLICATIONS

[2] Anderson, W.V., Winchester M. and E. Khorasani, N. (2005) Inspection Report-Humber River Arch Bridge, Mimico Creek Arch Bridge. *Technical Report submitted by Delcan Corporation to the City of Toronto*.

[1] Elhami Khorasani, N. (2005) Engineering Disasters. *The Project Magazine*. Winter Ed. Volume: 25.

CONFERENCE ABSTRACTS (bold indicates presenting author in the conference)

Underlined: student at UB.

[9] **Sarreshtehdari, A.,** Elhami Khorasani, N. (2018). "Enhancing community resilience by planning for response time during post-earthquake fires." International Symposium on Sustainable Systems & Technology (ISSST), Buffalo, NY, June 2018.

[8] **Qureshi, R.**, Elhami Khorasani, N., Gernay, T. (2018). "Need of active boundary conditions for fire testing." Engineering Mechanics Institute Conference, Boston, MA, June 2018.

[7] **Gernay, T.**, Gamba, A., Elhami-Khorasani, N., (2018). "Behavior of steel frame structures under natural fire and collapse mechanisms during cooling." Structures Congress, San Antonio, Texas, April 2018.

[6] **Elhami Khorasani, N.**, Billittier, J., Stavridis, A. (2017). "Assessment of structural damage in railway tunnels under fire." International Forum on High-Speed Railway, Changsha, China, December 2017.

[5] **Elhami Khorasani, N.**, Haase, B., Gernay, T. (2017). "A comparison of prescriptive and performance-based designs for fire as a primary or secondary event." Engineering Mechanics Institute Conference, San Diego, CA, June 2017.

[4] Coar, M., Elhami Khorasani, N., **Sarreshtehdari, A.**, and Garlock, M.E.M. (2017). "Community resilience assessment for fire following earthquake using a probabilistic framework." Engineering Mechanics Institute Conference, San Diego, CA, June 2017.

[3] Elhami Khorasani, N., **Haase, B**. (2017). "Post-blast fire resistance of low-rise buildings through membrane action of composite floor slabs." Structures Congress, Denver, Colorado, April 2017.

[2] **Elhami Khorasani, N.**, Gernay T., Garlock, M.E.M. (2017). "Effects of various design parameters on system-level fire fragility functions for steel buildings." Structures Congress, Denver, Colorado, April 2017.

[1] Coar, M., **Elhami Khorasani, N.**, and Garlock, M.E.M. (2016). "Integrating water and electric systems in a post-earthquake fire analysis." Engineering Mechanics Institute Conference and the Probabilistic Mechanics & Reliability Conference, Vanderbilt University, TN, May 2016.

INVITED TALKS

[10] "Structural fire engineering and the roadmap to resiliency", Central South University, Changsha, China, December 2017.

[9] "Structural fire engineering and the roadmap to resiliency", University of Toronto, Toronto, Canada, November 2017.

[8] "Fundamentals of fire engineering for bridges", NY State-wide Conference on Local Bridges, Syracuse, NY, October 2017.

[7] "Fundamentals of fire engineering for bridges", NYSATE 77th Conference, Buffalo, NY, May 2017.

[6] "Introduction to earthquake engineering," Structural Dynamics, University of Miami, April 2017.

[5] "Fundamentals of fire engineering for bridges", Bridge and Infrastructure Management and Public Policy, University at Buffalo, March 2017.

[4] "Fire and fire following earthquake: a probabilistic approach," Worcester Polytechnic Institute, October 2016.

[3] "Developing system-level fragility functions for performance-based fire engineering of buildings", JCSS Workshop on probabilistic methods in structural fire engineering, SP Technical Institute of Sweden, October 2016 (presented by Gernay, T.)

[2] "Fire and fire following earthquake: a probabilistic approach," Johns Hopkins University, Department of Civil Engineering, April 2015.

[1] "Probabilistic based evaluation of steel buildings under post earthquake fires", CEE460: Risk Assessment and Management, Princeton University, April 2013.

STUDENT ADVISING

Doctoral students
Ramla Karim Qureshi, *Hybrid simulation technique for fire testing*, expected graduation in 2020.

Amir Sarreshtehdari, *Post-earthquake fire response of multi-story steel buildings within a community context*, expected graduation in 2021.

Nan Hua (Co-advised with Anthony Tessari), *Structural fire resistance of tunnels considering soil-liner tunnel interaction*, expected graduation in 2021.

Doctoral committees
Alok Abhay Deshpande, University at Buffalo, Department of Civil, Structural and Environmental Engineering, Fall 2016-present.

Zheda Zhu, Lehigh University, Department of Civil and Environmental Engineering, Spring 2017-present.

Max Coar, Princeton University, Department of Civil and Environmental Engineering, Fall 2017-present.

Master students
Chenyang Fang, *Performance-based fire design and the U.S. prescriptive guidelines: A comparative study,* Spring 2017.

Fernando Jose Szasdi Bardales, *Fire spread in urban environment,* expected graduation in 2019.

Undergraduate research students
Nayana Streekumar, *Fundamentals of hybrid fire testing*, Summer Research Assistantship Program, Summer 2017.

Akirah Matthews, *Compiling bridge fragility curves to assess seismic vulnerability*, LSAMP Summer Research Internship Program, Summer 2017. (Selected to attend the 2017 LSMCE conference)

Derek Johnson, *Post-blast fire resistance of low-rise buildings through membrane action of composite floor*, Spring 2017.

Aysegul Sagmal, *Collecting an inventory and harmonizing bridge fragility curves for post-earthquake community assessment*, Spring 2017.

Jarlene Rojas, *Quantifying lifeline dependencies under extreme hazards*, LSAMP Summer Research Internship Program, Summer 2016.

ACADEMIC SERVICES

University at Buffalo
Undergraduate Studies Advisory Committee Member, University at Buffalo, Department of Civil, Structural and Environmental Engineering, September 2016-present.

Freshman Mentor Program, EAS202, University at Buffalo, Department of Civil, Structural and Environmental Engineering, Spring 2016 and 2017.

Faculty Judge for the Annual CSEE Poster Competition, Spring 2016.

Professional Services
Conference session organizer for two sessions, Structural-Fire Engineering: Past, Present, and Future, Engineering Mechanics Institute (EMI) Conference, Boston, MA, June 2018.

Organizing Committee, 9th International Conference on Structures in Fire (SiF), Princeton, NJ, June 2016.

Organizing Committee, Princeton Research Symposium, Princeton, NJ, June 2013.

ASCE Fire Protection Committee, Lead of Fire Following Earthquake Task Group, preparing a committee report on performance based design for fire following earthquake. September 2017-present.

Journal Reviewer for: Fire Safety Journal (7); Engineering Structures (4); Journal of Structural Engineering (4); Journal of Constructional Steel Research (4); Fire Technology (3); Sustainable and Resilient Infrastructure (2); Advances in Structural Engineering (2); Bulletin of Earthquake Engineering (2); Journal of Earthquake

Engineering (1); Journal of Structural Fire Engineering (1); Canadian Journal of Civil Engineering (1); Automation in Construction (1), Journal of Environmental Management (1).

Article Editor: SAGE Open.

Community Outreach

SC Governor's school for science and mathematics, South Carolina, Fall 2017, presented an online lecture to engineering high school students about bridge fires. The focus of the was how various engineering disciplines can make contributions to the field of transportation.

Science in Elementary Program at Westminster School, Buffalo, Spring 2017 to present, working with UB volunteers at a local K-8 school with majority of students from minority and underprivileged sections of our community. Through hands-on experiments, this program aims to facilitate self-learning of science among the school students. (http://www.elementaryschoolscience.org/)

PROFESSIONAL MEMBERSHIP AND CERTIFICATES

ASCE Fire Protection Committee, 2017-present
International Association for Fire Safety Science (IAFSS) Large Outdoor Fires and the Built Environment working groups, 2018-present
Member of ASCE Risk and Resilience Measurements Committee, 2016-present
Member of ASCE Civil Infrastructure and Lifeline System Committee, 2016-presnet
Teaching Transcript, the McGraw Center for Teaching and Learning, Princeton, 2014
Certificate of obligated engineer, University of Toronto, 2008
Passport to Safety, Health and Safety Certificate, Ontario, Canada, 2006
Member of the Golden Key International Honor Society, University of Toronto, 2005

PROFESSIONAL REGISTRATION

E.I.T., New Jersey (EIT-03160).