UNIVERSITY OF TORONTO
FACULTY OF APPLIED SCIENCE & ENGINEERING

July 21, 2017

30 Forensic Engineering Inc.
Suite 800 - 40 University Avenue
Toronto ON M5J 1T1

Dear Search Committee:

I am writing to apply for a position as a Structural Failure Analyst at the 30 Forensic Engineering firm. I recently finished my PhD degree in Structural Engineering at the University of Toronto under supervisions of Professor Frank Vecchio and Professor Oh-Sung Kwon. I would appreciate if you consider my application.

My doctoral research was focused on the performance assessment of reinforced concrete (RC) structures through advanced analytical and experimental methodologies. The main objective of my research was to develop a framework for multi-platform simulation of RC structural systems. The framework enables combining different analysis tools, which can be based on diverse modelling approaches, while fully considering the interaction between substructures. To date, the analysis programs that have been integrated into the simulation framework are: VecTor suite of software, OpenSees, Zeus-NL, ABAQUS, and S-Frame. The effectiveness of the proposed modelling approach was investigated through nonlinear analysis of a wide range of complex systems such as frame structures with critical joints, structures with repaired members, and soil-structure interaction under static and dynamic loads. In addition, a new interface element, specifically formulated for RC members, was introduced to connect beam elements to membrane elements. The experimental phase of my research focused on extending the application of the simulation framework to accommodate hybrid (experimental-numerical) testing. An experimental program was conducted using a six degrees-of-freedom hydraulic testing facility to verify the hybrid simulation framework and investigate the behaviour of RC structures in small-scale.

During my PhD, I worked on the development of the VecTor suite of software, a set of nonlinear analysis programs for reinforced concrete structures, and gained valuable experiences in the areas of computer programming, finite element modelling, and nonlinear behaviour of reinforced concrete structures. I was involved with the IC-IMPACTS research center to analyze the behaviour of damaged and repaired RC structures in India and Canada. Also, I collaborated with the S-Frame Software Company to integrate academic analysis tools with commercial design software. As a research advisor, I co-supervisor different undergraduate projects including development of a three-dimensional finite element mesh generation algorithm, numerical investigation of bond-slip effects between reinforcement and concrete, and development of graphical pre- and post-processors for RC analysis software.

While in university, I had the opportunity to be involved with industry and work part-time in consulting firms in Canada and in my home country of Iran. As part of my NSERC-IPS (National Science

and Engineering Research Council of Canada) scholarship, I worked as a structural engineer in the LEA consulting firm in Toronto, Canada. I was responsible for modelling and analysis of staged-construction effects on one of the Toronto's subway station structures. During my undergraduate studies, I worked as an assistant structural engineer on the design and construction of a 10-storey RC building structure in Tehran, Iran.

Working at an esteemed and reputable firm like the 30 Forensic Engineering would be a great opportunity for me to use my knowledge and skills for the performance assessment and failure analysis of real-world structures. I believe my background in computer programming, finite element modelling, nonlinear analysis of deficient and repaired reinforced concrete structures, and advanced hybrid testing, as well as collaborations that I had with industry through research projects, can help me to make many positive contributions to the 30 Forensic Engineering firm. Thank you for your time and consideration and I eagerly look forward to hearing from you.

Sincerely,

Vahid Sadeghian

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Education

Doctor of Philosophy (PhD) in Structural Engineering (Jan. 2012 – June 2017)
Department of Civil Engineering, University of Toronto, Toronto, ON, Canada
Grade Point Average: A
Dissertation Title: A Framework for Multi-Platform Analytical and Experimental Simulations of Reinforced Concrete Structures.
Supervisors: Prof. F. Vecchio and Prof. O. Kwon

Master of Applied Science (MASc) in Structural Engineering (Sept. 2009 – Dec. 2011)
Department of Civil Engineering, University of Toronto, Toronto, ON, Canada
Grade Point Average: A+
Thesis Title: FormWorks-Plus: Improved Pre-Processor for VecTor Analysis Software.
Supervisor: Prof. F. Vecchio

Bachelor of Civil Engineering (Sept. 2005 – June 2009)
Department of Civil Engineering, Faculty of Engineering, University of Tehran, Tehran, Iran
Grade Point Average: 17/20

Awards and Achievements

- Granted University of Toronto Graduate Fellowship, Research Assistantship, and Teaching Assistantship (2010-2017).
- Granted the NSERC-IPS (National Science and Engineering Research Council of Canada) scholarship for master studies in 2010.
- Exempted from the Iranian Entrance Examination for master studies based on outstanding academic achievements in 2009.
- Granted the FOE (Faculty of Engineering) award from the University of Tehran in 2008 and 2009 academic years.
- Ranked as the top 500 among over 800,000 participants in Iran's Nationwide University Entrance Exam in 2005.
- Ranked as the top 200 among over 200,000 participants in Iran's Azad University Entrance Exam in 2005.

Areas of Expertise

- Hybrid (experimental-numerical) simulation of reinforced concrete structures
- Nonlinear finite element analysis of structures under static and dynamic loads
- Behaviour of deficient and repaired reinforced concrete structures
- Behaviour of frame structures with critical joint panels
- Soil-structure interaction analysis
- Pre- and post-processors for structural analysis software

Work Experiences

Structural Engineer (May 2010 – Oct. 2010) – NSERC Scholarship
LEA consulting company, Toronto, ON, Canada
Projects: Modelling and analysis of the Staged Construction effects on Toronto's subway station structures using finite element shell models; Investigating soil effects on buried reinforced concrete structures.

Assistant Structural Engineer (2008 - 2009)
Rasha consulting company, Tehran, Iran
Project: Involved in the design of a 10-storey reinforced concrete building structure.

Teacher (2005-2007)
Mobin high school, Tehran, Iran
Duty: Teaching the Differential Equations course

Academic Experiences

Teaching (Winter 2016)
Department of Civil Engineering, University of Toronto, Toronto, ON, Canada
Course: Solid Mechanics II

Graduate Teaching Assistant (2010 - 2017)
Department of Civil Engineering, University of Toronto, Toronto, ON, Canada
Graduate-level course: Advanced Mechanics of Reinforced Concrete
Undergraduate-level courses: Structural Analysis II, Design of Steel Structures, Reinforced Concrete II, and Structural Design II

Graduate Research Assistant (2010 - 2017)
Department of Civil Engineering, University of Toronto, Toronto, ON, Canada
Projects: Development of a 6-DOF hydraulic testing facility for hybrid simulation; Development of a framework for multi-platform analysis of structures; Development of a new interface element for connecting layered beam elements with membrane elements; Development of the VecTor analysis software; Development of a generalized graphical user-interface for modelling reinforced concrete structures

Undergraduate Teaching Assistant (2008 - 2009)
Department of Civil Engineering, Faculty of Engineering, University of Tehran, Tehran, Iran
Course: Reinforced Concrete I

Undergraduate Research Assistant (2008 - 2009)
Department of Civil Engineering, Faculty of Engineering, University of Tehran, Tehran, Iran
Project: Worked as a researcher in the Concrete Institute of Tehran University

Collaborations

S-FRAME Software Company (2014 – 2017)
Vancouver, BC, Canada
Integrate academic analysis tools with commercial design software.

IC-IMPACTS Research Center (2013 – 2017)
Vancouver, BC, Canada
Investigate the behaviour of deficient or repaired reinforced concrete structures in India and Canada.

Computer Skills

Programming Language: LabVIEW, FORTRAN, C, Visual C++ (including MFC and OpenGL libraries), MATLAB

Software: VecTor suite of programs, ATENA, OpenSees, ABAQUS, RISA, S-FRAME, ETABS, SAP2000, SAFE, Auto-CAD

Hardware: Participated in a computer hardware workshop for 3 months

Publications & Presentations

Journal Articles

- Sadeghian, V. and Vecchio, F. (2016). "Application of Multi-Scale Modelling on Large Shear-Critical Reinforced Concrete Structural Systems Repaired with FRP Sheets." *Innovations in Corrosion and Materials Science Journal*, Vol. 6, No. 2, 106-114.
- Sadeghian, V. and Vecchio, F. (2015). "A Graphical User Interface for Stand-Alone and Mixed-Type Modelling of Reinforced Concrete Structures." *Computers and Concrete International Journal*, Vol. 16, No. 2, 287-309.
- Sadeghian, V., Kwon, O-S., and Vecchio, F. (accepted) "Small-Scale Multi-Axial Hybrid Simulation of a Shear-Critical Reinforced Concrete Frame." *Earthquake Engineering and Engineering Vibration Journal.*
- Sadeghian, V., Vecchio, F., and Kwon, O-S. (submitted) "Modelling Beam-Membrane Interface in Reinforced Concrete Structures." *ACI Structural Journal.*
- Sadeghian, V., Vecchio, F., and Kwon, O-S. (to be submitted in 2017) "A Multi-Platform Framework for Analytical and Experimental Simulation of Reinforced Concrete Structures." *ACI Structural Journal.*

Conference Proceedings

- Huang, X., Sadeghian, V., Rong, F., Kwon, O-S., and Vecchio, F. (2017) "An Integrated Simulation Method for Performance-Based Assessment of a Structure." CSCE, Vancouver, Canada.
- Sadeghian, V., Vecchio, F., and Kwon, O-S. (2016) "Integrated analysis of reinforced concrete columns

retrofitted with fibre-reinforced polymer." 16th World Conference on Earthquake Engineering, Santiago, Chile.

- Huang, X., Sadeghian, V., and Kwon, O-S. (2015). "Development of integrated framework for distributed multi-platform simulation." 6th Int. Conf. on Advances in Experimental Structural Engineering, Urban-Champaign, USA.
- Sadeghian, V., Vecchio, F., and Kwon, O-S. (2015). "An integrated framework for analysis of mixed-type reinforced concrete structures." 5th ECCOMAS Thematic Conf. on Computational Methods in Structural Dynamics and Earthquake Engineering, CompDyn, Crete, Greece.
- Sadeghian, V., Vecchio, F. (2013). "FormWorks-Plus: Improved pre-processor for VecTor analysis software." 3rd Special Conf. on Material Engineering and Applied Mechanics, CSCE, Montreal, Canada.

Manuals

- Sadeghian, V., Kwon, O-S., and Vecchio, F. (2016) "User's manual of a 6-DOF shake table for hybrid simulation." Online Publication, 41 pp.
- Sadeghian, V. and Vecchio, F. (2014) "User's manual of Cyrus, a framework for multi-scale analysis of reinforced concrete structures." Online Publication, 47 pp.

Presentations

- "Multi-Platform Analysis Using VecTor Suite of Software." UT-SIM workshop, University of Toronto, Toronto, Canada, 2017.
- "Recent Improvements in Nonlinear Analysis of Reinforced Concrete Structures." Arup Engineering Consulting, Toronto, Canada, 2016.
- "Numerical Modelling and Analysis of Retrofitted Structures." India-Canada Center for Multi-Disciplinary Partnership (IC-IMPACTS), University of British Columbia, Vancouver, Canada, 2015.
- "Cyrus: A Multi-Scale Framework for Hybrid Simulation." India-Canada Center for Multi-Disciplinary Partnership (IC-IMPACTS), University of British Columbia, Vancouver, Canada, 2014.
- "Shear Behaviour in Reinforced Concrete Structures." Read Jones Christoffersen (RJC) Engineering Consulting, Toronto, Canada, 2013.
- "Nonlinear Analysis of Reinforced Concrete Frame Structures with Critical Joint Panels." Morrison Hershfield Engineering Consulting, Toronto, Canada, 2013.
- "FormWorks-Plus: Improved Pre-Processor for VecTor Analysis Software." 3rd CSCE Conference, Montreal, Canada, 2013.

Undergraduate Research Project Supervision

Raymond Ma (2014 – Summer 2016)
Senior undergraduate student, Engineering Science Division, University of Toronto, Toronto, ON, Canada
Project: Development of a three-dimensional finite element mesh generation algorithm for solid and shell elements

Xiao Wang (Summer 2015)
Senior undergraduate student, Engineering Science Division, University of Toronto, Toronto, ON, Canada
Project: Numerical investigation of bond-slip models between concrete and reinforcement under

monotonic and cyclic loads

Agneya Sunil Loya (Summer 2015)
Exchange research intern, Department of Civil Engineering, Ryerson University, Toronto, ON, Canada
Project: Improvement of a graphical post-processor for a reinforced concrete frame analysis software

Jinghan Guan (Summer 2014)
3rd year undergraduate student, Department of Electrical and Computer Engineering, University of Toronto, Toronto, ON, Canada
Project: Improvement of a three-dimensional graphical pre-processor for a reinforced concrete analysis software

Memberships

- Engineering Intern (EIT) member, Professional Engineers Ontario, Canada
- Canadian Society for Civil Engineering (CSCE) student member
- American Concrete Institute (ACI) student member
- American Society of Civil Engineers (ASCE) student member