

Rakesh Ranjan, Ph.D., E.I.T. (Ontario, Alberta)

Junior Bridge Engineer, AECOM, Canada

rakeshstr77@gmail.com, <https://sites.google.com/view/rakesh-ranjan>**Education:****Doctor of Philosophy in Civil Engineering** September 2014 - August 2019

University of Waterloo, Ontario, Canada

Thesis: Probabilistic strain-based fracture mechanics analysis of weldments

Supervisor: Prof. Scott Walbridge

Master of Engineering in Civil Engineering August 2012 - June 2014

Indian Institute of Science, Bangalore, India

Project: Reliability analysis of composite beams subjected to fire load

Supervisor: Prof. C S Manohar

Bachelor of Technology in Civil Engineering August 2007 - May 2011

Motilal Nehru National Institute of Technology, Allahabad, India

Project: Development of computer-aided design application for the design of concrete pavement

Certificate in University Teaching May 2016 - August 2019

[Courses: Preparing for university teaching, Teaching practicum]

Centre for Teaching Excellence, University of Waterloo, Ontario, Canada

Fundamentals of University Teaching January 2015 - April 2016

Centre for Teaching Excellence, University of Waterloo, Ontario, Canada

Research Interests:

- Fracture Mechanics, Fatigue Testing and Analysis
- Development of Reliability-Based Structural Design Code Provisions
- Analysis and Design of Light Weight Structures
- Advanced Numerical Modelling for Bridges

Research Experience:**Research Associate** January 2020 – February 2021

Polytechnique Montréal, Quebec, Canada (Supervisor: Prof. Bruno Massicotte)

Project: Development of improved simplified and refined methods for the design of aluminum pony-truss bridges

- Developed improved design code recommendations for the analysis and design of aluminum pony truss bridges
- Performed 3D finite element analysis for three real pony truss bridges located in Quebec, Canada using SAP 2000 and ABAQUS

Postdoctoral Fellow September 2019 - December 2019

University of Waterloo, Ontario, Canada (Supervisor: Prof. Scott Walbridge)

Project: Quantification of fatigue strength improvement in mild steel, high strength steel and aluminum impact treated welded joints

- Developed recommendations for considering fatigue strength improvement in impact treated welded joints commonly used in bridge girders

Visiting Researcher

January 2017 - March 2017

University of Brasilia, Brazil (Supervisor: Prof. Antonio Miranda)

Project: Fatigue analysis of friction stir welded butt joints under bending and tension load**Graduate Researcher**

September 2014 - August 2019

University of Waterloo, Canada (Supervisor: Prof. Scott Walbridge)

Project: Probabilistic strain-based fracture mechanics analysis of weldments

- Developed and validated a two-dimensional fracture mechanics analysis model; applied the model to study fatigue strength improvement in impact treated welded joints; applied the model to study the effect of geometric and welding defects on the fatigue performance of friction stir welded joints
- Performed finite element modelling in ABAQUS to obtain stress distribution needed for fracture mechanics analysis; performed several material tests to obtain required input data for fracture mechanics analysis; and performed hundreds of fatigue tests to validate the two-dimensional fracture mechanics analysis model

Sponsored Researcher

March 2014 - April 2014

University of Edinburgh, Scotland, United Kingdom (Supervisor: Prof. Asif Usmani)

Project: ‘Making performance-based engineering for fire resistance attainable’, United Kingdom-India Education and Research Initiative (UKIERI), a joint project between the University of Edinburgh and the Indian Institute of Science

- Performed sequentially coupled thermal stress analysis in ABAQUS to simulate the response of a composite beam subject to fire
- Performed probabilistic analysis in MATLAB using an importance sampling-based approach (subset simulation method)

Journal Publications (Published):

- [1] **Ranjan, R.**, Walbridge, S. (2021). 2D Fracture Mechanics Analysis of HFMI Treatment Effects on the Fatigue Behaviour of Structural Steel Welds. *Welding in the World Journal*
- [2] **Ranjan, R.**, Walbridge, S., Shah, L., & Gerlich, A. (2020). Probabilistic Fracture Mechanics Analysis of Friction Stir Weld Fatigue Performance. *Light metal welding*, 58(Supplement), 72s-76s.
- [3] **Ranjan, R.**, de Oliveira Miranda, A. C., Guo, S. H., Walbridge, S., & Gerlich, A. (2019). Fatigue analysis of friction stir welded butt joints under bending and tension load. *Engineering Fracture Mechanics*, 206, 34-45.
- [4] Guo, S., Shah, L., **Ranjan, R.**, Walbridge, S., & Gerlich, A. (2019). Effect of quality control parameter variations on the fatigue performance of aluminum friction stir welded joints. *International Journal of Fatigue*, 118, 150-161.
- [5] **Ranjan, R.**, Ghahremani, K., Walbridge, S., & Ince, A. (2016). Testing and fracture mechanics analysis of strength effects on the fatigue behavior of HFMI-treated welds. *Welding in the World*, 60(5), 987-999.

Journal Publications (In Progress):

- [1] Fleury, A., **Ranjan, R.**, Shah, L., St-Georges, L., Rahem, A., & Walbridge, S. (2021) Fatigue performance of thick 6061-T6 aluminum friction stir welded joints.
- [2] **Ranjan, R.**, Paez, J., & Massicotte, B. (2021) An improved method to assess the load-carrying capacity of top chords in pony truss bridges under lateral-torsional buckling.

Conference Publications:

- [1] Fleury, A., **Ranjan, R.**, Shah, L., St-Georges, L., Rahem, A., & Walbridge, S. (2019, June). Fatigue design of friction stir welded joints in aluminium bridge decks. In *présenté à Canadian Society of Civil Engineering Annual Conference*, Laval, Canada (pp. 12-15).
- [2] **Ranjan, R.**, Walbridge, S. (2017). Crack shape effects on the fatigue behaviour of HFMI treated welds under variable amplitude loading conditions. *International Conference on Shot Peening (ICSP-13)*, Doc ID: 2017126, <https://www.shotpeener.com/library/pdf/2017126.pdf>
- [3] Ghahremani, K., **Ranjan, R.**, Walbridge, S., & Ince, A. (2015). Fatigue strength improvement of aluminum and high strength steel welded structures using high-frequency mechanical impact treatment. *Procedia Engineering*, 133, 465-476.

Conference Presentations:

- [1] **Ranjan, R.**, Walbridge, S. (2020). 2D Fracture Mechanics Analysis of HFMI Treatment Effects on the Fatigue Behaviour of Structural Steel Welds. 73rd International Institute of Welding, International Conference (Online), 2020.
- [2] **Ranjan, R.**, Walbridge, S. (2017). Crack shape effects on the fatigue behaviour of HFMI treated welds under variable amplitude loading conditions. *International Conference on Shot Peening (ICSP-13)*, Montreal, Quebec, Canada
- [3] **Ranjan, R.**, Ghahremani, K., Walbridge, S. (2016). Fatigue assessment and retrofit of top flanges on steel highway bridges damaged by saw cutting during deck replacement, *Canadian Society for Civil Engineering Annual Conference, Resilient Infrastructure*, London, Ontario, Canada, 2016.

Teaching Experience (as a Teaching Assistant):

- Fall 2018, Fall 2017 & Fall 2015: Structure and Properties of Materials
- Winter 2018: Civil Systems and Project Management
- Spring 2018, Spring 2017: Rehabilitation of Structures
- Fall 2016: Mechanics of Solids - 3
- Spring 2016: Advanced Mathematics for Environmental Engineers
- Winter 2016: Advanced Mathematics for Civil Engineers

Industrial Experience:**Junior Bridge Engineer**

March 2021 – Present

AECOM, Edmonton, Canada

- Load evaluation for bridges, fatigue and fracture evaluation of cracked bridge members
- Design of new bridges and rehabilitation of ageing bridges

Officer (Civil Engineer)

June 2011 – July 2012

Indian Oil Corporation Limited, India

Project: Rajasthan Atomic Power Project (Unit-7&8), India

- Supervised civil construction work at Rajasthan nuclear power plant construction site
- Reviewed technical documents such as work procedures, quality assurance procedures, investigation & testing procedures, segmental methodologies, pour-plan, construction drawings or sketches related to the construction of a nuclear power plant

Service & Leadership Experience:

- Reviewer, Materials (Journal of Materials Science and Engineering), MDPI (February 2020 - Present)
- Reviewer, Journal of Bridge Engineering, ASCE (January 2017 - Present)
- Associate Member, Canadian Institute of Steel Construction (June 2020 - Present)
- Member, Centre for Advanced Materials Joining (CAMJ), University of Waterloo (September 2015 - August 2019)
- Councillor (May 2018 - April 2019), VP Internal (September 2015 - April 2017) and President (May 2017 - April 2018) for Civil and Environmental Engineering Graduate Student Association at the University of Waterloo, Ontario, Canada
- Volunteer, Orientation for incoming students, 2015 - 2016, University of Waterloo
- Member, Farewell Coordination committee, 2013, IISc Bangalore, India
- Event Coordinator, Avishkar 2010 (Technical Festival), MNNIT Allahabad, India

Additional Experience:

Exam Centre Proctor (Part-time) March 2018 - August 2019
AccessAbility Services, University of Waterloo, Canada

- Ensured the implementation of the academic accommodation plan
- Recognized and responded to signs of distress in students during exam

Globalink Mentor (Part-time) April 2018 - November 2018
Mitacs, Globalink Research Internship Program, Waterloo, Canada

- Provided health, safety, and social support for five graduate research interns and helped them to get oriented to their host university and the surrounding area

VP Internal, President, Councillor

May 2015 – June 2017, May 2017 – June 2018, May 2018 – June 2019
Civil and Environmental Engineering Graduate Student Association (CE2GA), UWaterloo

- Voiced the needs of the graduate students at the department level as well as the university level, Chaired CE2GA council meetings to plan and co-ordinate the social events organized by CE2GA

Research Awards and Scholarships:

- Fonds de recherche du Québec – Nature et technologies (FRQNT) postdoctoral research scholarship (Awarded in April 2021)
- SAE Henry O. Fuchs Student Award (October 2020)
- Graduate Merit Scholarship, University of Waterloo (Fall 2018)
- University of Waterloo Graduate Scholarship (September 2017 - August 2018)
- International Doctoral Student Award (September 2014 - August 2018)
- David Johnston International Experience Award (January 2017 - April 2017)
- Sponsored Researcher Fund through the UK India Education & Research Initiative (UKIERI), University of Edinburgh, Scotland (March 2014 - April 2014)
- Top-ranked student in Graduate Aptitude Test in Engineering (GATE 2011), All India Rank 31 out of 29347 civil engineers
- Received 1st prize in ‘Connections’, an aluminum bridge fabrication competition in the national level technical festival (Avishkar - 2008) held at MNNIT Allahabad, India
- Merit Scholarship based on the All India Rank (6311) in All India Engineering Entrance Examination in 2007 from MNNIT Allahabad.