WINTER 2018 | Issue 11



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A Message from the President and Vice President

We are very excited to be part of this longstanding student group that works to foster enthusiasm and interest in transportation engineering.

In today's world of fast-paced change propelled by emerging technologies, it is becoming increasing important to encourage students to explore the industry and stay up to date. Transportation engineering is an especially fast-changing field because new technologies that impact it are constantly developed and there are a wide variety of disciplines that have applications in transportation engineering. As one of the main objectives of the Institute of Transportation Engineers, promoting advancement in transportation engineering is important since it affects multiple facets of society, from personal lives, to business operations, to the overall functioning of a city.

PICTURE

Our aim is to supplement the education and professional development of students interested in the transportation industry by inspiring them with new ideas and connecting them with professionals. This will be achieved through social and educational events where they can be exposed to current research and practices, as well as get a chance to network. By bringing together academics and professionals in an interdisciplinary and engaging environment, we hope to garner interest and broaden everyone's mindset.

We look forward to meeting you at our events!



ACADEMIC EVENTS

The UW-ITE chapter hosted a robust academic speaker series throughout the term, with speakers from various academic, industry, and agency backgrounds.

Dr. Ming Zhong, Ph.D., from Wuhan University of Technology in China, began the series with a discussion on the direction of integrated landuse transportation planning & modeling as it moves from theory



and assumptions towards big data and high-fidelity.

Mehran Kafi Farashah, M.A.Sc., P.Eng., from the Regional Municipality of York, next gave a presentation outlining the region's transportation services with a focus on the asset management strategies that are being employed.

Nimit Mittal, M.Eng., P.Eng., from HDR, next provided a case study of the redesign of the six points interchange at the confluence of Kipling Ave., Dundas St. W., and Bloor St. W. in the City of Toronto. The presentation highlighted the multi-modal design aimed to create a high quality public realm and create a transit-oriented mixed-use pedestrian-friendly community.

Dr. Lloyd McCoomb, PhD, P.Eng., from the University of Toronto presented on the design and construction of the Lester B. Pearson International Airport expansion.

Steve vanDeKeere, P.Eng., the Director of Transportation at the Region of Waterloo next presented on Waterloo Region's move toward the use of roundabout intersections, highlighting their safety and functional benefits, while providing insight into the performance of existing roundabouts.

Dave Hein, P.Eng., the Vice President of Transportation at Applied Research Associates Ltd., gave a presentation regarding pavement design, with a focus towards young engineers beginning their careers.

The UW-ITE chapter would like to thank all of the speakers as well as all of the people who attended the presentations. We are looking forward to another term full of interesting topics and discussion!



1st Annual Student Best Presentation in Transportation Competition

UW-ITE chapter launched its first Annual Student Competition: "Best Presentation in Transportation" that took place late fall. The competition offers students a great opportunity to present and share a topic of interest related to transportation engineering to their peers and professionals. While technical competence is an important element, the main focus of the competition is on the ability to present and communicate effectively to one's peers and the public. The event started with a keynote presented by Professor Susan Tighe, Deputy Provost and Associate Vice-President Integrated Planning and Budgeting, Current President of Canadian Society for Civil Engineering and Norman W. McLeod Professor of Sustainable Pavement Engineering.

Students presented in areas related to transportation including: planning, traffic, sustainability and material. A panel from the industry participated in the competition evaluation including: Hassan Baaj, Assistant Professor and Director of the Centre for Pavement and Transportation Technology (CPATT), Mehran Kafi Farashah, Transportation Asset Management Engineer at The Regional Municipality of York and Sina Varamini, Manager of Research and Development at McAsphalt Industries Limited. The panel evaluated the presentations in five category: communication skills, performance, time management, clarity of presentation, and organization. Congratulations to the winners: Shenglin Wang and Haya Almutairi

Thank you to our Sponsors!









SUSTAINABILITY INITIATIVE

Wat Walk

Increasing temperature changes to more drastic events like flooding are recognized impacts of anthropogenic carbon footprint and global climate change which affects our wellbeing. Canada intends to achieve 30% reduction of GHG emission economy-wide in 2030 below 2005 level. On the provincial level, Ontario targets a 15% GHG reduction below 1990 level by 2020. As a region, Waterloo is dedicated to assisting in the "development and implementation of a community climate action plan" to mitigate climate change impacts. The University of Waterloo community is committed to establishing environmental sustainability as "a core part of its culture". Agreements, targets and commitments is an interesting narrative but with little time left to reach goals for 2020 or 2030, it has become important to take a bottom-up approach looking from our individual contribution.

The goal of the UW-ITE Wat-Walk project is to sensitize individuals to the impacts that their transportation choices have on daily Greenhouse Gas (GHG) emissions. This





knowledge can then serve to encourage reductions for climate change mitigation, thus enabling us to chart a new path for environmental sustainability, as a university community.

Wat-Walk took place following the thanksgiving weekend, from October 10- 13, 2017. The event was organized to invigorate alternative modes of transportation within the Waterloo community, in order to increase awareness of individuals' impact, increase individuals' wellness, and reduce GHG emissions.



SUSTAINABILITY INITIATIVE

Wat Walk, CONTINUED

In those four days, Wat-Walk recorded a total of 209 sustainable alternative trips, totalling 1641.8 km cumulatively. Figure 1 highlights the number of trips by alternative transportation mode while Figure 2 highlights the distance traveled by alternative mode. It was found that walking is the most common travel mode selected by participants, while transit accounted for the greatest distance.







SOCIAL EVENTS

Fall Open House

The UW-ITE chapter hosted Fall Open House on September 22, 2017, we invited undergraduates, graduate students from Transportation Engineering, pavement Engineering to participate this event, we got so many students who are interested in civil engineering and are willing to know more about ITE. We provided a brief introduction about UW-ITE student chapter, including what is ITE? What is ITE all about and how can we benefit



from this student chapter as a potential civil engineer. Pizza and drink were served as lunch and the whole event achieved a big success, we got many students who wanted to participate ITE membership and created a platform that students from transportation and pavement engineering will be able to communicate and learn from each other.





STUDENT SPOTLIGHT

The University of Waterloo offers world class undergraduate and graduate programs in Transportation. UW-ITE would like to present some of our students, their experiences and their work.

AUDREY TAM UNDERGRADUATE

Audrey is an undergraduate student in her 3A Civil Engineering term (B.ASc). During the Fall 2017 term, she had the opportunity to work on the Hurontario LRT RFP phase with Stantec Consulting LTD. She continues to work on the project part-time during her Winter 2018 studies. Her past co-op terms include Metrolinx and the Ministry of Transportation of Ontario.

Audrey has experience in Provincial Highways Management and Rapid Express Rail Transit.As an undergraduate student, her intention has always been to pursue a career in the transportation industry. She looks forward to participating in fast paced and challenging projects in her future coop terms. While her past work terms have given her a lot of project management experience, she is hoping to further her technical skills at future placements.

In her free time, Audrey volunteers for St. John Ambulance and other Civil Engineering design teams such as Habitat for Humanity.





STUDENT SPOTLIGHT

DAHLIA MALEK GRADUATE

Dahlia Malek is a graduate student in the Master of Applied Science (M.A.Sc.) program in the department of Civil & Environmental Engineering at the University of Waterloo. She joined the Centre for Pavement and Transportation Technology (CPATT) research group in Fall 2017 as a new M.A.Sc. student, under the supervision of Dr. Susan Tighe. Dahlia completed her undergraduate degree in Civil Engineering, also at the University of Waterloo.



Her research project is on the topic of precast concrete inlay panels (PCIP). PCIP are being researched as a solution for addressing

deep-seated rutting problems that have been observed on high-traffic volume asphalt highways. The installation of PCIP is a long-lasting, rapid repair technique. The use of PCIP, compared to the traditional repair method, is expected to minimize construction-related lane closures and associated impacts, which include increased traffic congestion, road-user delays, and increased safety risks.

Dahlia's research will focus on performing finite element modelling of the PCIP pavement structure to understand the behaviour of this unique type of pavement and to predict its longterm performance. The aim of this research is to establish performance and life-cycle costs, provide design and construction recommendations, and contribute to developing guidelines



Precast Concrete Inlay Panels installed in the roadway

for implementing PCIP.

Dahlia is interested in transportation and structural engineering, and aims to apply this knowledge to working in industry later in her career.

Dahlia is a council member of the Civil & Environmental Engineering Graduate Association (CE2GA), and enjoys long-distance running and practicing karate with the Karate Club in her spare time.



STUDENT SPOTLIGHT

MATTHEW MURESAN GRADUATE

Matthew Muresan is a graduate student in the PhD program at the Unversity of Waterloo's Civil and Environmental Engineering Department. He joined the Innovative Transportation System Solutions (iTSS) Lab in 2013 as a Master's student and has worked under the supervision of Dr. Fu, the directory of the iTSS Lab.

As a Master's student Matthew's research topic was related to transportation and emissions modelling, and finding better ways to connect these two models. His work also examined the



effectiveness of ECO-based driving strategies from an emissions perspective using the platform he developed.

Since the completion of his Master's, he has been working on a topic related to the optimisation of traffic signals for his PhD. His specific interest is in finding ways to apply new techniques, such as Machine Learning (e.g. Deep Reinforcement Learning), and new Big Data sources (e.g. passive Bluetooth and WiFi signal detection) to optimise traffic signal controls.

In 2017 he was awarded an NSERC PGSD award, and prior to that he was a recipient of the Ontario Graduate Scholarship. Matthew is also the recipient of a Mitacs Globalink award and will travel to China as a visiting scholar at Wuhan Institute of Technology from March 2018 until



Simulation environment to test Machine Learning signal control

June 2018.

Matthew has always had an interest in computer applications and transportation systems. As a youth he enjoyed using computer programming to solve problems and had an interest in hobby electronics as well as playing transportation simulation games. Now as a PhD student he hopes to find ways to improve the operation of traffic systems and to help prepare our networks for the technological changes of the future.



PROJECT HIGHLIGHT

Precast Concrete Inlay Panel (PCIP) Installation for Highways

Research Team: Daniel Pickel, Dahlia Malek, and Dr. Susan Tighe

Precast Concrete Inlay Panels (PCIP)

PCIP are a type of precast concrete pavement that are being researched for use as a high-performance, rapid repair technique on high-traffic volume highways. Precast concrete pavements have an expected service life of 20+ years for repairs and require minimal field curing time which allows for rapid construction, unlike cast-inplace concrete.



Installation of PCIP in the right-most lane on Highway 400

Background

Pavements on high-traffic volume highways typically experience a faster rate of degradation and require more rehabilitation than low-volume roads.

Some of Ontario's 400-series highways experience an average annual daily traffic of more than 400,000 vehicles/day. The Ministry of Transportation of Ontario (MTO) has observed deep-seated asphalt rutting on some of these highways; this problem is caused by issues in lower layers of the pavement structure. The existing repair strategy of milling and replacing the asphalt has a short lifespan and often requires repair in only 3 to 5 years.

Repeated repair is costly for agencies, and lane closures to perform repairs cause increased traffic congestion and delays for highway users, increased vehicle emissions and safety risks for road users and construction workers. To minimize these impacts, the MTO typically requires that lane closures on high-traffic volume highways occur between the hours of 10 p.m. and 6 a.m. To achieve this, rapid repair strategies are required.

Objectives

The main objective of this research is to develop a solution that is high-performing, constructible within the time constraints, and cost-effective.



PROJECT HIGHLIGHT

Precast Concrete Inlay Panel (PCIP) Installation for Highways

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Current Research

PCIP were developed as a solution to the deep-seated rutting problem. To date, this project has included:

- Design of the panels, panel support layers, and detailing;
- Trial installation of the panels on Highway 400;
- Instrumenting the site to collect data
- Construction feasibility assessment of the panels for overnight repairs;
- Preparation of preliminary guidelines for implementing PCIP.

A major component of this work has been to develop a design that can be feasibly constructed overnight. The trial installation proved that this can be accomplished, as the panels were successfully installed during overnight lane closures.



Placement of panels during overnight construction

Further Research

Another major consideration is to evaluate the long-term performance of the PCIP installation. This will be performed through continued data collection and monitoring of the trial site, analysis of the field data, and creation of a finite element model to predict performance.

A life-cycle cost analysis will be performed to compare the PCIP technique to the existing mill-and-replace strategy.

Significance

Successfully implementing PCIP as a rapid repair strategy will provide superior performance from an engineering and usercomfort perspective, minimize constructionrelated impacts on highway users, and reduce spending on repeated repairs.



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