



CPATT NEWS

Message from the Director

We are pleased to be sending this, our first newsletter of 2013. It was a very busy Fall here at CPATT as we completed field measurements on the various test sections and collected samples for testing in the laboratory over the next few months. We had many students in attendance at the Fall OHMPA Seminar and CAC Seminars. We also had a record number of papers presented at the Transportation Research Board Meetings. We also attended two retirement parties for strong CPATT supporters, Mike O'Connor and Tom Kazmierowski. Thank you for your support and partnership. We look forward to continuing to work with you both in your new roles.

If you would like to learn more about anything we have presented in this newsletter, please do not hesitate to contact either Laura Bland at lbland@uwaterloo.ca or Susan Tighe at stighe@uwaterloo.ca. We look forward to hearing from you!

Sincerely,

Susan L. Tighe, PhD., PEng.

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Feature CPATT Faculty Member Dipanjan Basu, PhD. Assistant Professor



Education

Dr. Basu is an Assistant Professor in the Department of Civil and Environmental Engineering at the University of Waterloo. Prior to his current appointment, Dr. Basu was an Assistant Professor at the University of Connecticut, USA. He was a Postdoctoral Researcher at Purdue University before joining the faculty of the University of Connecticut. Dr. Basu received his B.E. (Hons.) in Civil Engineering from Jadavpur University, India. After a short stint as a Trainee Engineer at Development Consultants Limited, India, Dr. Basu joined the Indian Institute of Technology (IIT) Kanpur, India, from where he graduated with M.Tech in Civil Engineering with specialization in Geotechnical Engineering. Subsequently, he joined Purdue University, USA, and obtained his M.S.C.E and PhD.

Research Highlights

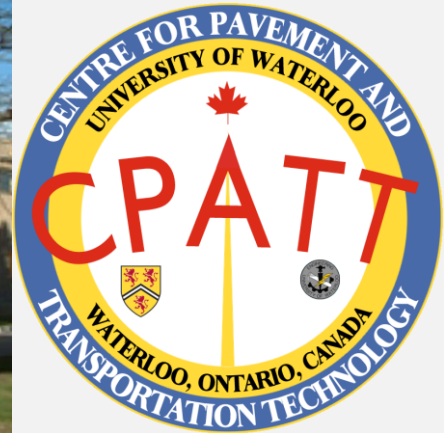
Dr. Basu has a broad research interest that includes deep foundations, energy foundations, load and resistance factor design, dynamic soil structure interaction, constitutive modeling, thermal behaviour of soil, blast analysis of geo-structures, finite element analysis, prefabricated vertical drains, and sustainability assessment framework in geotechnical engineering. His strength is in developing analytical and numerical solutions based on the principles of mechanics, although his latest focus has been on developing a quantitative sustainability assessment framework for geotechnical engineering. Dr. Basu has over 40 publications in peer reviewed journals and conference proceedings. He has delivered several invited lectures in the USA, Canada, India and Kazakhstan. He was also invited to deliver a graduate level short course on finite element analysis in Addis Ababa University, Ethiopia.

Professional Activity Highlights

- Member of Tau Beta Pi
- Recipient of the Telford Premium Award (U.K), Fugro Fellowship (U.S.A), ExCEED Teaching Fellowship (U.S.A) and Prof. S. Neogi Award (India).

Memberships

Dr. Basu is a member of the American Society of Civil Engineers, Canadian Geotechnical Society, Deep Foundations Institute, United States Universities Council on Geotechnical Education and Research, International Geosynthetics Society of North America, Geosynthetic Society. He is a life member of the Indian Geotechnical Society of International Association for Computer Methods and Advances in Geomechanics. He is also a Chartered Engineer in India. Dr. Basu serves on three ASCE Geo-Institute committees, one TRB committee and two ISSMGE committees. Very recently, he has been appointed as the Chair of a newly formed ISSMGE technical committee on Sustainability in Geotechnical Engineering. Dr. Basu is a reviewer of many Geotechnical journals.



Research Focus – John J. Carrick Pavement Laboratory



Superpave Gyratory
Sample



TSR Beam



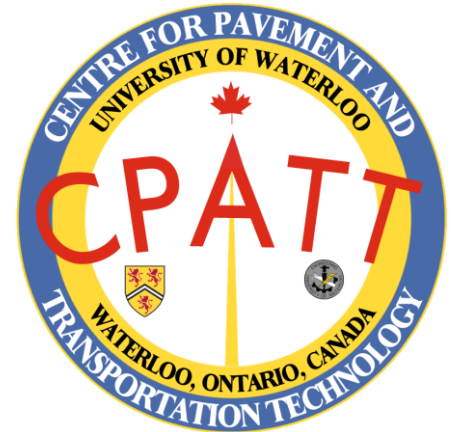
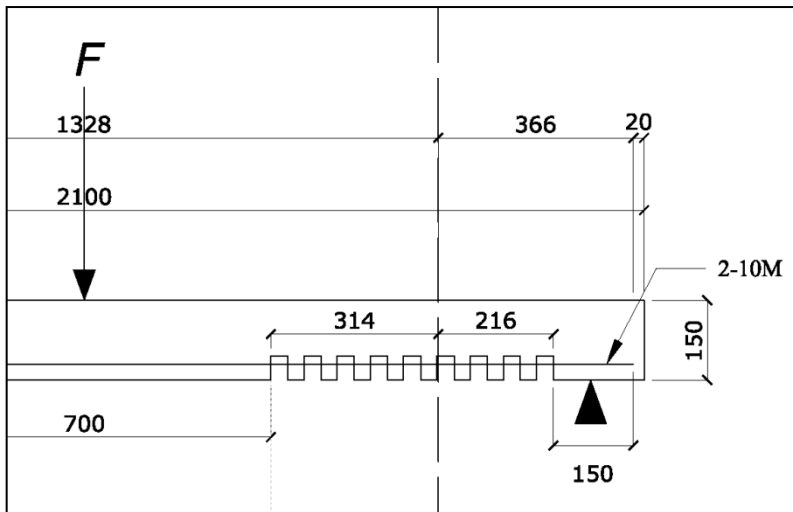
Process of Making the
Superpave Gyratory
Sample

Laboratory Updates

In 2011, CPATT collaborated with the Ontario Tire Stewardship, the Ministry of Transportation of Ontario, and the Ontario Hot Mix Producers Association to construct trial sections of Rubber Modified Asphalt (RMA) to evaluate their performance and feasibility in Ontario. When the jobs were constructed, samples were taken from the job sites and to the CPATT lab for performance testing.

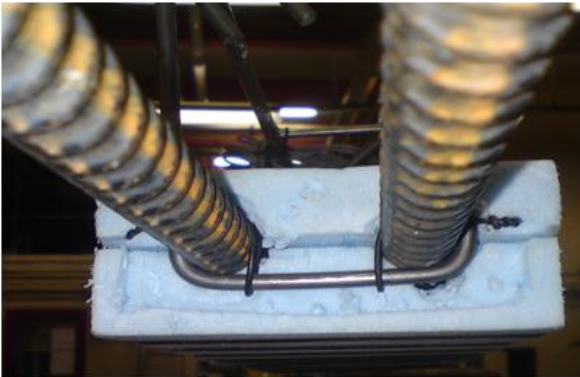
RMA has been in use in Texas, California, and Arizona for many years. The performance of these materials has been constantly exceeding that of the conventional Hot Mix Asphalt pavements that are in place in those jurisdictions. It is therefore important to study the performance of the rubber material in conditions that are faced in Ontario.

The tests include dynamic modulus, fatigue beam, and thermal stress restrained specimen tests. These tests would help model the performance of the sections in the conditions that pavements here in Ontario face. Once the work in the CPATT laboratory is completed, it will become clearer how the material will perform in comparison to other mixes being used here in Ontario.



Research Focus – Structures & Concrete Lab

Structures/Concrete Update



Foam blocks installed in simulated spalled regions, prior to concrete casting



Beam specimens with different simulated spalling conditions, ready for concrete casting



Casting of concrete beam specimens

A UW research project sponsored by the Ministry of Transportation Ontario (MTO) has resulted in the development of a new methodology for assessing the capacity of reinforced concrete bridge girders with exposed flexural reinforcing. A first series of static tests on concrete beam specimens with simulated spalled regions has been completed, and a second series of static tests is being prepared to further investigate the effects of difference spalling patterns on the development of the flexural reinforcing.

A range of spalling patterns is being studied, in order to obtain data for the development and validation of improved mechanical models. It is believed that such models will enable the assessment of the remaining capacity of these girders with a higher degree of accuracy than previously possible.

The pictures on the left show the fabrication of the second series of beam specimens, which will include 14 specimens in total. Spalled regions are simulated by placing foam blocks in the formwork at a predetermined spacing. The flexural reinforcing is instrumented, so that variations in the strains along the bar length can be monitored.

Please contact Dr. Marianna Polak or Dr. Scott Walbridge for further information concerning this research project.

Highlights

Feature Student – Aleks Kivi



Aleks Kivi is a MASc candidate working with the Centre for Pavement and Transportation Technology. Born and raised in Toronto, he completed a bachelor's degree in civil engineering from McMaster University in 2011. During his undergraduate studies, he completed a number of work terms in the areas of pavement engineering, infrastructure management and construction administration. These work experiences led him to the University of Waterloo and CPATT, where he began his graduate studies under the supervision of Dr. Susan Tighe in the fall of 2011.

Feature Project – Instrumentation of Concrete Pavements

Aleks's thesis research involves the investigation of Cupolex® as an innovative concrete pavement technology. Cupolex® is a concrete formwork product, consisting of interlocking dome-shaped units made from recycled plastic. This technology was originally developed for use in the construction of floor slabs and is now being evaluated for use in construction of pavements. This type of product can reduce the amount of concrete material required, as well as the required granular base thickness, since the dome shape provides an increased load carrying capacity. The open area beneath the dome also provides ventilation and drainage benefits.

CPATT participated in the construction of a trial Cupolex® concrete pavement section in April 2012 (this project was first introduced in the May 2012 CPATT newsletter). This project is a collaborative research effort between Holcim (Canada) Inc., Pontarolo Engineering Ltd., Applied Research Associates Inc., and CPATT. The 100 metre trial section was constructed at Dufferin Aggregates' Milton Quarry using a slipform paver. This site sees high volumes of heavily loaded aggregate trucks making it an ideal location for accelerated pavement testing. As part of CPATT's involvement, various types of instrumentation were installed in the pavement structure, including strain gauges, pressure cells and moisture probes. In addition to the frequent collection of data from the embedded sensors, research activities also regular visual condition surveys, deflection testing and road profile evaluation will be performed.

Highlights

Graduate Student Poster Symposium September 2012

On September 21, 2012, CPATT and the Norman W. McLeod Chair hosted a Graduate Student Poster Symposium in the University of Waterloo E5-Student Design Centre. This event was a great way for industry members and CPATT faculty members to see what the students have been researching. Student's prepared and displayed their posters showcasing their current research projects. Industry members and faculty members were encouraged to mingle with the students and ask questions relating to their projects. It was a great success and we would like to thank all the industry and faculty members that attended this event. Your support for these projects is greatly appreciated. If you are interested in more information regarding the presentations, please contact Laura Bland.

We would like to send a big thank you to Amir Halim (Stantec) for donating the gift cards for this event. We really appreciate it. Also a thank you to John Emery for volunteering to judge the posters and award a winner. Congratulations to the winners: Aleks Kivi, Zaid Alyami and Serhan Kirlangic.

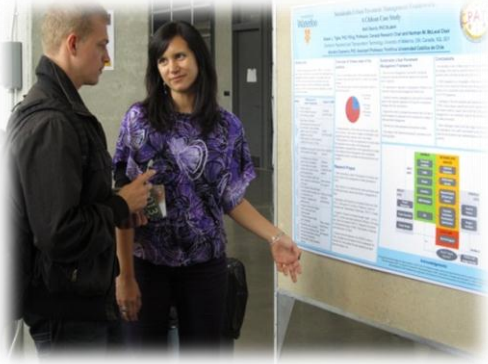


Doubra Ambaiowei (MASC Candidate)
Project: Recycling and Testing of Recycled Asphalt Pavements (RAP) with Marty Koabel from Norjohn Contracting and Paving Limited

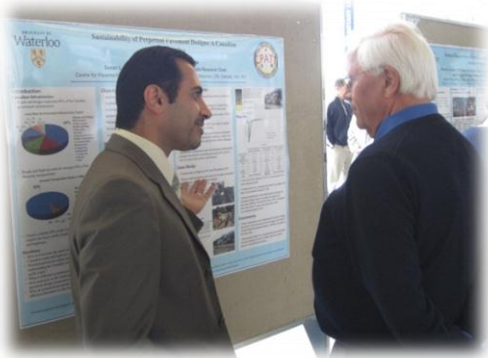


Andrew Northmore (MASC Candidate)
Project: Development of a Sustainability Framework for the City of Markham

Highlights Graduate Student Poster Symposium September 2012 – Cont'd



Aleli Osorio (Phd Candidate)
Project: Development of an Urban Pavement
Management System: A Chilean Case Study



Mohab El-Hakim (PhD Candidate)
Project: Sustainability of Perpetual Pavement
Designs: A Canadian Perspective with Dr. John
Emery, Judge



Susan Tighe, Carolyn Hansson and Richard Morrison
viewing the posters



Marcelo Gonzalez (Phd Candidate)
Project: Surface Characteristics of Next Generation
Concrete Pavements: A Canadian Perspective with
Gerry Chaput, ADM MTO

Highlights

Dr. David Timm Seminar

Perpetual Pavement Research at the NCAT Test Track

On January 9, 2013, Dr. David Timm, Brasfield & Gorrie Professor of Civil Engineering, Auburn University presented a seminar on the National Center of Asphalt Technology's (NCAT's) experience with perpetual pavements. Here is some information about the research he presented.

Over the past 10 years, perpetual or long-life pavements have come to the forefront of the asphalt pavement industry. These pavements are designed to limit distress to the very top of the pavement so that no deep structural rehabilitations are needed over 35+ years design life. While many live-traffic perpetual pavements have been identified across North America, detailed structural analyses that deepen our understanding of how they function have been rare. This presentation documented the fundamental concepts of perpetual pavement design and presented two case studies from the National Center for Asphalt Technology Test Track at Auburn University. Both cases included sections built at the Test Track with embedded instrumentation that provided valuable information regarding pavement response (i.e. stress and strain) and were subjected to extensive falling weight deflectometer testing to characterize the in-situ material properties. The first set of sections were designed and built in 2003 according to the 1993 AASHTO Pavement Design Guide and were not intended to be perpetual. The second set of sections was built in 2006 as part of a perpetual pavement experiment and included a rehabilitation component. Valuable insight into how perpetual pavements function and can be designed and rehabilitated in the future were gained from these sections.

The seminar was excellent and we appreciated Dr. Timm's very informative seminar.



Group photo of Dr. Jun Yang (Visiting Professor , South East University), Dr. Susan Tighe and Dr. David Timm (from Auburn University) with several of the people who attended the seminar.

Pavement Surface Performance Evolution and WMS/A for Eco-friendly Pavement Solutions: Two Experimental Research Approaches

On January 28, 2013, Dr. Vincenzo Gallelli, Associate Professor, Territorial Planning, University of Calabria (Italy), presented a seminar on Pavement Surface Performance. Here is some information about the research presented.

Pavement surface texture and skid resistance have a great influence on road functionality and can affect user's safety, vehicle operational costs, and environmental sustainability. The assessment of the evolution of pavement surface performance plays a fundamental role in road pavement management and is useful in order to achieve adequate allocation of maintenance resources. Furthermore, in recent years, several warm mix asphalt (WMA) technologies have been developed in order to enable significant energy savings and harmful emissions restraint by reducing mixing and compaction temperatures in hot mix asphalt (HMA) production processes.

In light of the above, two experimental researches were carried out in the Laboratory of Road Materials at the University of Calabria. One of the studies focused on the evaluation of pavement surface performance evaluation by means of a two-year monitoring of an experimental road section. Four different dense graded friction courses were designed with aggregates of different petrographic nature: limestone, basalt and expanded clay. Several surface performances were measured by means of different devices. This work is part of a wider research project designed and in partnership with the Road Network Division of Provincial Administration of Cosenze (Italy), with the final aim of conducting a technical and economic study of the definition of the allowance thresholds in the road management and maintenance contracts.

The second study is a laboratory investigation of compaction characteristics of WMA produced by water-containing methodology with the addition of synthetic zeolites. The influence of the time elapsed between mixing and compaction operations on mixes compactibility was also evaluated in order to define the optimum "Micro-Foaming Time" (FT), in which the additive can completely release the water contained. A systematic comparison between traditional HMA and warm mixes produced at lower mixing/compaction temperatures was carried out: two compaction methods (impact/gyratory) were used. Data obtained from the experimental tests showed that the foaming process due to the addition of the zeolite has a peak value of intensity when the mix is compacted after 1 hour of FT; the effect seems to vanish for a longer period of time when the behaviour of the warm mix is close to that of the mix compacted at the same lower temperature without the additive.

This was a very interesting seminar and we appreciate Dr. Gallelli taking the time to present his findings.



Waterloo Engineering Alumni and Friends Reception at the 2013 TRB Annual Meeting

The Faculty of Engineering and the Transportation Group in the Department of Civil and Environmental Engineering at the University of Waterloo were pleased to host a complimentary alumni and friends

networking reception, during the 2013 TRB Annual Meetings. This event was held at the Washington Marriott Wardman Park Hotel on January 15th, 2013. Some pictures from the event are below.



Tae-Jung Kwon, Karolina Konarski, Federico Irali and Dan Pickel (UW transportation graduate students) helping out at the reception



Milos Posavljak, Prof. Lee Fu and Prof. Susan Tighe



Prof. Ralph Haas



Prof. Lee Fu



Waterloo Engineering Alumni and Friends Reception at the 2013 TRB Annual Meeting – Cont'd

Some more pictures of the event are below.



Prof. Bruce Hellinga and Prof. Susan Tighe



Guest mingling at the event



Dr. Khaled Helali, Distinguished UW Alumni, Stantec Consulting



Amin Hamdi, Milos Posavljak, Dan Pickel, Federico Irali, Marcelo Gonzalez, Filippo Giustozzi (Politecnico di Milano) Karolina Konarski and Md. Safiuddin



Speakers Corner

What did you find most interesting from the September 2012 Graduate Student Poster Symposium?

Gerry Chaput, P.Eng – Assistant Deputy Minister– Ministry of Transportation Ontario (MTO)



“I was very pleased with the CPATT Student Poster Symposium. The number of students participating, their level of knowledge and the variety of topics were impressive. It provided me with a sense of comfort – that these students would be our future leaders in their various study areas sharing their knowledge as an academic with others or working in their field of interest. Their knowledge and enthusiasm were contagious, making the room buzz with discussions, questions, debates and excitement. I look forward to the next session to meet another group of eager students who are driven to make a difference in their study area.”

Richard Morrison – Technologist – Civil and Environmental Engineering – University of Waterloo



“As part of the technical staff at the University of Waterloo, I usually only get to see an aspect of a project. The symposium allowed me to see much more or all of a research project. I found this symposium very informative and will enable me to be a more value support person for the students. I was able to spend quite a bit of time at the symposium which allowed me to see 4-5 posters in great detail. I was able to spend time with the students asking questions and discussing their projects in much more detail than just quickly looking at the poster. I found it very interesting to see the projects that are outside of my area and to understand these projects helps me in my own work. Not only was this a great learning experience, it was a

great networking event to speak with industry members about the projects that they are currently working on and I found that I was able to direct the industry members to a student project that was in their area after viewing many of them.

Overall, I think this is a great event and that the Student Design Centre is a great location for this event and I hope to attend more in the future.”

Speakers Corner – Cont'd

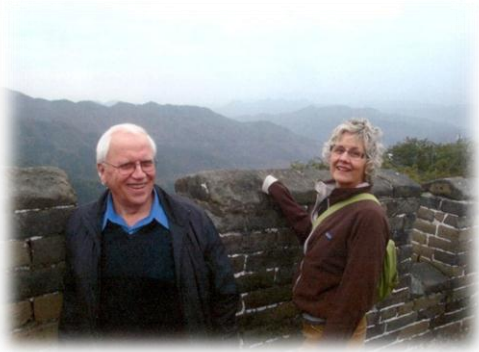
What did you find most interesting from the September 2012 Graduate Student Poster Symposium?

Amir Abd El Halim, Ph.D., P.Eng – Principal, Practice Leader, Infrastructure Management and Pavement Engineering – Stantec



“The CPATT Poster Symposium was well worth attending and very interesting. The quality of the research along with the variety of research topics was very nice to see. It is great to see that the University, CPATT and Susan support the growth and professional development of their students. There was a good mix of industry people, academics and students and I look forward to attending next year’s event.”

John Emery, PhD., MASCE, P.Eng – Adjunct Professor of Civil Engineering at McMaster and Waterloo, President and Principal Engineer - Shiloh Canconstruct Limited



“It was an honour to be a Poster Reviewer for the September 2012 Graduate Student Poster Symposium hosted by CPATT and the Normal W. McLeod Chair in Sustainable Pavement Engineering. Attending the Chair Advisory Board Meeting with its comprehensive review of activities and projects with focus on strategic planning, followed by reviewing and discussing 21 well prepared and informative Posters covering a wide range of topics from recycling to ultrasonic testing, made for an informative and enjoyable networking day at Waterloo. There were Posters on recycling asphalt and concrete aggregates, rubber modified asphalt, hot-on-hot paving, sustainable pavements, surface characteristics, pavement performance, pavement maintenance and rehabilitation

materials, methods, and management, mechanistic-empirical pavement designs, concrete reinforcement, and bridge structure repair systems. Discussion of each Poster with the Graduate Students clearly indicated a lot of hard work was in progress and the applied research will certainly result in a broad spectrum of enhanced applied infrastructure technology. During a Poster and research overview wrap-up with the Graduate Students, the increasing focus on sustainability and the importance of reviewing and incorporating previous research was emphasized. Stantec kindly provided some Poster prizes and these were awarded to Posters on: maintenance and rehabilitation programs for pavements under performance based contracts; performance evaluation of urban pavements rehabilitation with concrete; and advanced concrete elements testing. The Graduate Student Poster Symposium is certainly an important technology transfer and networking component of CPATT and the Chair.”

“I have attached a recent photograph of Dinah and I visiting the Great Wall of China from when we visited China in October-November 2012. This infrastructure focused trip involved: meeting in Beijing with the Deputy Minister of the Ministry of Environmental Protection – Policies and Regulation Bureau to discuss sustainable transportation technology; technical site visit to the 27 km HEDL Ruxin Expressway near Zhengzhou, completed in 2010 with good performance, that JEGEL and McMaster had provided materials, design, and quality verification engineering for the introduction of Superpave long-life flexible (asphalt) pavements in China; long-life flexible pavements lecture and research review at Tongji University in Shanghai; advanced asphalt pavement Graduate Course at the SCUT in Guangzhou; review of subway tunnel construction and safety with Metro in Shengzhen; and more transportation infrastructure advances and tourism in Hong Kong.”

Upcoming Events and Announcements

Upcoming Events

May 29 – June 1, 2013 – [Canadian Society of Civil Engineering Annual Conference](#). This conference will be held in Montreal, Quebec.

September 9-12, 2013 – [Summer Winter Integrated Field Technologies \(SWIFT\) 2012 Conference and Trade Show](#). This conference is being held in Westin Ottawa, Ontario.

September 22-25, 2013 – [2013 Transportation Association of Canada \(TAC\) Conference and Exhibition](#). This conference is being held in Winnipeg, Manitoba.

November 17-20, 2013 – [58th Annual Canadian Technical Asphalt Association \(CTAA\) Conference](#). This conference will be held St. John's, Newfoundland.

Welcome New Students and Congratulations

Sonia Rahman, MSc Candidate

Gulfam Jannat, PhD Candidate

Congratulations to **Tom Kazmierowski** and **Mike O'Connor** who celebrated their retirements since our last newsletter. They have both had long distinguished careers and we very much appreciate their participation in the CPATT BOA activities.



Norman W. McLeod Chair in Sustainable Pavement Engineering

Objective of the Chair

The objective of the Chair is to:

- Provide cutting-edge sustainable pavement engineering research
- Develop sustainable and cost-effective materials, designs, construction and management tools
- Collaborate with government, industry, and academia
- Teach and supervise students
- Disseminate findings through seminars, newsletters, papers and reports.

Updates

We are currently working on the 2012 Annual Report which is scheduled to be distributed in February 2013. The items included in this report are:

- Scope and Objective of the Chair
- Partners
- Outreach which includes: symposiums and seminars
- Recent Projects
- Board of Advisors Meetings
- Future Plans

The Board is also currently working on a 'Roadmap' which is a 5-year framework to assist in providing strategic direction to the Chair. This will be focused on sustainability research in Ontario. The Board has set up a working group to assist Susan with this task and then the 'Roadmap' will be distributed to all the Board members.

Roadmap

Possible projects for further consideration by the Board:

Technical/Economic – Develop pavement designs and strategies that result in life cycle cost savings to include: pavement structures, development of materials, preservation, maintenance and rehabilitation strategies.

Environmental – Major research areas where the Chair will seek to develop a life cycle inventory to access: natural resources, local materials, greenhouse gases, vehicle emissions, etc.

Social – Public comfort – work to develop modules that quantify public user needs including: vehicle operating costs, calculate vehicle emissions, and provide guidance on delays and traffic congestion.

News and Awards

New Projects

Title & Agency	Year
Sustainable long life concrete Pavements – Natural Sciences and Engineering Research Council of Canada/Cement Association of Canada	2012-2014
Improving the Fatigue Performance of Hot Mix Asphalt – Ministry of Transportation Ontario	2012-2014
Determination of Dynamic Modulus for HMA required for MEPDG Implementation – Ministry of Transportation	2012-2014
Evaluation of Rubber Modified Asphalt: Past, Present, Future – Ontario Tire Stewardship/NSERC	2012-2014
Determining Quantity of Recycled Asphalt Pavement (RAP) in HMA Research – Ontario Hot Mix Producers Association/NSERC/Ministry of Transportation Ontario	2012-2013

Completed Projects since August 2012

Title & Agency	Year
Evaluation of Pavement Distress Measurements – City of Markham	2010-2012
Quantifying Pavement Sustainability – City of Markham	2010-2012
Assessment of Long-Term Performance and Cost Effectiveness of Standard Pavement Treatments used in PMS2 – Ministry of Transportation	2010-2012
Automated Performance Measures for Contract Administration – Ministry of Transportation	2010-2012
Usage of Recycled Asphalt Shingles – Ontario Centres of Excellence	2010-2012
Evaluation of Recycled Asphalt Technology – Miller Paving Ltd.	2008-2012
C-LTPP Database – Transportation Association of Canada	2011-2012



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