Winter Maintenance at the 2019 TRB Annual Meeting

*Resource Spotlight: TRB Annual Meeting Online Portal*

If you’re searching for the latest research on a transportation topic, don’t forget to visit the [TRB Annual Meeting Online](https://www.trb.org/AnnualMeeting/OnlinePortal.aspx) portal. The portal includes papers, posters and presentation materials from the 2017-2019 Annual Meetings.

Below we’ve compiled links to the papers related to winter maintenance that were presented at the 2019 Annual Meeting. Papers are free to download for employees of state DOTs and other TRB Sponsor organizations. If you have trouble accessing the papers, check with your DOT or other transportation library.

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**Equipment and Facilities**

19-00255 *Sensor-Based Spreader Automation for Reducing Salt Use and Improving Safety*
Ayushmaan Aggarwall, Niharika Bhattacharjee, Aadi Bhattacharya, Raka Bose, Anshul Gupta, Deepta Gupta, Anuj Kapoor, Elina Rani
*IBM Thomas J Watson Research Center; students*

19-01231 *Maintenance Facility Location Optimization Review*
William Holik
*Texas A&M Transportation Institute*

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**Materials**

19-03679 *Determining the True Cost of Making Brine and Comparing Liquid Deicers*
Mallory Crow, William Schneider, Scott Lucas, Frank Phillips
*Ohio DOT; University of Akron*

19-02042 *Field Evaluation of Different Pre-wetting Ratios for Sustainable Salting*
Jaspreet Kaur, Taimur Usman, Liping Fu
*WSP Canada; University of Waterloo*

19-03630 *Side-By-Side Field Comparison of Snow and Ice Control Chemicals for Anti-Icing Applications*
Ken Rainwater, William D Lawson, James G Surles, Felipe J. Estrada, W. Andrew Jackson
*Texas Tech University*
19-00489 **Assessment of Potassium Succinate (KSu) as an Alternative Roadway Deicer**
Laura Fay, Michelle Akin
*Western Transportation Institute, Washington State University*

19-02757 **Impact of Deicing and Anti-Icing Materials on Concrete Pavement Durability Using Field Performance Data**
Danny Xiao, Sam Owusu-Ababio, Robert Schmitt
*University of Wisconsin, Platteville*

19-00174 **The Influence of Aqueous Solution on Compacted Snow: A Field Investigation**
Henri Giudici, Alex Klein-Paste, Johan Wåhlin
*Norwegian University of Science and Technology (NTNU); Statens vegvesen*

### Pavements and Bridges

19-01985 **Friction and Snow—Pavement Bond After Salting and Plowing Permeable Friction Surfaces**
Michelle Akin, Laura Fay, Xianming Shi
*Western Transportation Institute, Washington State University*

19-04400 **Development of Advanced Anti-icing Spray System Using Automated Road Surface Condition Judgement System**
Tomonori Ohiro, Kiyoshi Takakura, Takuya Sakuraba, Yasushi Hanatsuka, Toru Hagiwara
*Nexco Engineering Hokkaido, Japan; Nexco-Maintenance Hokkaido Co., Ltd.; East Nippon Expressway Co., Ltd.; Bridgestone Corp., Japan; Hokkaido University*

19-01523 **Research on Comprehensive Effects of Physics and Chemistry on Micro Surface Technology of Anticoagulant Ice**
Tianqing Ling, Xin Li, Yijia Xu
*Chongqing Jiaotong University*

19-02535 **Effect of Electrode Geometry and Size on Heating Performance of Electrically Conductive Concrete**
Amir Malakooti, Hesham Abdualla, Alireza Sassani, Halil Ceylan, Sungwhan Kim
*Iowa State University; Applied Research Associates, Inc. (ARA)*

### Safety, Traffic and Connected Vehicles

19-03084 **Winter Weather Maintenance Operations and Traffic Safety Implications**
Luning Zhang, Bryce Hallmark, Jing Dong
*Iowa State University*

19-02984 **Behavioral Analysis of Drivers Following Winter Maintenance Trucks Enabled With Collision Avoidance System**
Rajat Verma, Ramin Saedi, Ali Zockaie, Timothy Gates
*Michigan State University*
19-03303 Multimodal Connected Vehicle Technology for Improved Winter Travel
Yaqin He, Michelle Akin, Xianming Shi
*Wuhan University of Technology; Washington State University*

19-02218 Analysis and Real-Time Implementation of Variable Advisory Speed Limit Messaging During Winter Storms
Shefang Wang, Anuj Sharma, Skylar Knickerbocker, Neal Hawkins
*Iowa State University*

Bandhan Dutta Ayon, Benjamin Ofori-Amoah, Lei Meng, Jun-Seok Oh, Kathleen Baker
*Western Michigan University*

19-00374 Identification and Classification of Slippery Winter Road Conditions Using Commonly Available Vehicle Variables
Moksheeth Padarth, Emiliano Heyns
*HAN University of Applied Sciences; Vrije Universiteit Amsterdam*

19-02137 Leveraging Connected Vehicles to Provide Enhanced Roadway Condition Information
Howell Li, Joerg Christian Wolf, Jijo K Mathew, Nitin Navali, Steven Zehr, Brandon Hardin, Darcy Bullock
*Purdue University; Volkswagen Group of America; Indian Institute of Technology Madras*

### Snow Fences

19-05707 Quantifying the Safety Effectiveness of Snow Fence Implementations Based on Crash Severity and Snow Fence Type Utilizing Contemporary Statistical Analysis Methods
Rachael Larson, Thomas Peel, Mohamed Ahmed, Sherif Gaweesh
*University of Wyoming*

19-04375 Wind Speed and Blowing Snow Measurement Behind the Living Snow Fence in Northern Hokkaido, Japan
Toshimitsu Sakurai, Yasuhiko Ito, Wataru Takahashi, Joji Takahashi, Atsushi Nishimura, Masaru Matsuzawa
*Civil Engineering Research Institute for Cold Region; Hokkaido Regional Development Bureau*

### Technology and Information Systems

19-00105 Safety Assessment of the Integration of Road Weather Information Systems (RWISs) and Variable Message Signs (VMSs) in British Columbia
Mohamed El Esawey, Simon Walker, Caitlin Sowers, Joy Sengupta
*British Columbia Ministry of Transportation and Infrastructure*
19-04928 Use of Topography, Weather Zones, & Semivariogram Parameters to Optimize RWIS Station Density Across Large Spatial Scales
   Simita Biswas, Mingjian Wu, Stephanie J. Melles, Tae Kwon
   University of Alberta; Ryerson University

19-00551 Determining the Spatiotemporal Coverage of Road Weather Information Systems – A Case Study in Alberta, Canada
   Xu Wang, Lian Gu, Tae Kwon, Tony Qiu
   University of Alberta; Shandong University

19-02068 Testing Unmanned Aircraft for Roadside Snow Avalanche Monitoring
   Edward McCormack, Torgeir Vaa
   University of Washington; Norwegian Public Roads Administration