

Preliminary Program

Sixth International Symposium on

Snow Removal and Ice Control Technology

June 7-9, 2004

Doubletree Hotel Spokane City Center
Spokane, Washington

Sponsored by

**TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES**

In cooperation with

**WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
FEDERAL HIGHWAY ADMINISTRATION
U.S. DEPARTMENT OF TRANSPORTATION**

The objective of the 6th International Symposium on Snow Removal and Ice Control Technology is to provide a forum for the exchange of information about state-of-the-art and the state-of-the-practice in research and technology applications to improve snow removal and ice control operations in transportation systems. This symposium includes presentations on winter maintenance policy, management and performance, winter severity, customers' perspectives on winter operations, environmental stewardship, personnel involvement and support, monitoring road conditions during winter events, winter weather data quality, models and information, winter operations support, material distribution, performance and residual, large-volume snow control, bridge support systems, and winter maintenance vehicle advancements. Maintenance engineers and researchers from the following countries have been invited to present their papers: Australia, Canada, Denmark, Finland, Japan, New Zealand, Norway, Sweden, United Kingdom, and the United States. The symposium is being conducted by the Transportation Research Board (TRB) Committee on Winter Maintenance in cooperation with the Washington State Department of Transportation, American Association of State Highway and Transportation Officials (AASHTO), and the Federal Highway Administration.

Participation in the symposium is open to all interested parties. TRB extends a special invitation to representatives of federal, state, county and city departments of transportation, universities, and manufacturers of snow removal and ice control products.

REGISTRATION

Technical Program. The registration fee for attendees is \$350 for those who advance register by May 7, 2004 and \$450 for those who register after this date or at the symposium. The registration fee for technical program attendees covers, the Monday evening reception, Monday, Tuesday and Wednesday breakfasts and breaks, Monday and Tuesday lunches, and a copy of the symposium proceedings. Registration is on-site only after May 7. Refunds will be issued, less a \$25.00 cancellation fee, for all cancellations received in writing by Friday, May 7, 2004. No refunds will be issued thereafter.

Open Format Spouse/Guest Activities. The registration fee for spouse/guests is \$60. The fee covers the Monday evening receptions, and Monday, Tuesday and Wednesday breakfasts. The Monday morning breakfast will provide an opportunity for accompanying persons to get acquainted and a list of activities in the Spokane area will be provided for individuals to develop their own agenda.

PACIFIC NORTHWEST SNOWFIGHTERS CONFERENCE-June 9-11, 2004-Spokane Center

TRB 6th International Symposium on Snow Removal and Ice Control Technology attendees are invited to register and participate in the technical program of the Pacific Northwest Snowfighters (PNS) Conference scheduled for June 9-11, 2004 at the Spokane Center adjacent to the Doubletree Hotel Spokane City Center. Registered attendees for the TRB Symposium are invited to participate at no additional cost in the PNS Conference Equipment Trade Show on Wednesday afternoon, June 9, 2004. Note that attendance at the PNS Conference activities on Thursday and Friday (June 10-11) will require an additional registration fee.

ACCOMMODATIONS

The conference will be held at the Doubletree Hotel Spokane City Center, 322 North Spokane Falls Court, Spokane, Washington 99201. Limited rooms are available at the hotel on a first-come, first-served basis at the TRB symposium rate of \$63.00 per room for single/double occupancy plus applicable taxes (currently 10.1%) until May 7. Contact the Doubletree Hotel Spokane City Center at 800-222-TREE or 509-455-9600 and ask for the Transportation Research Board rate. Reservations will be accepted after May 7 based on availability. If you will be attending the PNS Conference on Thursday and Friday (see above), please adjust your hotel departure date.

GROUND TRANSPORTATION

The Doubletree Hotel Spokane City Center is located at 322 North Spokane Falls Court, Spokane, Washington. The Doubletree Hotel Spokane City Center offers complimentary airport transportation from 4:30 a.m. to Midnight. Use the courtesy telephone in the airport baggage claim area to request the shuttle. One-way taxi fares are approximately \$20.

ACKNOWLEDGEMENTS

TRB Committee A3C09 on Winter Maintenance

Wilfrid A Nixon, Chair, Russell G Alger, Brett Althouse, Richard M Balgowan, John P Burkhardt, Torgrim Dahl, Rand Decker, Graham B Gilfillan, Stephen N Goodman, Richard L Hanneman, Yasuhiko Kajiya, Dennis Kroeger, George Levasseur, Mikko Malmivuo, Jere E Meredith, L David Minsk, Richard J Nelson, Jan Olander, Max S Perchanok, Paul A Pisano, Leland D Smithson, Gregory E Thompson, Alfred Obiora Uzokwe, David Vieth, Donald M Walker

Program Committee

Richard M Balgowan, Edward Boselly, John P Burkhardt, Graham B Gilfillan, Richard L Hanneman, Yasuhiko Kajiya, Wilfrid A Nixon, Paul A Pisano, Leland D Smithson, Donald M Walker

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PRELIMINARY PROGRAM
Transportation Research Board
**6th International Symposium on
Snow Removal and Ice Control Technology**
Spokane, Washington • June 7-9, 2004

Sunday, June 6, 2004

3:00 p.m.-5:00 p.m. **REGISTRATION AND INFORMATION**

Monday, June 7, 2004

7:00 a.m.-5:00 p.m. **REGISTRATION AND INFORMATION**

7:00 a.m.-8:30 a.m. **CONTINENTAL BREAKFAST**

8:30 a.m.-9:30 a.m. **Opening Session**

Wilfrid A. Nixon, *University of Iowa*, presiding

Welcome

TBD

Keynote Address

Implementing Snow & Ice Control Research, SNOW04-056, Leland D. Smithson, *American Association of State Highway and Transportation Officials*

9:30 a.m.-10:00 a.m. **BREAK**

Track A

10:00 a.m.-Noon **Winter Operations Support**

Daniel S Roosevelt, *Virginia Transportation Research Council*, presiding

Winter Road Maintenance Decision Support System (MDSS) Project: Overview and Status, SNOW04-005, Paul A. Pisano, *Federal Highway Administration*; Andrew D. Stern, *Mitretek Systems, Inc.*; William P. Mahoney III and William L. Myers, *National Center for Atmospheric Research*; Dennis Burkheimer, *Iowa Department of Transportation*

Development of an Advanced Winter Road Management Support System for Greater Sapporo, SNOW04-039, Yuji Yamagiwa, Yasuhiko Kajiyama, and Tatsuya Uemura, *Civil Engineering Research Institute of Hokkaido*

Implementing an Algorithm to Predict Winter Storm Road Conditions and Recommend Treatment Actions: Results and Lessons Learned, Robert G. Hallowell, *MIT Lincoln Laboratory*; George L. Blaisdell, *U.S. Army Cold Region's Research & Engineering Laboratory*; William P. Myers, *National Center for Atmospheric Research*

Guidelines for Snow and Ice Control Materials and Methods, SNOW04-059, Robert R. Blackburn, *Consultant*; Duane E. Amsler, *AFM Engineering Services*; Karin M. Bauer, *Midwest Research Institute*

Track B

10:00 a.m.-Noon **Material Distribution for Snow & Ice Control**

Leland D. Smithson, *American Association of State Highway and Transportation Officials*, presiding

Using Salt Distribution Pattern, Friction and AVL to Evaluate Methods for Reducing Spreader Cycle Times, SNOW04-013, Max S. Perchanok, *Ontario Ministry of Transportation*

Implementation of the New Sanding Method in Norway, SNOW04-025, Torgeir Vaa, *SINTEF Roads and Transport*
Alberta's Benchmark Model for Maintenance Winter Service Delivery, SNOW04-057, Steve Otto, *Alberta Transportation*

Anti-Icing & Material Distribution Performance Measures for Achieving Level of Service via Mobile Data Collection, SNOW04-004, Gregory E. Thompson, *ThomTech Design, Inc.*

Noon-1:30 p.m. **LUNCH**

Track A

1:30 p.m.-3:00 p.m. **Customers' Perspectives on Winter Operations**

Ingrid Brakop, *Insurance Corporation of British Columbia*, presiding

Importance of Winter Urban Traffic Issues and Performance Indicators as Rated by Businesses, SNOW04-045, Chigako Yamamoto, Kunihiro Kishi and Keiichi Sato, *Hokkaido University*; Fumihiko Hara, *Hokkaido Development Engineering Center*

Conjoint Approach as Customer-Based Measurement for Winter Walkway Maintenance in the Most Snowfall Metropolitan City of Japan, SNOW04-011, Roberto A. Tokunaga, Naoto Takahashi and Motoki Asano, *Civil Engineering Research Institute of Hokkaido*

Study on Effects and Evaluation of Winter Road Information, SNOW04-023, Yasuhiko Kajiya, Takehiko Suzuki, Masaru Matsuzawa and Tatsuya Uemura, *Civil Engineering Research Institute of Hokkaido*

Track B

1:30 p.m.-3:00 p.m. **Winter Pavement Temperatures**

Dennis Kroeger, *Iowa State University*, presiding

Effect of Blowing Snow and Snow Fences on Pavement Temperature and Ice Formation, SNOW04-030, Ronald D. Tabler, *Tabler & Associates*

Road Surface Temperature Forecasting: A Case Study in a Mountainous Region in Japan, SNOW04-019 Noriyuki Sato, *Indiana University-Bloomington*; J.E. Thornes, *The University of Birmingham*; Teruhiko Maruyama, *Nagaoka University of Technology*; Akira Sugimura, *Hokuriku Regional Development Bureau*; Takashi Yamada, *Hokuriku Construction Association*

A First Principles Pavement Thermal Model for Topographically Complex Terrain, SNOW04-035, Edward E. Adams and L.R. McKittrick, *Montana State University, Bozeman*; P. Gauer, *Norwegian Geotechnical Institute*; A.R. Curran, *ThermoAnalytics, Inc.*

3:00 p.m.-3:30 p.m. **BREAK**

Track A

3:30 p.m.-4:30 p.m. **Personnel Involvement and Support**

Max S. Perchanok, *Ontario Ministry of Transportation*, presiding

Quality Improvement of Winter Services in Denmark, SNOW04-052, Freddy Knudsen, *Danish Road Directorate*

Analysis of RWIS Users in California and Montana, SNOW04-060, Lisa Ballard, *Montana State University, Bozeman*

Track B

3:30 p.m.-4:30 p.m. **Residual Material**

Wilfrid A. Nixon, *University of Iowa*, presiding

Patterns of Residual Salt on Road Surface: Case Study, SNOW04-017, Göran Blomqvist and Mats Gustafsson, *Swedish National Road and Transport Research Institute (VTI)*

Field Persistence of Anti-Icing Sodium Chloride Residuals, SNOW04-049, Christopher L. Hunt, Gayle F. Mitchell and Wallace Richardson, *Ohio University*

6:30 p.m.-8:00 p.m. **RECEPTION**

Tuesday, June 8, 2004

7:00 a.m.-5:00 p.m. **REGISTRATION AND INFORMATION**

7:00 a.m.-8:00 a.m. **CONTINENTAL BREAKFAST**

Track A

8:00 a.m.-10:00 a.m. **Winter Weather Models and Data Quality**

Jan Olander, *Swedish National Road Administration*, presiding

The Winter Model – A Winter Maintenance Management System, SNOW04-015, Carl-Gustaf Wallman, *Swedish National Road and Transport Research Institute (VTI)*

Forecasting Terrain Dependent Weather Conditions: Details of a Model-Chain Sequence, SNOW04-051, Ladean R. McKittrick, Edward E. Adams, *Montana State University*; P. Gauer, *Norwegian Geotechnical Institute*; J. Mewes, *Meridian Environmental Technology, Inc.*; A.R. Curran, *ThermoAnalytics, Inc.*

Verification of the Road Weather Forecast System Run During the 2003 Demonstration at the Iowa Department of Transportation, SNOW04-003, Ben C. Bernstein, Jamie K. Wolff, Seth Linden and William L. Myers, *National Center for Atmospheric Research*

Quality Management for Road Weather Data, SNOW04-026, Tuomo Iivanainen and Matti Pettersson, *Intrinsic, Ltd.*

Track B

8:00 a.m.-10:00 a.m. **Material Performance**

Richard L. Hanneman, *Salt Institute*, presiding

Norwegian Experience with Use of Magnesium Chloride, SNOW04-024, Torgeir Vaa, *SINTEF Roads and Transport*

Assessment of Safecote-A New De-Icer Product, SNOW04-064, Marilyn Burtwell, *Transport Research Laboratory, UK*

Development and Evaluation of Non-chloride Anti-freeze Admixture, SNOW04-038, Toshiya Takeshi, Kazuharo Kobayashi, Seishi Meiarashi, *Incorporated Administrative Agency of Public Works Research Institute (PWRI)*

Agricultural By-Products for Anti-Icing and Deicing Use in Michigan, SNOW04-009, Steve Kahl, *Michigan Department of Transportation*

10:00 a.m.-10:30 a.m. **BREAK**

Track A

10:30 a.m.-Noon **Winter Weather Information**

Paul A. Pisano, *Federal Highway Administration*, presiding

FinnRAs Web Road Weather Project, SNOW04-008, Kimmo Toivonen, Jouko Kantonen, *Finnish Road Administration*

The Development of the Automated Real-Time Road Weather System (ARROWS), SNOW04-010, S. Edward Boselly, *Washington State Department of Transportation*

Objective State of Road Weather Monitoring in Finland in Year 2007, SNOW04-021, Yrjö Pilli-Sihvola, *Finnish Road Administration*; Jukka Lähesmaa, *SysOpen, PLC*

Track B

10:30 a.m.-Noon **Winter Maintenance Vehicle Advancements**

Yasuhiko Kajiya, *Civil Engineering Research Institute of Hokkaido*, presiding

A Business Case for Winter Maintenance Technology Applications: Highway Maintenance Concept Vehicle, SNOW04-034, Dennis A. Kroeger and Reggie Sinhaa, *Iowa State University*

Needs Assessment and Cost Benefit Analysis of the RoadView™ Advanced Snowplow Technology System, SNOW04-006, David Kack and Eli Cuehol, *Montana State University, Bozeman*

GIS-Based Analysis of Intelligent Winter Maintenance Vehicle Data, SNOW04-029, Alan Vonderohe, Teresa Adams, Carola Blazquez and Justin Maloney, *University of Wisconsin, Madison*; Thomas Martinelli, *Wisconsin Department of Transportation*

Noon -1:30 p.m. **LUNCH**

Track A

1:30 p.m.-3:00 p.m. **Winter Maintenance Policy and Management**

John P. Burkhardt, *Indianapolis Department of Public Works*, presiding

Research on the Level of Winter Road Management, SNOW04-037, Takashi Yamada, *Hokuriku Construction Association*; Akira Sugimura, *Hokuriku Regional Development Bureau*; Teruhiko Maruyama, *Nagaoka University of Technology*

The Proactive Snow and Ice Control Toolbox, SNOW04-061, Leland D. Smithson, *American Association of State Highway and Transportation Officials*

Planning Blowing-Snow Control Facilities According to Danger Assessment: Development of a New Highway Snowstorm Countermeasure Manual, SNOW04-042, Yasuhiko Ito, Masaru Matsuzawa and Yasuhiko Kajiya, *Civil Engineering Research Institute of Hokkaido*

Track B

1:30 p.m.-3:00 p.m. **Bridge Winter Support Systems**

Donald M. Walker, *University of Wisconsin, Madison*, presiding

- An Implementation of Using a Conductive Concrete Overlay for Bridge Deck Deicing at Roca, Nebraska**, SNOW04-002, Christopher Y. Tuan, *University of Nebraska-Lincoln*; Sherif A. Yehia, *Western Michigan University*
- State-of-the-Art Fixed Automated Spray Technology (FAST)**, SNOW04-001, Jerry R. Waldman, *Surface Systems, Inc.-Quixote Transportation Safety, Inc.*
- Bridge Frost Occurrence and Prediction**, SNOW04-048, Tina M. Greenfield, Eugene S. Takle, Brian J. Tentinger and Jose J. Alamo, *Iowa State University*; Dennis Burkheimer and Diane McCauley, *Iowa Department of Transportation*

3:00 p.m.-3:30 p.m. **BREAK**

Track A

3:30 p.m.-4:30 p.m. **Environmental Stewardship**

Susan Feldman, *Salt Institute*, presiding

- Icy Road Management Using CMA to Meet Environmental and Customer Expectations in New Zealand**, SNOW04-050, Alan Burkett, *Transit New Zealand*; Nick Gurr, *Opus International Consultants*
- Washington State Department of Transportation 2002-2003 Salt Pilot Project**, SNOW04-044, Rico V. Baroga, *Washington State Department of Transportation*

Track B

3:30 p.m.-5:00 p.m. **Large-Volume Snow Control**

Richard J. Nelson, *Nevada Department of Transportation*, presiding

- GIS Based Three-Dimensional Snow Drift Computer Model**, SNOW04-007, Robert B. Haehnel, *U.S. Army Cold Regions Research and Engineering Laboratory*; Glen Liston, *InterWorks Consulting*
- Development of Advanced Snowbreak Fences**, SNOW04-020, Masaru Matsuzawa, Yasuhiko Ito and Yasuhiko Kajiya, *Civil Engineering Research Institute of Hokkaido*; Shinya Fujiwara, *Sekisui Jushi Corp*; Masayuki Murakami, *Sanei Kogyo Co. Ltd.*
- Avalanche Hazard Reduction on USR 89/191 (Jackson, Wyoming) Using Snow Sails**, SNOW04-062, Rand Decker, *Northern Arizona University*; Robert Rice, *University of California at Merced*; Leroy (Ted) Wells and Jamie Yount, *Wyoming Department of Transportation*

Wednesday, June 9, 2004

7:00 a.m.-12:00 p.m. **REGISTRATION AND INFORMATION**

7:00 a.m.-8:00 a.m. **CONTINENTAL BREAKFAST**

Track A

8:00 a.m.-9:30 a.m. **Monitoring Road Conditions During Winter Events**

S. Edward Boselly, *Washington State Department of Transportation*, presiding

- Winter Road Condition Model**, SNOW04-016, Staffan Möller, *Swedish National Road and Transport Research Institute (VTI)*
- Inverse Estimation of Friction Coefficient of Winter Road Surface Using Vehicular Motion Data Measured by GPS-Equipped Probe Vehicles**, SNOW04-043, Takashi Nakatsuji, *Hokkaido University*; Akira Kawamura and Tikakuni Maeda, *Kitami Institute of Technology*
- Using Taxi GPS to Gather High-Quality Traffic Data for Winter Road Management Evaluation in Sapporo, Japan**, SNOW04-036, Naoto Takahashi, Syuji Miyamoto and Motoki Asano, *Civil Engineering Research Institute of Hokkaido*

Track B

8:00 a.m.-9:30 a.m. **Material Performance – Part II**

Dan Williams, *Montana Department of Transportation*, presiding

- The Role of Performance Specifications in Developing a Quality Control System for Winter Maintenance**, SNOW04-046, Wilfrid A. Nixon, George Kochumman, Ju Qiu, Lin Qui, and Jing Xiong, *University of Iowa*
- De-Icing Trials on UK Roads: Performance of Pre-Wetted Salt Spreading Compared to Dry Salt Spreading**, SNOW04-063, Marilyn Burtwell, *Transport Research Laboratory, UK*; and Peter Whitfield, *UK Highway Agency*

Laboratory Melting Performance Comparison: Rock Salt With and Without Pre-Wetting, SNOW04-032, Craig A. Luker, Barry C. Rokosh, and Timothy Leggett, *Forensic Dynamics, Inc.*

9:30 a.m.-10:00 a.m. **BREAK**

Track A

10:00 a.m.-11:00 a.m. **Performance and Winter Severity**

Rand Decker, *Northern Arizona University*, presiding

Performance Audit Method for Winter Maintenance, Marilyn Burtwell, *Transport Research Laboratory, UK*; and, Adrian Runacres, *Consultant*

Indiana Winter Severity Index, SNOW04-014, Bob McCullouch, *Purdue University*; Dennis Belter, Tom Konciezny and Tony McClellan, *Indiana Department of Transportation*

Track B

10:30 a.m.-10:00 a.m. **Environmental Stewardship – Part II**

Rico Baroga, *Washington State Department of Transportation*, presiding

Modeling the Exposure of Roadside Environment to Airborne Salt: Case Study, SNOW04-018, Mats Gustafsson and Göran Blomqvist, *Swedish National Road and Transport Research Institute (VTI)*

Regulating De-Icing Runoff from Highway Operations, SNOW04-033, Richard S. Davis, *Beveridge & Diamond, P.C.*

11:00 a.m.-11:30 a.m. **Closing Session**

John P. Burkhardt, *Indianapolis Department of Public Works*, presiding

Closure

TBD

1:00 p.m. **PNS Conference Equipment Trade Show**

Registered attendees for the TRB Symposium are invited to participate at no additional cost in the PNS Conference Equipment Trade Show at the Spokane Center adjacent to the Doubletree Hotel Spokane City Center on Wednesday afternoon, June 9, 2004.

In addition, registered attendees of the TRB Symposium are invited to register and participate in the technical program of the Pacific Northwest Snowfighters (PNS) Conference. Note that attendance at the PNS Conference activities on Thursday and Friday (June 10-11) will require an additional registration fee.