What is Clear Roads?

- 29 current members: CA, CO, CT, IA, ID, IL, KS, MA, ME, MI, MO, MN, MT, ND, NE, NH, NY, OH, OR, PA, RI, SD, UT, VA, VT, WA, WI, WV, WY

- Primary activities include:
  - Evaluating winter maintenance materials, equipment and methods.
  - Developing specifications and recommendations.
  - Studying and promoting innovative techniques and technologies.
  - Supporting technology transfer by developing practical field guides and training curriculum to promote the results of research projects.
Plug and Play Initiative Update
Problem

In-cab electronics used on DOT vehicles are often provided by different vendors

Each vendor has their own proprietary communication protocols and data formats

Costly and time intensive to integrate the different systems into one data stream
Project: Plug and Play Initiative

The goal was to develop specifications that would support a “plug and play” approach to integrating electronic devices and sensors on plow trucks.

Clear Roads developed an initial specification and then engaged the vendor community to get their support and input.
The Approach

Specify a universal bi-directional communications protocol for in-cab electronics
Examples of in-cab electronics include spread controllers, temperature sensors, plow up/down indicators, etc.

The protocol will be configurable and dynamic
To provide the end user with the maximum available data at the lowest cost

Wherever possible it will be backwards compatible to support legacy equipment
Expected Results

A standard protocol that each state can specify in procurement to facilitate a “plug and play” approach to sharing operational data from electronic devices on modern winter maintenance vehicles.
Protocol Development Timeline

A collaborative group of spreader and AVL vendors have developed a draft protocol.

It was posted for public comment in February 2014. It will be posted for a second round of public comments in August 2014.

Testing and validation will take place in the 2014-2015 winter season. Revisions will be made based on the testing.

Clear Roads will host a free web-based “test bed” so that vendors can validate that they are compliant with the protocol.

The protocol should be final by the 2015-2016 season.
Recent Project Results
### Completed Research Highlights

#### Understanding the True Costs of Snow and Ice Control Operations

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**True Cost of Winter Maintenance Estimating & Data Entry Tool**

- Estimation Mode
- Data Entry Mode
- Storm Comparison
- Period Comparison

**Prepared by:** Parsons Brinckerhoff

**Note:** Macros must be enabled.

**Disclaimer:** These results are based on user inputs. The outputs generated by this assessment are only as relevant as the data put into the model.

All dollar amounts in the tool are in year-of-expenditure dollars.
Completed Research Highlights

Determining the Toxicity of Deicing Materials
Completed Research Highlights

Environmental Factors Causing Fatigue in Snowplow Operators
Completed Research Highlights

Development of a Totally Automated Spreader System
For more information:

David Wieder
Colorado DOT
David.Wieder@state.co.us
(303) 512-5502
Aurora is an international partnership of public road agencies working together to perform joint road weather-related research. This site is designed to introduce the program, its partners, and its research.

**Why Join Aurora?**

- to set the agenda for collaborative research, development, and deployment of road weather information systems (RWIS).
- to multiply your agency's financial resources to address its most pressing RWIS-related challenges.
- to develop relationships with national and international, public and private leaders in RWIS equipment, decision support systems, standards, and training.

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**Upcoming Events**

- **Board web meeting** - Thursday, June 27, 2013 (1:00 p.m. CDT)
- **Board web meeting** - Thursday, August 8, 2013 (1:00 p.m. CDT)

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**Aurora Features**

- **2012-2013 Work Plan Available**
  The 2012-2013 Aurora Work Plan is now available for download.
- **Knowledge Base Boasts New Content**
  Knowledge Base continues to offer more content on road weather best practices.
- **Revised Chapter 8 of the Final Report on NCHRP 25-25(04)**
Recently Completed

- Benchmarking the accuracy of RWIS forecasts
- Update RWIS part of CBT
- Pavement snowfall prediction system
- Migrating to open RWIS
Soon to Complete

- Multiple-use ITS data collection
- Agency experience with RWIS sensors
- Results-based standards, measures and benefit:cost analysis
- RWIS network density and location guidelines
- Web-cams for remote condition monitoring
New Projects 2014

- Seasonal weight restrictions demonstration
- Quantifying salt concentration on the pavement
- Accuracy of snow accumulation predictions
Contacts

Board Chair:
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janorville@pa.gov

Information Contact:
Chris Albrecht, Transportation Research Specialist,
Institute for Transportation at Iowa State University.
calbrech@iastate.edu
PIARC TC2.4 Winter Service Update

Richard Nelson
SICOP Coordinator
PIARC
Permanent International Association of Road Congresses

- Strategic Theme 1 - Management and Performance
- Strategic Theme 2 - Access and Mobility
- Strategic Theme 3 - Safety
- Strategic Theme 4 - Infrastructure
- Terminology Committee
ST 2 - Access and Mobility

Goal
Encourage the improvement of access and mobility provided to the community and industry by improved road network operation and integration with other transport modes.

TC 2.1 Road Network Operations  TC 2.2 Improved Mobility in Urban Areas  TC 2.3 Freight Transport  TC 2.4 Winter Service  TC 2.5 Rural Road Systems and Accessibility to Rural Areas
TC2.4 Winter Service Issues

- 2.4.1 - Crisis management of unusually severe and/or sustained snow events
- 2.4.2 - Sustainability and climate change considerations in winter operation
- 2.4.3 - Advanced technology for data collection and information to users and operators
- 2.4.4 - Preparation of the 2014 Winter Road Congress in Andorra + Snow & Ice Data Book Update
Winter Road Congress 2014

- Wilf Nixon
  - Top 10 topics for a world class winter maintenance program

- Max Perchanok
  - TRB Winter Maintenance Committee
  - Aurora update
  - 2013 National Winter Maintenance Peer Exchange

- Conference of European Directors of Roads
  - N3- Winter Maintenance Standards report
Winter Road Congress - 2014

- Topic 1: Winter viability and climatic change - 3 presentations
- Topic 2: Cost and benefit of winter viability in a context of constrained budget - 12 presentations
- Topic 3: Extreme events in winter - 13 presentations
- Topic 4: Management of winter maintenance - 49 presentations
- Topic 5: Operational Approaches, Equipment and Products for the Winter Conditions - 47 presentations
- Topic 6: The road user in winter conditions - 10 presentations
Seminars

- International Seminar on “Winter Operation At High Altitude and Extreme Zones”
- Second seminar planned for spring 2015 in the Baltic region.
Statistics: General Facts

- U.S. area: 9,161,979 km²
- Total lane miles: 8,602,666
  - State Departments of Transportation maintain the roads
- Snow & ice costs: $1.96 Billion / year
- Road salt use: 10 million tons / year
Next Cycle 2016-2019
Proposals

- Efficient systems to optimally deliver deicing salt and brines
- Transportation system management during winter events
- Winter Road Congress planning
- Snow and Ice Data Book
- Best practice during extreme events
- Performance measures for winter service delivery
Fall Protection Issues

Chris Christopher, P.E.
Director, Maintenance Operations Division
WSDOT

2014 AASHTO Maintenance
Chairman’s Meeting
Sunday July 27, 2014
OSHA Fall Protection Rules

• Issue: Requires that an employee that is within 6 feet of a fall hazard that is not protected by standard guardrails (hand rails) must be in fall restraint.
Shortcomings of the OSHA Rule:

- OSHA: 42” rail height min
- AASHTO rail height: 32”
- Written around vertical construction activities
- Live traffic and work zone complexities
- Static vs. mobile operations
- Accident statistics
Types of work impacted:

• Maintenance
• Construction Inspection
• Survey
• Design
• Incident Response
• Inspection
• Scoping
Static Work Operations on Bridges
Mobile/Short Duration/Inspection/Emergency Response Activities on Bridges
Incident Response
Therefore, How Do We Move Forward?

At WSDOT:
Static Work Operations
Static: Use a Temporary Rail
Static: Use a Temporary Rail
Static: Use a Temporary Rail
Mobile/Short Duration Operations:

Use the guidance provided

(see handout)
AASHTO Draft Resolution?

(see handout)
TC3 - AASHTO Technical Service Program

Year One

AASHTO Subcommittee on Maintenance Presentation
Tuesday July 29, 2014
Year 1 Accomplishments
The Transportation Curriculum Coordination Council

Transition is Complete!

- Reconfirmed our Mission
- Established new Executive Board
- First AASHTO funding solicitation to States
- Recruited new Council Members
- Created new committee structure
- Developed goals for 2014

- New Mobile App Link - tc3app.com/install

- More than 80 online courses
- 20 hours of new instruction under development now
- Over 50,000 trained since 2008
Committees
The Transportation Curriculum Coordination Council

Communication and Marketing
Competency Matrix
Course Development
Partner Outreach
Technology Advancement
Performance Measures
2014 / 15 GOALS

Increase State Participation

• Increase participation from 23 to 33 contributing states by 2015
• Customer focus on Curriculum Expansion
  – Solicit new course candidates from State DOTs
  – Prioritize course development through member input
• Increase Subject Matter Experts (SME) and state volunteers
• Partner outreach to at least 4 new national groups
• Continue to develop at least 20 course hours annually
• Investigate options for a TC3 web based training platform
Benefits to the States

Cost Savings, Innovation, Skilled Workforce

• 1,400% ROI

• 100% Online Access

• 100% utilization by AASHTO members
TC3 Curriculum

What is available?

- 80 on-line courses
- 20 course hours under development
- Primary Target is front line Technical Work Force
- Three Discipline Areas:
  - Construction
  - Maintenance
  - Materials
Endorse support in your DOT
Consider using curriculum of courses
Recommend new course needs
Provide course reference materials
Recruit Subject Matter Experts
Volunteer on TC3 Council
QUESTIONS?
Pathfinder

A Joint Project Between State DOTs and the Weather Enterprise

AASHTO Subcommittee on Maintenance Meeting
July, 2014
Big Picture: Project Motivation

- There are significant safety and mobility impacts of weather on the surface transportation system.
- These impacts are, in part, due to gaps in timely, accurate, relevant and consistent information.
- These gaps can be filled through improved collaboration and coordination between the DOTs and the Weather Enterprise (both public and private sector weather providers).
- This effort will also support broader national initiatives, which in turn, will help to optimize the surface transportation system:
  - Weather Ready Nation (NWS)
  - Improving transportation operations (SHRP2)
Who are the players?

- Weather Enterprise
  - NWS
  - Private Sector
  - Universities
- State DOTs
Project Description and Goals

• Evaluate Current Practices of State DOTs’ Interactions and Relationships with the Weather Enterprise
• Document These Interactions
• Provide State DOTs With a Guidance Document Including:
  - Differing Methods of Operations
  - Good Practices
• Who: NWS Forecast Offices and DOTs responsible for the I-80 corridor from Sierra Nevada Mountains in CA to eastern WY
Identified 5 Cases that Capture the Working Relationships

- Case 1
  Private Sector in the TMC
- Case 2
  Private Sector outside the TMC
- Case 3
  No Private Sector
- Case 4(a)
  Private Sector Met and DOT Met
- Case 4(b)
  Private Sector Met and DOT Met embedded in the TMC
What Does Success Look Like?

- Clearly Defined Alignment Among the Weather Enterprise
- Coordination of Decision Support Services
- Consistent Traveler Information Messaging
- An Engaged and Communicative Weather Enterprise
## Contacts

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Phone Number</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paul Pisano</td>
<td>FHWA</td>
<td>202-366-1301</td>
<td><a href="mailto:Paul.Pisano@dot.gov">Paul.Pisano@dot.gov</a></td>
</tr>
<tr>
<td>Lawrence Dunn</td>
<td>NWS</td>
<td>801-524-4378</td>
<td><a href="mailto:Larry.dunn@noaa.gov">Larry.dunn@noaa.gov</a></td>
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<tr>
<td>Duane Carpenter</td>
<td>NOAA</td>
<td>301-713-0090 x144</td>
<td><a href="mailto:Duane.carpenter@noaa.gov">Duane.carpenter@noaa.gov</a></td>
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Office of Maintenance
Winter Operations Initiatives
Iowa Department of Transportation
Topics

- GPS/AVL
- Dash camera
- Salt spreader evaluations
Winter Operations Averages

- 901 Snow Plows
- 31 “events”
- 35 inches of snow
- 9,500 miles of CL roadway
- 15,000,000 gallons of brine
- 165,000 tons of salt
- 35,000,000 dollars or 15% of Highway Division budget
Why GPS/AVL

- Situational awareness
  - Visualization of resources and storm progression
- Response consistency
  - Shop/district treatment practices
- Cost awareness/control
  - Awareness of materials, equipment, and hours used
- Automation of record keeping
  - Hours, materials, road segments
- Public awareness/information
  - Transparency of operations and demonstration of effort
GPS/AVL History

- 2010 RFP
  - Proving concept
    - Limited number
    - Fleet Movement
    - Material Usage
- 2011/2012 implementation
  - Wants, deployed, learned
    - Evaluate technology and driver interaction
    - Modem and limited interaction
- 2012/2013 refinement
  - Standardization
  - All trucks
- 2013/2014 operational
  - Data driven decisions
  - Public facing
WOPR
WOPR Mobile

Winter Operations Portal & Reporting

I want to...

DM - I-235 @ Valley West in WDM (17)

http://205.221.56.10/axis/DMTV17.jpg
Dash Camera Objective

- Identify and implement readably available technology to capture, upload, and geographically display photos taken from snow plow vehicles during winter operations
Cameras Considered

- Existing GPS/AVL and Brigade camera
- IPhone
- Internet protocol (IP) camera and modem
Camera Criteria

- Quality of photo
- Availability of hardware
- Availability of software/application
- Multi-functionality
- Simplicity
- Unobtrusiveness
- Connectivity and data transfer
- Cost
## Pilot

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Pilot 6 Month Cost (200 Installs)

- IPhone 4s = $0.00
- Application = 200 hours staff time - $10,000.00
- GIS = 200 hours staff time - $10,000.00
- Mount = $40.00
- Wiring = $10.00

  - Total initial = $30,000.00

- Unlimited data plan = $40.00 / month / IPhone
  - Total monthly = $8,000.00

- Total = $78,000.00
Findings

- Many uses
  - Situational awareness
  - Operational/treatment decisions
  - Roadway/travel conditions
  - Performance analysis
  - Research
- Positive field acceptance
- Simple
- Adaptable
Salt Spreader Evaluations

- One main goal when spreading salt:  
  *Make sure it lands on the road where it is useful!*

- Accomplished by a balance of:
  - Truck speed
  - Spreader type
  - “Pre wetting” the salt with brine

- Which combo is best was up to opinion and local experience
Salt Spreader Evaluations

- Devised and conducted a test:
  - 6 spreaders
  - 2 speeds
  - 5 prewet rates
- Measure the distribution of salt landing in a grid using all 60 combinations
Smooth rubber mat with 10 3x3 grids
Actual measurements of material loss and distribution patterns!
Salt Spreader Evaluations

- Helps the DOT:
  - Save money on salt
  - Choose the most cost effective equipment
  - Keep ‘wasted’ salt out of the environment
- Identify, propose, coordinate and promote research in winter maintenance
- Membership: 20 US, 5 international
  - Academic, government, private sector
- Synthesis and review projects
- NCHRP research projects
- International Conference 2016

https://sites.google.com/site/trbcommitteeahd65/
Areas of Expertise

- Snow clearing equipment
- Winter maintenance materials
- Road condition monitoring, measurement
- Training and certification
- Blowing snow, avalanches
- Cost:benefit analyses
- Frost heave, spring load restrictions
- Performance standards, best practices
- Service delivery approaches
- Sustainability
Promoting Research: Recently completed NCHRP

- 20-05/Topic 43-12 "Strategies to Mitigate the Impacts of Chloride Roadway Deicers on the Natural Environment"
- 20-07/Task 318 “Winter Operations and Salt, Sand and Chemical Management”, in Environmental Stewardship manual of the AASHTO Center for Environmental Excellence
- 20-07 Task 329 “Alternative Methods of Delivering Winter Operations Services”
Promoting Research: Upcoming NCHRP

- NCHRP 14-34

“Transitioning Toward Performance-Based Winter Maintenance; developing a toolkit of measures, standards and monitoring tools to fit any climate and budget”.

Technology Transfer

- Planned 2014 webinars:
  - Strategies to mitigate effects of chloride deicers
  - Winter operations and salt, sand and chemical management
- TRB 2015 Joint Session:
  - Scheduling the Onset and Ending of Winter Weight Premiums and Spring Load Restrictions
TRB 2014 Highlights

- Conference Sessions:
  - WM Standards and Practice
  - WM Materials and Equipment
  - WM Policies and Impact on Safety & Reliability
  - Chemicals, Technology & Asset Management
  - Observing, Classifying & Forecasting Winter Conditions

- Practice-ready papers
  - Literature review of municipal WM practices & policies
  - WM guidelines for parking lots (3 papers)
  - Monitoring traction during winter conditions
Identified Challenges for WM

- **Near Term**
  - Maintaining service levels with reduced resources
  - Measuring performance of WM operations

- **Long Term**
  - Sustainability; safety, resources, natural environment
  - Adapting to climate change
https://sites.google.com/site/site/trbcommitteeahd65/

Google ‘MyTRB’
and sign up to become a friend of the Committee!