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IOWA STATE UNIVERSITY
Institute for Transportation

How truck speed and distribution method influence salt bounce and scatter

By Shaughn Kern and Alexander Slepak, MI LTAP/Center for Technology & Training

Thousands of years ago, salt was prized for its ability to preserve food; it was also sown into the soil of enemy lands by invading armies to make the soil unsuitable for agriculture. Whether our ancestors understood the science of soil salinity is debatable, but they did have one thing in common with today's winter maintenance professionals: they knew the value of salt as a resource, and they appreciated the environmental damage salt could cause if misused.

According to a study conducted by the Michigan Department of Transportation (MDOT) in the early 1970s, 30 percent of dry salt used on roads is lost immediately to bounce and scatter. The study concluded that pre-wetting the salt before spreading it reduced bounce and scatter by improving the application pattern and accelerating the melt rate. Today, pre-wetting has become commonplace and is recognized by state and local transportation agencies as a significant cost-saving measure. However, further research was necessary to determine the influence of other distribution variables on the effectiveness of salt.

Building on past experience

In the summer of 2012, the MDOT Operations Field Services Division built on the research

from the 1970s with the goal of determining an optimum vehicle speed and distribution method for applying salt.

The new study reexamined the effectiveness of salt treated with a liquid chloride solution and correlated it to truck speed and salt distribution systems. The comparison of two salt types (untreated and treated), three truck speeds (25, 35, and 45 miles per hour or mph) and two distribution systems (Y-chute and cross-conveyor) made for a total of 12 tests. To conduct the tests, MDOT staff laid out a grid on a 100 ft stretch of unused freeway in southwest Michigan.

The test grid was made up of 4 ft lanes (12 total), which simulated a two-lane road with 12 ft paved shoulders. Trucks driving in the left travel lane dropped salt into the “target area,” which spanned 4 ft on each side of the centerline. The amount of salt recovered from the target area and each 4 ft grid lane was tabulated as a percentage of the total amount of salt that was dropped.

Special attention was paid to salt recovered in the target zone, and the rest of the travel lane, since only salt in the travel lane is considered effective. Over the course of the entire study, salt recovered

Salt bounce and scatter continued on page 3



Plowing and the distribution of salt on roadways are time-proven methods in ice removal.

Acronyms and Abbreviations in *Technology News*

AASHTO	American Association of State Highway and Transportation Officials
APWA	American Public Works Association
FHWA	Federal Highway Administration
IHRB	Iowa Highway Research Board
InTrans	Institute for Transportation (at ISU)
Iowa DOT	Iowa Department of Transportation
ISU	Iowa State University
LTAP	Local Technical Assistance Program
MUTCD	Manual on Uniform Traffic Control Devices
NACE	National Association of County Engineers
TRB	Transportation Research Board



U.S. Department of Transportation
Federal Highway Administration



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From the director: Finding a “vocation”

It has been said (by many I would guess) that the times we learn the most about ourselves and what makes us “tick” are during some of the most troubled times of our lives. Sometimes these points in time are obvious, but others happen so fast that we are just making the best decisions we can at the moment they are needed. With some reflection, however, they are often clearly identifiable. These points in time occur throughout our lives—sometimes expected and sometimes unexpected. They are the moments when we dig down deep, evaluate, and search our core value system. These moments can be connected to situations in our personal or professional lives or both at the same time. They can be confusing and scary times, or times of great joy. But, they are most assuredly moments of growth and contain an expansion of our knowledge that can help us throughout our lives. Sometimes, if we are lucky, we have someone (or more than one person) that can help guide us through these turbulent times. And, down the road (or maybe even today or tomorrow) we can hopefully be that person for someone who needs our help during similar challenges of their own. That balance just seems right.

A few weeks ago, I had a discussion with someone about the difference in finding a “career” and finding a “vocation.” This was an interesting discussion because many people often connect these two. Some might even say they are the same (or hopefully the same). But, I walked away from that conversation thinking that this is a very personal definition for each individual. We have all chosen a career or maybe we think we stumbled into one based on life circumstances. But I have always thought of a “vocation” as something bigger than a job or career. It is something that

feeds everything you are and is most important to you, driving that core value system I mentioned above. Maybe it could be something you would do because “it just feels right.” The definition I like the most is that a vocation is “a summons or strong inclination to a particular state or course of action.” It defines a way of life or living. I think the troubled times noted above, after they occur and are reflected upon, can help define what a “vocation” is for a particular person. And I think a “vocation” can be connected to your job/career or to your personal life (or both). Maybe it adjusts and changes as life circumstances change (or we decide, on our own, that they need to change). We “grow into it.” I had a milestone in time about 10 years ago where, upon reflection, I found what I call my “technical” vocation. Interestingly enough, the basis of this conclusion was something I knew about myself much further back than that point in time, but it was something I had “forgotten” with the rush of life. The recent conversation I had about “career” and “vocation” brought this all back and made me realize that what drove my decision-making at that time still remains with me—where everything is stripped away and what means the most and what is the most important to you leads the way.

Just something to consider. Everyone has their own journey to make and there are many paths to that journey.

Have a Happy Holiday and great New Year. The Iowa LTAP is grateful for all of its longtime supporters and our new and old friends. May 2017 be a safe and productive time for everyone. ■

Keith

Salt bounce and scatter continued from page 1

in the travel lane ranged from 95.3 to 35.7 percent, depending on the speed of the truck, distribution system used, and whether the salt was treated or untreated.

As expected, the results of treated vs. untreated salt verified those found 40 years ago: treated salt performed significantly better at all speeds and through all distribution systems. The comparison between cross-conveyor and Y-chute systems resulted in slightly better performance for the conveyor type. For untreated salt, 9 percent more stayed in the travel lane when distributed through a conveyor; with treated salt, 13 percent stayed in the travel lane.

Speed increases bounce and scatter

Regardless of salt type or delivery system, truck speed had the most profound effect on how much salt was lost to bounce and scatter.

The most effective method of spreading salt on roads, a truck driving at 25 mph spreading treated salt with a conveyor, lost only 9 percent to bounce

and scatter. The same test at 35 mph resulted in 32 percent loss, with 45 mph showing a 45 percent loss.

Less salt is better

Reduction of salt waste has benefits beyond cost savings. Salt causes deterioration of the road, corrosion of the vehicles travelling on it, and it can negatively affect roadside vegetation. Further, effective salt use can limit the need for abrasives such as cinders and sand, for which cleanup cost can be significant.

More information

The full Bounce and Scatter Summary Report is available at www.MichiganLTAP.org/DeicingStudy. Article reprinted from Michigan Local Technical Assistance Program newsletter The Bridge 27.3, with permission of the Center for Technology & Training. ■

Online winter maintenance resources

Weatherview (<http://weatherview.iowadot.gov>)

This interactive online map provided by the Iowa DOT includes up-to-date Roadway Weather Information System (RWIS) and Automated Weather Observing System (AWOS) data for the entire State of Iowa. The map includes road temperatures, traffic speed, and RWIS and AWOS air temperature; dew point; and wind speed, direction, and gust. Weather-view also provides current (daily) images of major Iowa highways and interstates directly on their site.

National Weather Service (NWS) (www.weather.gov)

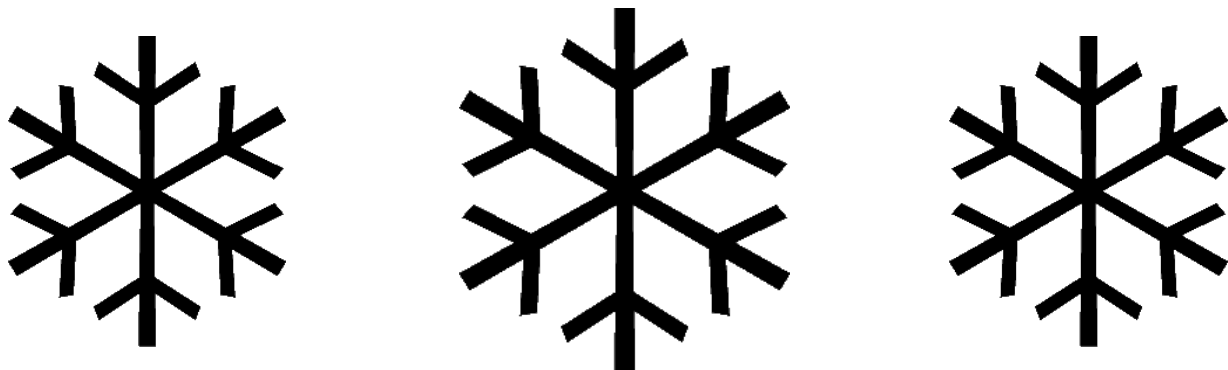
The NWS is a component of the National Oceanic and Atmospheric Administration (NOAA) and provides weather, water, and climate data, forecasts, and warnings for the protection of life and property and enhancement of the national economy. Their website provides everything from local forecasts to past weather records and information related to safety and education, as well as links to area news outlets to keep you ready and informed.

Track A Plow (<http://trackaplow.iowadot.gov>)

With the Iowa DOT's Track A Plow online application (app), you can see first-hand how the plows are doing out there during winter weather storms with their live streaming data. The app shows if the road conditions are either impassable, if travel is not advised, or if the roads are completely covered in snow and ice. It also pinpoints truck locations and lets you know if they are currently applying salt and other deicing materials in your area.

Iowa Environmental Mesonet (IEM) (<http://mesonet.agron.iastate.edu>)

Iowa State University manages the IEM with the goal of gathering, collecting, comparing, disseminating, and archiving metrological observations across the state. The IEM does not own or operate any of the automated stations but instead works with existing resources like the Automated Weather Observing System (AWOS), Automated Surface Observing System (ASOS), Cooperative Observer Program (COOP), among many others. This way, data about climate and roads as well as geographic information system readings can be easily found in one central location. ■



Iowa LTAP Mission

To foster a safe, efficient, and environmentally sound transportation system by improving skills and knowledge of local transportation providers through training, technical assistance, and technology transfer, thus improving the quality of life for Iowans.

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Meet Danny Waid, ICEA Service Bureau secondary roads research engineer

After graduating from Iowa State University with a degree in civil engineering, Danny Waid began his career as an assistant engineer in Floyd County, Iowa, where he later received his professional engineer (PE) license. However, besides a few additional years spent working as a private consultant and as a county engineer for several counties in Iowa, Waid is most recently known for being the Hamilton County engineer—a position that he has held for the past 10 years.

His new position

Waid became the secondary roads research engineer for the Iowa County Engineer's Association (ICEA) Service Bureau in mid-October 2016. In his new position, he works closely with Iowa DOT research staff and the research community to coordinate, monitor, and implement transportation research important to the secondary road system.

“The goal is not only to foster research but also to make sure that research that is performed becomes part of the constantly improving system of roads we all enjoy here in the State of Iowa.”

Why the switch?

Waid always wanted to be involved with researching better ways of doing things and considered constant improvement as part of the everyday duties of an engineer, so this was a natural next step.

Plus, he isn't new to the ICEA, as Waid has been associated with them for over 30 years.

“Working for the ICEA Service Bureau will allow me to assist county engineers across the state with research topics and secondary



Danny Waid

road issues in general. It is a good way for me to give back to an organization that has served me so well throughout my career.”

What's next for Waid?

His goal is simple: “Success for me would include assisting county engineers in continuing to construct and maintain the safest, most effective, and economically efficient system of secondary roads here in Iowa.”

However, as Waid put it himself, there can always be more:

“I hope my experience and desire to be of service to Iowa county engineers will continue to encourage implementation of research and the continued development of a state-of-the-art system of secondary roads for the road users of Iowa.” ■

FAST ACT update

By Donna Buchwald, Director, Iowa DOT, Office of Local Systems

Fixing America's Surface Transportation (FAST) Act was signed into law on December 4, 2015. The FAST Act is a five-year (Federal Fiscal Years 2016–2020) surface transportation authorization funding bill with a total budget of \$305 billion, \$228.8 billion of which is to go towards highways and highway safety. This was the first time in 10 years that a funding act was passed that covered more than two years of funding authority at once. The Act includes a 15 percent increase over its life, but due to inflation this will only slightly increase buying power.

While the FAST Act did not include significant program changes like the Moving Ahead for Progress in the 21st Century (MAP 21) Act, a few new programs were added, some minor adjustments were made to others, emphasis was placed on freight movement, and the streamlining and flexibility efforts continued.

The passage of a new surface transportation authorization bill is an opportunity to review how federal transportation funds should be allocated in the State of Iowa. A key part of this review includes seeking input from those with an interest in federal surface transportation funding. The Iowa DOT met with a few Metropolitan Planning Organizations (MPOs), Regional Planning Affiliations (RPAs), and city and county officials back on March 9, 2016, to have an initial discussion. After input from several forums and review by the Iowa Transportation Commission, the proposed implementation policy of the FAST Act in the State of Iowa was passed on September 13, 2016. Information on the policies is available at http://www.iowadot.gov/local_systems/mailling/2016/september/fast_act_policies.pdf.

At the request of the Iowa Chapter of the American Public Works Association and the Iowa County Engineers Association (ICEA), the Iowa DOT, Office of Local Systems, will continue to administer the Federal Bridge Program that was originally developed under the Safe Accountable Flexible Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) of 2005. Information on the Federal and State Bridge Program is available in Local Systems' Instructional Memorandum 2.020 at http://www.iowadot.gov/local_systems/publications/im/2020.pdf. ■

LPA Stakeholder Partnering group established for Iowa

By Nicole Fox, P.E., Iowa DOT, Office of Local Systems

On November 16, 2016, the Iowa DOT, Office of Local Systems, along with representatives from the FHWA Iowa Division, Iowa County Engineers Association (ICEA), Iowa LTAP, and American Public Works Association, held a kickoff meeting for what is referred to as "LPA Stakeholder Partnering." FHWA has included this initiative in its Every Day Counts (EDC) program.

Additionally, Kevin Cheznik, a principal engineer at Applied Research Associates, Inc., was in attendance and provided background information and a national perspective. He discussed Local Public Agency (LPA) Stakeholder Partnering in various states. Several other states across the country have been doing LPA Stakeholder Partnering for a few years, and this is something Iowa has been interested in for some time.

Tom Parham from FHWA mentioned that while Iowa has a very good relationship and foundation with the LPAs in Iowa, as well as FHWA, this partnering group can enhance the relationships across the state.

In Iowa's neighboring state of Missouri, through LPA Stakeholder Partnering, they were able to develop performance measures that helped ensure LPA-administered projects were in compliance with FHWA rules and regulations. They were also able to decrease the number of days it took for projects to go from being programmed for funding to being let to construction.

Some Iowa-specific topics that were discussed were the automation of the concept statement form that is being worked on. Nicole Fox from the Iowa DOT, Steve DeVries from the ICEA Service Bureau, and many others, are working together to automate this form. At the next meeting, instructional memorandums published by the Iowa DOT, Office of Local Systems, will be reviewed and feedback will be provided. One topic mentioned at the kickoff meeting was the options for alternate bidding and communicating that information to the LPAs. Also discussed was the Environmental Process that each project utilizing Federal-aid must go through and if there are any potential ways to further streamline this process. Nationally, the Environmental Process is a subject that is on many LPA Stakeholder Partnering agendas.

The group thought that quarterly meetings would be beneficial.

Additional information on EDC LPA Stakeholder Partnering can be found at the EDC-3 LPA Stakeholder Partnering Resource Library: http://www.fhwa.dot.gov/innovation/everydaycounts/edc-3/partnering_library/index.cfm. ■

The VIEW from here: 2016 Excavation Safety Trainings

The Iowa LTAP sponsored Excavation Safety Competent Person Training at three locations this past October. The locations chosen for this year's classes were Denison, Ames, and Iowa City, and we had a total of 159 attendees that participated in the workshops. The instructor covered critical definitions and context for excavation safety, soils analysis, testing local soils, and handling equipment while also providing a walk-through of all the basic shoring systems (i.e., sloping, shoring, and shielding). All relevant duties of a competent person at an excavation site were fully covered and explained.

This is an annual workshop that occurs each fall. If you are interested in attending, please contact Paul Albritton at palbritt@iastate.edu or 515-294-1231. ■



2016 Excavation Safety Workshops, from left to right: Iowa City, Ames, and Denison, Iowa

The VIEW from here: 2016 Local Road Safety Workshops

In October, the annual Local Road Safety Workshops were held in six locations throughout the state. The workshops, which provide current information and advice for improving safety on local agencies' roads and streets in terms of engineering, law enforcement, education, and planning, had over 130 attendees from engineering, law enforcement, planning, and other disciplines. Those attendees heard presentations on a variety of safety subjects including crash trends, law enforcement campaigns, data and funding sources, and current research of local interest.

For anyone who was not able to attend this year's workshops, the presentations have been posted on the LTAP website at <http://www.intrans.iastate.edu/events/local-road-safety-workshops/>. ■



2016 Local Road Safety Workshops, from left to right: Fort Dodge, Iowa City, and Sioux City, Iowa

Conference calendar

Date	Event Name	Location	Contact
February 2017			
7	Iowa Work Zone Safety Workshop	Ames	Paul Albritton
9	Iowa Work Zone Safety Workshop	Cedar Rapids	Paul Albritton
10	Iowa Work Zone Safety Workshop	Ottumwa	Paul Albritton
28-02	NHI–Bridge Inspection Refresher Training	Ames	Paul Albritton
March 2017			
1-3	Greater Iowa Asphalt Conference	Des Moines	Keith Knapp
6	Iowa Work Zone Safety Workshop	Waterloo	Paul Albritton
20	Iowa Work Zone Safety Workshop	Storm Lake	Paul Albritton
21	Iowa Work Zone Safety Workshop	Council Bluffs	Paul Albritton
22	Iowa Work Zone Safety Workshop	Ames	Paul Albritton
23	Iowa Work Zone Safety Workshop	Ames	Paul Albritton
30-31	Iowa Chapter, APWA Spring Conference	West Des Moines	Keith Knapp
April 2017			
9-13	National Association of County Engineers	Cincinnati, OH	Keith Knapp
23-26	APWA North American Snow Conference	Des Moines	Keith Knapp

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Event details and online registration

Watch for details and online registration information, by specific dates and events, on the Iowa LTAP Workshops page, www.iowaltap.iastate.edu/workshops/ltap-workshops/. ■

Iowa LTAP Tech Corner—Iowa 511 app

What is it?

The Iowa 511 app is the Iowa DOT's official traffic and traveler information app. Providing statewide up-to-date traffic information for interstates, U.S. routes, and state highways in Iowa, the app keeps you updated about construction, detours, incidents, winter road conditions and more. However, the app does not include information for county roads or city streets.

How does it work?

1. Open the app and customize your view.
2. See up-to-date details about your route by searching for your destination by place or highway.
3. Get a bird's-eye view of traffic from cameras located across the state.

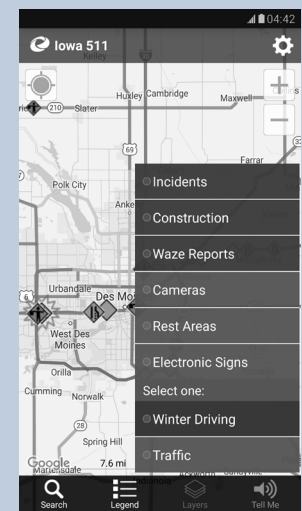
Additional features include hands-free, eyes-free, audio notifications of traffic events while you drive, a zoom-enabled map, near real-time updates on winter road conditions and road closures, citizen reports via Waze, electronic roadway sign messages, and information about highway rest area locations and current traffic speeds statewide.

Remember that while traveling, mobile communication devices should be used only when the motor vehicle is at a complete stop off the traveled portion of the roadway. Do not text and drive or use this app while driving.

Where can I get it?

Use the QR code here or visit Google Play (search for "Iowa 511") to download the free app today.

Visit the Iowa DOT website at <http://www.iowadot.gov/index.html#/services> to learn more about the services they have to offer. ■



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