Clear Roads Research Proposals
2017

#	Title	Est. Cost	Est. Duration	Project Summary	Presented by	Page
1	Reclaimed Water as an Alternative Water Source in the Production of Salt Brine	$100,000	12 months	This research will include a synthesis of current sources of water for brine production; an analysis of the chemical composition of wastewater effluent for its suitability for salt brine; a look at the environmental regulations and permitting necessary; and infrastructure needed to transport wastewater to brine production facilities.	Group 1 Sandi Sauter, Maryland DOT	5
2	Reducing Snow Plow Driver Fatigue by Modifying Human Behavior	$200,000	18 months	This project would confirm or reject the link between drivers' quality of rest and driver fatigue. If confirmed, the investigator would develop a series of training materials for managers and drivers to help improve the quality of rest for drivers as well as practices managers can use during operations to identify and relieve the fatigue in drivers.	Group 1 Allen Williams, Virginia DOT	7
3	Aftermarket Cameras in Winter Maintenance Vehicles- Quantity and Location, Snow Build up Prevention, Rear Facing Plow Cam, and Screen Fatigue	$100,000 +	18 months	The goal of this project is to have a synthesis and a set of guidelines that can be used by department of transportations and other winter maintenance agencies to guide applying aftermarket camera systems.	Group 2 David Frame/ Chris Smith (Lisa Kunzman), California DOT	9
4	The Mona-Lisa of Pre-Wet	$250,000	24 months	The goal of this project is to: a) Identify optimal rates to meet pre-wet goals, b) Identify pre-wet delivery systems that are most effective at coating materials and c) Evaluate liquid product performance in meeting pre-wet goals.	Group 2 Patti Caswell, Oregon DOT James Morin, Washington State DOT	12
5	Clear Roads Program to Test/Compare Snow and Ice Equipment	$100,000	12 months	To develop and establish testing and evaluation standards for the unbiased review of snow fighting equipment.	Group 2 Jeff Pifer West Virginia DOT	15

Clear Roads Research Proposals
2017

#	Title	Est. Cost	Est. Duration	Project Summary	Presented by	Page
6	Managing Resources (manpower and equipment) to Improve Operational Efficiency	$150,000-$175,000	18 months	There's a critical need to match an agency's qualified manpower with the right, available equipment resources. The product of this research would be a set of recommendations for how to address equipment and personnel issues developed using case studies and communicated through a clear, easy to read document and PPT slides for the buy in of upper level management.	Group 3 Mark Trennepohl, Arizona DOT	17
7	Integrating Advanced Technologies into Winter Operations Decisions (BMP for Future of Winter Maintenance)	$75,000-$100,000	12 months	The goal of this research is to develop a BMP guide spelling out the technologies available for winter operations; what these technologies measure; how to incorporate them into a winter maintenance operations strategy; and how to make the technology successful.	Group 3 Justin Droste, Michigan DOT	20
8	Traffic Demand Management during Storms through Use of Variable Message Sign-mounted Cameras	$100,000	18 months	The goal is to provide messaging on a closer to real time basis than is now practicable, enabling better decision-making by drivers about whether to travel and what routes to use.	Group 3 Mike Lashmet, New York State DOT	22
9	Using New Technologies to Train Snowplow Operators	$125,000-$150,000	18 months	Develop a guide to assist trainers who are updating or developing training programs to incorporate the use of new technologies and social media as a supplement to the traditional educational delivery method.	Group 3 Jon Fleming, Pennsylvania DOT	24

Clear Roads Research Proposals
2017

#	Title	Est. Cost	Est. Duration	Project Summary	Presented by	Page
10	Combined Impacts of Magnesium and Sodium Chloride on Chloride Migration	$200,000	24 months	To determine the amount of chloride MgCl2 and NaCl deicers potentially released into the environment and determine if combined use of these deicers influence total chloride releases or impact chloride mobility in the environment.	Group 4 Patti Caswell, Oregon DOT	26
11	Standardized Specifications/Subject-Based Web Pages	$10,000-$20,000 each	6 to 12 months each	Establish Clear Roads as a national resource for snow and ice information and specifications via web pages dedicated to specific categories that include information on research, specifications, product experience, and other information as applicable. This will promote better consistency and predictability for the various suppliers and contractors.	Group 5 Brian Burne, Maine DOT	28
12	Winter Preparedness Web Page	$50,000	6 to 12 months	Educate the masses in a clear, consistent, and professional manner via web pages dedicated to specific topics such as snow tires vs. all-season tires, tire chains, driving around plows, preparing your vehicle for winter, driving in snow, staying off the roads, etc. Also, provide a resource for driver education and an informative web link for each of our state DOT web sites.	Group 5 Brian Burne, Maine DOT	30
13	Guide to Implementation of Snowplow Route Optimization	$50,000	12 months	Develop a process or guide to assist states, which have not yet optimized their snowplow route system, describing how to proceed with the implementation of that process.	Group 5 Larry Gangl, North Dakota DOT	32

Clear Roads Research Proposals
2017

#	Title	Est. Cost	Est. Duration	Project Summary	Presented by	Page
14	Online pre-treatment advisor	$75,000	6 months	The goal of this project is to have an online tool that will allow a person to enter data such as chemicals available for pretreating, and the road and weather conditions, and the output of the tool will be to provide an effective pretreatment plan.	Group 5 David Gray, New Hampshire DOT	34
15	Standard Specification for Carbide Insert Blades and Carbide Insert	$15,000	6 months	To goal will be to allow the manufacturing industry to reduce their costs for carbide blades and pass those savings on to the State DOT's. With one common specification for all 34 Clear Road States, the buying power connected to a single agreed upon specification would be greater. Inventory management would also be less complicated. Counties and cities would also be able to take advantage of this single specification. Using one standard specification would potentially allow for Procurement Coalitions to bid one uniform standard for carbide blades.	Group 5 Cliff Spoonemore, Wyoming DOT Brian Burne, Maine DOT	36

2017 Research Proposal Form

Proposer name: Sandi Sauter
Organization: Maryland DOT, State Highway Administration

Title of proposed research synthesis or project:
Reclaimed Water as an Alternative Water Source in the Production of Salt Brine

Topic area (highlight one):
Methods Equipment Materials Training Technology Safety

1) **Explain the specific problem or issue.**
With the movement towards a reduced use of salt for winter maintenance, state Salt Management Plans are increasingly likely to include initiatives to transition from traditional granular salt application to more salt brine application. An increase in the manufacturing of salt brine for winter maintenance operations could put a strain on local water resources and limitations on available water resources, particularly in areas prone to drought, could prevent some DOTs from expanding their use of salt brine. Meanwhile, many local governments and private industries are challenged with the responsible disposal of wastewater effluent.

2) **What is the goal of the project?**
The potential to use effluent from wastewater treatments plants in the production of salt brine should be researched. The results of this research could provide winter maintenance managers, as well as public and private parties responsible for planning the disposal of wastewater, valuable information on the opportunities and challenges of using reclaimed water in the production of salt brine.

3) **Describe the expected products/deliverables of the research?**
This research would deliver written material on the possibilities, limitations and general guidelines for the use of reclaimed water in salt brine production.

4) **List the specific research tasks that would form the scope of work, ie. what steps will the researcher need to take to develop the deliverables?**
    a. Synthesis of current sources of water for creating salt brine solutions
    b. Review other uses of reclaimed water on public infrastructure projects and demonstrate proven applications of reclaimed water
    c. From a scientific standpoint, the chemical composition of wastewater effluent would be researched to determine its suitability for creating salt brine solutions capable of treating roads
    d. The environmental regulations placed on winter maintenance activities, as well as those of wastewater discharge permits would be explored
    e. Infrastructure needs for transporting reclaimed water to brine manufacturing facilities would need to be understood

5) **Who is the intended audience for the products/deliverables? Identify training needed and describe the use of products/deliverables.**

The material resulting from this research would be shared with maintenance managers of all DOTs and would be made available to any public and private entity interested in partnering with the highway maintenance professionals.

6) **How will they be used to impact your organization? How would they benefit DOTs? Describe how the research recommendations can be used to improve the winter maintenance operations of state transportation systems?**
The knowledge gained through this research may make brine production possible to DOTs in areas where water resources have been a limiting factor. The use of reclaimed water may assist DOTs in meeting targets of environmental regulations on impaired waterways, such as Total Maximum Daily Load (TMDL) requirements for pollutants such as nitrogen and chloride.

7) **How will you measure the success of the project?**
Successful research would lead to a better understanding by the DOTs on the potential to use reclaimed water in salt brine production. This research may also lead to the use/increased use of wastewater for brine production.

8) **Estimated funding needed?**
$100,000

9) **Estimated timeline for completing the research.**
- Six (6) months
- Twelve (12) months
- Eighteen (18) months
- Other:

10) **Are you aware of any similar or related research on this topic? If so, please list below.**
We are not aware of research on this topic. There are examples in which wastewater is used in winter operations.
http://www.newsweek.com/oil-and-gas-wastewater-used-de-ice-roads-new-york-and-pennsylvania-little-310684

2017 Research Proposal Form

Proposer name: Allen Williams
Organization: VDOT

Title of proposed research synthesis or project:
Reducing Snow Plow Driver Fatigue by Modifying Human Behavior

Topic Area: Methods Equipment Materials Training Technology Safety

1) **Explain the specific problem or issue**.
In the previous study on Snow Plow Driver Fatigue, the investigator found there was a probable link between drivers' quality of rest and fatigue during snow operations. Driver fatigue can be a major cause of accidents and low productivity.

2) **What is the goal of the project?**
This project would confirm or reject the link between drivers' quality of rest and driver fatigue. If confirmed, the investigator would develop a series of training materials for managers and drivers to help improve the quality of rest for drivers as well as practices managers can use during operations to identify and relieve the fatigue in drivers.

3) **Describe the expected products/deliverables of the research?**
The investigator would provide a report first confirming or rejecting the link between drivers' quality of rest and driver fatigue during winter operations based upon field research with a statistically significant sample of snow plow operators. The investigator would develop training guides, DVD's and classroom training materials for managers and drivers to improve drivers' behavior to get better quality of rest before and during winter operations. The investigator would also provide ways to identify fatigue during operations and techniques/practices to relieve fatigue during operations.

4) **List the specific research tasks that would form the scope of work, ie. What steps will the researcher need to take to develop the deliverables?**
   a. Investigator shall build off of the work by Virginia Tech Transportation Institute to perform a literature search nationally and internationally,
   b. Investigator shall conduct field research of a statistically significant number of snow plow drivers to confirm or reject the link between driver rest and driver fatigue. Provide a detailed report of the findings from the field research,
   c. If confirmed, the investigator shall develop training materials to reduce driver fatigue, identify driver fatigue and develop techniques/practices to relieve fatigue during operations.

5) **Who is the intended audience for the products/deliverables?**
DOT field management, snow plow drivers and senior management in setting practices to provide drivers the greatest opportunities for quality rest.

6) **How will they be used to impact your organization? How would they benefit DOTs? Describe how the research recommendations can be used to improve the winter maintenance operations of state transportation systems**.
The findings of this research and subsequent training materials will provide DOTs with the resources to reduce fatigue in snow plow drivers during winter operations. Field managers and drivers will have the ability to identify fatigue during operations and have the tools to alleviate the fatigue. This will reduce accidents caused by driver fatigue and increase productivity as drivers will be more alert, thus making better decisions.

7) **How will you measure the success of this project?**
A reduction in the number of accidents involving snow plow drivers during winter operations and increased productivity during operations. Feedback from drivers on their levels of fatigue during winter operations.

8) **Estimated funding needed.** $200,000

9) **Estimated timeline for completing the research.**
- Six (6) months _____
- Twelve (12) months _____
- Eighteen (18) months XXX__
- Other: ___24 months

10) **Are you aware of any similar or related research on this topic? If so, please list below.**
Environmental Factors Causing Fatigue in Snow Plow Drivers – VTTI (2014)

2017 Research Proposal Form

Proposer name: David Frame/Chris Smith (Lisa Kunzman)
Organization: Caltrans

Title of proposed research project:
Aftermarket Cameras in Winter Maintenance Vehicles- Quantity and Location, Snow Build up Prevention, Rear Facing Plow Cam, and Screen Fatigue

Topic Area (highlight one):
Methods Equipment Materials Training Technology Safety

1) **Explain the specific problem or issue to address**.
Camera technology is increasingly available and affordable as an aftermarket tool to 1) assist snowfighters with viewing the front, sides, and rear of their winter maintenance vehicles for safety and function, and 2) provide visual information to the operations center and/or, in some instances, the traveling public. Because of the harsh winter maintenance environment and limitations of driver attention, guidance is needed with many factors to apply this technology to winter maintenance vehicles to ensure maximum benefit, for example:

   1) Quantity and location of cameras for operational and safety needs.
   2) Prevention of snow build up and water droplet accumulation on cameras.
   3) Assessment of roadway conditions, for example, plow cameras are currently used in some states showing a forward view of the road conditions, but this doesn't show the condition after the road is treated/plowed.
   4) Prevention of screen fatigue and information overload of snow plow drivers subject to multiple display screens.

2) **What is the goal of the project?**
The goal of this project is to have a synthesis and a set of guidelines that can be used by department of transportations and other winter maintenance agencies to guide applying aftermarket camera systems for the following:

   1) The quantity and location of cameras for operational and safety needs.
   2) The best practices, mounting locations, technologies, and/or technology features of aftermarket cameras that would prevent or mitigate snow build up and water droplet accumulation.
   3) The feasibility of using backup camera images for operational use similar to how forward facing camera images are used. Determine what technology is currently available now and what needs to be developed.
   4) The magnitude/seriousness of snow plow driver's information overload and fatigue. Determine what are the best practices and mounting locations to eliminate the problem or mitigate it. Determine the feasibility of using combination screens, heads up displays, etc. Determine what technology is currently available now and what needs to be developed.

3) **Describe the expected products/deliverables of the research.**
This project would deliver written, schematic, pictorial, and videographic documentation describing the state of the practice, considerations, ramifications, testing, specifications, and recommended guidelines for applying aftermarket camera systems to winter maintenance vehicles for the following:

1) Quantity and locations of cameras for safety and function of winter maintenance vehicles.
2) Mitigation of snow build up and water droplet accumulation on aftermarket cameras, including:
   A. Recommendations/guidance on mounting locations for aftermarket backup camera on various configurations of winter maintenance vehicles to mitigate snow build up and water droplet accumulation.
   B. Information on product features and availability that mitigate snow build up and water droplet accumulation. And test results on the effectiveness of these features. Product specifications to include mitigating snow build up and water droplet accumulation when purchasing back up cameras for winter maintenance vehicles.
   C. Recommendations on technological features that are currently not available that the backup camera industry should develop.
3) Information on product features and availability of aftermarket backup cameras that could be used similar to how forward facing camera images are used. Product specifications to include the ability to capture images and transmit them. And test results on the effectiveness of this feature.
4) Report on findings on the magnitude/seriousness of snow plow driver's information overload and fatigue due to screen exposure. Recommendations on best practices and technology to eliminate the fatigue and sensory overload.

4) **List the specific research tasks that would form the scope of work. (What steps will the researcher need to take to develop the deliverables?)**
   - Literature Search and Discovery of Existing Guidance (manufacturers' guidance, SAE, etc.)
   - Survey of Practice and Discovery of Existing Guidance (states DOT, municipal fleets and private fleets, etc.)
   - Product Review (what product and features are available on the market)
   - Testing of Products

5) **Who is the intended audience for the products/deliverables? Identify training needed and describe the use of products/deliverables.**
   Winter maintenance fleet operators, specifiers, designers, and installers (state and local municipalities, etc.). Training will likely be needed for fleet managers, camera installers and plow operators.

6) **How will they be used to impact your organization? How would they benefit DOTs? Describe how the research recommendations can be used to improve the winter maintenance operations of state transportation systems**.
   Each DOT would implement as needed on affected vehicles. The benefits include more safe and efficient operations.

7) **How will you measure the success of this project?**
   Whether backup cameras can be effectively used in winter maintenance vehicles and operations and the images transmitted and used to enhance operations similarly to the forward facing images currently being used in some state dots. If verification of driver fatigue is determined and solutions are presented to reduce information overload and fatigue.

8) **Estimated funding needed.** $100,000 (this number might need to be higher)

9) **Estimated timeline for completing the research.**
   - Six (6) months _____
   - Twelve (12) months _____
   - Eighteen (18) months __X___
   - Other: _____ months

10) **Are you aware of any similar or related research on this topic? If so, please list below.**
   We are unaware of research related specifically to the unique challenges of using aftermarket cameras in winter maintenance equipment. Specifically how many cameras and what locations for

operational and safety needs, how to mitigate snow build up and water droplet accumulation, and how to capture rear facing images that can be used that could be used similar to how forward facing camera images are used. There may be current pending research on snow plow driver screen fatigue and sensory overload.

References

[1] Backover Crash Avoidance Technologies NPRM FMVSS No. 111, November 2010.
[2] Federal requirements, 49 CFR Part 571 – Federal Motor Vehicle Safety Standards; (Figure 5 Test Cylinder Locations for testing camera performance)
[3] Truck Mirrors, Field of View, and Serious Truck Crashes, University of Michigan, Transportation Research Institute, June 2007.
[4] Wide-angle Camera Technology for Automotive Application: A Review, Connaught Automotive Research, Group, Department of Electronic Engineering, National University of Ireland, IET Intelligent Transport System, 4 July 2008
[5] An Investigation of the Potential Safety Benefit of Vehicle Backup Proximity Sensors, Transport Canada, Paper number 05-0408

2017 Research Proposal Form

Proposer name: Patti Caswell/James Morin
Organization: ODOT/WSDOT

Title of proposed research project:
The Mona-Lisa of Pre-Wet

Topic Area (highlight one):
Methods Equipment Materials Training Technology Safety

1) **Explain the specific problem or issue to address.**
   - **Methods:** Pre-Wet is widely used in the snow and ice industry to achieve three goals:
     1. Reduce bounce and scatter
     2. Activate Salt
     3. Inhibit corrosion

     Research is needed that will help agencies identify appropriate rates to meet the above purposes. Research has been done that addresses speed and to some degree addresses effectiveness of different rates, however none of the research that we are aware of addresses effective rates as it relates to each purpose. The proposed research would determine the optimum rate that should be applied at a given rate (gallons/ton) in different speeder configurations for each purpose. Further it would define the benefit received for each given rate. For example: At 10 gallons/ton all three purposes are accomplished with a loss of 10% of salt, at 20 gallons/ton the salt loss is reduced to 5% loss etc for each of the three purposes at different rates.
   - **Equipment:** Pre-wet liquid delivery systems are designed in many different ways and incorporated into a variety of spreader configurations. Some systems apply liquid at the spinner while others apply liquid at the flight chain or along the auger inside a mix chamber. Some systems rely on electric pumps; others use hydraulic pumps, other factors include nozzle selection, optimum pressure, screen size, hose diameter and flow meter design. This research would evaluate a variety of common delivery systems and quantify which provide the best application of liquid to solid product. The research would provide guidelines and recommendations for pump type, flow rate, hose diameter, flow meter and screen size.
   - **Materials:** A variety of liquids are used for pre-wet including MgCl, CaCl and Inhibited Brine. This research would evaluate these and other potential pre-wet liquids and quantify the effectiveness of each in accomplishing the above purposes (bounce and scatter, activation and corrosion inhibition). An obvious issue with this evaluation would be that different products with different inhibitors and proprietary products may perform differently. It would be very difficult to compare all or even the majority products on the market.

2) **What is the goal of the project?**
   a. Identify optimal rates to meet pre-wet goals.
   b. Identify pre-wet delivery systems that are most effective at coating materials.
   c. Evaluate liquid product performance in meeting pre-wet goals.

3) **Describe the expected products/deliverables of the research.**
   A comprehensive guide for pre-wet practices to include:

a. Synthesis of what other states are using for pre-wet rate, delivery systems (tanks, pumps, nozzles; type, size, location) and products (MgCl, CaCl, Brine)
b. Provide optimal rates for meeting pre-wet goals as well as quantify benefit of different rates (10gpt vs 20 gpt for each goal) in addition to speed and other deliver factors such as spinner/non spinner application methods.

c. Evaluation of at least 3 different delivery systems on at least three material types (solid salt, ***quarter-ten rock, cinder, other??***) ***I'm open to this as we use quite a bit of mix but wondering if anybody else is using enough sand to be interested, obviously salt would be the one that most are interested in.*** Ranking of delivery systems from most to least effective in meeting pre-wet goals.
d. Evaluate and (if possible) rank common liquids used for pre-wet in terms of how well they meet goals.

4) **List the specific research tasks that would form the scope of work. (What steps will the researcher need to take to develop the deliverables?)**
- Synthesis and summary of existing research for delivery systems, application rates and application materials.
- Application Rates
  - Identify representative spreader systems to test
  - Identify field test-bed
  - Develop field test procedures based on previous research
  - Test a variety of liquid rates and measure benefit for each pre-wet goal
- Delivery Systems
  - Evaluate existing systems and identify representative types for testing (spinner vs chute, center discharge vs tailgate)
  - Evaluate systems to identify issues such as flow constriction, screen size, flow meters, nozzle vs no nozzle, mix chambers etc.
  - Develop method to test effectiveness of salt and salt/sand saturation
  - Field test a representative sample of delivery systems
  - Develop design considerations and recommendations
- Materials
  - Identify representative sample of liquids used in the industry for pre-wet
  - Develop method to test effectiveness of material against goals
  - Field test
  - Rate products for effectiveness

5) **Who is the intended audience for the products/deliverables? Identify training needed and describe the use of products/deliverables.**
DOTs, public works agencies, anyone involved in snow and ice control.

6) **How will they be used to impact your organization? How would they benefit DOTs? Describe how the research recommendations can be used to improve the winter maintenance operations of state transportation systems**.
Better design pre-wet systems will result in more efficient and effective delivery of solid deicer products. This has the potential to minimize impact (less salt/sand in the ditches) reduce waste and provide better roads for our customers

7) **How will you measure the success of this project?** Patti will become permanent President of CR

8) **Estimated funding needed.** $250,000

9) **Estimated timeline for completing the research.**
- Six (6) months _____
- Twelve (12) months _____

- Eighteen (18) months _____
- Other: __24___ months

10) **Are you aware of any similar or related research on this topic? If so, please list below.**
Yes, many pieces of research has been done that address the value of pre-wet in general, some identify and evaluate different rates and speed. None that we are aware of address the delivery system, evaluate pre-wet materials, or define the ideal rate for all three goals.

2017 Research Proposal Form

Proposer name: Jeff Pifer
Organization: WVDOT

Title of proposed research project:
Clear Roads Program to Test/Compare Snow and Ice Equipment

Topic Area (highlight one):
Methods Equipment Materials Training Technology Safety

1) **Explain the specific problem or issue to address**.
Currently, information on snow fighting equipment comes from salesmen, word of mouth and the experience of peers, and seat of the pants experience. It would be desirable to have defined test criteria and to evaluate snow fighting equipment in the same fashion that Pacific Northwest Snowfighters review snow fighting chemicals; Underwriters Laboratories reviews products; or ASTM standards enhance performance and help everyone have confidence in the things they buy and use from a child's toy to aircraft.

2) **What is the goal of the project?**
To develop and establish testing and evaluation standards for the unbiased review of snow fighting equipment. Similar equipment would be judged using fixed methods to level the playing field. A well-organized website hosted by Clear Roads to disseminate testing results would be the ultimate goal.

3) **Describe the expected products/deliverables of the research.**
A fair and unbiased review of snow fighting equipment that gives snow fighting professionals a one stop source for performance details so they can make educated purchasing decisions. The testing group's seal of approval should become a "must have" accreditation for vendors, much like PNS is for snow fighting chemicals and the UL ® mark or Consumer Reports is for consumer goods.

4) **List the specific research tasks that would form the scope of work. (What steps will the researcher need to take to develop the deliverables?)**
The research group would develop testing standards and evaluation methods to ensure all products receive a fair and unbiased review. Product manufacturers would then send a sample to a certified lab for a series of tests and evaluations which would be reported with a uniform scoring system. The manufactures will pay for the tests. Finalized test results would be reported to Clear Roads and would be posted according to ranking to a website where snow fighting professionals would have access to the information.

5) **Who is the intended audience for the products/deliverables? Identify training needed and describe the use of products/deliverables.**
Clear Roads states, municipalities, private snow removal contractors, and basically anyone working in the trade that purchases snow fighting equipment.

6) **How will they be used to impact your organization? How would they benefit DOTs? Describe how the research recommendations can be used to improve the winter maintenance operations of state transportation systems**.

It would allow snow fighting professionals to make educated decisions before purchasing snow fighting equipment. Allow the wheat to be separated from the chaff.

7) **How will you measure the success of this project?**
Developing a resource list ranking evaluated snow fighting equipment that is unbiased and as respected as PNS or Consumer Reports when it comes to the review of snow fighting equipment. This accreditation will become a must have and manufacturers will adopt and desire this group's approval seal.

8) **Estimated funding needed.**
$100,000

9) **Estimated timeline for completing the research.**
- Six (6) months _____
- Twelve (12) months _X____
- Eighteen (18) months _____
- Other: _____ months

10) **Are you aware of any similar or related research on this topic? If so, please list below.**
Not that I am aware of.

Note: This project could start off small to establish itself by choosing a few types of SRIC equipment to test initially. As the project grows and gains acceptance, additional types of SRIC equipment could be added which may require the development of additional testing standards and evaluation methods.

2017 Research Proposal Form

Proposer name: 2017 CR research group #3
Organization: Fleming (PA), Lester (CO), Trennepohl (AZ), Longworth/Droste (MI), Lashmet (NY), Miller (MO)

Title of proposed research project:
Managing Resources (manpower and equipment) to Improve Operational Efficiency

Topic Area (highlight one):
Methods Equipment Materials Training Technology Safety
This project touches all topic areas.

1) **Explain the specific problem or issue to address**.
There's a critical need to match an agency's qualified manpower with the right, available equipment resources.

Many states are dealing with reductions to their fleets of highway maintenance equipment due in part to down time from the additional maintenance/repair activities related to older equipment. In addition to this, states have limited access to trained snowplow operators, and therefore, have less available man-hours to get the work done. This impacts the entire maintenance cycle but has the greatest impact on winter maintenance operations. This can also negatively impact an agency's ability to react to severe winter events affecting their own transportation system, as well as supporting overwhelmed local municipalities during states of emergency.

Because of these equipment and personnel issues, some have seen reductions at the highway operations level of 30% or more in the past few years. Lean and efficient is the name of the game these days. Having every piece of equipment needed to perform highway maintenance functions, readily available at the garage level, is oftentimes, a thing of the past.

2) **What is the goal of the project?**
Knowledge transfer, but knowledge that comes from actual successes and failures, not from a BMP manual.

Specifically, Clear Roads would like to learn…
<u>Related to Equipment</u>

- What is the state of practice for sharing or re-allocating equipment resources?
- What software systems are states using for equipment/fleet management?
- What are the pros and cons of equipment rentals vs. purchasing?
    - This might be especially beneficial with regard to how to deal with underutilized and/or aging equipment.

<u>Related to Personnel/Staffing</u>

- What are the tradeoffs (costs and otherwise) of relying on
    - Permanent versus seasonal and/or contracted operators?
        - What types of seasonal operators are being used?
        - Is there an optimal ratio and or situation for using one or the other?

- What are costs/tradeoffs of using contracted forces? This may include a detailed look at experience, safety, LOS, percentages, and costs. CR project "NA study on Contracting Snow and Ice response" provides a good start to this comparison, but a deeper dive is needed.

Equipment/Staffing Combined

- What is a normalized rate of staff/equipment per lane mile for various levels of service?
- What strategies can be implemented to maintain operations with less resources (modifying shifts, utilizing new technologies, changing LOS, relocating resources from one district to another to support emergency operations, etc.)?

3) **Describe the expected products/deliverables of the research.**
The product of this research would be a set of recommendations for how to address equipment and personnel issues in a clear, easy to read document. This document should provide…
   - Charts/graphs to more clearly illustrate the recommendations.
   - A list of case studies that document various levels of successes and failures, similar to CR 16-01 Utilization of AVL/GPS Technology: Case Studies.

   Accompanying this document should be a set of PowerPoint slides to present to upper level managers for purposes of buy-in.

4) **List the specific research tasks that would form the scope of work. (What steps will the researcher need to take to develop the deliverables?)**
The research tasks will likely include the following…
   - Literature search
   - Survey of Clear Roads states and other potential candidate states/agencies/international resources (Canadian or European)
   - Synthesis of the information gained for the literature search and survey.
   - Case studies will be conducted.
     - Based on the previous tasks, 5 to 7 states will be identified as potential case study candidates.
   - Development of a clear and easy to read document/manual.
   - Development of PPT slides for the buy in of upper level management.

5) **Who is the intended audience for the products/deliverables? Identify training needed and describe the use of products/deliverables.**
The product of this research is aimed at all levels of supervision and management in the highway operations and maintenance. Specifically, the document/manual will be helpful to the supervisors, where at the PPT slides will to used by supervisors to obtain buy in from upper level managers.

6) **How will they be used to impact your organization? How would they benefit DOTs? Describe how the research recommendations can be used to improve the winter maintenance operations of state transportation systems**.
If accepted by the group, this project has the potential to help maintenance operations, fleet and equipment repair shops, and all levels of leadership from the district to statewide level.

   The outcomes of this project can positively impact fleet management practices, especially with regard to that of underutilized equipment. By reducing equipment downtime, we can improve level of service.

7) **How will you measure the success of this project?**
A Clear Roads Research Use Survey will be distributed one year after the completion of the project. The results of this survey will be shared with the TAC for individual follow up as appropriate.

8) **Estimated funding needed.**

$150,000 - $175,000 (depending on the number and method of conducting case studies)

9) **Estimated timeline for completing the research.**
   - Six (6) months _____
   - Twelve (12) months _____
   - Eighteen (18) months ___X__
   - Other: _____ months

10) **Are you aware of any similar or related research on this topic? If so, please list below.**
CR has funded and completed several projects, both research and synthesis, whose deliverables have given us BMP manuals and synthesis of state practices regarding efficiency in the use of materials and resources.

These projects have produced valuable deliverables that can help guide agencies as they seek to provide acceptable levels of service with less available resources. Examples include…

- CR 15-03 North American Study on Contracting Snow and Ice Response
- CR 14-07 Identifying Best Practices for Snowplow Route Optimization

2017 Research Proposal Form

Proposer name: 2017 CR research group #3
Organization: Fleming (PA), Lester (CO), Trennepohl (AZ), Longworth/Droste (MI), Lashmet (NY), Miller (MO)

Title of proposed research project:
Integrating Advanced Technologies into Winter Operations Decisions
(BMP for Future of Winter Maintenance).

Topic Area (highlight one):
Methods Equipment Materials Training Technology Safety

1) **Explain the specific problem or issue to address**.
There are many new technologies available to evaluate road conditions and measure response. Clear Roads has projects to evaluate sensor and AVL technologies. However, many agencies still rely on older technologies/practices for decision making, or have some new technologies, but don't incorporate them into decision making. What is needed is a comprehensive guide to provide a blueprint on what the future of winter operations is and how these technologies, and the parameters they collect, should be used for decision making.

2) **What is the goal of the project?**
A BMP guide spelling out the technologies available for winter operations; what these technologies measure; how to incorporate them into a winter maintenance operations strategy; and make the technology successful. Also how to incorporate future technologies (i.e. connected vehicles and advanced sensors).

3) **Describe the expected products/deliverables of the research.**
Summarize traditional methods for winter maintenance operation decision making. Summarize technologies available for winter maintenance (What they measure. How they can be used for operational planning, performance monitoring, and reporting). Why they are better than traditional practices. Generate a blueprint of what technologies agencies should use now and could use in the future and what parameters they should use for decision making (i.e. grip, MDSS, WSI, AVL, etc). What is level of investment? What are returns on investment?

   Easy to read BMP guide with charts (similar to salt BMP guide). Powerpoint presentation summarizing BMP recommendations.

4) **List the specific research tasks that would form the scope of work. (What steps will the researcher need to take to develop the deliverables?)**
Lit Search. Review recent and ongoing Clear Roads projects. Conduct survey of agencies on technologies agencies use, why they use them, and how they made decisions prior to the technology.

5) **Who is the intended audience for the products/deliverables? Identify training needed and describe the use of products/deliverables.**

Managers/Supervisors. Powerpoint to introduce topics of guide, when approaching management. Note there is another proposal aimed to convince/teach operators on new technologies and decision parameters.

6) **How will they be used to impact your organization? How would they benefit DOTs? Describe how the research recommendations can be used to improve the winter maintenance operations of state transportation systems**.
BMP guide would be good to share with executives and managers to employ new technologies and employ new strategies for winter maintenance.

7) **How will you measure the success of this project?**
Follow up with agencies to see if BMP recommendations are being used. Note which items have been implemented in agencies after BMP guide release.

8) **Estimated funding needed.**
$75,000 - $100,000

9) **Estimated timeline for completing the research.**
- Six (6) months _____
- Twelve (12) months __x___
- Eighteen (18) months _____
- Other: _____ months

10) **Are you aware of any similar or related research on this topic? If so, please list below.**
No

2017 Research Proposal Form

Proposer name: Mike Lashmet
Organization: NYS DOT Region 6

Title of proposed research synthesis or project:
Traffic Demand Management during Storms through Use of Variable Message Sign-mounted Cameras

Topic Area (highlight at least one):
Methods Equipment Materials Training Technology Safety

1) **Explain the specific problem or issue**.
Variable Message Signs (VMS) are proven to be effective in providing drivers with information about roadway conditions and with direction about preferred driving responses to those conditions. In rural areas with limited information technology infrastructure, that effectiveness is limited by the lead time needed to discern roadway conditions about which to warn drivers, the challenge of keeping messages current with changing conditions, and uncertainty about the geographic extent of hazardous driving conditions. Drivers will disregard VMS messaging if storm related messages are not applicable to road or weather conditions that drivers experience as they receive the messages.

2) **What is the goal of the project?**
The goal is to provide messaging on a closer to real time basis than is now practicable, enabling better decision-making by drivers about whether to travel and what routes to use. Installing cameras on the VMS we use to advise motorists would provide continuing information about weather and road conditions, traffic volumes, and highway incidents to our Transportation Management Center (TMC) operators, who could then revise messaging appropriately to conditions in less time than is now necessary to get reports from field staff and with greater location-specific accuracy than is now available from weather reports.

3) **Describe the expected products/deliverables of the research?**
- More accurate VMS messaging with better direction to motorists.
- More timely VMS messaging based on TMC operators' direct observations without the need to wait for information from field staff.
- More timely awareness of when messaging can end, reducing the trend of drivers becoming inured to, and ignoring, storm messaging.

4) **List the specific research tasks that would form the scope of work, ie. What steps will the researcher need to take to develop the deliverables?**
- Install cameras on twenty-two (22) variable message signs dedicated to positions along the Interstate highways in NYSDOT Region 6
- Train TMC operators in the use of the cameras (pan, tilt, zoom, etc) and in resolving the camera image information with information from other sources (weather reports, field supervisors, police agencies, etc.)
- Develop a set of prepared-in-advance messages for the most common conditions/incidents, so operators have messages at hand when needed.

5) **Who is the intended audience for the products/deliverables? Identify training needed and describe the use of products/deliverables.**
Drivers are the immediate audience for the improved messaging – more accurate and timely information

will help drivers make better travel decisions. Additional beneficiaries include NYSDOT field staff and other incident response agencies, who could expect fewer incidents requiring response. The needed training is as noted in item 4 above.

6) **How will they be used to impact your organization? How would they benefit DOTs? Describe how the research recommendations can be used to improve the winter maintenance operations of state transportation systems.**
The information will be used for better travel demand management during storms and incidents. We anticipate that results and recommendations from this project will improve winter maintenance outcomes by relieving some portion of the demand on maintenance supervisors to report conditions to the TMC, freeing them to concentrate on snow and ice control activities.

7) **How will you measure the success of this project?**
Indicators of success will include**:**

- More messaging initiated independently of field supervisors' input
- More timely changing or termination of messages as conditions change
- Favorable feedback from drivers on social media platforms

8) **Estimated funding needed.** $100,000

9) **Estimated timeline for completing the research.**
- Six (6) months _____
- Twelve (12) months _____
- Eighteen (18) months __X___
- Other: _____ months

10) **Are you aware of any similar or related research on this topic? If so, please list below.** No

CLEAR ROADS
research for winter highway maintenance

2017 Research Proposal Form

Proposer name: Jonathan Fleming
Organization: Pennsylvania DOT

Title of proposed research project:
Using New Technologies to Train Snowplow Operators

Topic Area (highlight one):
Methods Equipment Materials Training Technology Safety

1) **Explain the specific problem or issue to address**.
Current training programs and practices follow traditional educational methodology. Today's operators are technologically savvy and will benefit from refreshed, technology-driven training methodologies.

2) **What is the goal of the project?**
Develop a guide to assist trainers who are updating or developing training programs to incorporate the use of new technologies and social media as a supplement to the traditional educational delivery method.

3) **Describe the expected products/deliverables of the research.**
This research will deliver a guide trainers can use to develop programs, or modify existing programs, using training techniques and methodologies to take advantage of access to current technology.

4) **List the specific research tasks that would form the scope of work. (What steps will the researcher need to take to develop the deliverables?)**
Research new educational methodology, paying particular attention to community and/or technical colleges, incorporating new social media examples into training programs like cell phone use, apps, and social media outlets.

5) **Who is the intended audience for the products/deliverables? Identify training needed and describe the use of products/deliverables.**
Snowplow operators and entry level managers who utilize electronic media and information from systems like RWIS, AVL, etc.

6) **How will they be used to impact your organization? How would they benefit DOTs? Describe how the research recommendations can be used to improve the winter maintenance operations of state transportation systems**.
Transportation entities need to upgrade how they present their educational programs. As colleges (including community and/or technical) and high schools change the way they instruct, so should state DOTs. This research is designed to engage operators at an early stage by using techniques developed at educational institutions to engage their learning.

7) **How will you measure the success of this project?**
Through the feedback received from trainees receiving the new training and the ease of incorporating the techniques developed by this research project into existing programs.

8) **Estimated funding needed.**
$125,000 to $150,000

9) **Estimated timeline for completing the research.**
- Six (6) months _____
- Twelve (12) months _____
- Eighteen (18) months __X___
- Other: _____ months

10) **Are you aware of any similar or related research on this topic? If so, please list below.**
I am not aware of any new training techniques that have been developed for the transportation industry.

2017 Research Proposal Form

Proposer name: Patti Caswell
Organization: Oregon Dept. of Transportation

Title of proposed research project:
Combined Impacts of Magnesium and Sodium Chloride on Chloride Migration

Topic Area (highlight one):
Methods Equipment Materials Training Technology Safety

1) **Explain the specific problem or issue to address**.
ODOT, like other DOTs uses both MgCl2 and NaCl deicers to efficiently manage its winter highways. While research has shown use of MgCl2 is generally more protective than NaCl, both deicing salts release chloride ions which damage highway infrastructure, vehicles, and the environment. Because of widespread use, there is a need to examine both these roadsalt deicers, quantify their chloride exposure risks, and then determine if those risks are consistent when MgCl2 and NaCl deicer salts are used singly or combined.

2) **What is the goal of the project?**
To determine the amount of chloride MgCl2 and NaCl deicers potentially released into the environment and determine if combined use of these deicers influence total chloride releases or impact chloride mobility in the environment.

3) **Describe the expected products/deliverables of the research.**
Findings from this research would provide a method to estimate chloride releases resulting from road applications of NaCl and MgCl2. Findings could also provide a basis to develop road salt application BMPs for MgCl2 and/or NaCl that may help minimize chloride impacts.

4) **List the specific research tasks that would form the scope of work. (What steps will the researcher need to take to develop the deliverables?)**
This project would first calculate the total mass of chloride theoretically released when NaCl and MgCl2 are applied to the highway. Then this quantity would be compared to actual chloride released by setting up bench tests that simulate the application of salt to the highway. These tests would measure or calculate total chloride applied, the movement of chloride as it migrates across or through various highway materials and then the final quantity of chloride discharged into the surrounding environment. Bench tests would measure chloride application and migration for both NaCl and MgCl, but also measure combinations of these salts in different forms (rock salt, rocksalt pre-wet with MgCl, salt brine, etc.)

The intent would be to develop calculation methods that could be used by DOTs to estimate the amount of chloride released from the highway prism after deicer salts are applied. How much of the applied chloride is expected to leave the highway as the chloride makes its way across highway surfaces? How much of the applied chloride is expected to infiltrate into the ground through highway shoulder materials? Is there a difference in the amount of Cl moving through the highway prism depending on whether its source is MgCl2, or NaCl, or a combination of the two deicers?

5) **Who is the intended audience for the products/deliverables? Identify training needed and describe the use of products/deliverables.**
DOTs or Environmental regulators concerned with chloride contamination from highway salt deicers would have an interest in this project. The project would provide a tool to estimate actual chloride contamination quantities that result from deicer salt applications.

6) **How will they be used to impact your organization? How would they benefit DOTs? Describe how the research recommendations can be used to improve the winter maintenance operations of state transportation systems**.
If the amount of deicer salt applied to the highway is known, and the amount of chloride ultimately released to the environment can be estimated, then a general assessment of environmental risk can be made. This research would ultimately provide a tool to assess chloride contamination risks that are associated with the use of MgCl2 or NaCl (the most common highway deicer chemicals). Long term application of the research findings would be the ability to identify or map high risk chloride highway areas that could be managed or mitigated for chloride impacts.

7) **How will you measure the success of this project?**
Immediate success would be measured by estimating chloride release quantities using project calculation methods, then comparing these estimates with actual chloride numbers measured in the field. Long term success would be demonstrated if project findings resulted in MgCl2 and NaCl application BMPs that helped control chloride releases or migration. If it is found that combined MgCl2 and NaCl applications do not influence chloride release, the project would still prove valuable in that it could provide a method to identify high risk chloride highway areas, ultimately resulting in special management areas where chloride impacts could be mitigated or better managed.

8) **Estimated funding needed.**
$200,000

9) **Estimated timeline for completing the research.**
- Six (6) months _____
- Twelve (12) months _____
- Eighteen (18) months _____
- Other: __24__ months

10) **Are you aware of any similar or related research on this topic? If so, please list below.**
EPA research?

2017 Research Proposal Form

Proposer name: Brian Burne
Organization: Maine DOT

Title of proposed research project:
Standardized Specifications/Subject-Based Web Pages

Topic Area (highlight one):
Methods **Equipment** **Materials** Training Technology Safety

1) **Explain the specific problem or issue to address.**
Clear Roads has become a leading national snow and ice organization. It seems appropriate that we should have subject-based web pages that would include related research reports and recommended base specification templates for numerous items that are required in any snow and ice agency. Examples would include things like salt, carbide plow blades, equipment, etc… An example for the salt would be a web page that includes our recent *Roadway Salt Best Management Practices* report, samples of several state specifications, and a base specification that would have sections where an entity might pick which options they prefer (e.g. gradation specs with 3 or 4 different choices, different penalty options, delivery options, etc.) It would help with moving research into practice more quickly and more consistently.

2) **What is the goal of the project?**
Establish Clear Roads as a national resource for snow and ice information and specifications, which will promote better consistency and predictability for the various suppliers and contractors.

3) **Describe the expected products/deliverables of the research.**
Web pages dedicated to specific categories that include information on research, specifications, product experience, and other information as applicable.

4) **List the specific research tasks that would form the scope of work. (What steps will the researcher need to take to develop the deliverables?)**
Collect pertinent information from states, past Clear Roads efforts, and potentially other partners (AASHTO, APWA). Sort through them for common threads and differences, consolidate them down to primary options, and present the information in a logical and accessible manner.

5) **Who is the intended audience for the products/deliverables?**
Identify training needed and describe the use of products/deliverables. All DOTs and Public Works entities.

6) **How will they be used to impact your organization? How would they benefit DOTs? Describe how the research recommendations can be used to improve the winter maintenance operations of state transportation systems.**
They would educate quickly and save people time. Just consider the emails we send amongst each other now. If we had one on salt, it would have helped Dave in NH. If we had one on AVL, it would have helped Justin in MI. We all deal with the same stuff, we just need to organize it better and fill in the gaps with our research.

7) **How will you measure the success of this project?** Web hits

8) **Estimated funding needed.** $10-20k each

9) **Estimated timeline for completing the research. 6 to 12 months each**
   - Six (6) months __X___
   - Twelve (12) months _X___
   - Eighteen (18) months _____
   - Other: _____ months

10) **Are you aware of any similar or related research on this topic? If so, please list below.**
Depends on the selected topic.

2017 Research Proposal Form

Proposer name: Brian Burne
Organization: Maine DOT

Title of proposed research project:
Winter Preparedness Web Page

Topic Area (highlight one):
Methods Equipment Materials **Training** Technology Safety

1) **Explain the specific problem or issue to address.**
This project is along the lines of the "Ice and Snow, Take it Slow" effort. It's about standardized messaging, presented in a clear and professional manner, that all of our states can use. This particular effort is aimed at developing a Winter Weather Preparedness Web Page (or pages) that will focus on educating the public about being prepared for winter.

2) **What is the goal of the project?**
Educate the masses in a clear, consistent, and professional manner. Provide a resource for driver education. Provide an informative web link for each of our state DOT web sites.

3) **Describe the expected products/deliverables of the research.**
Web pages dedicated to specific topics such as snow tires vs. all-season tires, tire chains, driving around plows, preparing your vehicle for winter, driving in snow, staying off the roads, etc.

4) **List the specific research tasks that would form the scope of work. (What steps will the researcher need to take to develop the deliverables?)**
Collect pertinent information from states, including past Clear Roads efforts, and other sources. Compile the best information, fill in the gaps, develop the web pages, and give them to Clear Roads to post as part of their web site.

5) **Who is the intended audience for the products/deliverables? Identify training needed and describe the use of products/deliverables.**
The public, all DOTs and Public Works entities, driver education schools.

6) **How will they be used to impact your organization? How would they benefit DOTs? Describe how the research recommendations can be used to improve the winter maintenance operations of state transportation systems.**
I will link our DOT web site to it and not have to develop it myself.

7) **How will you measure the success of this project?** Web hits and a better educated public.

8) **Estimated funding needed.** $50k?

9) **Estimated timeline for completing the research.** 6 to 12 months
   - Six (6) months __X___
   - Twelve (12) months _X___
   - Eighteen (18) months _____
   - Other: _____ months

10) **Are you aware of any similar or related research on this topic? If so, please list below.**

2017 Research Proposal Form

Proposer name: Larry Gangl
Organization: NDDOT

Title of proposed research project:
Guide to Implementation of Snowplow Route Optimization

Topic Area (highlight one):
Methods Equipment Materials Training Technology Safety

1) **Explain the specific problem or issue to address**.
Clear Roads has completed the project, C*R 14-07 Identifying Best Practices for Snowplow Route Optimization* and I am looking at the next logical step which is how to move forward with implementing a snowplow route optimization program.

2) **What is the goal of the project?**
Develop a process or guide to assist states, which have not yet optimized their snowplow route system, describing how to proceed with the implementation of that process.

3) **Describe the expected products/deliverables of the research.**
A document that can be used as a "How To" or "Best Practices" for implementation of snowplow route optimization.

4) **List the specific research tasks that would form the scope of work. (What steps will the researcher need to take to develop the deliverables?)**
Interview other states or other individuals that have experience in route optimization to determine what may be needed to implement such a system. This may include learning more about the following items, such as technology, data (not just data generated by GPS/AVL equipment but also data about the network roadways and the plow vehicles), training, and the costs associated with those.

5) **Who is the intended audience for the products/deliverables? Identify training needed and describe the use of products/deliverables.**
Winter maintenance managers, snowplow operators, and route modelers.

6) **How will they be used to impact your organization? How would they benefit DOTs? Describe how the research recommendations can be used to improve the winter maintenance operations of state transportation systems**.
We are currently looking at optimizing truck routes statewide and trying to determine the process on how to proceed.

7) **How will you measure the success of this project?**
By the improved efficiency of plowing operations as measured by both labor and fuel cost savings.

8) **Estimated funding needed.**
$50,000

9) **Estimated timeline for completing the research.**
Twelve (12) months _X____

10) **Are you aware of any similar or related research on this topic? If so, please list below.**
No.

2017 Research Proposal Form

Proposer name: David Gray
Organization: NHDOT

Title of proposed research project: Online pre-treatment advisor

Topic Area (highlight one):
Methods Equipment Materials Training Technology Safety

1) **Explain the specific problem or issue to address**.
Maintenance doesn't have a good grasp as to when to pre-treat the roads and when not too.

2) **What is the goal of the project?**
The goal of this project is to have an online tool that will allow a person to enter data such as chemicals available for pretreating, and the road and weather conditions, and the output of the tool will be to provide an effective pretreatment plan.

3) **Describe the expected products/deliverables of the research.**
An online tool.

4) **List the specific research tasks that would form the scope of work. (What steps will the researcher need to take to develop the deliverables?)**
Need to find out what are the conditions in which pre-treatment should and should not be done. A list of the chemicals that are used for pre-treatment and the effects of them according to different road and weather conditions.

5) **Who is the intended audience for the products/deliverables? Identify training needed and describe the use of products/deliverables.**
Maintenance supervisors would be the audience for this product. There would be a need for a training guide.

6) **How will they be used to impact your organization? How would they benefit DOTs? Describe how the research recommendations can be used to improve the winter maintenance operations of state transportation systems**.
This tool would provide DOTs the ability to input the road and weather conditions and see is any of the chemicals they have to pre-treat should be used on the roads for each storm.

7) **How will you measure the success of this project?**
An effective tool that helps DOTs with pre-treating the roads.

8) **Estimated funding needed.**
$75,000

9) **Estimated timeline for completing the research.**
   - Six (6) months _X____
   - Twelve (12) months _____
   - Eighteen (18) months _____
   - Other: _____ months

10) **Are you aware of any similar or related research on this topic? If so, please list below.** No.

2017 Research Proposal Form

Proposer name: Group 5 (Cliff Spoonemore and Brian Burne)
Organization: DOT (WYDOT & MaineDOT)

Title of proposed research project:
Standard Specification for Carbide Insert Blades and Carbide Insert

Topic Area (highlight one):
Methods Equipment Materials Training Technology Safety

1) **Explain the specific problem or issue to address**.
Each State DOT has a specification for Carbide Blades. They may vary in size, weight, or other small difference. This project would create a Clear Roads carbide blade standard specification available for all states to use when bidding carbide blades. This should result in cost savings for the State DOT's.

2) **What is the goal of the project?**
To goal will be to allow the manufacturing industry to reduce their costs for carbide blades and pass those savings on to the State DOT's. With one common specification for all 34 Clear Road States, the buying power connected to a single agreed upon specification would be greater. Inventory management would also be less complicated. Counties and cities would also be able to take advantage of this single specification. Using one standard specification would potentially allow for Procurement Coalitions to bid one uniform standard for carbide blades.

3) **Describe the expected products/deliverables of the research.**
Collect the current specification for carbide blades from all 34 Clear Roads states. Correlate the information and create a common single version of the carbide blade specification. The PI would also need to collect the vendors' current best carbide blade. Each vendor also has a unique shape for their carbide insert. The finished spec would need to account for this fact and allow them to bid using nominal dimensions rather than a hard and fast shape.

The reason for not creating a specific shape is to allow the vendor to have their unique shape of carbide on hand and this would also allow them to cut down on delivery time. Using their customary shape that fits the nominal dimensions will allow them to meet the specification without causing them to modify their process completely.

4) **List the specific research tasks that would form the scope of work. (What steps will the researcher need to take to develop the deliverables?)**
   - Collect all 34 Clear Roads members current specification for plow blades with carbide insert.
   - Collect from the carbide blade vendors their most common carbide blade and insert shape.
   - Break down the common elements of each specification.
   - List the common elements, and list the special non-common elements.
   - Evaluate what elements have to be in the specification and what elements may help improve the overall specification.
   - Present a draft to the Project TAC for comments and edits.
   - Prepare a synthesis of the project to explain how the specification was developed.

- Prepare a carbide blade specification and drawing, e-drawing files, Auto-CADD and/or MicroStation.
- Receive feedback from the Clear Roads TAC.

5) **Who is the intended audience for the products/deliverables? Identify training needed and describe the use of products/deliverables.**
All agencies that use plow blades with carbide inserts to protect the mold board.

This specification and detail drawing should be available to be included in the bid documents for each DOT or other agency.

No training should be needed.

6) **How will they be used to impact your organization? How would they benefit DOTs? Describe how the research recommendations can be used to improve the winter maintenance operations of state transportation systems**.
With one common specification, the bid process should result in cost savings. The inventory of carbide blades will become consistent. Should other states or agencies need to secure carbide blades from each other, the carbide blades will be consistent. Bidding Coalitions will also be able to bid one common specification.

Cost savings should be passed on from the manufacturer if they do not have to maintain a multi-sized inventory of carbide blades and use their most common carbide insert.

7) **How will you measure the success of this project?**
After bidding with the new specification for carbide blades, the 34 Clear Roads members will be able to report if they have implemented the new specification into their bid process. They would also be able to show a history of the purchase prices to determine if the cost savings has been passed down from the manufacturer. This will take some time and effort to track by each individual state.

8) **Estimated funding needed.**
$15,000 - this really should be a man-hour project. Any drafting is a secondary item.

9) **Estimated timeline for completing the research.**
- Six (6) months __X___
- Twelve (12) months _____
- Eighteen (18) months _____
- Other: _____ months

10) **Are you aware of any similar or related research on this topic? If so, please list below.**
Brian Burne of Maine DOT tried to correlate several specification in his spare time. He found that he did not have the spare time to accomplish the task. This task may sound simple but it may have several pitfalls that will not show up until Clear Roads begins this project.