

## ***Introduction***

*Sodium chloride, better known as common rock salt, has been the choice of snow and ice control for many years. The initial cost, ice melting performance, availability, and ease of handling have made it the most wide spread chemical in use today. Although rock salt has long been considered the premier de-icer, there are negatives associated with its use which are becoming more evident each passing season. Currently it is the most cost effective chemical for maintaining safe driving conditions during the winter. However it is not as environmentally friendly as many would like it to be. At the present time, use salt, but use it wisely.*

*Numerous companies, organizations, and individuals are competing in the search to identify winter maintenance chemicals that will perform better than “salt” and remain affordable. Stringent demands are being placed on the new chemicals and they will be required to be less corrosive, offer a wider range of working temperatures, lower the overall amount necessary, and also be environmentally friendly. These attributes and probably some others will need to be met before the “magic formula” for snow and ice control will ever truly be found.*

*As these new formulas and chemicals are introduced, the need arises for us to evaluate their potential benefits. Data must be collected and analyzed so that each of these winter maintenance chemicals can be considered and compared with each other as well as the current material used. This “Basic Field Evaluation” booklet provides the format needed to carry out such an evaluation process. Although there are a huge number of variables involved with snow and ice control, by following the guidelines within these pages, a sufficient evaluation and comparison will be made.*

*Providing the safest winter driving conditions possible within a publicly acceptable time frame will always remain one of Mn/DOT Maintenance’s highest priorities.*

***John Tarnowski***  
***Maintenance Research Project Manager***  
***Mn/DOT Maintenance Research***

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*Weighing the Balance of the Data*

*Choosing a chemical for evaluation*

First, identify the reasons why you want to evaluate a new chemical for winter maintenance. There may be many, however, choose several of the main points because this will provide for a better comparison. Remember, whichever chemical is chosen, the reasons for its evaluation will have to be addressed during the testing process. Other areas for evaluation may come to light, however, the main reasons for conducting the evaluation should always be the primary focus.

Listed below are the most common reasons Mn/DOT Maintenance Research has heard for evaluating a new de-icing or anti-icing chemical.

- *More cost effective*
- *Lower application rates*
- *Wider range of working temperatures*
- *Less corrosive-equipment lasts longer*
- *Less bounce and scatter – stays in place better*
- *Begins de-icing or melting action faster*
- *Helps the Minnesota economy by using products from local businesses*
- *Environmentally friendly for the ground water and vegetation*
- *Mixing not required*
- *Dissolves and is completely unnoticeable in water*
- *Leaves a residue on the road surface- provides an anti-icing effect*
- *Provides safer driving conditions throughout the winter storm*
- *No need to purchase or use on-board pre-wetting equipment*
- *Improves friction on the road surface*
- *Reduces accidents*
- *Easy to store*

These are the most common reasons that requests are made to evaluate new chemicals and products for winter maintenance. As the principle investigator you will have to decide which reasons you are going to use to justify your evaluation request, and what process or field tests will be utilized so that data can be collected, analyzed, and a conclusion reached about the use of the chemical. To sum it up, decide what the primary reasons are why you want to evaluate a different winter maintenance chemical. Write them below.

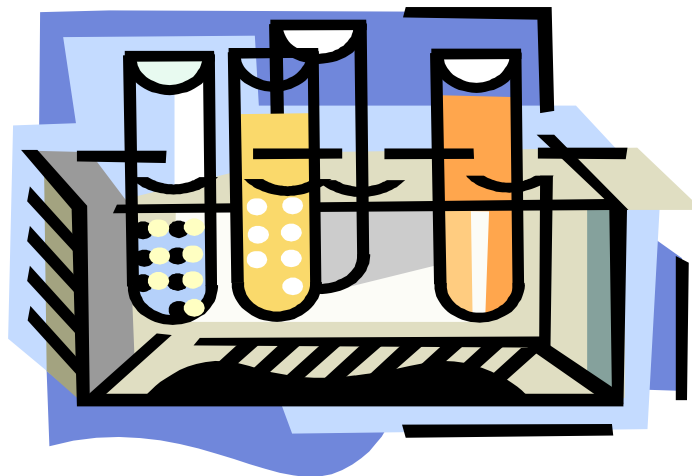
1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

Now decide what are some of the secondary reasons for the chemical evaluation and write them down.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

Now that you have completed this you can compare these reasons to the chemical that you are going to request an evaluation on. If the chosen chemical does not meet or exceed your reasons you may want to search for another that does. Many times a vender will offer different formulations and one may suit your needs.

Remember, you must decide *why* you would like to field test and evaluate a chemical that has not been used in Mn/DOT. What will be gained by the evaluation? What will be the result of a positive or negative evaluation and who or what would benefit from it? Just “*trying out*” every new chemical that becomes available is next to impossible. New ones are being introduced every year and many with little or almost no differences, short of a name change. Your responsibility is to decide what chemical is “new” and if it will meet your primary and secondary reasons for requesting an evaluation. Once you have done this and you have decided what chemical you would like to evaluate, you can explain it to the Maintenance Research and Training Engineer in your proposal for an evaluation. (See page 6) Once this is done you can set up a test and control area and decide how tests and comparisons will have to be performed and how they will be accomplished.



*Requesting an evaluation*

**The initial role of the Maintenance Research and Training Engineer is to prevent redundant evaluations, and then oversee the approval process and coordinate statewide project evaluations.**

**Before any new de-icing chemicals are used on Minnesota maintained highways and interstate freeways, they must go through a screening process administered by the Maintenance Research and Training Engineer. Several other offices assist in this pre-screening and analyze the information supplied by the vender. If approved, a lab evaluation will be conducted which will determine the melting capacity, undercutting, and other related items, to insure that the chemical is capable of performing as stated. For more information on this process contact the Maintenance Research and Training Engineer at the address or phone number listed below.**

**The screening process can take several months, however, an initial field evaluation may be granted before the process is completed. This is entirely at the discretion of the Mn/DOT Research and Training Engineer. In your proposal for evaluation be sure to include the reasons why you would like use a new anti or de-ice chemical, how you plan to test and compare it, and all other information that the Maintenance Research Proposal Form asks for. If questions arise about the completion of the proposal contact the Office of Maintenance - Operations Research Unit at (651) 297-7576.**

**Fill out the project proposal on page 6 and send it to the Maintenance Research and Training Engineer to get the process started. Include any information that you can, such as brochures, etc. about the new chemical. You will be contacted if or when other information is required.**

*Mn/DOT Maintenance Research and Training Engineer  
Mail Stop 722  
395 John Ireland Blvd.  
St. Paul, MN 55155-1899*

*Office Phone # 651/282-2281  
Fax # 651/296-6758*

# **Mn/DOT Maintenance Research Proposal – Chemical Use**

**Project Name:**

**Date of proposal:**

**Proposal sponsor/champion:**

**Office:**

**Principal Investigator:**

**Funding requested:**

**Synopsis:**

**Background:**

**Description / Analysis: .**

**Proposed Evaluation Criteria:**

**Performance measures to be tracked:**

**Assumptions to be made:**

**Project implementation:**

Please submit this to Linda Taylor, MS 722, 651/282-2281

Figure 1

*Setting up a Test and Control Section*

Now that you have selected a chemical and sent in a proposal, it is time to think about a location for the evaluation. This is not a difficult task, however, there are some points and questions to consider which may affect your decision.

1. The test section should be easily compared to the control section. Try to choose an area of roadway where both the new (test) and old (control) sections and chemicals can be visibly monitored. Many times a divided highway will work out for this by utilizing one direction as the test and the other as the control. Another way is to have an intersection point where one chemical ends and the other begins. This way some “tracking” of either chemical may occur however it will only be for a short distance. Intersections with other districts or maintenance areas can also work well as well as with county and city roads. The important thing to remember is that there is a distinction point to monitor and compare the short and long-term melting and frost prevention capacity of both the old and the new chemical.
2. Roadside terrain and vegetation can be a factor to consider. Will trees or other obstacles block the sun? If so, it should do so on both the test and control sections.
3. Is the road surface material the same for both the test and control? (concrete or bituminous)
4. Will the wind be blowing in the same directions for each area, as the highway changes directions etc., and will wind gusts and drifting be possible on both the test and control?
5. Will traffic volumes be the same? At a main intersection or interchange a large number of vehicles can change directions and turn off. This could have an effect if the test and control change takes place and continues in the first or previous direction.
6. Levels of service have to be the same for both the test and control and also the number of trucks, equipment, and personnel assigned to them.
7. Application rates, and all other pertinent information will have to be recorded for both sections. How can you record what is being done in another district if the change takes place between the two?

Hopefully the above will give you some idea of the things that should be considered when choosing your test and control sections. This is important because the information collected from each section will help you draw a conclusion for your final report and a recommendation as to the use of the new chemical.

## *Collecting and Recording Information*

A good evaluation will not occur unless the data and information is recorded in a legible manner. Recording forms should be kept clean and unfolded and they should be placed in a file or folder. Keep them in the order that they were dated. By taking these simple steps during the data collection process it will make the following steps of the evaluation much easier.

The next page contains a sample of the form that should be used for all anti-icing and de-icing chemicals involved in field evaluations. Use of this form will insure that the majority of the necessary information will be collected for each chemical. They should be filled out as completely as possible at the end of the shift and/or the new chemical is used. When completed they should be placed in a pre-selected file or folder.

*Unless all pertinent data is recorded, the Field Evaluation of a new chemical anti-icer or de-icer can not be made in a reputable manner. This is the reason for completing the form on the next page as completely as possible.*

*When comparing chemicals such as sodium chloride to a another chemical such as an agricultural magnesium chloride mix, one form should be filled out for the test and control. (sodium chloride and one for the new chemical being evaluated.)*



*Good Recording = Good Reporting*

# Anti and De-ice Chemical Field Evaluation Form

This form is for the Test \_\_\_\_\_ Control \_\_\_\_\_ section of the project

Chemical Name \_\_\_\_\_ Recorded by \_\_\_\_\_

	Sun	Mon	Tue	Wed	Thur	Fri	Sat
<b>Date</b>							
<b>T.H. #</b>							
<b>MP to MP</b>							
<b>Time of Application</b>							
<b>Application Rate</b>							
<b>Surface Temperature</b>							
<b>Air Temperature</b>							
<b>Type of Event</b>							
<b>Bare Pavement Lost</b>							
<b>Time Regained</b>							

**Comments**

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The form on page 9 can be copied and new forms should be used for each week of the evaluation period. Under the comments section include information such as, changes in mixing formulas, comments about the visual inspection of “non-use” areas, or comparisons with other roadways. Use the back of the form when more room is needed and always include the date that the comments pertain to. You may want to include information about any problems encountered or personal observations. The main thing to remember is that the more information you write now, the easier it will be to complete your final evaluation later.

Because this form will be used for many different chemicals, liquid and solid, for deicing and anti-icing, and more, it is highly probable that other information will have to be recorded. Use the back or another sheet of paper and attach it to the form. Just because a data column is not on the form does not mean that it is not necessary. You can go back to your reasons for requesting the evaluation and determine if more information will have to be collected.

The next pages of this booklet deal with comparing, evaluating, and reaching a conclusion. All research projects have to include these three parts or they are not really research. In some cases it can be difficult to reach a conclusion, however, it is necessary or a research project is never really “ended” it is simply closed until reopened at a later date.

## ***Research;***

*A scholarly or scientific investigation or inquiry, a close and careful study.*



## *Evaluating and Comparing*

**At the beginning of the project you should have had an idea as to the duration of the project. If all has gone well and the weather and other non-controllable factors have co-operated, you now have enough data collected to evaluate and compare. This will lead to a conclusion as to the value of the new chemical.**

**Depending on the types of tests performed, evaluations will vary. With some test values, averages can be determined. Because of all the variables relating to snow and ice control chemicals, an average gives the overall picture for the long term. Some of the information that can be evaluated and compared with an average includes,**

- 1. Bare pavement regain time**
- 2. Application rates**
- 3. Pavement temperature**
- 4. Air Temperature**

**When the above information is averaged and then compared for both the test and control sections, a picture will develop. The information that ensues can then be analyzed by you and a price placed on each chemicals value accordingly.**

**It is a little more difficult to evaluate comments and observations by operators and others which reflect personal opinions or can not be measured. One way is to set up a simple question and answer page. A sample can be found on page 15 of this booklet. This can work well when several operators or input from other observers is involved. Set up your page with questions that require simple yes or no answers. Like or dislike can work also. From the comments you read on the Field Evaluation Forms you can get a good idea on what questions to ask on your "Questionnaire." This can reveal some good information that will also move you closer to a conclusion.**

**Although these may not be the most scientific methods of evaluation and comparing, they will assist you in reaching a conclusion. You (or others working with you) may be able to come up with more ideas to measure and compare the value of these chemicals. This is excellent! That is exactly what a research project requires to make it successful.**

*Success can be measured in many ways.*

## *Reaching a conclusion and Reporting the Findings*

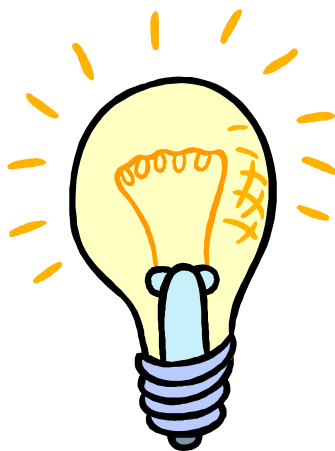
The project timeline has been achieved, you have collected data and the information has been recorded and evaluated. Now it is time to reach a conclusion and report your findings.

Look at your original reasons for deciding to participate in the evaluation of the chemical. Were all of your primary reasons and questions answered? What about secondary? If so, you should be able to address each reason with the information you found by comparing, and reach a conclusion. On the Chemical Field Evaluation-Test form located on pages 13 and 14, you are going to include all of your findings and you will be asked to make a recommendation as to whether or not this chemical should be used based on your findings. This will be your conclusion and the end of the project. This will also be your final reporting of the project.

The chemical may or may not have worked the way it was claimed to. Because you were able to test, collect data, evaluate, compare, and reach a conclusion, the project will be deemed a success.

Remember, if you have questions or comments feel free to contact the Central Office Maintenance Operations-Research Unit at, 651/ 297-7576. After the Maintenance Research and Training Engineer has reviewed your findings the report will be included in the NTREC/MORE Biannual Report as well as other project reports then sent out statewide and to other agencies that may be interested.

This Basic Field Project Guide is meant to be just that, a guide only. Use your imagination and many new ideas will come to light.



**Mn/DOT MAINTENANCE  
CHEMICAL FIELD EVALUATION-REPORT**

Date of Approval Letter:	District and Subarea/Office:
Project Title:	
Project Sponsor:	Sponsor Phone:
Principal Investigator:	Date Reported:
Project Manager:	
Purpose of Field Test:	
Test Procedure:	
Material Used:	Material Cost when Acquired:

Equipment Used:	Equipment Cost when Acquired:
Test Results:	
Actual Duration in Months:	Actual Date Completed:
Est. Reduction in Costs:	Est. Time Savings:
Cost of Training:	Project Life Expectancy:
Conclusions:	
Persons Present:	

*Sample Questionnaire*

1. Do you believe that the melting and bare pavement times were reduced by using the new chemical? Yes\_\_\_\_\_ No\_\_\_\_\_
2. Was there a noticeable residue or substance left on the roadway after the application dried? Yes\_\_\_\_\_ No\_\_\_\_\_
3. On the day following the storm after the road surface had dried, was there any material left over that had not dissolved? Yes\_\_\_\_\_ No\_\_\_\_\_
4. Did the material stick inside the box when you were trying to unload it back into the stockpile? Yes\_\_\_\_\_ No\_\_\_\_\_
5. Did the material “tunnel” inside of your sander box? Yes\_\_\_\_\_ No\_\_\_\_\_
6. Were you able to visibly compare your treated road surface to another where the new chemical was not being used? Yes\_\_\_\_\_ No\_\_\_\_\_
7. Was there a noticeable difference in the reduction of corrosion?
8. Was there a noticeable difference in roadside vegetation?

*Another information question to ask,*

*Do you feel that this new chemical may have other uses or work in other areas?*

