SNOW & ICE CONTROL

Preparing for Winter

Benjamin Franklin

"The only things certain in life are death and taxes." I would add; Winter will also come and with it comes the cold, the snow, the wind, as well as the complaints.

INTRODUCTION

Bruce W. Drewes

- Transportation Technology Transfer Group

Snowfighters Training

Presented by:

3T Group

in cooperation with the

Salt Institute

Winter Maintenance Materials

Bruce W. Drewes

What you will learn today

Why Snow Fighting

Snow removal policies

What tools do we use

Introduction of Chemicals

How the Chemicals Work

Specifications and Sampling

Use of Abrasives

Applying Chemicals to the roadway

Applying Liquid Chemicals to Solids

Learning Experience

Combination Treatments

Hazards of Chemical Use

Corrosion

Legal Issues

Exercises and Examples

Issues with Snow

- When are you going to plow my road?
- I just moved here. I have seen your plow go past my road twice. Why have you not plowed my road yet, I have to get to work?
- Officer Smith called and said that south 3400 west is slick and unsafe!
- I know that my road is private but can't you just plow it this once?

Why Snowfighting?

Unsafe Driving Conditions

Snow Covered Roads

Why Snowfighting?

Is This Road Safe?

Why Snowfighting?

- Slippery Snow-Covered Roads Create Havoc.

- Vehicular Crashes Multiply with an Increase in Deaths, Injuries and Property Damage

Why Snowfighting?

- Traffic Gets Jammed
- Congestion Causes Frustration, Lost of Work
- Schools Close Requiring Parents at Home

Why Snowfighting?

Emergency Operations are Hampered or Cease to Operate

- Police
- Fire
- Emergency medical services
- Hospitals

Why Snowfighting?

- Businesses are stranded and close down
- Production is lost with substantial lost dollars
- Workers suffer with lost wages
- Consumer buying decreases significantly

Why Snowfighting?

- Your Liability can Hit the Ceiling
- Trial Lawyers Have a Field Day

Results


People Demand Mobility and a Safe Transportation System
Drivers Demand Safe Accessible Roads, Even in the Wintertime.

What About Your Snowfighting Program?

Are You Prepared?

Do You Have A Plan?

What Should Your Plan Contain?
Should it be "Reactive" or "Proactive"?

In this section we will look at:

- The value of having a “Snow Removal” Plan.
- Element of this policy.
- Who should have access to this policy?

Snow Removal Plan should:

Inform:

- Employees
- Elected Officials
- General Population

Level of Service (LOS) of the road system

Policies of the agency for:

- Snow removal
- Employees

Levels of Service (LOS)

Minimums:

- Service hours
- Priority levels of roadways
- Policy when dealing with private roads
- Process for deals with emergencies
- Contact information
- General depths of snow required before service

LOS

Additional Items that can be added:

- Agency Map showing priories

Who Establishes Your LOS?

Likely the state, county or city engineer by:

Gathering input from operations.

Verifying that the LOS calculations are workable for the plow routes.

Listening to public expectations.

Considering success and failures of the previous year.

Benefits from a well thought-out LOS

- **Balance between safety, mobility, cost & environment.**
- **Saves salt, time & money**
- **Less damage to the environment**
- **Provides customer safety**
- **Manages customer expectations**
- **It can be done consistently**

Share your Snow Removal policy

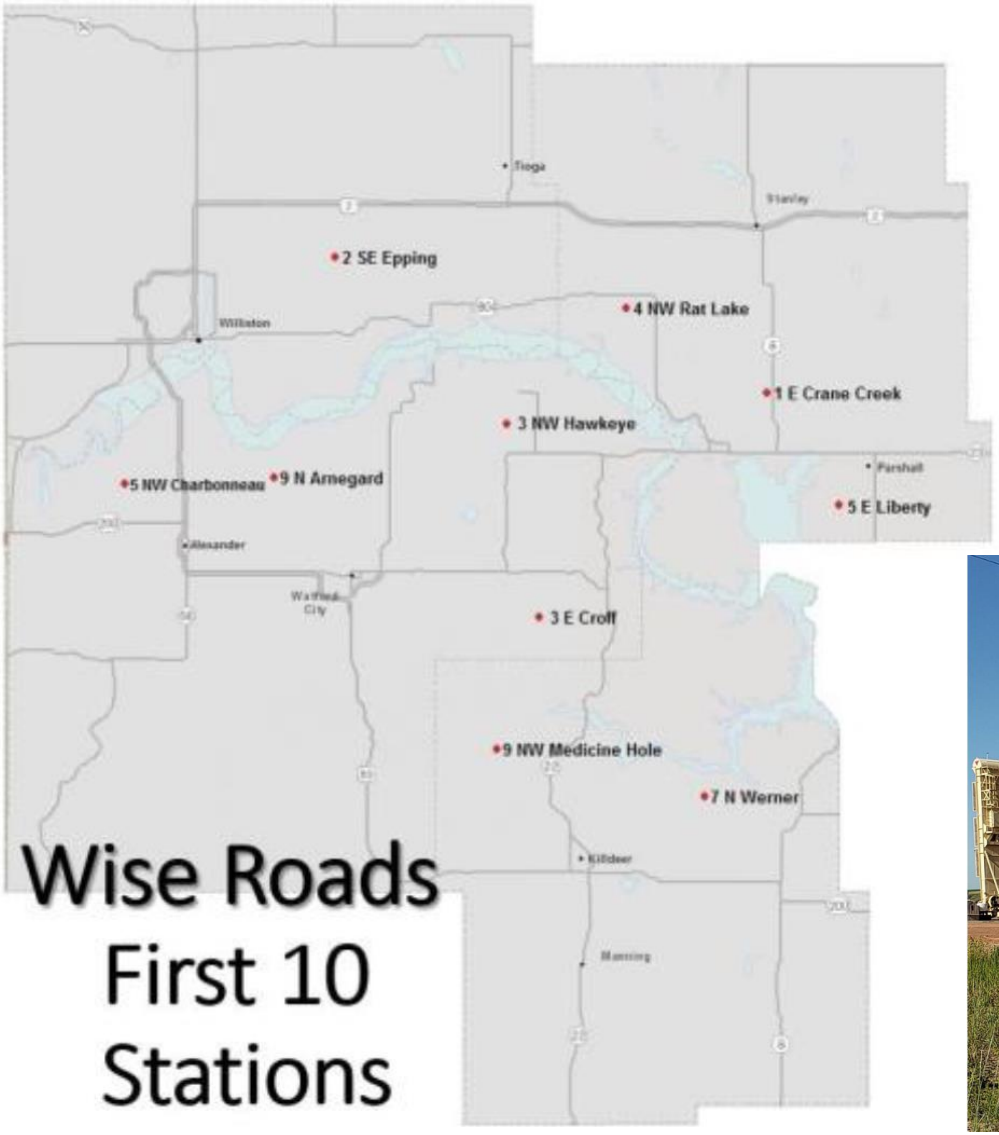
- Agency website
- Agency Planning and Zoning
- Share with Local News Paper (Fall)
- Post in “Worker break room”
- Facebook Page

Tools

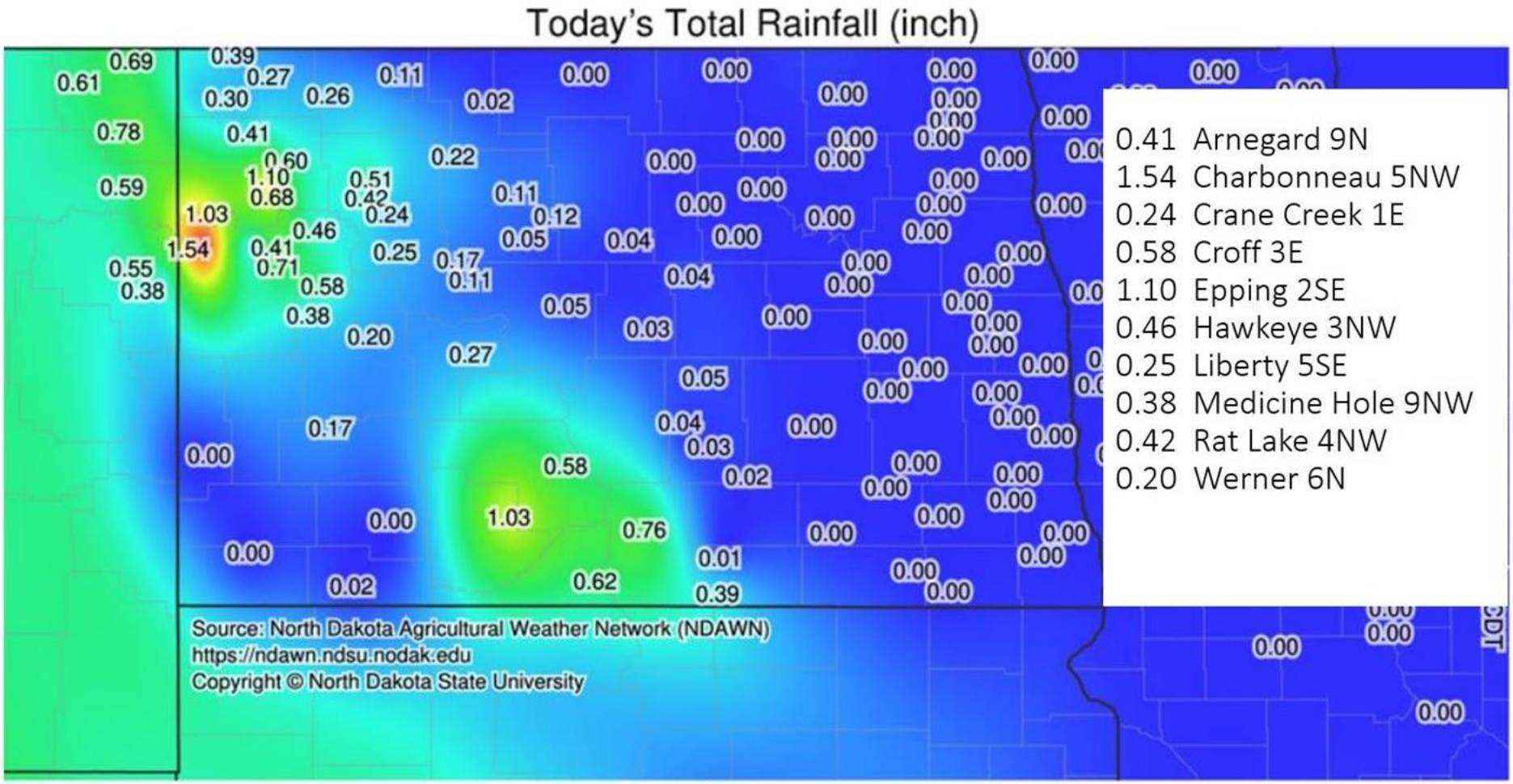
- Weather Forecasts
- Plowing and Plows
- Chemicals
- Snow Fences and Trenches
- Abrasives

Weather Forecasts

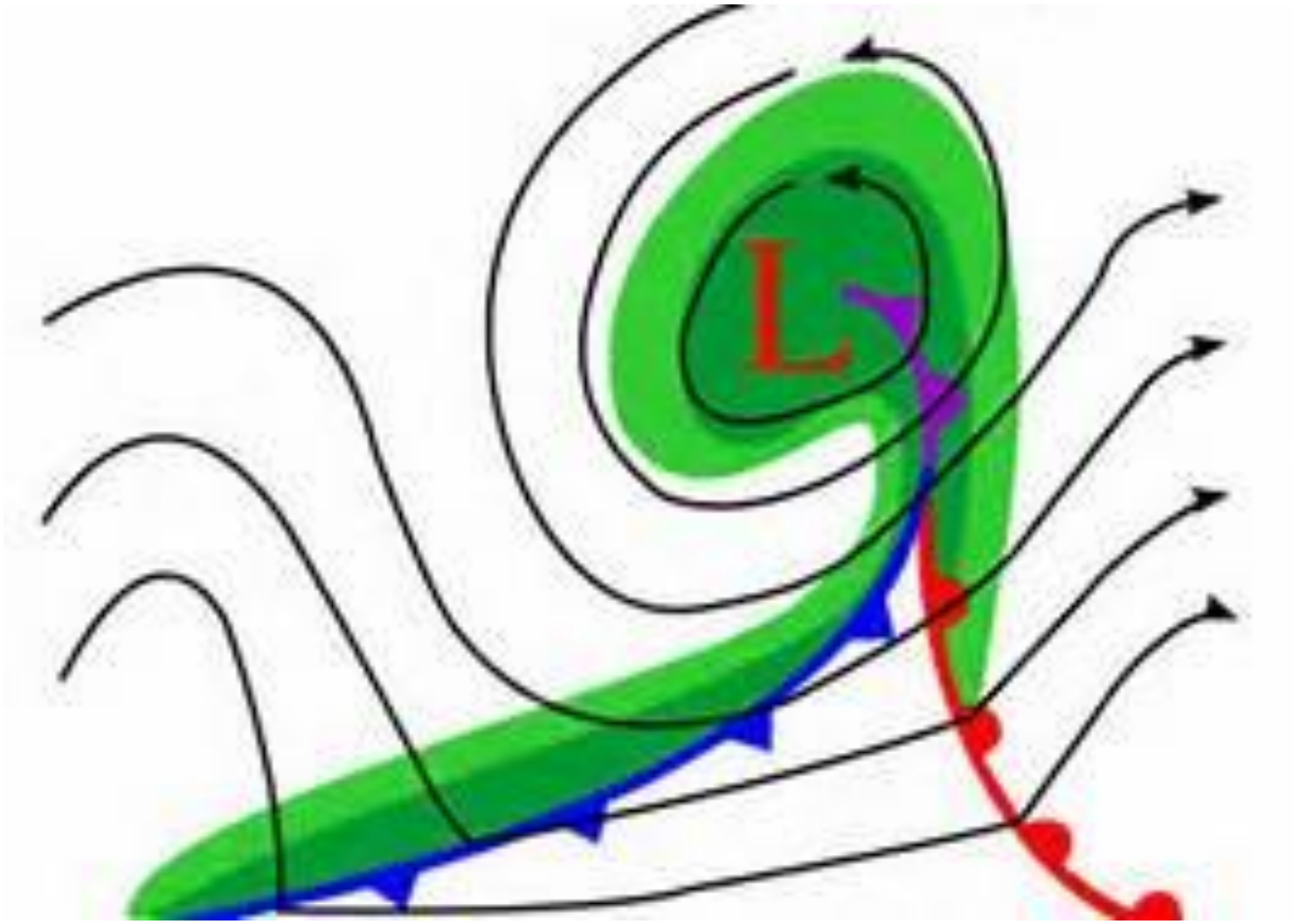
- Local News
- Web – NDDOT Travel Information Map
  - https://dot.nd.gov/travel-info-v2/
  - WISE – Weather Information System – Western Counties
    https://ndenergy.org/News/Wise-Roads-Project-Phase-1-Complete
- States “Road Weather Information System”
- States, 511 web site



Wise Roads First 10 Stations



The new stations can be identified by the precipitation numbers on the map. The names are either related to a nearby community or the township in which the station is located.


L

Valuable information to Make Decisions

- Surface Temperature
- Wind speed
- Timeline of weather changes (temp, snow depth, wind speed/ direction)
- Air Temperature
- Snow depth (current and from storm)
- (Generally, snow will form between 35 and 25 degrees)

Bill Boland, Maintenance Foreman, ITD

“If I do not have to pull you out of the ditch once in a while, you are not plowing the shoulders”.

Plowing and Plows

- Know your equipment!
- Know your route, at night.
- Do you know where the end of the curb, guardrail ends, the manhole that has a lip, the railroad tracks, bridge expansion joint are?
- Have you calibrated your sander?
- Have you checked your cutting edges?

In a bad winter - trees, buildings and machinery are often close to the road

Bales too close to R-O-W!

Seems Minor in the Fall

Then the problem grows!

End result!

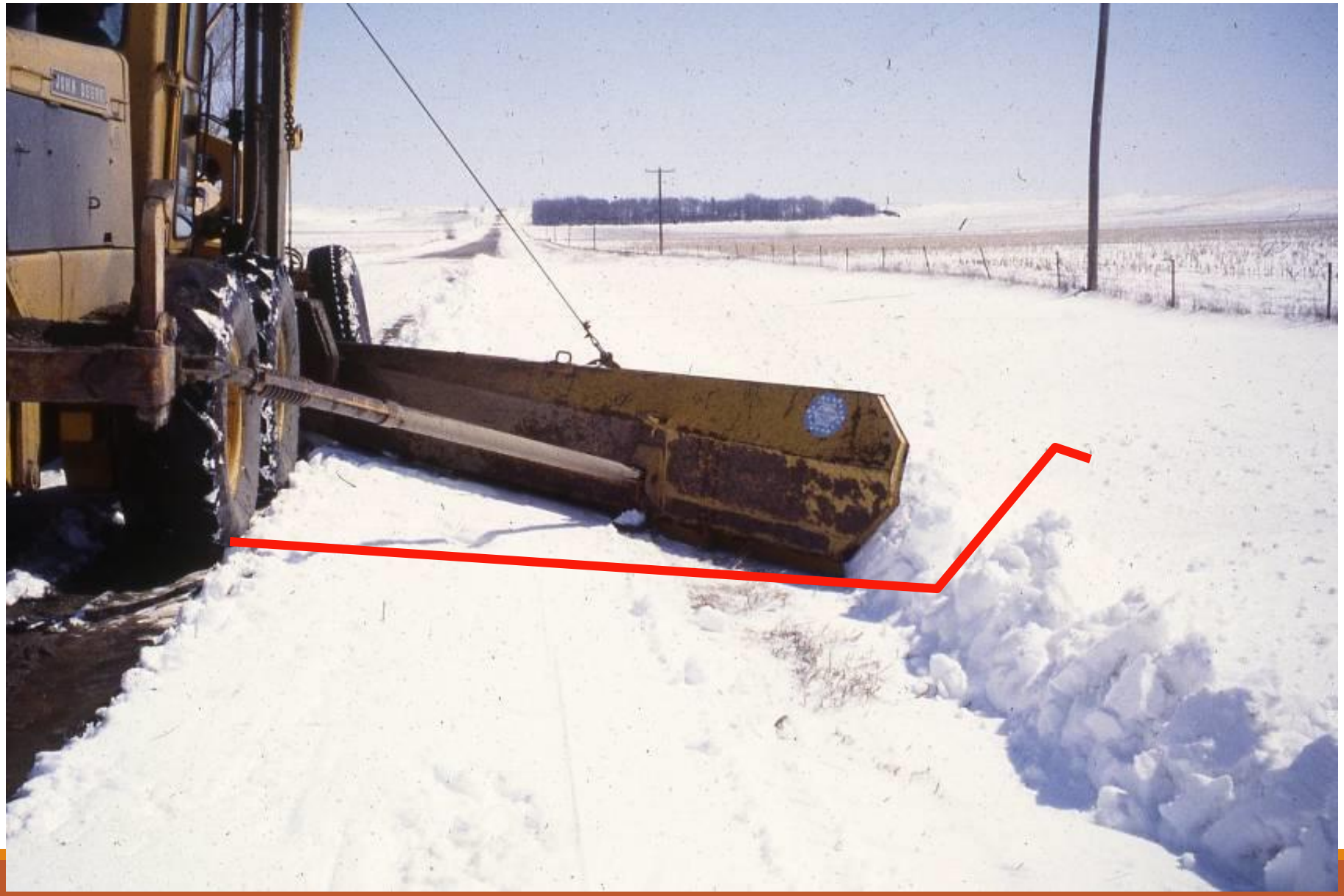
In deep snow use your plow first

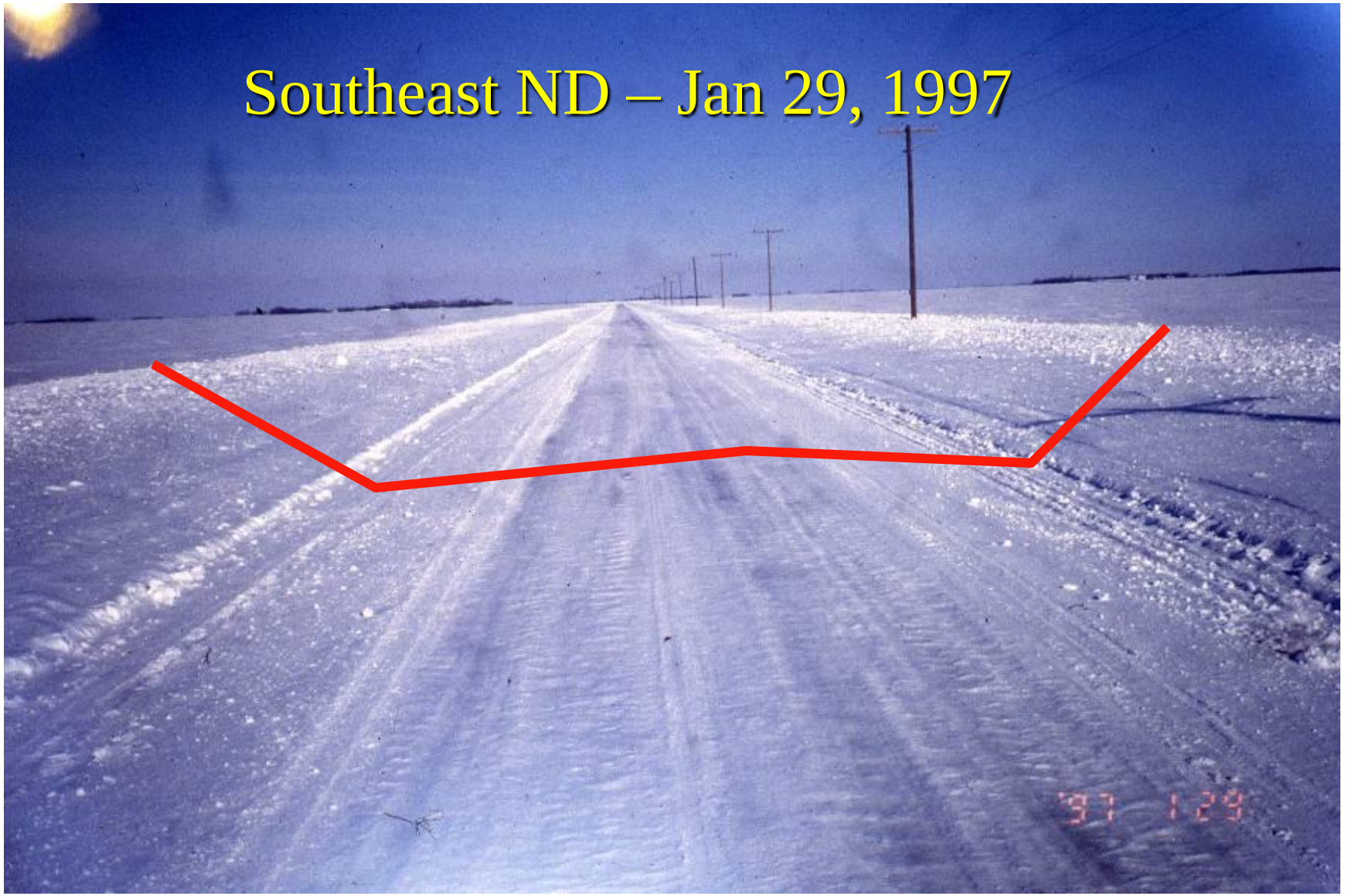
First break-through

First pass is critical

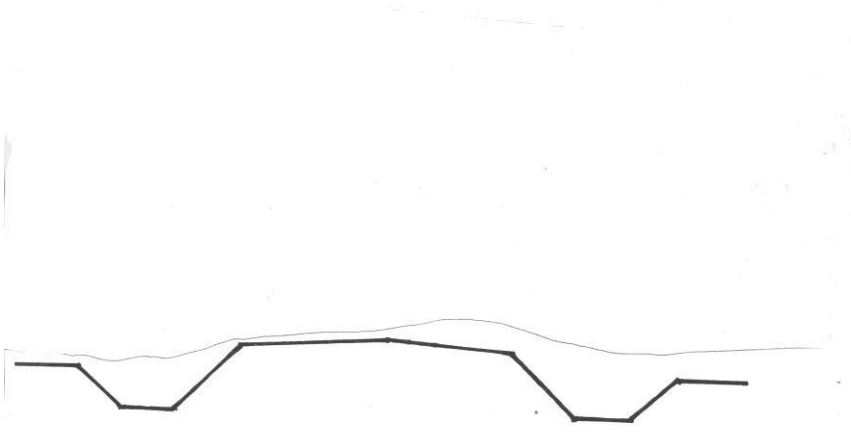
Use of under blade, V-plow & wing simultaneously – requires skill!


JOHN DEERE



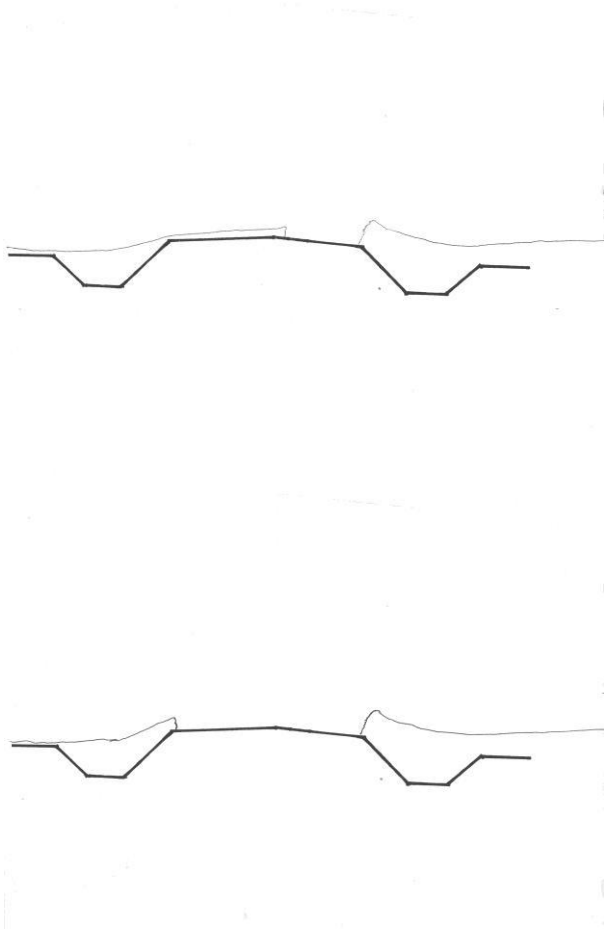

Southeast ND – Jan 29, 1997
97 1 29

The making of a snow bank



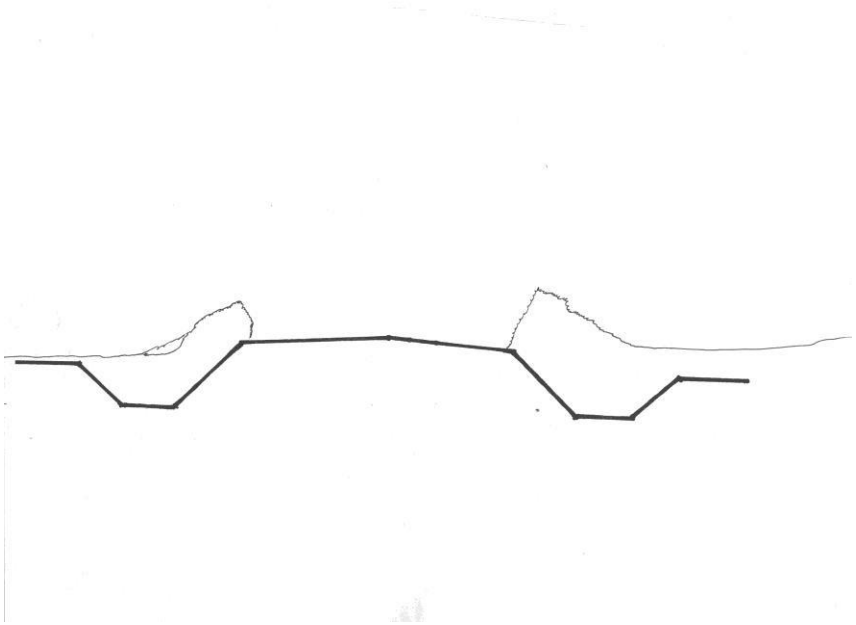
- As the snow begins to build across the road, it will usually be heavier on the side the wind is coming from.

The problem grows



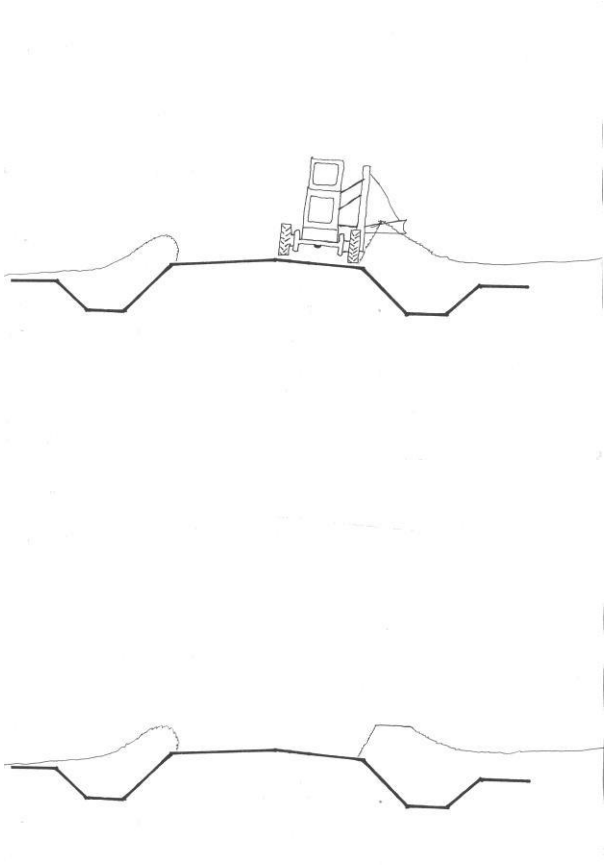
- As we begin to plow the snow, we compound the problem on the windy side of the road, because we try to throw the snow into the wind. We end up going slow because visibility is low. Consequently, the bank keeps getting higher and harder.

The damage is done



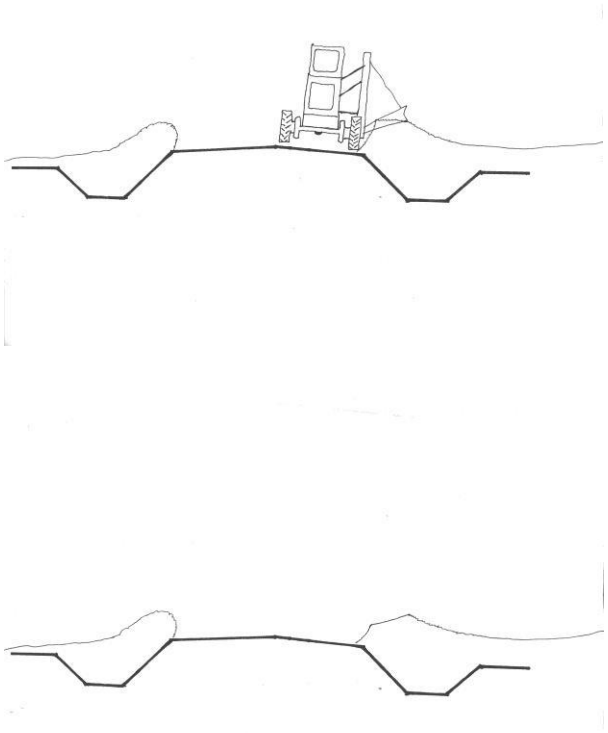
- By the time we get to the bank with the grader wing, the damage is done, and we have high, straight walled banks. If left like this, they will fill in every time the wind blows. If we just continue to plow them, soon they will be unmanageable with a plow truck. Remember, we have probably added de-icing chemicals to the road, then plowed them onto the bank. This makes the banks much harder.

Redesigning the drift plane



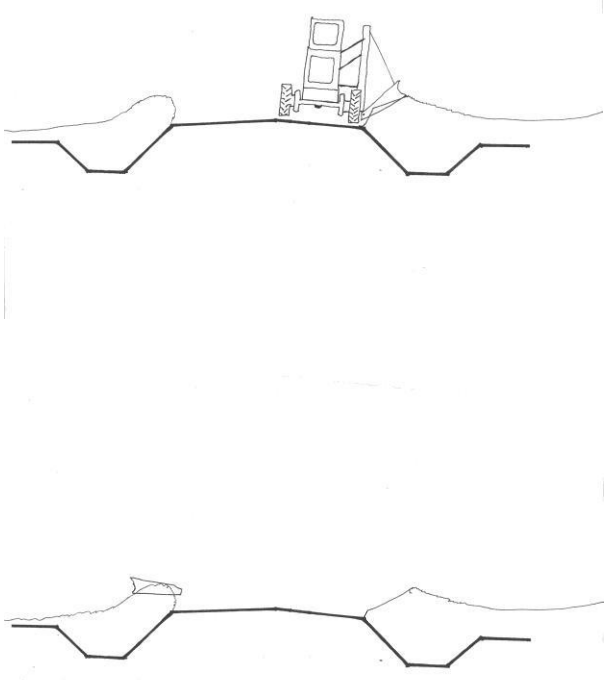
- The grader wing is an extremely effective tool for dealing with this problem.
- As we tackle these banks, we simply knock the high peaks off with the first pass. The wing should be level as possible for maximum reach. Do not let the heel cut in.

Our second pass



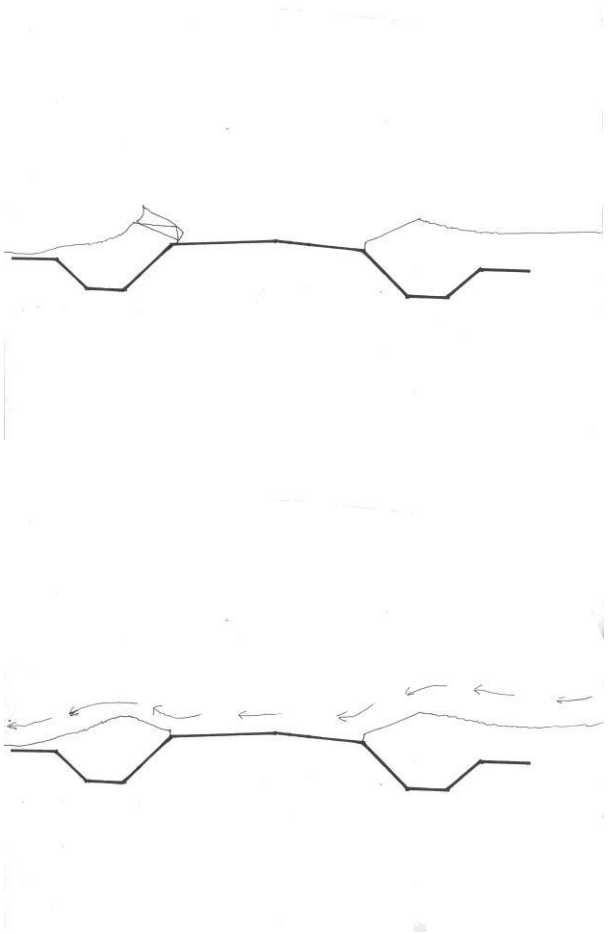
- With the second pass, keep the heel day lighted out and lower the toe. Take only what you can handle, and still maintain your speed.
- Remember, all passes when winging need to be made at a speed fast enough to throw the snow, but at a speed where you can maintain control of the machine and wing. Back up as far as needed to obtain proper speed and momentum.

All additional passes



- Once again, only lower the toe, leaving the heel day lighted out on additional passes.
- We address the bank on the other side of the road in the same manner, keeping the blade level and just taking off the peak with the first pass.

Don’t overdo it !



- Make as many passes as you need to, but not more than you have to. Many times it is that last pass, when you try to do a little more than you should, things go wrong, like the wing heel digging in and creating a less than desirable finished product.
- When the job is done properly, the wind should blow right through without depositing any snow back onto the shoulder or road. This is a well redesigned drift plane.

Our goal is no ridges!

- This is an example of a properly adjusted wing blade. Neither the toe or heel are digging in. The snow is being cast off the heel and not leaving a ridge.

Improper Technique

- The operator here is demonstrating a poor winging technique. The ridge that is being left off the heel will catch snow every time the wind blows, and soon the ditch will be full with no place to put more snow.
- If you feel you need to put a windrow to stop snow, put it at the right of way fence, or on the adjacent land.

Not tooooo much!

- Here, the operator has taken more than the wing or the machine can handle. He has lost all his momentum and is simply creating a bigger problem. When you are winging snow and you find your machine loosing momentum, lift the wing, and make that pass again. Remember, NEVER TAKE MORE THAN YOU CAN HANDLE! If you are not throwing the snow, than you are ridging it.

Take care of your machine

Before every shift, much care needs to be given to checking all mounting points for loose bolts.

Redesigning the Drift Plane with a snow wing can be stressful on the machine, and extra care needs to be given to it during this operation.

Hauling becomes an only option

Watch out for the public

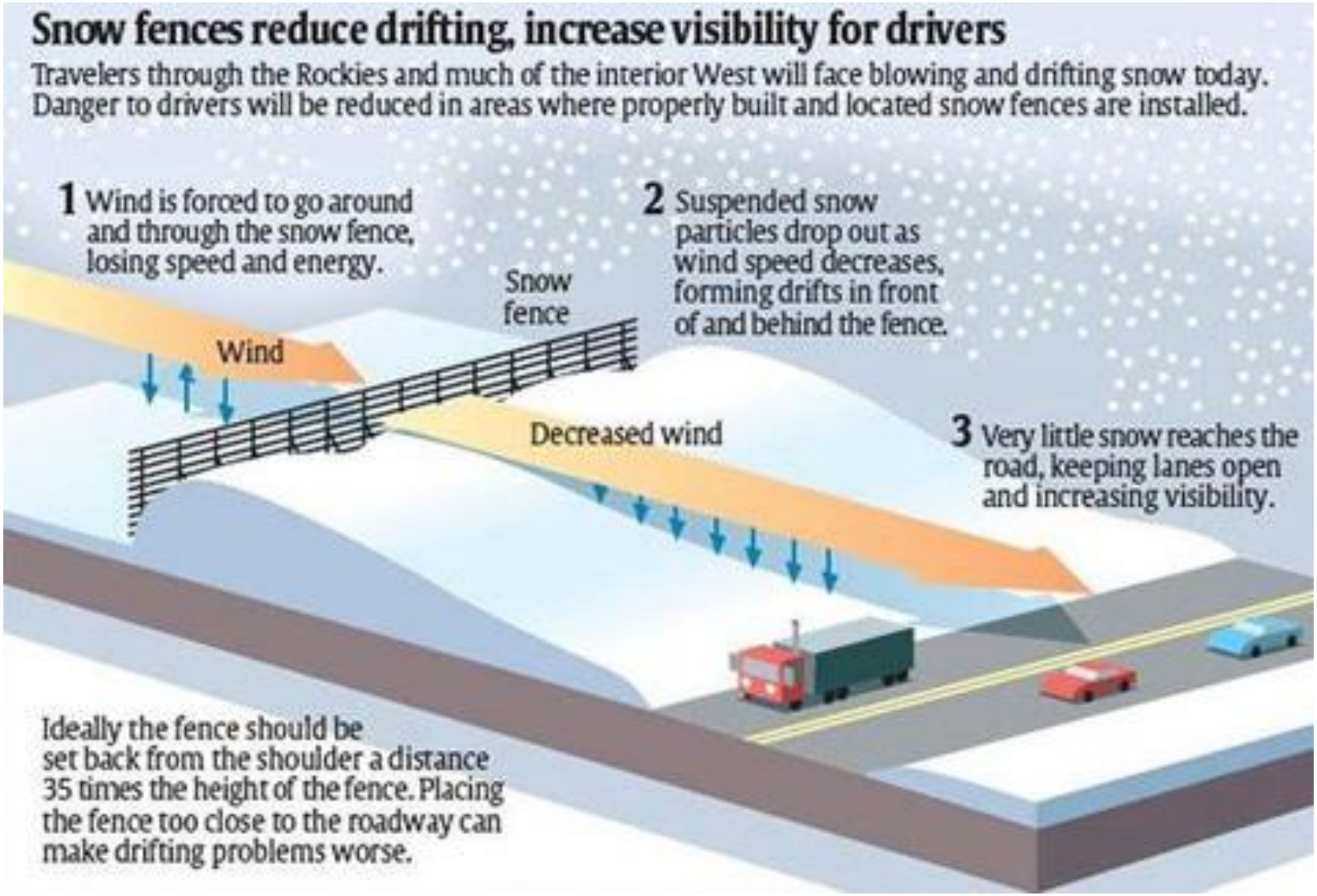
They tend to pay more attention to equipment than traffic

Effective but not many have these

Be careful!

Trucks with sanders become very top-heavy

Snow Fences and Trenches



Snow Fence Guide available on-line

NDLTAP>Resources>Snow and Ice Control>Snow Fence Guide

NORTH DAKOTA LOCAL TECHNICAL ASSISTANCE PROGRAM

- About Us
- Programs
- Resources
  - Asphalt
  - Bakken Briefings
  - Bridges
  - Culverts
  - Erosion and Sediment Control
  - Equipment Loan Program
  - Gravel/Motor Grader
  - GRIT
  - Local Road Needs Study
  - Local Roads Safety
  - Media Relations
  - Mobile/Phone Apps
  - ND Truck-Weight Education
  - Newsletters NDLTAP
  - NRRA/MnROAD
  - Resource Library
  - Road Ready Research, R3

NDLTAP

Snow and Ice Control

- Anti-Icing Flow Chart *(PDF, 84K)*
- Calibration Chart *(XLSX, 16K)*
- Daily Checks and Preventative Maintenance for Motorgrader *(PDF, 1530K)*
- Effective Snow Fences *(MP4, 67265K)*
- Evaluation of Snow Plow Blade Systems *(PDF, 3100K)*
- Evaluation of Snow Plow Blade Systems - Summary *(PDF, 21K)*
- Equipment Fluids *(PDF, 205K)*
- How Deicing Chemicals Work *(MP4, 37715K)*
- How Road Salt Works *(MP4, 13325K)*
- Local Roadway Snow and Ice Control *(MP4, 83311K)*
- Poor Visibility During County Snow Plowing Operations *(MP4, 6744K / Mark Moser, Barnes County)*
- Pre-Wetting *(MP4, 12556K)*
- Properties of Salt *(PDF, 260K)*
- Proper Plowing Techniques *(MP4, 18320K)*
- Safety & Maintenance Inspection: Motor Graders *(MP4, 952K)*
- Snow Fence Guide *(PDF, 2347K)*
- Snow Plowing Policies *(PDF, 197K)*
- Snow Plowing Techniques *(MP4, 109689K)*
- Snowfighter's Handbook *(PDF, 1441)*
- Spreading Salt *(PDF, 13675K)*
- Straight Salt Application *(PDF, 315K)*
- The Making of a Snow Bank *(PDF, 84K)*
- Winter Driving Supply Checklist *(PDF, 236K)*
- Winter Operations Check List *(PDF, 36K)*

INTRODUCTION TO CHEMICALS

Common Road Treatment Materials

Chemicals

- Salt (Sodium chloride)
- Calcium Chloride
- Magnesium Chloride
- Potassium Chloride

Natural Occurring Salts

- Brines (by-product of gas production)
- Potassium Acetate
- Calcium Magnesium Acetate
- Urea
- Agricultural By-products
- Other Proprietary Materials
- Abrasives

NCHRP
SYNTHESIS 449

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

Strategies to Mitigate the Impacts of Chloride Roadway Deicers on the Natural Environment

A Synthesis of Highway Practice

TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

CHLORIDES

- Sodium Chloride
- Magnesium Chloride
- Calcium Chloride

Sodium Chloride

- Most common, Solid and Liquid used
- 210 Million Metric tons mined in world
- 45.3 Million metric tons mined in US
- 12.5 Million metric tones mined in Canada
- Approximately 80% used on Roads

Sodium Chloride

- Inexpensive and available
- Solids or “Rock Salt”
- In Solution or as a Brine
- Common in most all areas
- Need Specification
  - Size
  - Moisture content

Sodium Chloride

- The highest eutectic temperature of the three major salts -6 F @ 23%
- Effective Temperature around 15 F
- Endothermic
- Corrosive
  - Used as Standard for other two chlorides

How much ice will a pound of salt melt

Temperature Deg F	One pound NaCl
30	46.3 lbs of Ice
25	14.4
20	8.6
15	6.3
10	4.9
5	4.1
0	3.7
- 6	3.2 lbs of Ice

Application Rates

- Vary Widely with the State and Weather Conditions
- Rock Salt used as abrasive in some areas
- Mixture of sand and salt
- Brines used from 25 to 200 gallons/mile

In general: Any time you can use a pound of liquid instead of a pound of solid, you protect the environment.

One pound of brine approximately fills this pint glass

One pound of salt approximately fills this coffee mug

Magnesium Chloride

- Obtained from naturally occurring brines
- Major source in Northwest is Great Salt Lake
- More expensive than Sodium
- Used as a brine
- Application rates usually less
  - 20 to 60 gal per lane mile

Magnesium Chloride

The middle of the three chlorides for eutectic temperature -28 F @ 26%

Exothermic

- Gives off heat

Hydroscopic

- Attracts Moisture

Calcium Chloride

- Available to be used in colder climates
- Lowest eutectic temperature of the three chlorides -60 F @ 30%
- Most Costly of the three Chlorides
- Exothermic
- Hydroscopic
- Corrosive

CMA
(Calcium Magnesium Acetate)

FHWA originally identified CMA as a possible replacement for salt in 1980.

CMA manufactured by reacting dolomitic lime with acetic acid

CMA
(Calcium Magnesium Acetate)

Advantages

- less corrosive than salt
- minimal environmental concerns

Disadvantages

- cost more than salt (10-20x)
- not as effective as salt (1.7:1)
- more storage capacity needed

CMA Use

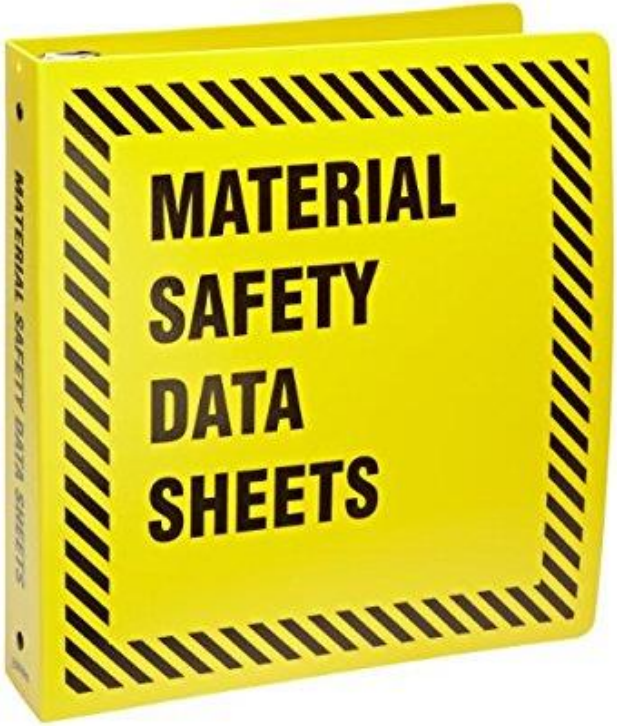
Bridge Structures

Parking Garages

Environmentally Sensitive Areas

Chemicals

- Specifications
- Material Safety Data Sheet (MSDS)
- Sample and test (certification)
- Talk to other users: effectiveness, concerns, problems



CORROSION

- All chloride chemicals are corrosive
- Effect different metals in various ways, and in severity
  - Steels
  - Aluminum Alloys
  - Copper

Corrosion

More corrosive

- Calcium Chloride
- Sodium Chloride
- Magnesium Chloride
- CMA
- Urea

Less Corrosive

Chemicals: How do they work?

- Depress the freezing point of water, turning ice or snow into liquid or slush
- Solid salts dissolve to form brine solution

How do Chemicals Work

Training Clip from the Salt Institute

Chemicals

Chemicals applied to:

- prevent bonding of ice and snow to road surface
- prevent ice or frost from forming
- prevent buildup of snowpack
- melt ice that has formed

Evaluating Snow & Ice Control Chemicals

Performance (deicing mechanics)

- Effective temperature range
- Speed
- Quantity needed
- Duration of melting action

Evaluating Snow & Ice Control Chemicals

Use Criteria

- Equipment requirements
- Storage & handling needs
- Application versatility
- Safety & hygiene considerations

Evaluating Snow & Ice Control Chemicals

Infrastructure Impacts

- Structures (bridges, buildings)
- Roadway pavement & structure
- Vehicles & equipment

Evaluating Snow & Ice Control Chemicals

Environmental Impacts

- Soil
- Animals
- Vegetation
- Water
- Air
- Human Health

Evaluating Snow & Ice Control Chemicals

Availability

Cost

- Availability
- Alternatives
- Performance
- Use Criteria
- Infrastructure Impact
- Environmental Impact

Chemical: Advantages

Melting action

Relatively low cost

No cleanup (as with abrasives)

“Enhanced Safety & Reduced Liability”

Chemical Terms

Concentration
- % by weight of chemical in solution

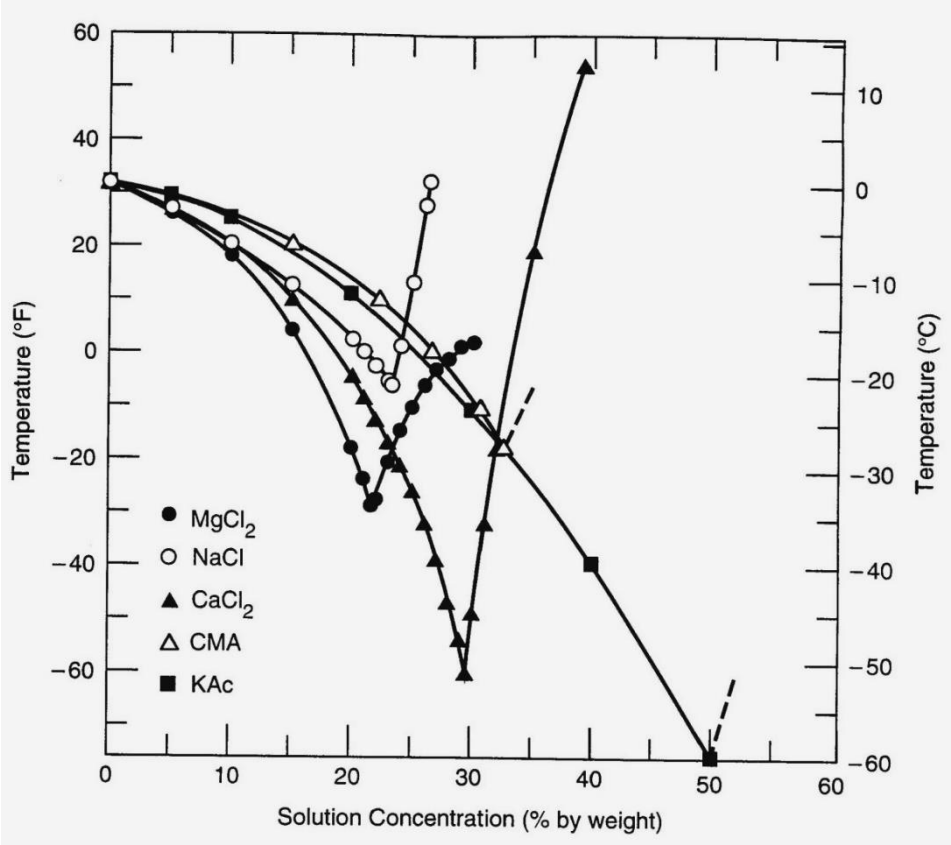
Eutectic Temperature
- Lowest Temp solution will melt ice

Endothermic
- Requires heat when going into solution

Exothermic
- Gives off heat when going into solution

Hygroscopic
- Draws water from the air

Eutectic Temperature Curves



Magnesium Brine

% of concentration at various temperatures

% by Weight	Specific Gravity	Freeze Point F
5%	1.013	26.4
6	1.051	25.1
7	1.06	23.5
8	1.069	21.8
9	1.071	20.1
10	1.086	17.9
11	1.096	15.7
12	1.105	13.1
13	1.114	10.3
14	1.123	7.3
15	1.132	4.1
16	1.142	0.4
17	1.151	-3.5
18	1.161	-7.7
19	1.171	-12.2
20	1.181	-17.2
21	1.191	-23.1
22	1.201	-27.1
23	1.211	-14.1
24	1.221	-14.1
25	1.231	-10.1
26	1.241	-6.1
27	1.251	-3.1
28	1.262	-0.9
29	1.273	1.1
30	1.283	3.1

Salt Brine

% of concentration at the eutectic temperature

Hydrometer / Salometer Chart for Salt Brine (59°F)			
% Salt	Salometer Using 0 - 100%	Hydrometer Specific Gravity	Eutectic Tempature
0	0	1	32
1	4	1.007	31
2	7	1.014	30
3	11	1.021	29
4	15	1.028	27
5	19	1.036	26
6	22	1.043	25
7	26	1.051	24
8	30	1.059	23
9	33	1.067	21
10	37	1.074	20
11	41	1.082	19
12	44	1.089	17
13	48	1.097	15
14	52	1.104	13
15	56	1.112	12
16	59	1.119	9
17	63	1.127	7
18	67	1.135	4
19	70	1.143	2
20	74	1.152	0
21	78	1.159	-2
22	81	1.168	-4
23	85	1.176	-6
24	89	1.184	2
25	93	1.193	16
26	96	1.201	30
27	100	-	32

Chemical Comparison

Chemical	Eutectic Temp		Conc.
	°C	°F	% by weight
NaCl (salt) sodium chloride	-21	-6	23
CaCl calcium chloride	-51	-60	30
MgCl magnesium chloride	-33	-28	22
KCl potassium chloride	-11	+13	20
KAc potassium acetate	-60	-76	49
CMA calcium magnesium acetate	-27	-17	32
Urea	-12	+10	33

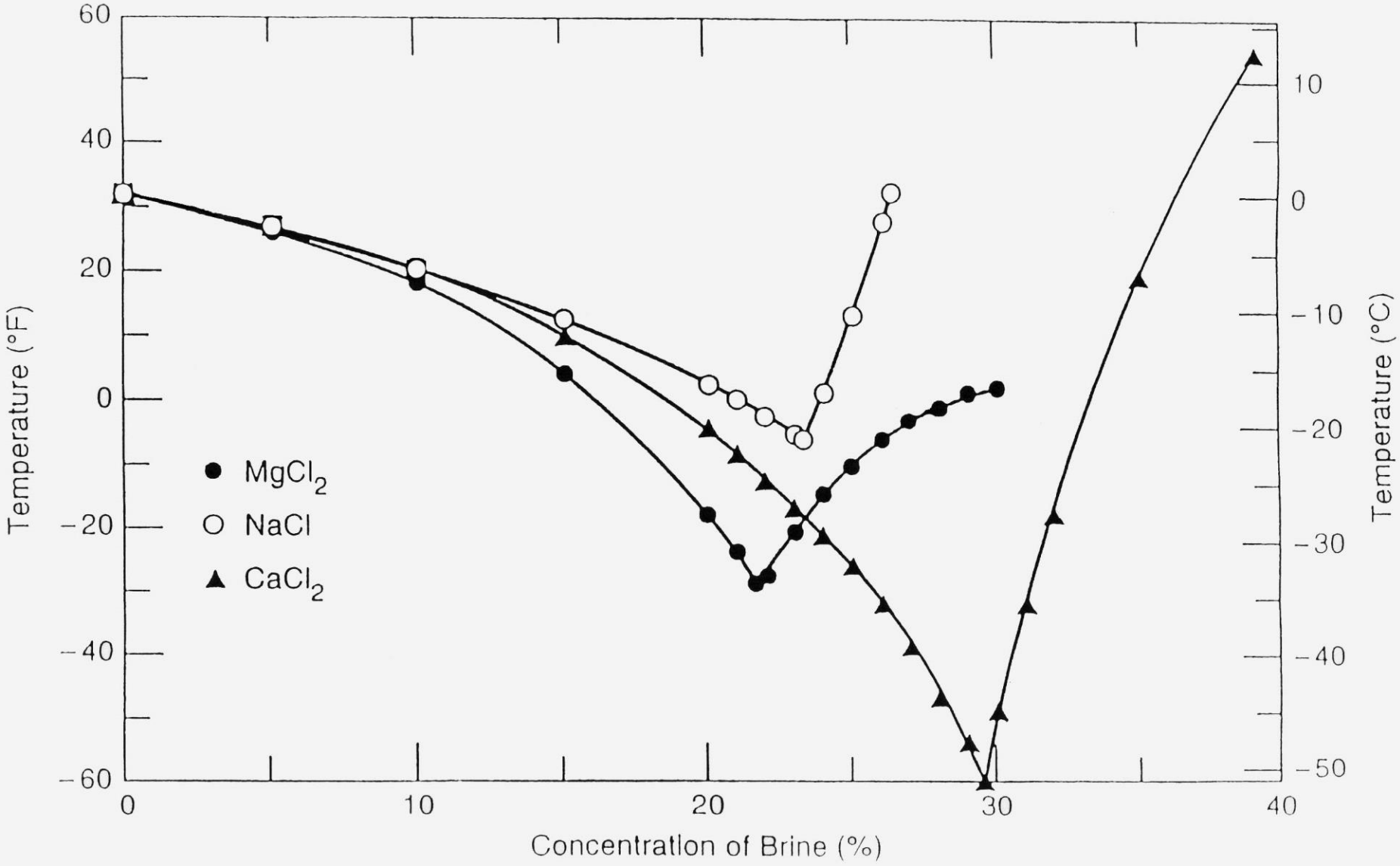
Chemical Comparison Eutectic vs Effective Temp

Chemical	Eutectic		Effective*	
	°C	°F	°C	°F
NaCl (salt) sodium chloride	-21	-6	-9	+15
CaCl calcium chloride	-51	-60	-32	-25
MgCl magnesium chloride	-33	-28	-15	+5
KCl potassium chloride	-11	+13	-4	+25
KAc potassium acetate	-60	-76	-26	-15
CMA calcium magnesium acetate	-27	-17	-6	+21
Urea	-12	+10	-4	+25

Dilution

DISCUSSION ON TEMPERATURE/CONCENTRATION CURVE

Phase Diagrams of Three Brines



MATERIAL PERCENTAGE

Determine percentage by specific gravity

Water specific gravity is 1.00

Adding salt increases the Sp Gr.

30% Magnesium Chloride is 1.283

Table on slide 38

% by Weight	Specific Gravity	Freeze Point F
5%	1.013	26.4
6	1.051	25.1
7	1.06	23.5
8	1.069	21.8
9	1.071	20.1
10	1.086	17.9
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12	1.105	13.1
13	1.114	10.3
14	1.123	7.3
15	1.132	4.1
16	1.142	0.4
17	1.151	-3.5
18	1.161	-7.7
19	1.171	-12.2
20	1.181	-17.2
21	1.191	-23.1
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PRODUCT DELIVERY

BILL OF LADING

- **NAME OF PRODUCT**
- **SUPPLIER AND MANUFACTURER**
- **DESTINATION**
- **QUANTITY (TONS, LITERS, GALS)**
- **LOT NUMBER**
- **TRANSPORTER INFORMATION**
- **LIQUIDS - %CONC AND SP. GRAVITY**
- **PRODUCT MSDS**

PRODUCT INVOICING

INFORMATION FROM THE BILL OF LADING PLUS THE FOLLOWING

- **UNIT PRICE**
- **TOTAL PRICE**

FIELD INSPECTION, UNLOADING, SAMPLING, AND TESTING

PRELIMINARY INSPECTION

- **DOCUMENTATION**
- **VISUALLY INSPECT THE PRODUCT**

PRIOR TO UNLOADING

- **RECORD VOLUME IN STORAGE**
- **FIELD TEST A GRAB SAMPLE**
- **ACCEPT OR REJECT**

FIELD INSPECTION, UNLOADING, SAMPLING, AND TESTING

SAMPLING AND TESTING

- **COLLECT DURING UNLOADING**
- **FIELD MEASUREMENTS**
- **RECORD FIELD MEASUREMENTS**
- **RECORD TRANSPORTER INFORMATION**
- **SEND DOCUMENTATION AND SAMPLE TO CENTRAL LABORATORY**


06 37 9


TRACEABLE® THERMOMETER
OFF
ON
°F
°C
97459741

Magnesium Chloride Concentrations and Freezing Points

Concentration wt % $Mgcl_{12}$	Freezing Temperatures		Density	
	F°	C°	Specific Gravity	lb./gal.
21	-23	-31	1.20	10.01
22	-24	-31	1.21	10.11
23	-18	-28	1.22	10.17
24	-13	-25	1.23	10.28
25	-9	-23	1.24	10.34
26	-6	-21	1.25	10.46
27	-3	-19	1.26	10.51
28	0	-18	1.27	10.63
29	1	-17	1.28	10.68
30	1	-17	1.29	10.80
31	4	-16	1.30	10.84
32	7	-14	1.31	10.97
33	14	-10	1.33	11.09
34	23	-5	1.34	11.14
35	57	14	1.35	11.26
36	91	33	1.36	11.31

ANTI-ICING
VS
DE-ICING

DE-ICING

Removal of snow and ice from the roadway after accumulation

Preformed during and after a storm event

Application of solids and brines

ANTI-ICING

Proactive activity to prevent snow and ice from building up on a road surface.

Usually preformed before a storm event

Normal application of brines

Chemicals begin their dilution cycle when if begins to snow

ANTI & DE-ICING

Techniques to apply chemicals before and during a storm event that will assist in breaking up the snow floor.

Brine and solid combinations

Delayed reaction of chemicals

Total Storm Management

The selection of a series of operations that will yield the desired level of service at the lowest total cost.

A planned process to prepare before the storm, provide the best service possible during the storm, and return to a desired level of service as soon as possible after the storm.

TOOLS IN OUR TOOLBOX

Plowing

Abrasives

Chloride Chemicals

- Solids
- Brines
- combinations

ABRASIVES

WHAT DO WE MEAN BY

ABRASIVES

Abrasives

Sand, cinders, ashes, crushed rock

Specifications

- Size (gradation)
- Type of material
- Characteristics
- Environmental

Advantages / Disadvantages

Abrasives

How effective are they

When do you use them

What are the costs

Environmental concerns

Abrasives: Advantages

Relatively inexpensive (initial material cost)

Easy to apply

Skid resistance

Can be mixed with salt and/or prewetted with salt or other chemicals

Abrasives: Disadvantages

no melting action

"Safety"

easily scattered off road

windshield breakage

air pollution

water pollution

tracking – sidewalks, into homes

requires clean-up

Solid vs Liquid Advantages

Solids

- Less costly
- Easier to handle
- Dilute slower (retention)
- Initial skid resistance (salt)

Liquids

- Instant action
- Not displaced by traffic
- Residue remains effective
- Versatile
  - Used directly
  - Treat solids

Solid vs Liquid Disadvantages

Solid

- Need moisture
- Takes time
- Not good for anti-icing (bounce & scatter, displaced by traffic)

Liquid

- Mostly water
- Not useful for thick ice
- Rain will wash off pavement
- Can cause slippery conditions

APPLYING CHEMICALS To the Roadway

Successful Application Depends On

Accurate weather forecasts

- Temperature
- Moisture

Information based strategies

Knowledge of how chemicals work

Solid Chemicals

Sodium Chloride used as a solid

Spinner bar used similar to a sanding truck.

Use Rock Salt, granular material

Spread across roadway, usually placed in middle of roadway and spreads to outside by traffic flow or melting and water flow.

USE SOLIDS

Low traffic volumes

Soft snow fall, conditions where the granular salt will adhere.

During a storm event. Temperatures above 15 F and rising

- Melting during storm
- Break up snow floor after storm

Liquid Chemicals (Brines)

Use tanker truck and apply through

- Spray Nozzles on a spray bar
  - Spreads brine out over large area
  - Overspray
  - Used with Sodium Chloride
- Streamer tubes below a header bar
  - Evenly distributed flow of chemicals just above pavement
  - Leaves “lines” of chemical that spreads out with melting.

ANTI-ICING TECHNIQUES

Prior to a storm event

Place brine directly on bare pavement

- Use spray bar
- Use streamer nozzles

ANTI-ICING TECHNIQES

Melts snow as it falls

Maintains bare pavement as long as the dilution process continues.

Works within the eutectic curve, moisture and temperature

Stops working when the dilution reaches the freezing point

ANTI-ICING TECHNIQUES

If dilution of the first application is complete and snow begins to accumulate

An additional application can be put down

Or other techniques to deal with a snow floor can be employed

APPLYING LIQUIDS TO SOLIDS

PREWETTING SOLIDS

Prewetting of sanding material

Prewetting of rock salt

- Both of these prewetted materials will work in different storm management situations.

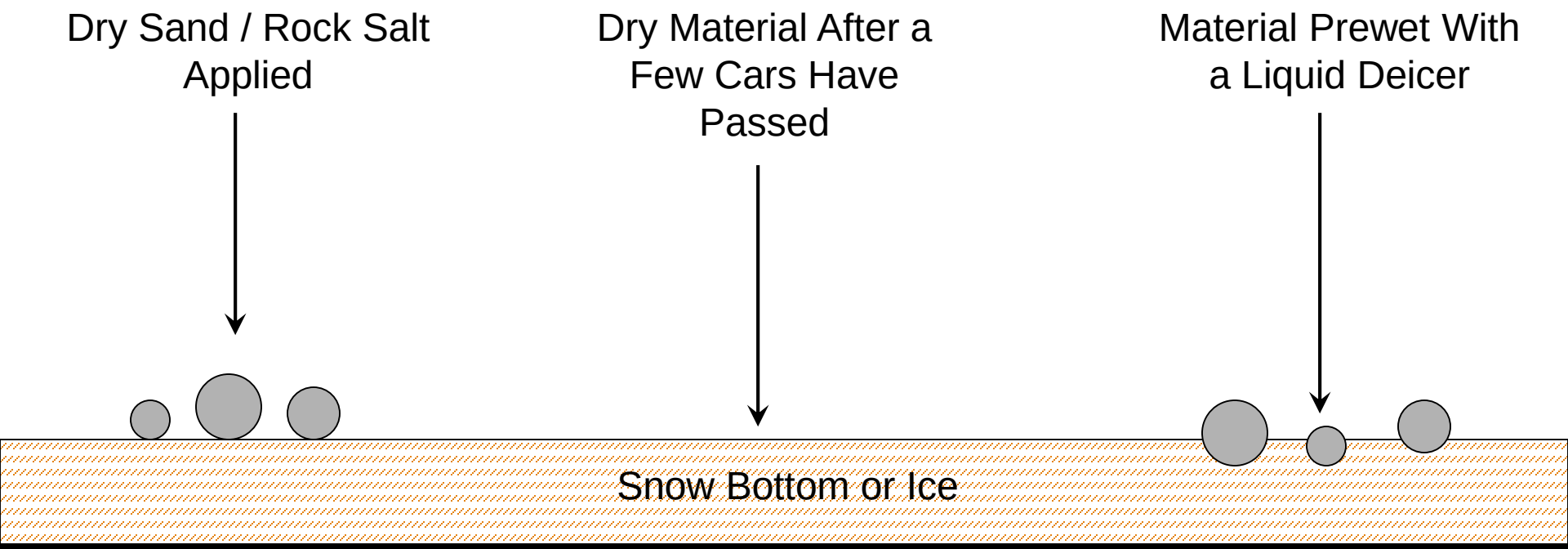
PREWETTING

Prewetting occurs when we add a small amount of a brine to a solid as it is spread on the road surface.

The brine around the solid particle starts to melt the ice/snow around the particle, dilutes rapidly, and then refreezes, causing the solid particle to be frozen on the surface

How to Use Liquid Anti-Icers

Pre-Wetting Solids



Prewetting: Benefits

Less bounce & scatter

Faster reaction time

More effective melting action

Less material needed resulting in:

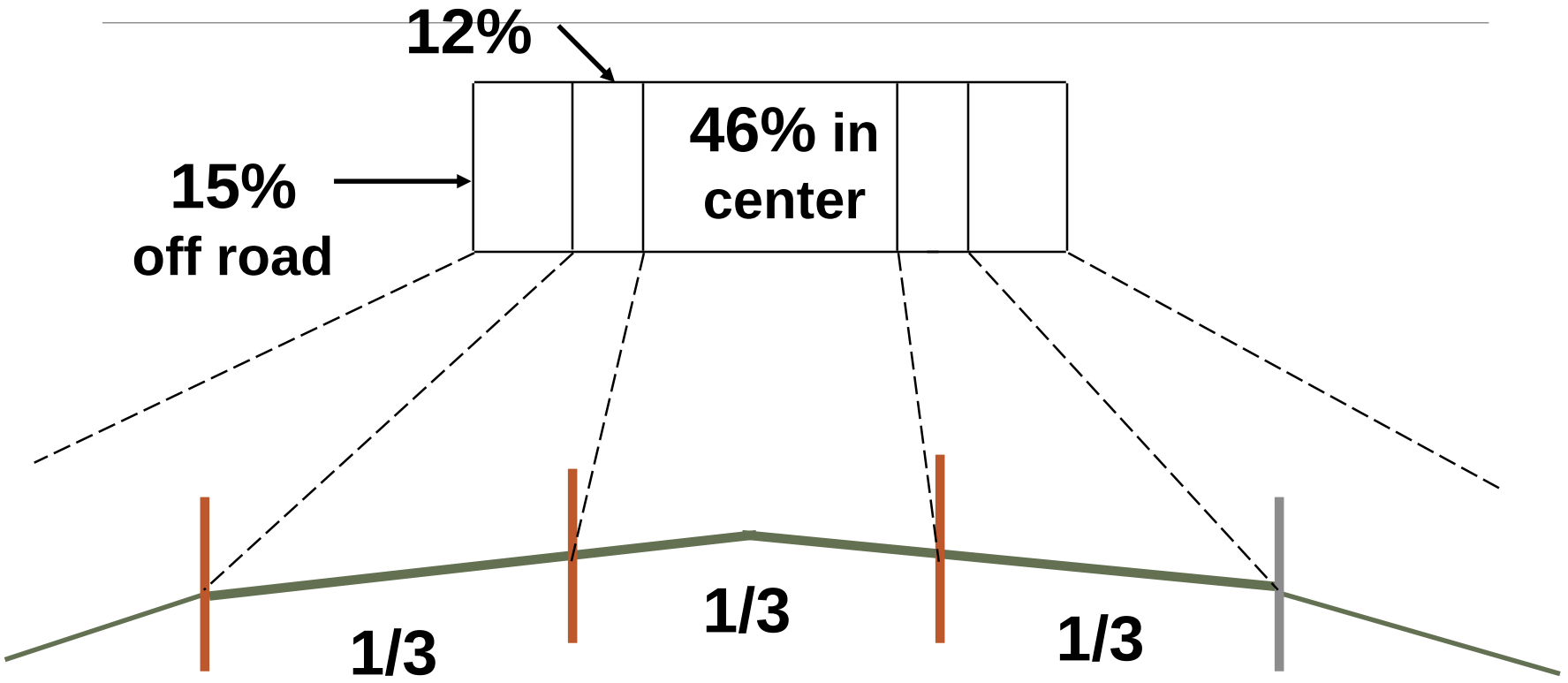
- reduced costs
- reduced environmental concerns

Prewetting

Wetness provided by solutions does cause abrasive to stick to the road surface or embed more quickly into an icy surface,

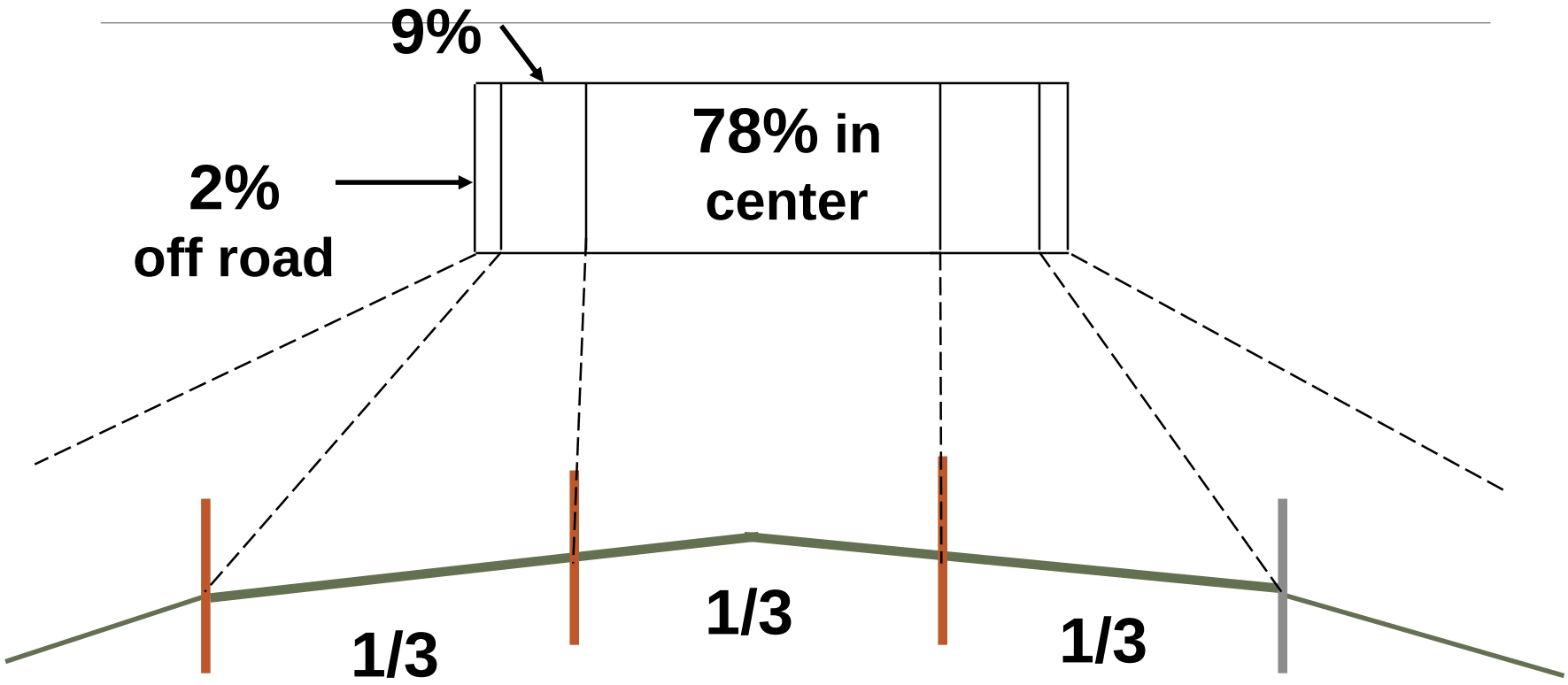
thereby keeping the deicing mixture or abrasive within the desired area.

Typical Scatter of Road Abrasives



100% salt spread in center 1/3 of road

Typical Scatter of Prewetted Road Abrasives



100% <u>prewetted</u> salt spread in center 1/3 of road

Wetted Salt Benefits

“Wetted salt has.... less tendency to bounce and scatter.”

“Wetted salt begins immediately.... cleaning is achieved with less salt, less effort, and reduced operating costs.”

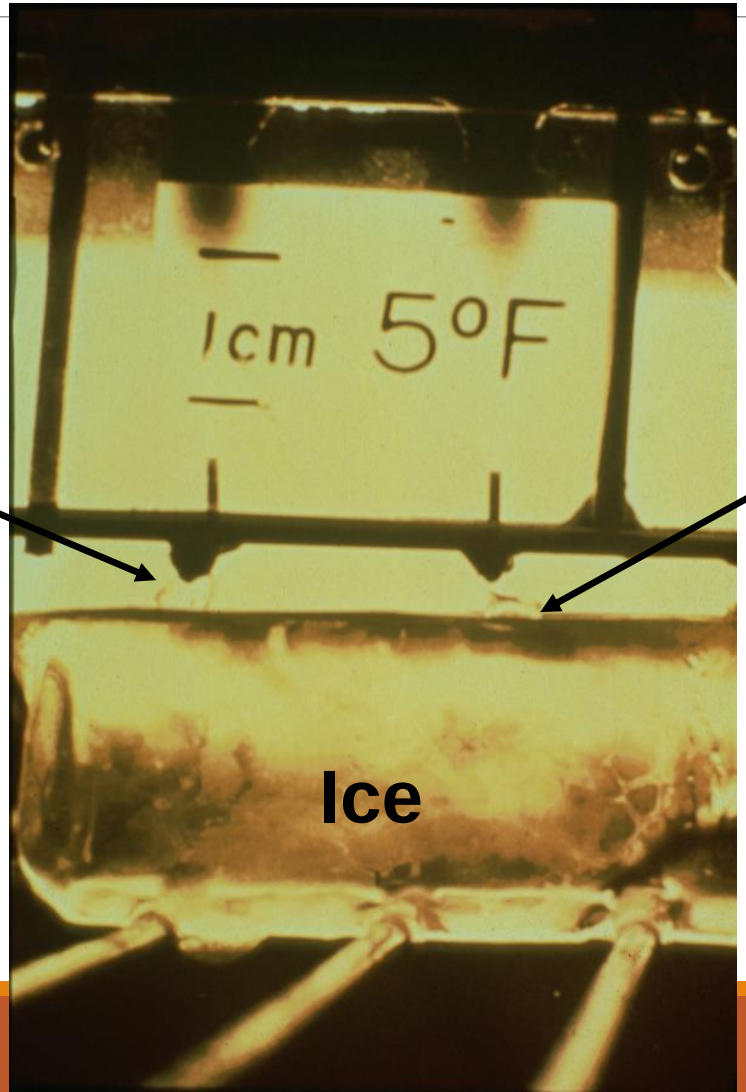
continued....

Wetted Salt Benefits

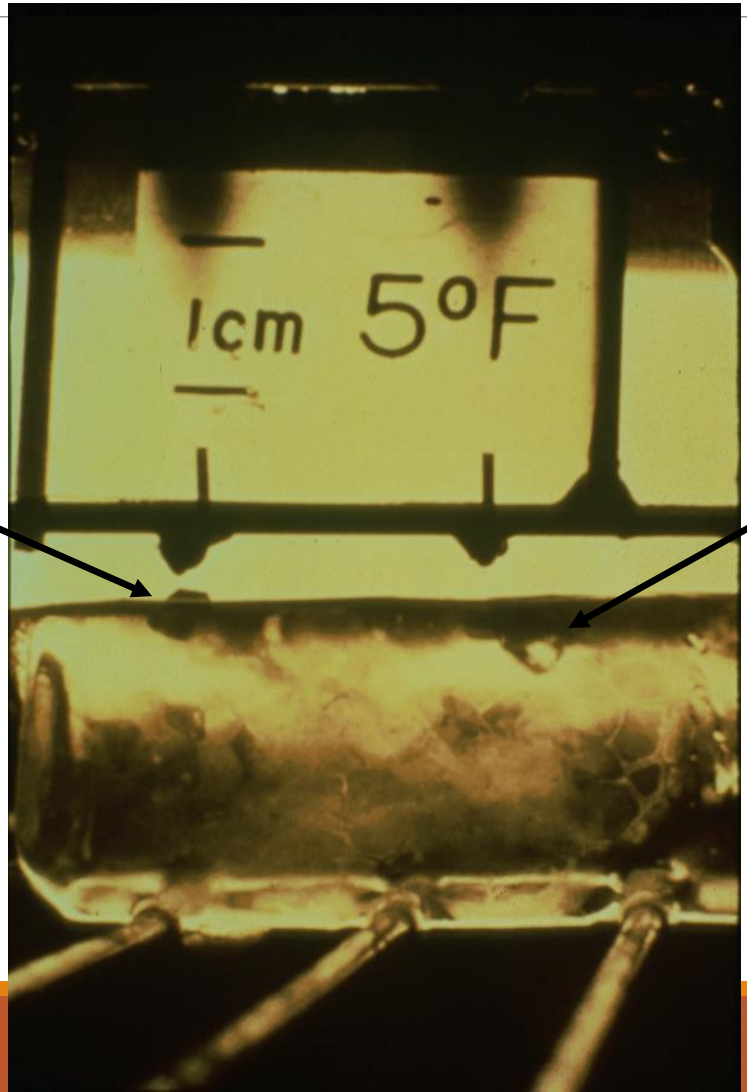
"....a 30% reduction of salt use taken as a reasonable minimum...."

Public Technology, Inc.

Melting Action: Untreated Salt vs Prewetted Salt



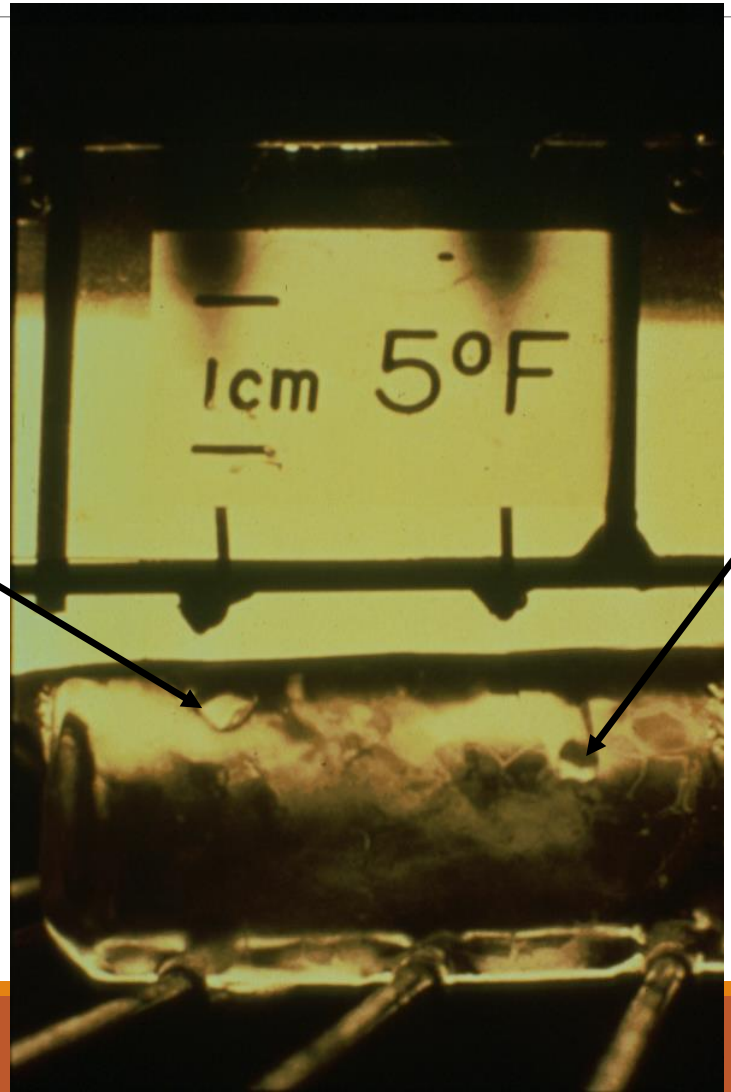
Melting Action: Untreated Salt vs Prewetted Salt



Salt

Prewetted Salt

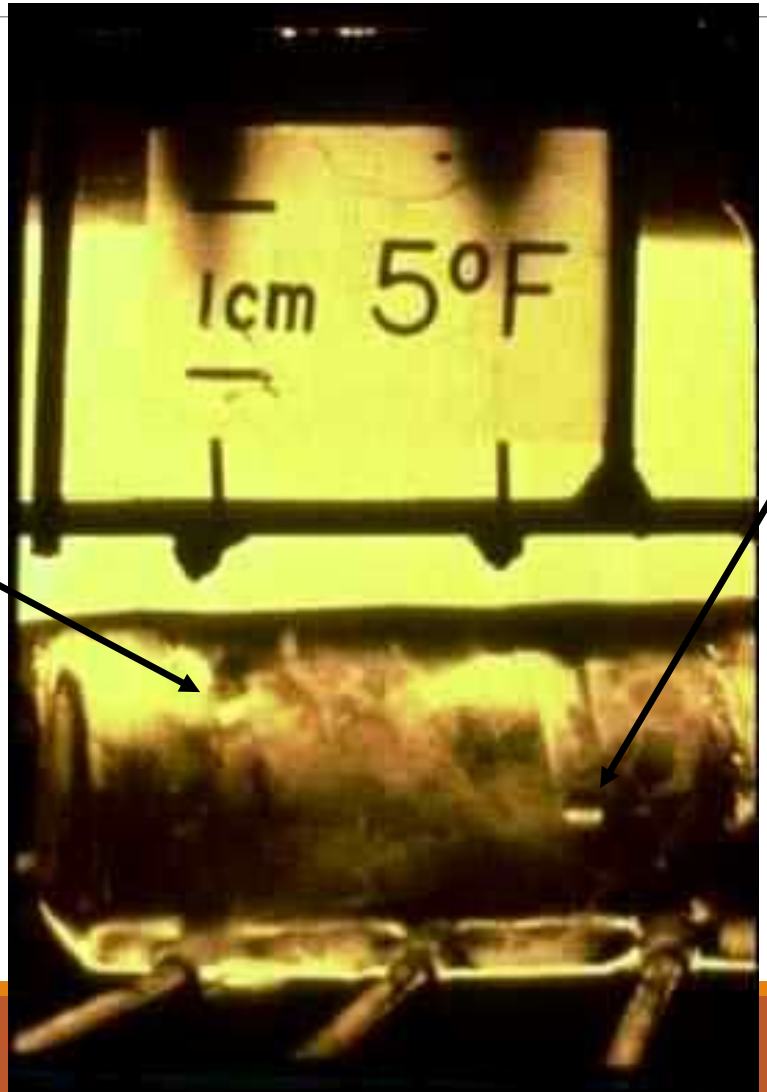
Melting Action: Untreated Salt vs Prewetted Salt



Salt

Prewetted Salt

Melting Action: Untreated Salt vs Prewetted Salt



Salt

Prewetted Salt

Advantages of Prewetting

- Reduced Abrasive usage
- Reduced cost of deicing materials
- Reduced labor costs
- Increased deicing efficiency and faster melting action
- Increased safety to motorists

Sanding Material

When there is a snow floor of ice on the road

- Prewetted sand will stick to the road surface
- The amount of sanding material can be reduced
- The abrasive effect of the sanding material will be increased

MAJOR STORM EVENT

When the storm event is large enough that there will be a snow floor develop, what techniques can we use to help remove the snow floor after the event

- Use conventional equipment, graders, plows
- Use application of brines that will freeze to the roadway before the storm
- Use rock salt early during the storm to put a layer of chloride on the road surface.

COMBINATION TREATMENTS

Total Storm Management

A combination of abrasives, brines, and solids may be necessary to manage a storm. Using each of the tools we have to produce the most safe condition on the roadway throughout the duration of the storm and the clean up effort afterwords.

Cost of Snow Removal economics

Traditional

- Cost of sand
- Cost of plows/sanders
- Storage of material
- Labor
- Clean up

Chemicals

- Cost of Material
- Cost of spreading equipment
- Storage
- Labor

Cost of Snow Removal Environmental

Traditional

- PM 10 dust particles
- Siltation of streams and rivers
- Ditch cleaning
- Lost material accumulation

Chemicals

- Chlorides/Chemicals in water table
- Harm to vegetation

Cost of Snow Removal Corrosion/harmful

Traditional

- Broken Windshields
- Dirty roadways

Chemicals

- Corrosion of Aluminum
- Corrosion of Steel
- Electrical failures

Bottom Line

Traditional

- Snow floors
- Vehicular accidents
- Lost commerce

Chemicals

- Bare Pavement (faster)
- Reduction in accident rates
- Continued movement of products and services

Post Storm Benefits

Easy snow floor removal

Reduced environmental impact

Less Cleanup

Overall storm cost minimized

LEGAL

Agency Liability

- Causes of Liability
  - Level of Service
  - Proper application of materials
  - Expectations of the Public

Scenario

1. A major storm is being predicted. The front is supposed to hit about midnight in your area. The temperature is now 30 degrees but is expected to drop to 20 by midnight and continue to drop into the single digits by morning. An early accumulation of snow is expected, up to 3 inches, then the snow will taper off only to start again tomorrow afternoon, 2 to 3 inches. The temperatures are expected to rise into the mid 20's

Scenario 2

The above is happening, but you have a mountain pass to consider, which is at an elevation 2000 feet above you, with temperatures expected to be 10 degrees colder. Snow accumulations increased by as much as 2 inches.

Scenario 3

It has been raining all day, at least ½ inch, and it is predicted to change to snow by 11PM and continue throughout the night. Possible accumulation of 3 inches. The temperature is now 38 but is expected to hit a low of 28 overnight.

Scenario 4

Morning fog has been a problem for the last three days, the temperature has been hovering around 33 degrees in the morning but is expected to drop to around 30 tonight and tomorrow night. Daytime high is 40 to 43. No rain is expected.

Scenario 5

A mountain pass is expected to get 12 plus inches of snow in the next 12 hours. The wind is predicted to be 15 to 20 mph causing drifting snow and near blizzard conditions. Temperatures are running 28 in the daytime, and will be dropping to 19 overnight. This is a major route and must be kept open.

Scenario 6

There has been an unexpected storm come through, dumping snow on the roadway. The plows have been out, but a snow floor has accumulated. Sanding material has been spread, but there has been 3 accidents, and you have been told to do something. The temperature is 29 and expected to drop to 20 overnight and then raise back up to 35 tomorrow, again dropping below freezing tomorrow night.

Other Resources

Your Local Technical Assistance Program (LTAP).

- AASHTO's RWIS/Anti-Icing CBT
- ClearRoads CBT

Bruce Drewes, LLC

bdrewes@3tgroup.org


SANDWICHES
Ouvert Jour
LET'S HAVE ONE MORE
AND THEN WE'LL GO !!

THANK YOU