frame of mind for winter — that means efficiency and safety (notice that “safety” is underlined).

The idea of a plow rally started in 1988 when the city of Concord’s safety people teamed up with the New Hampshire Municipal Association’s Property Liability Insurance Trust (NHMA-PLIT). Only one rally was held in 1988 but it was so successful that plans for 1989 got under way immediately.

In the early part of the fall five rallies started up. The city of Concord and NHMA-PLIT led the way but this year they had a little help from the Road Agent Association, the New Hampshire Safety Council, the New Hampshire Municipal Trust Worker’s Compensation, the town of Londonderry, the city of Keene, the city of Lebanon, the city of Hampton, and the New Hampshire Technology Transfer Center.

There were five events at each rally. Event one included a summary of the CDL (commercial drivers license) requirements and a drivers safety quiz. Event two was a mechanically defective truck where plow teams had a limited amount of time to find and report all of the problems — something every driver should do before jumping in and starting to plow. Event three was a plow mounting contest. Two safety warnings and the team was disqualified — better than losing a couple of fingers or breaking a back. Event four was the wing slalom. This event required the skill of a wingperson and driver working together. We had a few mail boxes uprooted as well as a few parked cars — the cars were supplied by a local junk yard — better to happen in practice than in a winter storm. The fifth event was backing blind (we

continued on p. 8
Using Salt As A De-icer

In the future, it could be against the law

by Darryl L. Hearn

Snow removal and ice control are probably the most demanding tasks any street or highway maintenance agency has to handle. While the motoring public doesn’t expect “June driving conditions in January,” they do expect adequate driving conditions in a reasonable length of time following a winter storm.

Everyone will not be satisfied with the level of service provided, but the majority should be.

It’s doubtful you’ll ever satisfy everyone, but you probably can satisfy the majority, and that’s what counts.

You do the best you can with what you have, and hope there won’t be too many complaints. Maybe you’ll be complimented, but don’t bet on it. It’s far easier to respond to a poor road condition than to say “thanks for making my travel safe.”

Winter storms are far too complex and unpredictable to have a simple set of rules or policy. The public want the roads and streets clear; the Public Works agencies try to achieve that end, but they have some severe constraints — funding, equipment, and manpower.

LOCAL MEDIA CAN HELP: The public’s perception of snow and ice control can become much more positive with simple, honest, and accurate information provided through local media: television, newspapers, and radio. Radio can provide almost instantaneous information on local road conditions and maintenance activities.

Providing the media with up-to-date information can eliminate many calls and questions. If the public know what to expect and what action will be taken, they will not be on edge.

PROVIDE A WRITTEN POLICY: A written or formal policy on snow removal and ice control operations identifying what, where, and when will eliminate many headaches if made available to the public. Both public works personnel and the public then know what procedures are planned.

However, everyone needs to understand that Mother Nature does not always cooperate in winter storms. It has been estimated that there are over 66,000 different winter storm conditions. While weather forecasting is fairly accurate, there can be surprises of major consequence, or the storm may not materialize at all.

SAFETY: There are no specific rules that apply to all agencies. Not only do storm conditions vary but equipment, labor force, level of service desired, and available funds also vary. The one thought that all agencies should have in common, though, is to provide adequate safety for the motorist as quickly and efficiently as possible.

NEW TECHNOLOGY AVAILABLE: One of the major complaints by Public Works officials is the lack of funds. Winter maintenance is definitely one area where the expenditure of money today could save much more money tomorrow.

There are new (yes, possibly expensive) technologies on the market to help make snow removal and ice control easier for everyone. Although there are many things about snow removal and ice control that will never change because we can’t change or control Mother Nature, many things are changing.

The computer age is here, and in the next few years many agencies will be using localized and computerized weather data input, thermal mapping, and other computer applications we have not yet even thought about.

In the recent past many agencies fought a storm by the seat-of-the-pants. Today, there is new technology to assist them, but many agencies consider it too expensive.

What is expensive is a call-out when no action is necessary.

Private Weather Forecasting — Provided initially by the National Weather Service, forecasting is also now offered by private services, and is tailored to specific regions. Services that allow you to determine what to expect by contacting adjacent or distant agencies in the path of your normal storm patterns are now available. These services can “instrument” you and your neighbors so that all road and storm conditions are relayed on an instant basis.

Thermal Mapping — Road sensors from pavement monitoring are currently provided by only a few companies. One company uses in-road sensors to give readings of pavement temperature, pavement condition (wet or dry), and concentration of salt on the pavement.

The important advantage of this system is that you have a history of pavement temperature, which is probably the single most important factor in making a decision on a course of action. While most agencies rely on ambient temperature, the pavement temperature may be quite different.

As an example, the ambient temperature may be 32 degrees F and falling, with snow expected, but the pavement temperature might be 40 degrees F. It’s quite possible the snow would melt on contact and a call-out or use of deicers would not be necessary.

Automatic Spreader Controls — These have been around for over 20 years, but for various reasons have not been adopted by many agencies. The prime factor may be their cost, yet what most agencies could save in material cost would easily pay for the automatic controls — often in one winter season.

Automatic controls save more money than they cost.

Automatic controls guarantee accurate application rates at all road speeds. The controls commence spreading when the vehicle starts moving; stop spreading when the vehicle stops; and adjust the rate of output according to vehicle speed. Automatic controls eliminate the need to constantly adjust the salt output as speed changes, allowing the operator to concentrate on other important activities, such as watching out for the motoring public around him.

New Snow Plows — One of the most dramatic improvements in snow removal and ice control in recent years is in new snow plow equipment. Before you purchase your next snow plow, you should contact all potential suppliers. There have been some major changes in the design and operation of plows in the last few months.

It’s no longer just push, plow, or cast, but when, where, how far, and how much.

There are plows that will (with a touch of a switch) put the snow where you want it, as high as you want it, and cast in any direction you want it.

continued on p. 4
Shoulder Reinforcement With Recycled Tires

An innovative approach for reinforcing narrow or eroded roadway shoulders

by David Huft

Most highway departments face two common problems—the high cost of new construction materials and disposal of used tires. The California Department of Transportation's Transportation Laboratory has developed a novel way to address both problems at once, by reinforcing narrow or eroded highway shoulders with recycled tires.

In a typical installation, a bench is cut and sloped slightly towards the traveled way. After the bench is lined with engineering fabric to prevent erosion, a layer of tires is placed. Steel clips fabricated from half-inch reinforcing bar tie the tires together in parallel rows. After the first layer is filled and covered with permeable material, the second layer of tires is placed.

Walls up to six feet high can be built by adding more tire layers. Salvaged steel posts driven through the inside rows of tires tie the embankment together vertically. Caltrans recommends covering the top and sides of the installation with engineering fabric to prevent erosion.

At a test site on Route 32 in northern California, Caltrans determined that the tires provided a safer highway by developing a wider traveled way. The tires remained stable after installation. Caltrans found the cost of the tire reinforcement to be less than half that of other alternatives (see table).

Caltrans cautions that recycled tire reinforcement should be considered an interim repair, with a life expectancy of five to ten years.

More information on this use of recycled tires can be obtained from The New Hampshire Technology Transfer Center at 1-800-423-0060 or from Caltrans by calling (916) 739-2417 or writing to:

Transportation Laboratory
5900 Folsom Blvd.
Sacramento, CA 95819

The above article was reprinted from The Connection, Vol. 2, No. 3, a publication of the South Dakota Transportation Technology Transfer Service. The author, David Huft, is a research engineer with the SDDOT.

---

<table>
<thead>
<tr>
<th></th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discarded Tire wall *</td>
<td>80.00</td>
</tr>
<tr>
<td>Gabion wall</td>
<td>165.00</td>
</tr>
<tr>
<td>Concrete crib wall</td>
<td>230.00</td>
</tr>
<tr>
<td>Reinforced concrete wall</td>
<td>325.00</td>
</tr>
</tbody>
</table>

*Suitable excavated material is assumed as backfill.

Shoulder erosion along a narrow highway can be mitigated by using salvaged post anchors and discarded tires. Shoulders can be restored thus making the highway safe for travel.
Corrosion Inhibitors -- The foremost objection to salt use has been and continues to be vehicle corrosion. The public sees a rusted vehicle, and believes delcing salt is to blame, even though there are many factors involved. Automobile manufacturers have recently solved this problem. One manufacturer offers a ten-year warranty against corrosion. In a few years, vehicle corrosion will not be a major problem. (However, the owner should continue to give reasonable care to his vehicle.)

Salt Institute member companies are also addressing the corrosion problem.
Many of them now have corrosion inhibitors available, which will reduce, if not eliminate, rebar corrosion.

STORING SALT EFFECTIVELY: Covered salt storage is not new but there have been dramatic improvements in storage facilities throughout North America in the past 20 years. There is still room for improvement by many agencies. Improper salt storage is responsible for the majority (80 percent or more) of vegetation damage and groundwater pollution.

Salt spread on the roads is quickly diluted by snow, ice, and rain, but potential runoff from an unprotected storage facility may produce concentrations that could be undesirable.

The Salt Institute began its Excellence in Storage Award in 1988 to acknowledge the top five storage facilities each year. Honorable mention will also be made to other qualifying agencies. Application forms for the 1990 Excellence in Storage Award may be obtained from the Salt Institute, 77 N. Fairfax Street, Suite 600, Alenandria, VA 22314-2040, (703) 549-4648.

LEGISLATION PENDING: Legislation was introduced in Michigan this year to prohibit the use of salt after 1991 if a suitable alternative could be found. It may be only a matter of time before New Hampshire introduces a similar bill. Calcium magnesium acetate (CMA) is considered the most likely alternative. CMA has been tested extensively in the laboratory and (on a much smaller scale) in the field. Based on those tests, it is considered a viable alternative to salt, but the cost for CMA is currently about $600 per ton. Greater demand for CMA may increase this cost faster than improved production techniques can reduce it. Also, approximately 1.6 times as much CMA is needed to achieve the same results as salt.

The Michigan Department of Transportation has estimated it would cost over $400 million more to use CMA in place of salt on state highways alone. Although there is no official estimate, it is likely that cities, counties, and townships collectively could expend an equal additional amount.

Snow removal and ice control will never be an exact science; there are too many variables. Winter highway maintenance is part art, part science, and part luck. There are no simple guidelines that will satisfy every storm condition. Therefore, winter maintenance personnel must have the flexibility to fight each storm as it occurs with the most appropriate equipment and materials available, using their expertise and judgment based on past experience.

Sensible Salting and all that it entails - proper storage, calibration of spreaders, automatic controls, operator and management training, equipment maintenance, and good common sense based on experience - could eliminate the need for legislation to restrict salt use as a deicer. Public Works agencies are in the best position to see that these Sensible Salting ideas are put into practice.

The above article was modified and reprinted from The Bridge, Vol. 4, No. 1. The author, Darryl Hearn, is Chief Engineer with the Salt Institute, Alexandria, Virginia. He may be contacted at 925 Spring Mill Drive, Hofman Estates, Illinois 60194; (312) 882-5861.
AASHTO Updates Design Guide

A review of a valuable reference for town engineers and other officials involved in roadside features such as drainage, guardrail, sign supports, etc.

by Ed Kannel

Highway accident statistics indicate that approximately 60 percent of fatal highway accidents involve a single vehicle. In about 70 percent of these cases, the vehicle overturned or hit a fixed object off the roadway. The American Association of State Highway and Transportation Officials (AASHTO) is offering a new design guide to assist engineers in developing a safer roadside environment to reduce the fatalities, injuries, and property damage associated with these accidents.

The "Roadside Design Guide" incorporates information from several AASHTO publications and from the most recent research and technology developments. The guide supersedes the 1977 AASHTO Guide for Selecting, Locating and Designing Traffic Barriers.

Since roadside is defined as the area beyond the edge of the shoulder, the guide emphasizes the need for a forgiving environment for motorists who run off the roadway. Although design for traversable embankments and removal of obstacles is favored means for reducing hazards, the engineer must also consider other alternatives such as breakaway supports and redirection of vehicles. The AASHTO guide provides materials in each of these areas as well as a cost effectiveness selection procedure to evaluate alternative strategies.

The design concepts in the guide are not new. For example, a major concern is providing a clear zone. However, unlike the original interpretation of the 30-foot clear zone, the guide recognizes that alignment, vehicle speed, traffic volume, and embankment slopes all affect the distance needed for safety. Design curves and tables provide basic guidance on these variables.

These design tools and the many other sections dealing with drainage structures, sign and luminaire supports, guardrail length and location, bridge rail, and safety features for work zones make the guide a valuable reference for the engineer.

The user of the new guide should note that the information provided is only a guide and not intended to be a standard or policy document. It should be used to understand the problems with selected roadside features and to develop a safer environment for motorists. Users must evaluate all factors in light of their own experience with safety, environment, traffic, and resources to weigh and select design improvements. Based on these data, a policy for their own jurisdiction may be formulated.

A complement to the design guide is a computer program, entitled Roadside, to assist the engineer in making economic evaluations of roadside design strategies. The program extends the economic analysis of the 1977 Barrier Guide by providing additional capabilities to account for curvatures, gradients, design speed, accident severity, and traffic growth over the project life. Although the computer program is not needed to undertake the analysis, the user should find substantial time-saving benefits by using the program. A separate appendix in the guide provides several examples of the economic analysis and program output.


The analysis software (IBM and compatible systems) can be obtained through the McTrans Center, 512 Weil Hall, University of Florida, Gainesville, FL 32611. To order by phone call 904-392-0378.

The above article was reprinted from Iowa State University’s publication Technology News, November 1989. The author, Ed Kannel, is a professor of civil engineering.
Safe Winter Driving

The tradeoff isn't worth the risk

Although New Hampshire has widely varying winter weather, there are driving habits that are appropriate throughout the season. Let's review some ideas to prevent winter accidents.

SPEED - Give yourself plenty of time to get where you're going. Posted speed limits are for dry conditions, but on icy roadways, half the speed limit may be suicide. Vary your driving speeds according to the road conditions.

VISION - No other factor is as important for safe driving. Place frost shields in critical view areas. Clear all windows of snow, ice, or condensation. Also, remove snow from the hood. This snow turns into a quick white-out, and it gets into the air intake and ices the inside of the windshield. Use garage time to wash windows inside and out to reduce the accumulated film. Wear sunglasses if sunlight is reflecting from snow.

LIGHTS - Even though you can see during twilight and daylight, drive with low-beam headlights (not parking lights). Periodically clean all lenses because dirty headlights can cut visibility by 50 percent or more. Don't forget the directional lights, taillights, and rotating lights.

TIRES - Be sure your tires have adequate tread. Extra weight over the rear wheels might improve traction a little, but it's at the expense of steering control and longer stopping distances. The tradeoff isn't worth the risk.

Lower tire pressures do not increase traction, and underinflated tires can seriously affect steering. Keep in mind that for every degree F drop, the tire air pressure goes down about one psi. Remember, underinflated tires are the major cause of tire failure.

ICE - At +30 degrees F, ice is twice as slippery as at 0 degrees F. As temperatures plunge below 0, it becomes "dry," so the relatively warm times can be the trickiest. Ice forms first and lasts longer on bridges and in the shade. If you hit an unexpected patch, don't try to brake, accelerate, or downshift. Let up on your accelerator and idle your vehicle through the slippery area. If you skid, quickly take your foot of the gas and brake, and steer into the direction of the skid. Hold the steering wheel firmly and don't turn sharply. Use a light touch to correct the swerve.

BRAKING - For front and rear wheel drive vehicles with disc or drum brakes, the National Safety Council recommends squeezing the brakes with a slow steady pressure. When you feel them starting to lock, ease off until the wheels are rolling, then squeeze again. Pumping the brakes is no longer considered the most effective technique. Be sure the brakes are adjusted and balanced to minimize skidding.

FOLLOWING DISTANCE - Maintain at least twice the normal following distance on snow or ice. Accident Review Boards report that rear-end collisions account for most of the winter accidents. If you are being followed too closely, maintain a greater breaking distance for gradual stops. Brake slowly when entering turnarounds while plowing or sanding. During adverse weather conditions, motorists may use your vehicle as a pilot car. Be alert for this hazardous situation!

VENTILATION - Crack windows for flow-through ventilation, even at very low temperatures. Be sure that the fresh air intake is free of ice and snow.

TOWING - All employees should be out of both vehicles when hooking or unhooking chains or cables. Fingers have been crushed and amputated when unaware drivers have moved their vehicles before everything was ready.

DEAD BATTERIES - When jumping batteries, connect one cable to the (+) terminal of each battery. Then connect one end of the second cable to the (−) terminal of the booster battery and the other end to a nut or bolt on the dead vehicle's engine. Do NOT connect it to the (−) of the discharged battery; that's close to any possible hydrogen gas production and unnecessarily increases the chances of an explosion. Start the engine of the helper vehicle and let it run a few minutes, then start the disabled vehicle's engine. Remove cables in the exact REVERSE order.

Always wear eye protection, preferably chemical goggles, when jumping batteries, and avoid placing your head directly over either battery. Explosions do happen!

SAFETY BELTS - Wear them!

Experience is a hard teacher, and that's where these ideas came from. They should help you handle winter's driving challenge. Have a safe winter!

The above article came from the top winter driving experts in the country, Alaska Transportation Technology Transfer, Vol. 13, Fall 1989.

Storage Of Gas Cans

You may benefit from the advice of one of NHDOT's safety officers

Wayne Perrault, Safety Officer, suggests Supervisors to designate individuals in each shed to check for proper storage of gas cans each day. Pointing out the fact that winter maintenance produces many different tasks in one day for Maintenance crews.

A crew could be cutting wood and carrying gas cans in the truck. The same truck could be used later in the day or at night to plow snow and should not be carried in the truck body during this procedure.

When gas cans are removed from vehicles they must not be randomly placed on floors or counters where the potential for a welder's spark could ignite them, nor should they be left in truck bodies parked in sheds all night.

Heat will expand gas and the potential of an electric spark is present with salt corrosion acting on the vehicles wiring system. The Department has lost equipment due to this problem before. Perrault recommends all sheds have a designated area for the storing of these gas cans.

The above helpful safety tip was reprinted from Transportation News, November, 1989, a publication of the New Hampshire Department of Transportation.
Salt And Highway Deicing

Q. The Salt Institute's Storage Handbook gives some good ideas on storage but it doesn't indicate how much salt is lost if not covered. What is the loss if salt is left exposed to rain and elements?
A. There may be losses of salt from an uncovered stockpile from rain and, to a much less extent from wind. Rain losses are estimated at 1/4 percent per annual inch of precipitation. To my knowledge, wind losses have never been calculated, but should be considered very small because once exposed dust particles are blown away no more will be generated until the face of the stockpile is disturbed. A covered stockpile not only prevents losses, but provides a dry, free flowing product.

Q. At a recent conference, the question was asked - what is the single worst problem you have to deal with in snow and ice control operations?
A. Many would agree that the public does not give you the opportunity to do your job on a timely basis without complaint. They will not give you ample room to plow, won't keep streets clear of parked cars and, of course, question why you didn't plow their street sooner.

We know it is impossible to do everything at once and sometimes there are not enough funds to do all the public wants, regardless of time. This is why it's so important to have a public relations program to inform the public of what should be expected and when.

People should also be advised that fluctuating storm conditions may require temporary adjustments to general policy. There are too many variables in snow and ice control to have a policy or guideline that universally guarantees specifics. But having general policy guidelines is a major step toward getting the job done effectively, efficiently, safely, and within the boundaries of public expectations.

Q. Is the gradation of highway deicing salt from all sources the same?
A. Yes, all Salt Institute member companies produce rock and solar salt for highway use to ASTM-D632-84 specification. The specification was re-approved in 1989 by ASTM without change. In recent years, several companies have produced "enhanced" salt products which vary on the basis of proprietary additives.

Q. Why do you use the 500 pounds per-two lane mile figure so often? We've found that we have to adjust to suit the storm and sometimes it may require more or less salt.
A. Your point is well taken, there must be flexibility in the amount of salt spread for varying storm conditions. That's the problem, the storm conditions change not only from storm to storm but during a single storm.

The 500 pounds per two-lane mile is a good starting point for the so called "average" storm, yet we all know there is no average storm. It has been estimated that there are 66,666 different storm conditions.

Start with the least amount of salt you feel is reasonable to provide safe driving as quickly as possible and adjust as necessary to provide continuing safety. The quicker you reach bare pavement and maintain it, the higher the level of safety and usually the less costly - maintenance as well as accidents.

Q. When plowing and spreading in tandem, should both trucks be spreading salt?
A. The objective should be to clear the road as quickly and effectively as possible but not to duplicate effort or waste salt. The lead plow should spread salt only on the lane it clears as with each successive plow. Salt should not be spread across pavement where a following plow will clear snow and just-spread salt. If only two plows are operating, it may be possible for the follow-up plow to handle all spreading. They can change positions when one truck runs out of salt.

Q. What's new in alternatives to salt for highway deicing?
A. As always these days, calcium magnesium acetate (CMA) is in the forefront and continues to be tested by several agencies. Generally, results indicate that CMA is slower to react, more CMA is required and the price continues to increase. The long-term affects on the environment of CMA and NaFo (sodium formate) are not yet known. Although they appear to be less corrosive, we'll have to wait for the results on other long-term environmental effects. Efforts are ongoing to produce CMA more inexpensively from corn-based acetic acid rather than natural gas as all CMA is currently being produced.

The City of Ottawa, Ontario has conducted tests with CMA, salt, and sodium formate (NaFo) and would like to conduct further area-wide NaFo tests. NaFo is a relative new comer to the market but according to ottawa it is a viable alternative. Although far more expensive than salt, NaFo appears to be less corrosive.

Highway Sign Legends -- Nonstandard Alphabets

It has been brought to the attention of the Federal Highway Administration that a few vendors are selling computerized sign copy cutout machines that generate nonstandard highway alaphabets and nonstandard spacings between alaphabets/numerals for highway signs.

Please be advised that the design of computer-generated alphabets and spacings must comply with the Federal Highway Administration's (FHWA) Standard Alphabets for Highway Signs and the Standard Highway Signs publication. The standard alphabets were developed to provide optimum day and night legibility.

As a simple check in the field, refer to pages 6-16 and 6-17 of the Standard Highway Signs book. The destination New York City layout in 16-inch upper case and 12-inch lower case letters should be about 200 inches in width. Philadelphia should be about 145 inches. This simple test can be made by any sign shop.

It has also been learned that a few vendors are selling cutout dies for nonstandard lower case letters. These alphabets are commonly referred to as "Series C or D modified." As a reminder, only the FHWA Series E modified alphabet is standard. All other modified lower case alphabets are nonstandard and should not be approved for use in highway signing.

If there are any questions on this matter, please call the Bureau of Traffic at the New Hampshire Department of Transportation.

Q. Our first operation is to plow as soon as necessary, but not salt until the final stage of cleanup as the storm subsides. Is there a more efficient way to deal with the storm?
A. You first have to ask yourself what you want to accomplish. If you only plow, there will usually be snow left on the pavement.

The above questions and answers were rewritten from the Salt Institute's Fall, 1989 Newsletter Salt & Highway Deicing. Other pertinent questions concerning salt may be addressed to the Salt Institute, 206 North Washington St., Alexandria, Virginia 22314; or call the Technology Transfer Center at 1-800-423-0060.
On The Road...
continued from p. 1

blocked the rearview window) down an "L" shaped course with a small compressor.

Trophies were given for each event and
a plaque was presented to the overall
winners as listed here: Robert McCabe &
Harold Blanchette of Hopkinton; Paul
Schacht & Bob Burbank of Londonderry;
Bruce Tatro & William Cashman of Keene;
Bernie Hazelett & Tom Bircher of Hanover;
and Marc St.Pierre & Ken Henderson of
Rochester -- congratulations!

Actually, the real winners of this
program are the towns that participated.
Our hats off to them for getting there
workers out there practicing safe winter
operations.

A special thanks needs to go out to Les
Horne and Ken Ward from NHMA-PLIT.
They've got one of the best programs going
in the state!

Next year
will be big so
keep your eyes
and ears open.
For additional
information call
Les or Ken at
1-800-852-3358
or contact the
NH T² Center
at 1-800-423-
0060.

Above: The plow mounting event in Londonderry was exciting to watch. Plow teams went at it with a vengeance. The competition was steep and the safety judges kept a keen eye out for violations.

Left: One of the plow teams at the Lebanon rally looked over the defective truck a second time while others watched the action during the wing slalom.
The Lebanon mechanics did a great job setting up the problems on this truck. They rigged both safety and general maintenance type defects for the teams to hunt down.

Right: Before running the wing slalom the wing of each truck had to be set. Here, one of the teams adjusts to the first mailbox on the Concord course. As a plow truck moved through the course they were required to touch the chains hanging off of eight mailboxes with the wing. If the chain nearest the mailbox was struck the team got zero points.
The slalom course also included parked cars, a stop sign, and a right angle turn.

The above photos were provided by NHMA-PLIT
<table>
<thead>
<tr>
<th>Temperature Range</th>
<th>Type of Precipitation</th>
<th>Road Condition</th>
<th>Temp.</th>
<th>Activity</th>
<th>Beginning Storm</th>
<th>During Storm</th>
<th>After Storm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Below Zero (−18°C)</td>
<td>Dry snow</td>
<td>No packing Dry pavement</td>
<td>Rising</td>
<td>Plowing Sanding Salting</td>
<td>After ½ inch (12 mm) snow accumulates Follow after plowing No</td>
<td>Continuously to bare pavement As necessary after plowing No</td>
<td>Wing back shoulders/cleanup Icy spots only Icy spots only</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Falling</td>
<td>Plowing Sanding Salting</td>
<td>After ½ inch (12 mm) snow accumulates Follow after plowing No</td>
<td>Continuously to bare pavement As necessary after plowing No</td>
<td>Wing back shoulders/cleanup Icy spots only Icy spots only</td>
</tr>
<tr>
<td>2. 0°F to −10°F (−18°C to −23°C)</td>
<td>Dry snow</td>
<td>No packing Dry pavement</td>
<td>Rising</td>
<td>Plowing Sanding Salting</td>
<td>After ½ inch (12 mm) snow accumulates Follow after plowing No</td>
<td>Continuously to bare pavement No No</td>
<td>Wing back shoulders/cleanup Icy spots only Icy spots only</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Falling</td>
<td>Plowing Sanding Salting</td>
<td>After ½ inch (12 mm) snow accumulates Follow after plowing No</td>
<td>Continuously to bare pavement No No</td>
<td>Wing back shoulders/cleanup Icy spots only Icy spots only</td>
</tr>
<tr>
<td>3. 0°F to −10°F (−18°C to −23°C)</td>
<td>Dry snow</td>
<td>Packing</td>
<td>Rising</td>
<td>Plowing Sanding Salting</td>
<td>One-half hour after salting No Before ¼ inch (6 mm) snow accumulates</td>
<td>Continuously to bare pavement No No</td>
<td>Wing back shoulders/cleanup Icy spots only Icy spots only</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Falling</td>
<td>Plowing Sanding Salting</td>
<td>After ¼ inch (12 mm) snow accumulates Follow after plowing No</td>
<td>Continuously to bare pavement No No</td>
<td>Wing back shoulders/cleanup Icy spots only Icy spots only</td>
</tr>
<tr>
<td>4. 10°F to 20°F (−12°C to −7°C)</td>
<td>Dry snow</td>
<td>No packing Dry pavement</td>
<td>Rising</td>
<td>Plowing Sanding Salting</td>
<td>One-half hour after salting No No</td>
<td>Continuously to bare pavement No No</td>
<td>Wing back shoulders/cleanup Icy spots only Icy spots only</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Falling</td>
<td>Plowing Sanding Salting</td>
<td>After ¼ inch (12 mm) snow accumulates Follow after plowing No</td>
<td>Continuously to bare pavement No No</td>
<td>Wing back shoulders/cleanup Icy spots only Icy spots only</td>
</tr>
<tr>
<td>5. 10°F to 20°F (−12°C to −7°C)</td>
<td>Dry snow</td>
<td>Packing</td>
<td>Rising</td>
<td>Plowing Sanding Salting</td>
<td>One-half hour after salting No No</td>
<td>Continuously to bare pavement No No</td>
<td>Wing back shoulders/cleanup Icy spots only Icy spots only</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Falling</td>
<td>Plowing Sanding Salting</td>
<td>After ¼ inch (12 mm) snow accumulates Follow after plowing No</td>
<td>Continuously to bare pavement No No</td>
<td>Wing back shoulders/cleanup Icy spots only Icy spots only</td>
</tr>
<tr>
<td>6. Above 20°F (−7°C)</td>
<td>Wet snow</td>
<td>Packing Wet pavement</td>
<td>Rising</td>
<td>Plowing Sanding Salting</td>
<td>One-half hour after salting No Before ¼ inch (6 mm) snow accumulates</td>
<td>Continuously to bare pavement No No</td>
<td>Wing back shoulders/cleanup Icy spots only Icy spots only</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Falling</td>
<td>Plowing Sanding Salting</td>
<td>One-half hour after salting No Before ¼ inch (6 mm) snow accumulates</td>
<td>Continuously to bare pavement No No</td>
<td>Wing back shoulders/cleanup Icy spots only Icy spots only</td>
</tr>
<tr>
<td>7. Above 20°F (−7°C)</td>
<td>Sleet</td>
<td>Possible icing Wet pavement</td>
<td>Rising</td>
<td>Plowing Sanding Salting</td>
<td>No No Yes</td>
<td>Remove slush Icy spots only Icy spots only</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Falling</td>
<td>Plowing Sanding Salting</td>
<td>No No Yes</td>
<td>Remove slush Icy spots only Icy spots only</td>
<td>No</td>
</tr>
<tr>
<td>8. After Storm Any Temperature</td>
<td>No precipitation</td>
<td>Road snow-packed icy</td>
<td>Rising</td>
<td>Plowing Sanding Salting</td>
<td>No No</td>
<td>Continuously to bare pavement No No</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Falling</td>
<td>Plowing Sanding Salting</td>
<td>No No</td>
<td>Continuously to bare pavement No No</td>
<td></td>
</tr>
<tr>
<td>9. After Storm Any Temperature</td>
<td>No precipitation</td>
<td>Drifting</td>
<td>Rising</td>
<td>Plowing Sanding Salting</td>
<td>No No</td>
<td>Continuously to bare pavement No No</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Falling</td>
<td>Plowing Sanding Salting</td>
<td>No No</td>
<td>Continuously to bare pavement No No</td>
<td></td>
</tr>
</tbody>
</table>

† Note: Recommended treatment for various conditions shown on this chart should be used in most cases. However, unusual circumstances may necessitate departure from the recommended treatment. Reprinted with permission from Street and Highway Maintenance Manual, AFWA, 1989, p. 354.
"NO HANDS" On The Level

Maintenance crews often perform tasks like placing culverts or cutting a ditch where elevation readings are needed and regular surveyor's tripod-mounted levels are not available. The accompanying sketch shows how a Missouri highway department staff member solved this problem with a hand level.

This shop-built holder for the ordinary hand level is simple, rugged, and reliable. It takes up little space and can be easily carried in a pickup truck or on a grader to be ready when needed.

The level fits into the bracket which is mounted on an adjustable rod. The base can be set firmly into the ground so that the person taking the readings can move around without losing reference elevations.


Sign Causes Suit

Can you afford to give away $100,000?

A superior Court jury found a New Hampshire town responsible for a tree-covered stop sign blamed in a motorcyclist's death and ordered it to pay $507,000 to the victim's family. A car went through the stop sign and hit the motorcycle. A state trooper had photographs showing the stop sign almost totally obscured by trees and other growth. Despite the more than half million dollar award, the town was only liable under state law for up to $100,000.