

# **PENN TOWNSHIP'S SNOW AND ICE CONTROL PLAN**

General Information, Guidelines and Operational  
Procedures of the Road Crew

Operations and Materials Management Plan

# Penn Township's Snow and Ice Control Plan

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## GENERAL

It is **Penn Township's** goal to provide a transportation system that is passable and reasonably safe as much of the time as possible within the limitations imposed by the natural environment and the availability of equipment, material and personnel resources. As a result of those limitations, it is recognized that there will be occasions when the pavement and bridge surfaces will be slippery and/or snow and ice covered. During these periods drivers must recognize the conditions and operate their vehicles in an appropriately safe manner.

This manual provides information and guidance to assist **Penn Township's** road crew in conducting snow and ice control operations. It will serve as a basis for training township personnel.

The manual contains information on pre-winter operations and readiness, total storm management and decision making using **Penn Township** information resources, pre-storm preparedness, treatment options, post storm and post season activities. The provisions were developed to provide a reasonable balance among safety, cost, and environmental responsibility. The manual also contains related operational procedures and personnel procedures. The contents of this manual supersede all applicable prior manuals, directives and guidance relating to snow and ice control.

The contents of this manual reflect best practices as determined from a review of the relevant national and international literature and from information obtained from the township's maintenance personnel through surveys and interviews. It is intended to be a document that is responsive to new technology and techniques developed within **Penn Township** and elsewhere. Suggestions for change may be submitted at any time to the roads supervisor.

The words shall, must, should, recommended and may, use in Section II of this manual have the following meanings:

- shall and must - a required course of action
- should and recommended - a recommended course of action
- may - an optional course of action

## SPECIFIC INFORMATION FOR RESIDENTS AND PROPERTY OWNERS

1. Residents are required to adhere to Penn Township Ordinance No. 2014-01, restricting parking and placing property on or along township roads during and following any snowfall or weather emergency. The complete ordinance available at the township office or on the township website.
2. Do not allow children to build and occupy snow forts and similar creations within 10 feet of the edge of pavement.
3. Do not relocate snow from driveways and sidewalks into the paved street. This is in violation of Pennsylvania law and will cause a hazardous condition on the street (PA C.S., Chapter 55)
4. Fences are recommended to not be within 10 feet of the edge of pavement.
5. Remove all non-permanent seasonal items from within 10 feet of edge of pavement
6. Trim trees so that branches do not extend beyond the curb and into the street.
7. Pile most of the snow from your driveway throat on the traffic downstream side. This will minimize visibility problems. This will help to prevent snow being pushed back into your driveway when the plow comes through again.

## ROADS WITHIN PENN TOWNSHIP BUT NOT MAINTAINED BY PENN TOWNSHIP

The following is a list of roads and streets within **Penn Township** that are **NOT** maintained by the Township. Listed below are the roads and streets either maintained by the state or receive private maintenance. If the road or street you live on is **not** on the following list, then you receive winter maintenance from the Township.

State Maintained Roads	Private Roads – Privately Maintained	
Fair Oak Road (eastern end)	Beacon Light Lane	Meadow Cir
Middle Creek Road	Birdnest Road	Minton Dr
Route 204	Camp Road	Music Row Ln
Route 35	Costenbader Ln	Musser Ln
Route 522	Devon Ct	Myles Ln
Clifford Road (southern end)	Dogwood Ln	North Dr
S Market Street	Don Ally Ln	Old 11 + 15 (portion)
Salem Road	Double Diamond Hill	Oxford Dr
Sportsman Drive	Dusty Ln	Paramount Rd
State School Road	Forest Rd	Penn Avon Trail
University Ave	Goose Ridge Ln	Pennsylvania Ave
W. Sassafras	Hawk Ln	Pine Dr
S Market Street	Hazelwood Dr	Rogers Dr
Salem Road	Hidden Acre Ln	Rudy Road
	Hideaway Hill	S and H Dr
	High Hill Ln	Salem Manor Ct
	Hillside Dr	Saybrook Ln
	Juniper Ter	South Dr
	Lake Rd	Ulrich Ln
	Lenox Dr	White Block Studio
	Log Cabin Ln	Windy Acres Dr
	M and M Ln	Yale Dr
	Maple Ln	Zechman Dr

### PRIVATE DRIVEWAYS

Township road crews do not clear private driveways or driveway entrances of accumulated snow.

### PROTECTION OF DRIVEWAYS

Prior to snow removal season residents may apply a driveway protectant. This will help eliminate the possibility of damage from snow removal materials. The Township is not responsible for damage to private driveways, etc. due to snow removal materials.

### PLOW TRUCKS WITH PLOWS RAISED

A truck with a raised plow does not always mean the driver has completed your area. This vehicle may be:

- a. Returning for fuel or vehicle service
- b. Returning to the maintenance yard for additional treatment material
- c. Responding to a call to assist Emergency Services, i.e.:
  1. Police Department
  2. Fire Department
  3. Volunteer Ambulance
  4. School District Transportation Department

## **MAILBOXES AND MAILBOX POSTS**

Any installation within the right of way - including a mailbox/post - is placed there at the owner's risk. Residents are encouraged to install mailboxes at the maximum usable distance from the edge of the pavement. Posts should also be checked for deterioration to reduce the possibility that the weight of the plowed snow may simply break or push the post over. The Township shall not repair or replace mailboxes or posts damaged by the force or placement of plowed snow. In the event that your mailbox is hit by a plow blade, contact the Township Office at 570-374-4778.

## **CONTACTING THE TOWNSHIP DURING A SNOW OR ICE EVENT**

Personnel are extremely busy dealing with storm conditions. If you call during a storm please be aware your call may be answered by the answering machine. Always leave a clear message with your name and number. All calls will be returned at the earliest convenience.

**If it is a true emergency,  
Please call 911.**

## **PRIORITY OF TREATMENT**

Traffic flow and pavement condition information for critical locations are important in prioritizing snow and ice control operations. Critical areas include hills, intersections, bridges, cold locations (low, shaded and elevated) locations having mist or fog generation tendencies, traffic generators, high snow and ice accident locations, school bus routes and access to the Fire Stations and Ambulance Service.

## **OPERATIONAL GUIDELINES**

### **GOAL OF SNOW AND ICE CONTROL OPERATIONS**

**Penn Township** will conduct snow and ice control activities that afford residents a reasonably safe and passable (not necessarily bare) road surface as much of the time as possible. To accomplish that, snow and ice accumulations will be removed as soon as possible, consistent with stated priorities and resources. Abrasives may be used as necessary to provide temporary friction improvement. Certain conditions such as blizzards, whiteouts, other locally severe snow or ice events, thin ice formation in the absence of or during very light and spotty precipitation, and other conditions unknown to or beyond the control of **Penn Township** maintenance forces may temporarily preclude achieving this goal.

### **PERSONNEL POLICIES, CALL-IN PROCEDURES AND FITNESS FOR DUTY**

1. Drivers are required to report for duty within 45 minutes of notification.
2. Penn Township's personnel policy and the Pennsylvania CDL Policy outline requirements and zero tolerance for confirmed drug and alcohol use while on duty. Confirmation will result in immediate dismissal.
3. Other factors

### **OPERATIONAL RESOURCE**

#### Equipment Available:

- 2012 case Front End Loader
- 2008 Chevy T-tag
- 2006 Freightliner M2
- 2005 Freightliner M2
- 2001 Freightliner FL 80
- 2015 Western Star
- 2016 Chevy 3500

Personnel Available:

<b>Personnel Available</b>	
Isaac Ramer	CDL - A
Roger Catherman	CDL -A
Andy Howell	
Chad Brandt	CDL - B
Matt Cook	
Tom Wallish	CDL - B
Jeff Benfer	
Steve Keefer	CDL - A
Ken Carroll	
Zack Bogar	
Wade Hawn	
Ross Smoker	
Shane Kerstetter	
Jon Payne	CDL - B
Tom Snyder	

Winter Maintenance Budget:

	2014	2015	2016	2017
Salt and Anti-Skid	28,000.	30,000	25,000.	20,000.
Payroll	16,000.	19,000.	12,000.	12,000.
Total	44,000.	49,000	37,000.	32,000.

Salt Storage: Salt barn capable of storing 1000 +/- tons of material

Salt Brine Storage: N/A

Brine/Magnesium Blend: N/A

Magnesium Chloride Storage: N/A

Miles of Roads: @ 33 miles

Number of Cul-de-sacs: 8

Number of Assigned Plow Routes: 5

**OPERATORS DIRECT COMMUNICATION WITH THE PUBLIC**

In the event of an accident Penn Township operators may stop to check to see if the vehicle passengers are safe and emergency services notified as needed.

Please do not flag down township drivers during plowing duties for a complaint, please call the Twp Office or the Roadmaster.

**EMERGENCIES WILL BE REPORTED TO 911**

## **PRE-WINTER ACTIVITIES**

As this is a living document, this manual shall be reviewed and revised as necessary. Appropriate changes should be incorporated as soon as possible. Areas that may change include: highway responsibility, technology, procedures, equipment, personnel, materials and level of service. Sources of changes may include: our residents, individual or work group suggestions, personnel meetings, post-season reviews and Penn Township Supervisors.

### **EMERGENCY AND SEVERE WEATHER RESPONSE PROCEDURES**

**PENN TOWNSHIP** will initiate emergency operating procedures under two (2) conditions; if the Township, County or State declares a state of emergency, or if winter storm predictions are expected to exceed 8 inches of snow in a 24 hour period. Under these conditions all road crew employees are called to service. The Penn Township Emergency Operations Center (EOC) will be activated and all Township communications and computers will be consolidated for an efficient control center. If the storm is expected to exceed 24 hours **PENN TOWNSHIP'S** max drive time scenario will be utilized.

### **EQUIPMENT READINESS**

All of **PENN TOWNSHIP'S** snow and ice control related equipment should be inspected; test runs completed, repaired as necessary, and receive scheduled maintenance prior to the snow and ice season.

### **TRUCK READINESS**

The prescribed seasonal and use based maintenance service should be completed prior to the winter season. All trucks should be checked with full winter gear (plows and spreaders) well in advance of the first anticipated snow or ice event.

### **MATERIAL SPREADER READINESS**

The materials spreaders should receive required maintenance and be lubricated, repaired, test run and calibrated.

### **PLOW EQUIPMENT**

Plow equipment should be inventoried, test mounted, and inspected for proper function, missing parts, structural damage, proper adjustment, and sufficient remaining wear depth on items like shoes and cutting edges. Necessary repairs and replacement should be made. Plows should be stored in a position for easy hookup and have easy-to-read identification to match them to the proper truck.

### **SPARE PARTS**

The maximum allowable stock of commonly used spare parts should be acquired prior to the snow and ice season. These include: cutting edges, plow shoes, shear pins, nuts and bolts, filters, bulbs, spreader controller parts, springs. Windshield wipers should be new or near new at the start of the winter maintenance season.

### **INDIVIDUAL TOOLS AND SAFETY GEAR**

Trucks should be checked for the required compliment of tools and safety gear. These include, for example: shovels, bars, hand tools, tire chains, flashlights, flags, flares, warning devices, gloves, hard hats, tow chains, ice scrapers, and snow brushes/brooms. Proper stowage for these and other in-cab loose items must be provided.



## **PERSONNEL READINESS**

### **ACQUISITION AND ASSIGNMENT**

Sufficient personnel should be acquired and trained for snow and ice operations prior to the winter season. Specific route assignments should also be made prior to the snow and ice season and added to this document. However, there should be provisions to accommodate the lack of specific people.

### **CALLOUT AND FAMILY READINESS**

Callout procedures, impacts of winter maintenance on family life and family responsibilities should be reviewed and discussed with applicable **PENN TOWNSHIP** personnel before the snow and ice season.

### **TRAINING**

Snow and ice control training should be accomplished prior to the snow and ice control season. Training topics include at a minimum: Intra-**PENN TOWNSHIP** communication, cooperation and responsibilities; weather conditions, road conditions, road and weather information systems; safety issues; public relations/information issues; operational issues and procedures; level of service (local and system-wide); equipment readiness; materials management; new technology, new initiatives and procedures; and emergency response issues.

## **MATERIALS, STORAGE AND MAINTENANCE FACILITY READINESS**

**PENN TOWNSHIP** acquires most snow and ice control materials through the contract process. Given the time required to establish a contract, these requirements and contracts and purchase requisitions should be done early. Typical material purchased is sodium chloride (salt or rock salt). Individual responsibilities in the contract administration process should be defined. Quality assurance procedures should be established for each material.

Most **PENN TOWNSHIP** snow and ice control chemicals are stored in a structure. This structure and associated run-off containment features, lighting systems, and ventilation systems should be inspected and repaired as necessary. It should be filled to working capacity prior to the snow and ice season.

Certain features of **PENN TOWNSHIP'S** maintenance facilities should be inspected and repaired as necessary prior to the snow and ice season. These include: buildings, yard traffic areas, fuel delivery systems, yard and garage lighting, emergency generators, and run-off control features.

## **HIGHWAY SYSTEM READINESS**

Various elements of **PENN TOWNSHIP'S** road system should be checked and given necessary attention as required. These include: crack and joint sealing, permanent pothole repair, striping, drainage clearing and marking, winter signage, obstacle markers and delineators.

## **PUBLIC AND RESIDENT READINESS**

The traveling public and **PENN TOWNSHIP** residents should review information to assist them in transitioning and adjusting to winter driving. A number of opportunities to deliver valuable information including: media clips, media press releases, public service announcements, public access TV (for local distribution), local and web sites. Township employees are to be as courteous and helpful to public inquiries as possible.

## **COMMUNICATION SYSTEMS**

**PENN TOWNSHIP** has a variety of communications systems including: radio, cell phone, and land-line phone and fax. These systems should be checked prior to winter and any necessary training/retraining provided.

## **DECISION MAKING FOR SNOW AND ICE CONTROL OPERATIONS**

As **PENN TOWNSHIP** acquires more information resources, it will be moving toward routine information-based decision making for determining appropriate snow and ice control treatments. That process involves the following:

1. Gathering all available relevant information about recent past, present and near-term future conditions.
2. Selecting a treatment option that best addresses those conditions.
3. Systematically gathering and evaluating data on treatment effectiveness, actual road conditions and actual weather conditions from operators and other sources.

## **STATUS OF CRITICAL LOCATIONS**

Traffic flow and pavement condition information for critical locations are important in prioritizing snow and ice control operations. Critical areas include hills, intersections, bridges, cold locations (low, shaded and elevated) locations having mist or fog generation tendencies, traffic generators, high snow and ice accident locations, school bus routes and access to the Fire Stations and Ambulance Service.

## **ASSESSMENTS OF EFFECTIVENESS AND EFFICIENCY**

Systematic after-action assessments of effectiveness and efficiency are important in the decision-making process as they provide a knowledge base for future decisions. Results achieved in response to treatment can be obtained from the reports of operators and crew leaders. Other factors to evaluate include cycle times achieved, materials used, equipment performance, and cooperative procedures.

# SNOW CONTROL

## GENERAL

For the purpose of this manual snow and ice control operations are separated into two categories 'snow control' and 'ice control'. Snow control is the mechanical removal of accumulations of loose snow from the paved and stabilized portions of the system. This is accomplished primarily with truck-mounted plows. In certain circumstances like cleanup and drift removal, front-end loaders are sometimes used. It may also involve the use of passive measures like snow fence and plantings.

Ice control is all treatment operations directed toward preventing snow or ice from bonding to the pavement and the chemical and or mechanical removal of bonded snow or ice from the pavement. It also includes providing temporary friction improvement by spreading abrasives and abrasives/chemical mixtures and using no-treatment when appropriate.

Snow control is one of the most difficult and important tasks assigned to **PENN TOWNSHIP'S** road crew personnel. Having uniform snow control methods is important for the safety of our customers and our maintenance personnel.

There are some definitions relating to snow control that will help clarify subsequent sections of this manual:

- **snow plowing** - the relatively rapid displacement of snow from paved surfaces with vehicle-mounted plows and wing plows.
- **snow removal** - physically relocating areas of accumulated snow. This is usually a slow operation that may be accomplished with plows, loaders or snow blowers.
- **berm or windrow** - an accumulation of snow cast by plow or other equipment.

## GENERAL GUIDELINES FOR REASONABLY UNIFORM SNOWPLOWING

1. To the extent possible, traffic should not have to pass through a berm of plowed snow.
2. All plowing shall be done with trucks moving in the direction of traffic, except in an emergency situations where the work area is closed to traffic or, backing in the direction of traffic is required to spread material on very slippery surfaces where normal directional travel will not provide sufficient traction for the truck to move and as necessary in the cul-de-sacs.
3. To the extent possible, plow snow beyond the point where it could melt and run back across the highway.
4. Plowed snow shall not be cast into traffic.
5. Cast snow downwind to the extent possible.
6. In the cul-de-sacs, cast snow away from the driveways to the extent possible. This is less demanding on the property owners and facilitates more efficient general route plowing.
7. Within the normal sequences of operations, any time there is enough snow on the road to plow, it should be plowed.
8. In events where snow is likely to change to freezing rain before ending, consideration should be given to leaving enough unplowed snow on the road to absorb the freezing rain. Plow and treat the road again after the event has ended.
9. At the end of the storm, push snow back as much as possible to make room for the next snow storm.

Occasionally snowfall intensity is so severe that operator visibility is reduced to a few feet. With supervisor approval, operators may drive their trucks to a safe haven that is stable and well off the highway, and wait until visibility improves before continuing. Emergency light should remain on.

When low visibility is anticipated, extra caution in operations should be exercised. Vehicles and other obstacles may be anywhere. Supervisors should be prepared to suspend operations and recommend road closure if conditions warrant, or recommend temporary road closure so that plowing can be completed.

### **SAFETY RESTORATION AND CLEANUP OPERATIONS (SNOW REMOVAL)**

After the entire **PENN TOWNSHIP** road system is in satisfactory condition, safety restoration and cleanup operations shall begin and continue until complete or operations are directed to higher priority snow and ice control or emergency work. ***This work will generally be performed on a regular time basis.***

1. Locations that could melt and run onto traveled areas, for example: banked curves and sloped bridge decks.
2. Snow stored on bridge decks. (Do not throw snow over the side of the bridges; transport it beyond the back wall and off the shoulder.)
3. Areas having reduced sight distances for customers and plow operators, such as sharp curves and intersections.
4. Buried or obscured regulatory and warning signs, delineators, and accumulated snow around work zone delineation.
5. Any area where accumulated snow is causing traffic to use other-than-intended pavement areas.
6. Any narrow raised features between the outside edges of pavement that may be storing snow.

### **DRAINAGE RESTORATION**

After safety restoration and cleanup operations are complete, drainage facilities should be inspected and cleared as necessary.

## **ICE CONTROL**

Ice control is all treatment operations directed toward preventing snow and ice from bonding to the pavement and the chemical and/or mechanical removal of bonded snow or ice from the pavement. It also includes providing temporary friction improvement by spreading abrasives (cinders) and abrasives/chemical mixtures, and using delayed or no-treatment options when appropriate.

### **ICE CONTROL STRATEGIES**

There are four basic ice control strategies used by **PENN TOWNSHIP**; anti-icing, de-icing, temporary friction improvement, and delay of, or no treatment. When conditions are favorable for success and resources permit, anti-icing shall be the strategy of choice.

1. **De-icing** - De-icing is a traditional strategy for dealing with snow or ice that has already bonded to the pavement surface. It is used when anti-icing treatments have failed, as they occasionally will, or as a series of treatments at the end or after a storm. De-icing is most effectively accomplished by spreading a coarse-graded solid or pre-wet solid ice control chemical on the surface of the bonded snow or ice during favorable road, weather and traffic conditions. The coarse particles will melt through the snow and ice and break the bond as created chemical solution flows across the pavement surface.
2. **Temporary Friction Improvement** - Temporary friction improvement is an immediate short-term improvement in surface friction that is achieved by spreading abrasives

(cinders) or abrasives/chemical mixtures on the snow or ice surface. There will be times when this is an appropriate strategy usually in very cold conditions. A major disadvantage of this strategy is that its effectiveness degrades very quickly with traffic. If sufficient ice control chemical is spread with abrasives, it can be part of anti-icing and de-icing strategies.

**3. Delayed or Non-Treatment** - Delaying or not applying ice control materials is a tactic that may be used in support of the anti-icing strategy. Conditions where this tactic should be considered include light precipitation events, where pavement temperature is likely to remain above freezing and dry snow and blowing snow events where pavement surface temperature is below about 10° F and there is no residual ice control chemical on the pavement.

## DEFINITIONS

### PRECIPITATION TERMS

1. **Light Rain** - Small liquid droplets falling at a rate such that individual drops are easily detectable splashing from a wet surface. Include drizzle in this category.
2. **Moderate Rain** - Liquid drops falling are not clearly identifiable and spray from the falling drops is observable just above pavement or other hard surfaces.
3. **Heavy Rain** - Rain seemingly falls in sheets; individual drops are not identifiable; heavy spray from falling rain can be observed several inches over hard surfaces.
4. **Freezing Rain** - When rain freezes upon impact and forms a glaze on the pavement or other exposed surfaces.
5. **Sleet** - Precipitation of transparent or translucent pellets of ice.
6. **Light Sleet** - Scattered pellets that do not completely cover an exposed surface regardless of duration. Visibility is not affected.
7. **Moderate Sleet** - Slow accumulation on ground. Visibility is reduced by ice pellets to less than 7 miles.
8. **Heavy Sleet** - Rapid accumulation on ground. Visibility is reduced by ice pellets to less than 3 miles.
9. **Light Snow** - Snow alone is falling and the visibility is greater than 2miles.
10. **Moderate Snow** - Snow alone is falling and the visibility is greater than 3miles but less than or equal to 2miles.
11. **Heavy Snow** - Snow alone is falling and the visibility is less than or equal to 3miles.
12. **Blowing Snow** - When fallen snow is raised by the wind to a height of 6 feet or more and is transported across a road.

### ROAD CONDITION TERMS

1. **Dry** - No wetting on the pavement surface.
2. **Damp** - Light coating of moisture on the pavement resulting in slight darkening of surface, but with no visible water drops.
3. **Wet** - Road surface saturated with water from rain or melt-water, whether or not resulting in puddling or run-off.
4. **Slush** - Accumulation of snow on the pavement that is saturated with water. It will not support any weight when stepped or driven on but will squish until the base support is reached.
5. **Loose Snow** - Unconsolidated snow that can be blown by the wind into drifts or off of a surface, or blown by traffic into non-traffic areas or off of a surface.

6. **Packed Snow** - Snow-pack or pack that result from compaction of wet snow by traffic or by alternate surface melting and re-freezing of the water.
7. **Frost** - Also called hoarfrost. Ice crystals in the form of white scales, needles, feathers, or fans deposited on pavement and other surfaces cooled by radiation or by other processes.
8. **Thin Ice** - A very thin coating of clear, bubble-free, homogeneous ice which forms on a pavement; sometimes called black ice.
9. **Thick Ice** - A coating of ice thicker than black ice or frost that is formed from freezing rain, or from freezing of ponded water or poorly drained melt-water. It may be clear or milky in appearance, and generally is smooth though it sometimes may be somewhat rough.

#### ICE CONTROL CHEMICAL TERMS

1. **Form** - The physical state of the chemical usually solid or liquid.
2. **Gradation** - The distribution of particle sizes for solid chemicals and abrasives; (a characterization) fine, coarse, percent passing various sieve sizes, etc.
3. **Concentration** - The percent (by weight) of the ice control chemical in the liquid or solid product.
4. **Solution** - A liquid containing chemicals and water.
5. **Eutectic Temperature** - The lowest temperature a concentrated (near saturated) solution begins to freeze or the lowest temperature it will melt ice.
6. **Eutectic Concentration** - The solution concentration that produces the eutectic temperature.
7. **Dilution** - Reducing solution concentration by adding water.
8. **Endothermic** - Becomes colder when going into solution.
9. **Exothermic** - Becomes warmer when going into solution.
10. **Hygroscopic** - Having the ability to draw water vapor from the air.

#### OPERATIONAL PROCEDURE TERMS

1. **Pre-treating** - Applying an ice control chemical (liquid or solid) to the road before a snow or ice event begins.
2. **Pre-wetting** - Adding liquid ice control chemical or water to solid ice control chemicals or abrasives prior to distribution on the road.
3. **Application Rate** - The amount (weight or volume) of ice control chemical applied per mile or lane-mile of highway. In the case of pre-wetting liquids, it is the number of gallons of liquid applied to a ton of solid ice control chemical, or abrasives.

**ICE CONTROL CHEMICALS**

**PENN TOWNSHIP'S** primary ice control chemical is Sodium Chloride (salt)

The important properties of ice control chemicals include the lowest (eutectic) temperature it will melt ice. The lowest (eutectic) ice melting temperature appears below.

Chemical		Temperature, F		Corrosion Potential		Concrete Damage Potential	Handling Concerns	Environmental Concerns
Formula Name	Form	Effective to*	Eutectic**	Vehicles	Structure			
NaCl (Road Salt)	Solid	15	-6	Yes	Yes	Some***	Dust	Water, Plants

\* Pavement surface temperatures.

\*\* Eutectic temperature – the lowest temperature at which the chemical will melt ice.

\*\*\*If concrete is non-air entrained or has utilized poor materials or procedures.

The importance of pavement temperature in ice control operations should be obvious.

**FACTORS THAT IMPACT THE CHOICE OF ICE CONTROL TREATMENTS  
THE APPLICATION RATES OF SNOW AND ICE CONTROL MATERIALS**

**Pavement Surface Temperature**

Pavement temperature is one of the most important factors that impacts treatment decisions. A number of factors influence this temperature and understanding them will aid in making treatment decisions.

**Solar Radiation or Sunshine**

Solar radiation can warm surface temperatures significantly above air temperature. The darker the surface, the more pronounced this effect will be. It is not uncommon to have surface temperatures 30 to 40 Fahrenheit degrees above the air temperature early in the afternoon. As the angle of the sun above the horizon increases, solar warming increases. The lowest sun angles occur at the winter solstice and at sunrise and sunset of each day.

**Clear Night Sky Radiation**

Just as the sun warms surfaces through radiation, clear night skies, with little or no wind will cool surfaces. This can result in pavement surface temperature being colder than the adjacent air temperature. This condition often allows black ice or frost to form on the pavement surface. This cooling is also related to the subsurface temperatures and the time of the year.

**Geo-Thermal Effects**

Subsurface temperature influences pavement surface temperature primarily through thermal conduction. In the fall, when the earth is still warm and short-term air temperature drops below freezing, absent radiational effects will probably not cause the pavement surface to fall below freezing. During the spring, at the end of the season, pavement surface temperatures will remain cold although the air temperature is warmer (absent radiational effects). Bridge decks may freeze quicker than adjacent road surfaces in the fall due to the lack of thermal conduction provided by the earth. However, in the spring bridge decks can warm more quickly than surrounding surfaces for the same reason.

### **Air Temperature and Wind**

Absent radiational and geo-thermal effects, the pavement surface temperature will always be moving toward the adjacent air temperature. The rate of temperature change is usually slower than changes caused by radiational or geo-thermal effects. However, with increasing wind speed, the rate of pavement temperature change due to air temperature will increase.

### **Traffic**

Traffic can slightly increase pavement surface temperature as a result of tire-road friction and the radiant effects of engine and exhaust systems.

### **Strong Cross Winds and Blowing and Drifting Snow**

When spreading in strong cross winds, try to keep the spreader upwind of the intended spread location. If the wind is too strong, and the pavement temperature is low, spreading may not be appropriate.

### **Banked or Elevated Curves**

Try to keep the spread pattern on the high side of elevated curves. As the chemical works, chemical brine will migrate over the remainder of the pavement.

### **Parking Areas and Walkways**

Spreading ice control chemicals as evenly as possible over the entire paved area is recommended for parking areas and walkways. These areas present an opportunity for pre-event anti-icing with solid chemicals as traffic will not displace them very readily from the surface.

### **The Worst Case Scenarios**

The worst cases usually occur when the chemical treatment is quickly overwhelmed (diluted) by excessive amounts of water or ice.

- **Blizzard conditions** (intense snowfall, wind, very cold temperatures) quickly dilute ice control chemicals and render them virtually useless. ***If the pavement temperature going into and coming out of a blizzard is expected to be low, then plowing only is probably the best strategy.*** After the blizzard if it is still very cold, use abrasives as necessary until warmer temperatures allow chemical de-icing to work. If the pavement temperature throughout and after the blizzard is likely to be fairly warm, a treatment with an ice control chemical before or early in the storm followed by plowing only throughout the storm, will make de-icing at the end of the storm much quicker.
- **Rapidly accumulating freezing rain** is a major maintenance concern. The best strategy here is to apply solid ice control chemicals, at a high rate, in very narrow bands in the high side wheel path of each lane. Usually, this will provide a location in each lane that will have enough friction to allow vehicles to stop and steer.

### **Getting the Application Rate Right**

Application rates for ice control chemicals are usually specified in pounds per lane mile. Spreaders are usually calibrated to deliver pounds per mile (the discharge rate). It is important to understand that relationship in order to be sure the proper application rate is being used. The application rate is the number of pounds dispensed per mile (the discharge rate), divided by the number of lanes being treated. The application rate (when necessary) shall be 250 lbs/per lane mile. Abrasives and mixes should be spread reasonably uniformly across the travel lanes, within the confines of the plowed path.



## MATERIALS SPREADING EQUIPMENT

Materials spreading equipment is most efficient and effective when associated with plow trucks. Independent plowing and spreading operations require almost impossible coordination. By spreading chemicals on freshly plowed surfaces, the chemicals will dilute less and last longer. Most chemicals need time to work. **Uncoordinated plowing that removes chemicals from the surface too soon is wasteful.**

### CALIBRATION

Whatever materials distribution system is used, it must be calibrated. This will assure that the proper amount of material is being applied. Over-application is wasteful and under-application will not achieve the desired results. Solid material spreaders are usually calibrated by capturing and weighing material dispensed at various speeds, control settings and gate openings. A back-up or manual calibration for automatic control systems should be developed for each spreader.

### SPREAD PATTERN CONTROL

Most commercial materials spreaders have the capacity of adjusting the spread pattern they deliver. The most common device for spreading solid materials is a vaned spinner plate. The distance material is cast is controlled by the speed of the spinner plate. The faster the spinner plate rotates the farther it will cast material.

The direction of cast from spinner plate is controlled by the direction of rotation of the spinner and the location of the point where the material drops onto the spinner plate. Material dropped on one side of the spinner plate is generally discharged on the opposite side. Deflectors or skirts that divert the cast material downward provide additional control.

The proper spread pattern adjustments should be determined on the floor of the chemical storage facility. By pushing the discharged material into a windrow that runs parallel to the back of the spreader, a good indication of spread pattern can be obtained. Spread patterns determined by this method should be field verified by observing the distribution under actual operating conditions and making adjustments as necessary. Observing the pattern is the best method to determine if it provides the desired distribution.

### SPREADING SPEED

The potential for solid ice control chemicals to bounce and scatter increases with increasing truck speed. Spreading speed should be as slow as possible, consistent with maintaining a safe speed in traffic.

## **POST-STORM ACTIVITIES**

### **POST-STORM EVALUATIONS**

Post-storm evaluations should be conducted at the crew level. The following should be discussed and significant findings/results should be committed to record:

1. Personnel issues
2. Materials and materials management issues
3. Equipment issues
4. Safety issues
5. Weather and information system accuracy
6. Observed storm conditions
7. Treatment effectiveness and pavement conditions
8. Motorist response issues
9. Coordination and cooperation issues

### **EFFECTIVENESS AND EFFICIENCY OF SAFETY RESTORATION ACTIVITIES**

1. Melt water control
2. Snow containment features, and potential problems on bridges
3. Safety appurtenances attenuators, median and safety barrier, guard rail, etc.
4. Traffic restriction areas
5. Narrow raised features
6. Signs and delineators
7. Sight distance restorations
8. Drainage features
9. Raised obstructions

### **POST-STORM OPERATIONAL TASKS**

The following is a partial list of post-storm operational tasks that should be accomplished:

1. Asset inventory (number and operational status)
  - Personnel
  - Materials
  - Equipment
  - Information system
2. Treat Persistent Snow and Ice Conditions
  - Blow-over areas
  - Freeze-back areas
  - Areas with snow pack or ice
3. Road Maintenance Activities
  - Pothole patching
  - Appurtenance repair
  - Brush and tree work
  - Sign and delineator work
4. Abrasives clean-up in critical areas
5. Equipment repair, cleaning, maintenance and re-calibration
6. Maintenance and inventory of ice control materials
7. Yard and facility clean up
8. Repair of damaged safety appurtenances, signs, etc.
9. Parts and fuel inventories

## **POST SEASON ACTIVITIES**

### **EVALUATION OF ALL ELEMENTS OF SNOW AND ICE CONTROL OPERATIONS DURING THE PAST SEASON**

The following is a partial list of topics that should be discussed, evaluated and committed to writing at the crew, and **PENN TOWNSHIP**-wide levels following the winter season:

- a. Personnel
- b. Materials availability, management, problems, etc.
- c. Equipment
- d. Maintenance of equipment
- e. Safety
- f. Treatment effectiveness
- g. Weather and other information systems
- h. Routing and response
- i. Level of service
- j. Cooperative agreements and inter-agency cooperation
- k. Emergency response/management

### **POST SEASON EQUIPMENT MAINTENANCE**

The following equipment should be repaired, given use or time-based maintenance, and prepared for storage as required:

- a. Material spreaders
- b. Pre-wetting systems
- c. Storage tanks and pumps
- d. Plow equipment
- e. Trucks, loaders, etc.

### **MATERIALS, EQUIPMENT AND PARTS INVENTORY AND ACQUISITION ACTIVITIES**

With the long lead-time required to acquire commodities, the inventory and purchase activities for next season should begin for:

- a. Abrasives
- b. All ice control chemicals
- c. Plow equipment
- d. Safety equipment
- e. Spare parts

### **CONTINUOUS IMPROVEMENT ACTIVITIES**

**PENN TOWNSHIP** is committed to continuous improvement of all of its operations. Snow and ice control is no exception. Discussion available at all levels of **PENN TOWNSHIP** including:

- a. Direct communication with the Roadmaster;
- b. Task specific employee meetings;
- c. Suggestions accepted;
- d. Resident communication;
- e. And continued training

With the above in mind, it is **PENN TOWNSHIP'S** policy to create a reasonable balance among cost, safety (**PENN TOWNSHIP** plow operators and the traveling public) and environmental responsibility with its snow and ice control operations.

## SITUATIONAL ANALYSIS

**PENN TOWNSHIP** is not aware of any locations within the zone of influence of highway salting where road salt is creating severe negative environmental effects.

## SALT MANAGEMENT PLAN

**PENN TOWNSHIP** will utilize best practices as the primary tool in salt management.

### PENN TOWNSHIP ROAD USE

**PENN TOWNSHIP** will do the following in support of this salt management plan:

- a. Use only the amount of salt necessary to provide a satisfactory level of service for individual combinations of weather and road conditions
- b. Calibrate all materials spreading equipment to allow the proper application rates of salt
- c. Upgrade equipment over time to include ground speed materials application rate control
- d. Acquire technology to assist in better defining weather and road conditions
- e. Conduct operations in an efficient and effective manor
- f. Use pre-wetting of salt when operationally necessary
- g. Train township employees in the use of appropriate snow and ice control procedures and the importance of salt management
- h. Use the principles of ***CONTINUOUS IMPROVEMENT***

### NON-HIGHWAY CONSIDERATIONS

- a. **PENN TOWNSHIP** stores all its salt under structural cover
- b. Trucks will be loaded only to a point below where spillage is likely to occur
- c. All trucks and spreaders will be washed in where appropriate waste water controls are in place
- d. All salt spillage in the yard will be cleaned up ASAP or after every snow event
- e. The salt storage area shall be lit during all night time operations
- f. The salt storage area shall be kept clear of all stored equipment and materials so as to not interfere or cause a hazard during loading and unloading of salt and magnesium chloride