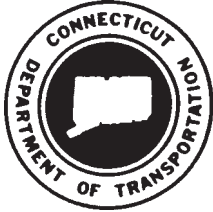


# Technology Transfer



U.S. Department of Transportation  
Federal Highway Administration



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## Winter Storm Safety

Introduction by

John Able, CSP, Occupational Safety Training Specialist  
CONN-OSHA, (860) 263-6902

The following article provides a wealth of information on safety and health to assist employers and employees in getting through another tough New England winter safely.

The Connecticut Transportation Institute and the State of Connecticut Department of Labor's Division of Occupational Safety and Health (CONN-OSHA), through our Alliance Partnership, have joined forces to provide education and increase awareness of workplace risks and hazards.

The article states that 70 percent of injuries during winter storms result from vehicle accidents. Small changes in behavior behind the wheel can decrease the likelihood of getting in a motor vehicle accident. Too often, adult drivers are simply expected to be competent. Consider how you, if you are in a supervisory role, can ensure that safe driving techniques and behaviors are modeled and encouraged within your area of influence.

For more information on Motor Vehicle Safety from the OSHA perspective, go to [www.osha.gov/SLTC/motorvehiclesafety](http://www.osha.gov/SLTC/motorvehiclesafety).

If you are interested in more information on safe driving and would consider hosting a safe driving class at your facility, please contact Thomas

Hozebin, Program Manager, CONN-OSHA at (860) 263-6915.

Enjoy the article and remember: "Bad habits are acquired by chance; good habits result from deliberate practice."

~ Author Unknown

**A** major winter storm can be lethal. Preparing for cold weather conditions and responding to them effectively can reduce the dangers caused by winter storms. The following frequently asked questions will help workers understand how winter storms may affect their health and safety.

### ***What workers are at increased risk of injury during winter storms?***

While most workers can stay inside during a winter storm, some workers may be required to go into the storm. These may include utility workers, law enforcement personnel, firefighters, emergency medical personnel, federal, state and local government personnel, military personnel, highway personnel, and sanitation workers.

*continued on page 4*

# Ice and Snow Removal Operating Procedures

*Our thanks to the City of New Haven's Public Works Department for sharing the following operating procedures developed by Federik R. Mottola, National Institute for Driver Behavior, and Richard Christensen, New Haven Public Works.*

## Beginning from Garage

- Truck should be backed in
- Avoid excessive engine idle time

## Management of Ignition Keys

- Keys are in vehicle at start of day
- Keys are to be removed before vacating vehicle during work day
- Keys are left in vehicle in garage

## Before Entering Cab

- Open hood
- Check oil
- Check water
- Check power steering fluid
- Check brake fluid
- Check washer fluid
  - under hood or in cab
- Check tires
  - for proper air pressure
  - condition of tires

## Plow Checks Before Entering Cab

- Check condition of plow blade
- Check bolts on plow blade

- Check plow guides
- Check hydraulic hoses
- Check chain or cable for plow lift
- Check hydraulic tank

## Starting Engine

- Shift lever in Neutral
- Turn ignition key
- After engine starts
  - check air pressure for 120 psi

## Before Driving Checks

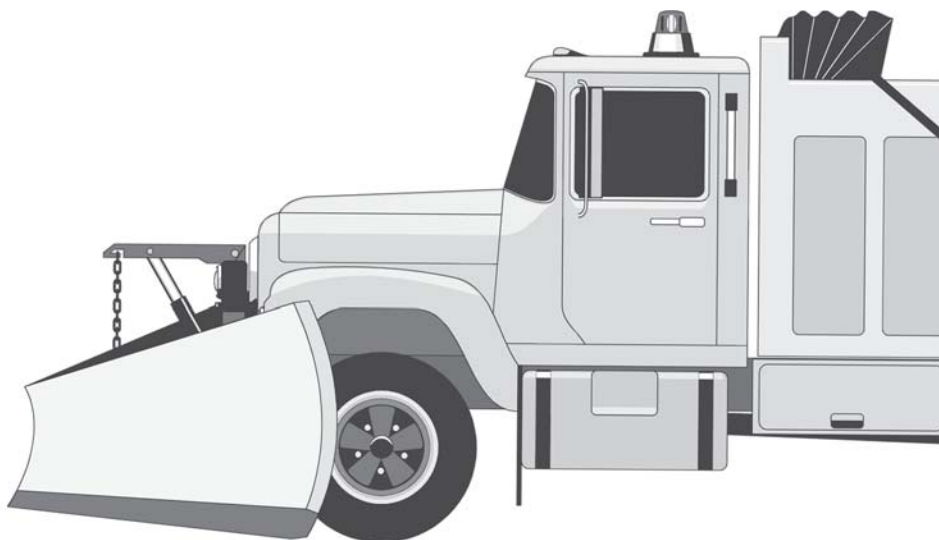
- Check fuel
- Check oil pressure for normal
- Check water temperature
- Check voltage
- Check windshield wipers
- Test windshield washer
- Turn headlights on
- Test cab lights
- Test 4-way flasher switch
- Test strobe light
- Check lights' reflections in garage
  - if not visible get out of cab
- Remove loose objects in cab
- Drive with headlights on

## Adjustments Before Driving

- Adjust seat back straight upright
  - have body pressed into back of seat
- Adjust lumbar support
- Adjust seat height
- Adjust mirrors
- Safety belts on
- If standard shift, check clutch

## Before Moving Truck Forward

- Raise plow
- Keep blade angled to the right to reduce width



## Technology Transfer

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### Rear Spreader Checks Before Driving

- Check rear gate for 2-3" opening
- Turn spreader on
- Set conveyor control
- Set spinner control to cover width of truck
- Make necessary spreader/conveyor adjustments
- Turn spreader off

### Side Spreader Checks Before Driving

- Open front gate approximately 2 inches
- Plate over conveyor should be open
- Turn spreader on
- Set conveyor control
- Set spinner control to cover width of truck
- Make necessary spreader/conveyor adjustments
- Turn spreader off

### Moving Truck Forward

- Clutch in (if standard shift)
- Shift lever in Drive (standard shift, 2<sup>nd</sup> gear)
- Foot on brake
- Release parking brake (push in)
- Check intended path of travel
- Accelerate

### Moving Truck Rearward

- Raise plow before backing
- Use outside backing guide when possible
- Do not move truck without guide in mirror
- Backing guide stays in mirror on inside of turn
- If driver loses sight of guide, truck stops
- Foot on brake
- Shift to reverse (standard, clutch in)
- Release parking brake (push in)
- Check left and right flat and convex mirrors
- Accelerate lightly (standard, clutch control)
- Continually check
  - Backing guide, when used
  - Mirrors on both sides
  - Plow's alignment to backing path and objects

### Operating Plow

- Raise plow to set angle
- Lower plow after angle is set
- Use reference points on truck to accurately judge distance of plow to objects
- Once plow is down for plowing, keep it down
- Raise plow before backing
- Speed while plowing City streets must not exceed 15 mph. Damage to vehicle and to operator could occur when raised sewer grates or manhole covers are hit

### Operating Sander in Traffic

- Have spinner and conveyor adjustments set
  - pull spreader lever back

- When approaching traffic manually decrease spinner and conveyor flow to minimize spraying vehicles

### Securing Parked Truck

- Select safe and appropriate location
- Curb tires on downgrades
- Engage parking brake (pull out)
- All switches off
- Key off and remove key from truck
- Close all vents and windows
- Lock doors

### When Returned to Garage

- Fuel truck before parking
- Clean cab of debris
- Wash truck if needed
- Back into garage
- Leave key in ignition
- Report any repairs needed

## 10 Commandments for Snow Fighters

- 1 Thou shalt present thyself to thy job physically and mentally fit and properly clothed for any emergency in order to withstand the rigors of thy task.
- 2 Thou shalt never enter thy cab without inspecting thy lights, windshield wipers, defrosters, flares and other safety equipment.
- 3 Thou shalt know thy spreading and plowing routes, as well as the performance of thy spinner and the life of thy plow blade.
- 4 Thou shalt faithfully remain alert in order to avoid guardrails, headers, stalled cars, manhole covers, railroad tracks and mailboxes. Otherwise thee may smite thy windshield with thy head.
- 5 Thou shalt contain thy temper even though cars and trucks pass thee on both sides and tailgate thee too close for comfort. Anger only multiplies thy prospects of coming to grief by accident.
- 6 Thou shalt use thy radio as briefly as possible, if thee is fortunate enough to have one. Remember thy fellow workers may need to communicate in an emergency.
- 7 Thou shalt interrupt the flow of power to thy spreader before attempting to free any foreign objects or blockages if thee treasure thy fingers.
- 8 Thou shalt render thy truck and spreader out of gear and stoutly set thy brakes before dismounting from thy cab.
- 9 Thou shalt govern thy speed according to conditions, else thee may wind up with thy truck upside down.
- 10 Thou shalt mind thy manners on the roadway; clearly signal thy intentions; render assistance to stranded motorists and remember that it is more blessed to give than to receive.

Excerpted with minor editing from *Rural & Urban Roads*, June 1980

**SAFETY** continued from page 1

### **What kinds of injuries are associated with winter storms?**

According to the National Weather Service, about 70 percent of injuries during winter storms result from vehicle accidents and about 25 percent of injuries result from being caught out in the storm.

Some of the hazards associated with working in winter storms include:

- Driving accidents due to slippery roadways
- Carbon monoxide poisoning
- Slips and falls due to slippery walkways
- Hypothermia and frostbite due to the cold weather exposure
- Being struck by falling objects such as icicles, tree limbs, and utility poles
- Electrocution due to downed power lines or downed objects in contact with power lines
- Falls from heights (e.g. falls from roof or skylights while removing snow)
- Roof collapse under weight of snow (or melting snow if drains are clogged)
- Burns from fires caused by energized line contact or equipment failure
- Exhaustion from working extended shifts
- Dehydration
- Back injuries or heart attack while removing snow



### **What can be done to avoid frostbite and hypothermia?**

Recognize the environmental and workplace conditions that lead to potential cold-induced illnesses and injuries.

Learn the signs and symptoms of cold-induced illnesses/injuries and what to do to help those who are affected.

Train the workforce about cold-induced illnesses and injuries.

Select proper clothing for cold, wet, and windy conditions.

Layer clothing to adjust to changing environmental temperatures.

Wear a hat and gloves, in addition to under-wear that will keep water away from the skin (polypropylene).

Take frequent short breaks in warm dry shelters to allow the body to warm up.

Perform work during the warmest part of the day.

Avoid exhaustion or fatigue because energy is needed to keep muscles warm.

Use the buddy system (work in pairs).

Drink warm, sweet beverages (sugar water, sports-type drinks). Avoid drinks with caffeine (coffee, tea, or hot chocolate) or alcohol.

Eat warm, high-calorie foods like hot pasta dishes.

### **How do I walk safety on snow and ice?**

Walking on snow or ice is especially treacherous and wearing proper footwear is essential. A pair of well insulated boots with good rubber treads is a must for walking during or after a winter storm. Keeping a pair of rubber overshoes with good treads that fit over your street shoes is a good idea during the winter months.

When walking on an icy or snow-covered walkway, take short steps and walk at a slower pace so you can react quickly to a change in traction.

If you cannot walk on an uncleared sidewalk and are forced to walk in the street, walk against the traffic and close to the curb as you can.

Be on the lookout for vehicles that may have lost traction and are slipping towards you. Be aware that approaching vehicles may not be able to stop at crosswalks or traffic signals.

At nighttime, wear bright clothing or reflective gear; dark clothing makes it difficult for motorists to see you.

During the daytime, wear sunglasses to help you see better and avoid hazards.



### **What hazards are associated with repairing downed and damaged power lines?**

The work activities involved with repairing downed or damaged lines entail many of the activities involved in installing and removing overhead lines and in general maintenance on overhead lines. The crucial difference is that in emergency condition, such as winter storms, there are unknown hazards and the potential for changing hazards as work progresses. Under these conditions workers must be extra vigilant and cautious. Potential hazards include:

- Electrocution by contacting downed energized lines, or contacting objects, such as broken tree limbs, in contact with fallen lines
- Falls from heights
- Being struck or crushed by falling poles, towers or parts thereof, tree limbs, ice accumulation on lines, towers and poles
- Being injured in vehicular accidents when responding to an emergency situation
- Burns from fires caused by energized line contact or equipment failure

### **What protective measures should be utilized when working on or around downed or damaged power lines?**

Stay well clear of any downed or damaged power lines. Establish a safe distance from the lines and report the incident to the responsible authority. Only properly trained electrical utility workers should handle damaged power lines.

Electrical utility workers should first assess the hazards present in order to

minimize the chances of exacerbating the situation. Ideally the lines involved should be de-energized, but this may not be possible in all situations.

When working on downed or damaged power lines, electrical workers should utilize proper electrical safety work practices and personal protective equipment, as usual. However, as mentioned previously, extra caution should be exercised when working in winter storms due to the adverse conditions present.



**What hazards exist during removal of downed trees during a winter storm? What safety precautions should be taken?**

Clearing downed trees is a critical job during a winter storm. When winter storms occur, downed trees can block public roads and damage power lines. Emergency crews are often sent out to clear downed trees during a winter storm. Potential hazards include:

- Electrocution by contacting downed energized lines or contacting broken tree limbs in contact with fallen lines
- Falls from trees
- Being struck or crushed by falling tree limbs or ice
- Being struck by emergency equipment such as chain saws and chippers

Proper personal protective equipment (PPE) including gloves, chaps, foot protection, eye protection, fall protection, hearing protection and head protection should be worn by workers using chainsaws and chippers to clear downed trees.

Only appropriate power equipment that is built to be used outdoors and in wet conditions should be used. All saws, chippers, and other tools should be used properly and according to their intended application. It is important that all equipment is well-maintained and functioning correctly in order for use. In addition, all equipment should have proper guarding, working controls, and other safety features as installed by the manufacturer.

**What safety precautions can I take if I must drive in a winter storm?**

Inspect the vehicle to ensure the following systems are operating properly:

- Brakes: Brakes should provide even and balanced braking. Also check that brake fluid is at the proper level.
- Cooling System: Ensure a proper mixture of 50/50 antifreeze and water in the cooling system at the proper level.
- Electrical System: Check that the battery is fully charged and that connections are clean. Check that the alternator belt is in good condition with proper tension.
- Engine: Inspect all engine systems.
- Exhaust System: Check exhaust for leaks and that all clamps and hangers are snug.
- Tires: Check for proper tread depth and no signs of damage or uneven wear. Check for proper tire inflation.
- Oil: Check that oil is at proper level.
- Visibility Systems: Inspect all exterior lights, defrosters (windshield and rear window), and wipers. Install winter windshield wipers.

Also, carry an emergency kit in the vehicle with the following items:

- Blankets/sleeping bags
- Cellular telephone or two-way radio
- Windshield scraper
- Snow brush
- Flashlight with fresh/extra batteries
- Extra winter clothes
- Shovel
- Tow chain
- Matches
- Traction aids (bag of sand or cat litter)
- Emergency flares

- Jumper cables
- Snacks
- Water
- Road maps



**What should I do if a winter storm strands me in my vehicle?**

Stay in the vehicle. Do not leave the vehicle to search for assistance unless help is visible within 100 yards. You may become disoriented and lost in blowing and drifting snow.

Display a trouble sign by hanging a brightly colored cloth on the radio antenna and raising the hood. Turn on the vehicle's engine for about 10 minutes each hour and run the heater to keep warm. Also, turn on the vehicle's dome light when the vehicle is running as an additional signal.

Beware of carbon monoxide poisoning. Keep the exhaust pipe clear of snow and open a downwind window slightly for ventilation.

Watch for signs of frostbite and hypothermia. Do minor exercises to keep up circulation. Clap hands and move arms and legs occasionally. Try not to stay in one position for too long. If more than one person is in the vehicle, take turns sleeping. For warmth, huddle together. Use newspapers, maps, even the removable floor mats for added insulation.

Avoid overexertion since cold weather puts an added strain on the heart. Unaccustomed exercise, such as shoveling snow or pushing a vehicle, can bring on a heart attack or make other medical conditions worse. Be aware of the symptoms of dehydration.

Excerpted from OSHA's guide for "Winter Storms" at [www.osha.gov/SLTC/emergencypreparedness/guides/winterstorms.html](http://www.osha.gov/SLTC/emergencypreparedness/guides/winterstorms.html)

# Selected Winter Maintenance and Operations Resources

Public works and highway agencies within Connecticut may borrow resources available from the Technology Transfer Center for up to two weeks by calling 860-486-6446, sending the request form on the back page of this newsletter, or using our on-line information request form at [http://www.engr.uconn.edu/ti/Technology/info\\_request.htm](http://www.engr.uconn.edu/ti/Technology/info_request.htm).

## From the Technology Transfer Center

### PUBLICATIONS

***Guide for Snow and Ice Control***, American Association of State Highway and Transportation Officials, 1999.

***Manual of Practice for an Effective Anti-Icing Program: A Guide for Highway Winter Maintenance Personnel***, Federal Highway Administration, 1996

***The Salt Storage Handbook***, Salt Institute, 1987

***Snow and Ice Control: A Best Practices Review***, Minnesota Office of the Legislative Auditor, 1995

***Snow Fence Guide***, Federal Highway Administration, 1991

***The Snowfighter's Handbook***, Salt Institute, 1991

### VIDEOTAPES

***Anti-Icing for Maintenance Personnel***, U.S. Army Corps of Engineers Cold Regions Research and Engineering Laboratory, 13 minutes

***Planning and Organizing for the Snowstorm***, Pennsylvania Department of Transportation, 12 minutes

***Plow Power***, American Public Works Association, 15 minutes

***Response to Winter***, Pennsylvania Department of Transportation, 21 minutes



***Safety Restoration Snow Removal Guidelines***, Federal Highway Administration, 25 minutes

***Snowfighting from A to Z***, Salt Institute, 73 minutes

***Snow Plow and Spreader Operation***, Nebraska Department of Roads, 48 minutes

***Snowplow Safety***, National Safety Council and FLI Learning Systems, Inc., 23 minutes

***Snow Removal***, Colorado Department of Highways, 18 minutes.

***What Is Anti-Icing***, U.S. Army Corps of Engineers Cold Regions Research and Engineering Laboratory, 9 minutes

### COMPUTER BASED TRAINING CD

***Anti-icing/RWIS Training***, American Association of State Highway and Transportation Officials, 2003,

A self-paced, interactive multimedia winter maintenance computer based training program that contains practice and review exercises, links to key word definitions, a glossary, a knowledge base, and Internet sites.

## On the Internet

### PUBLICATIONS

***Snow and Ice Control: Guidelines for Materials and Methods***, NCHRP Report 526, 2004, at [http://gulliver.trb.org/publications/nchrp/nchrp\\_rpt\\_526.pdf](http://gulliver.trb.org/publications/nchrp/nchrp_rpt_526.pdf).

Provides guidance for selecting roadway snow and ice control strategies, and tactics for a wide range of winter maintenance operating conditions. This guidance applies to highways, roads, streets, and other paved surfaces that carry motor vehicles—under state or local jurisdictions.

***Winter Highway Operations***, NCHRP Synthesis 344, 2005, at [http://trb.org/publications/nchrp/nchrp\\_syn\\_344.pdf](http://trb.org/publications/nchrp/nchrp_syn_344.pdf).

Examines changes that occurred between 1994 and 2004 to practices and strategies used to control the impacts of winter weather on the safe and efficient movement of traffic.

***Sixth International Symposium on Snow Removal and Ice Control Technology***, TRB Electronic Circular 63, 2004, at <http://trb.org/publications/circulars/ec063.pdf>.

A compendium of papers addressing winter weather; winter maintenance; customers' perspectives on winter operations; environmental stewardship; winter maintenance vehicle advancements; bridge support systems; winter pavement temperatures and road conditions; material distribution, performance and residual; and large-volume snow control.

## STREAMING VIDEOS

**Iowa Snow and Ice Control**, Iowa Department of Transportation, 1998. Covers snow and ice control from Iowa DOT's perspective.

Part 1: *Introduction to Winter Operations*, 12 minutes, at <http://www.state.il.us/video/streaming/idot/V070a.asx>

Part 2: *Pre-Season Preparation*, 30 minutes, at <http://www.state.il.us/video/streaming/idot/V070b.asx>

Part 3: *Equipment Operation*, 11 minutes, at <http://www.state.il.us/video/streaming/idot/V070c.asx>

Part 4: *Snow Plowing Techniques*, 31 minutes, at <http://www.state.il.us/video/streaming/idot/V070d.asx>

Part 5: *Anti-icing and Deicing*, 31 minutes, at <http://www.state.il.us/video/streaming/idot/V070e.asx>

**Snow and Ice Control 2002**, Illinois Department of Transportation, 2002. Covers snow and ice control from Illinois DOT's perspective.

Part 1: *Plows and Blades*, 11 minutes, at <http://www.state.il.us/video/streaming/idot/1plows.asx>

Part 2: *Spreaders and Spinners*, 7 minutes, [www.state.il.us/video/streaming/idot/2spreaders.asx](http://www.state.il.us/video/streaming/idot/2spreaders.asx)

Part 3: *Forecasting and Chemical Application*, 9 minutes, at <http://www.state.il.us/video/streaming/idot/3forecasting.asx>

Part 4: *Pre-Storm Preparation*, 14 minutes, at <http://www.state.il.us/video/streaming/idot/4prestorm.asx>

Part 5: *Plowing Techniques*, 13 minutes, at <http://www.state.il.us/video/streaming/idot/5techniques.asx>

Part 6: *Post-Storm Clean Up*, 3 minutes, at <http://www.state.il.us/video/streaming/idot/6poststorm.asx>



## Calendar

### Technology Transfer Center Training Opportunities

#### OCTOBER

- 19 **Roundtable Discussion: Winter Maintenance Issues**  
*Road Scholar Elective*, Hartford
- 26 **Winter Operations**  
*Road Master Elective*, Hartford
- 27 **Winter Operations**  
*Road Master Elective*, Storrs

#### NOVEMBER

- 9 **Phase II Stormwater: Information and Updates**  
*Road Master Elective*, Hartford
- 10 **Phase II Stormwater: Information and Updates**  
*Road Master Elective*, Waterbury

**For more information on our upcoming programs or to register on line, please visit our web site at [www.engr.uconn.edu/ti/Technology/workshops.html](http://www.engr.uconn.edu/ti/Technology/workshops.html) If you have additional questions, please call 860-486-5400.**

## WEB SITES

*American Public Works Association Winter Maintenance Subcommittee* site at <http://www.apwa.net/About/TechSvcs/Transportation/Winter-Maint/index.asp> contains web links to a variety of useful information and resources including chemicals and abrasives, anti-icing, communications, equipment, storage, weather, and research and reports.

*Environmental Protection Agency Snow and Ice* site at <http://www.epa.gov/naturalevents/snow-ice.html> contains information on how to reduce the environmental effects of winter highway maintenance activities.

*Federal Highway Administration Road Weather Management Program's Snow and Ice* site at [http://ops.fhwa.dot.gov/Weather/weather\\_events/snow\\_ice.htm](http://ops.fhwa.dot.gov/Weather/weather_events/snow_ice.htm) contains links to more than 70 publications and 14 snow and ice control best practices developed by state and local agencies.



*Salt Institute Winter Roadway Safety* site at <http://www.saltinstitute.org/30.html> contains information on winter maintenance training resources and links to a host of materials and publications.

*Snow and Ice Pooled Fund Cooperative Program (SICOP)* site at <http://www.sicop.net/> contains snow and ice control documents, equipment specifications, links to governmental and non-governmental agencies, and a subscriber-based snow and ice list-serve and archives.

# Technology Transfer Center Request Form

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City/State/Zip: \_\_\_\_\_

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_ E-mail: \_\_\_\_\_

I would like to see a future newsletter article on the topic of \_\_\_\_\_

I would like to submit a newsletter article; please call me at \_\_\_\_\_

I would like to request the following informational resource materials:

\_\_\_\_\_

\_\_\_\_\_

Please fax a copy of this form to 860-486-2399 or mail to:

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