

# Winter Storm Action Plan

Disaster Preparedness from Liberty Mutual Insurance



Organizations and individuals will likely face unexpected emergencies — both natural and manmade. It is vital to have a crisis management plan in place in order to protect you, your employees, your customers and your business facilities, as well as your company's reputation.

The illustrations, instructions and principles contained in the material are general in scope and, to the best of our knowledge, current at the time of publication. No attempt has been made to interpret any referenced codes, standards or regulations. Please refer to the appropriate code-, standard-, or regulation-making authority for interpretation or clarification. Provided that you always reproduce our copyright notice and any other notice of rights, disclaimers, and limitations, and provided that no copy in whole or in part is transferred, sold, lent, or leased to any third party, you may make and distribute copies of this publication for your internal use.

Winter storms can be devastating, causing those affected to lose their business, inventory, property, and lives. Winter storms can affect more than those living in Northern climates. In recent history, freezing pipes and snow collapse losses have occurred in many Southern states. It is wise to be as prepared as possible in the event a winter storm threatens your business and your employees. You can take steps to maintain and protect your facilities by using the information contained in this action plan.

## Pre-Winter Storm Preparation

### Step 1: Secure Supplies and Information

Ensure that equipment and emergency supplies are on hand and ready for the on-site emergency action team. Obtain cash for post-storm needs such as buying food and supplies or paying employees and contractors.



## Winter Storm Emergency Kit

- First-aid kit, including over-the-counter painkillers, rubbing alcohol, eye wash kit, and vomit-inducing medicine (in case of accidental poisoning)
- Rock salt or ice melt, sand, and snow shovels
- Water and nonperishable food (three-day supply)
- Emergency lighting; flashlights with extra batteries
- Whistles to signal and direct attention during and after the storm
- Battery- or crank-powered radio
- Walkie-talkies and/or cellular phones (with spare batteries)
- Batteries
- Blankets and extra clothing
- Hand and power tools
- Portable pumps and hoses
- Plastic covers and tarpaulins
- Have all employee, vendor, and client contact information collected and backed up at an off-site location
- Maintain copies of vital records off site, including business and customer records, utility plans, etc.



## Emergency Contacts

Fire Department \_\_\_\_\_  
Police Department \_\_\_\_\_  
Insurance Agent/Broker \_\_\_\_\_  
Building Owner \_\_\_\_\_  
HVAC Contractor \_\_\_\_\_  
Electrician \_\_\_\_\_  
Plumber \_\_\_\_\_  
Other \_\_\_\_\_

**Step 2: Inspection and Fortification of Facility**

Update your Emergency Response Program to include appropriate response procedures for winter emergencies.
Add rock salt or ice melt, sand, and snow shovels to your disaster supply kit.
Identify who is responsible for snow/ice removal from driveways, doorways, and roofs.
Determine if there are alternative ways to enter the premises if snow and/or ice prohibit access.
Mark hydrants near your business to make them easy to locate in accumulating snow.
Remove loose yard debris.
Relocate nonessential yard equipment to a safe indoor location (furniture, trash receptacles, portable planters, portable signs, dumpsters, etc.).
Relocate yard storage of raw and finished goods indoors or secure.
Secure yard storage of flammable liquids drums or move them to a safe location away from important buildings.
Anchor all portable buildings and trailers to the ground.
Secure scaffolds and cranes. Secure scaffolds to the building. Fasten rail crane chassis to track with bolts and clamps.
Brace outdoor signs.

**Procedures During a Winter Storm**



During a storm evacuation, consider your phone lines — redirection to cell phones or answering service could be critical.

Shut down all non-critical and nonessential electrical equipment.
Keep driveways, walkways, doorways, and roof access points clear of snow and ice.
Patrol the property when safe to do so and watch for roof leaks, pipe breakage, fire, or structural damage.
During power failure, turn off electrical switches to prevent reenergizing of equipment until necessary checks are completed.
Stay informed. Listen to local news and weather channels for situation developments and road closures.
Ensure employee and customer safety.
Be mindful of indoor safety. If backup power supplies are needed, do not use an electric generator indoors, inside a garage, or near building air intakes because of the risk of carbon monoxide poisoning.
Do not store gasoline indoors where the fumes could ignite.
Use individual heavy-duty, outdoor-rated cords to plug in other appliances.

## Freeze-Ups



During severe cold spells, water in sprinkler system piping, domestic water systems, HVAC, or process equipment can freeze and expand causing pipes or fittings to burst. Water damage from this type of incident can be extensive, especially if the water continues to flow for an extended period. Total costs of the damage and business interruption can be substantial.

In deep freeze conditions, a broken window or open door can let in enough cold air to freeze nearby water pipes and start a catastrophic chain of events. In addition, any equipment that contains or uses water, produces condensation, or depends on pneumatic controls is vulnerable to freezing. Other conditions that make your business susceptible to freeze-ups are heating systems that lack reserve capacity beyond their normal heating load, inadequate building insulation, and piping that runs through unheated areas or concealed spaces.

Many businesses find themselves unprepared when normal winter weather suddenly turns extreme. The following guidelines will help you implement preventive measures to better protect your business from the threat of freeze-ups.

### Before the Cold Weather Season

	Update your Emergency Response Program to include appropriate response procedures for below normal temperatures or extreme cold.
	Appoint one or more members of the Emergency Response Team to monitor weather forecasts and initiate winter emergency procedures when appropriate.
	Develop procedures to be followed if you lose heat or electricity (including procedures for restoring electrical services on an item-by-item basis).
	Determine which processes depend on continued building heat for safety (i.e., processes that are subject to solidification or runaway reactions) and need prompt attention.
	Identify equipment, processes, and piping that contain or use water or other liquids that could freeze, and take appropriate measures to prevent potential damage during cold spells. <ul style="list-style-type: none"> <li>■ Drain any idle equipment</li> <li>■ Frequently drain condensation from equipment and pneumatic lines</li> <li>■ Provide adequate heat and relocate equipment to a heated enclosure, protect it with suitable antifreeze, or install electrical heat tracing and insulation</li> </ul>
	Identify building areas that are unusually difficult to heat or that lose heat rapidly. Install an ordinary thermometer and develop procedures to monitor temperatures during cold spells. If these areas are unattended, provide low temperature detectors that can be monitored from a central location.
	Verify that water-filled sprinkler pipes that pass through open areas, cold rooms, passageways, or other areas exposed to temperatures below 40°F are protected against freezing by insulating coverings, frost-proof casings, or listed heat tracing systems.
	Verify that windows, skylights, doors, ventilators, other openings and closures, concealed spaces, unused attics, stair towers, roof houses, and low spaces under buildings do not expose water-filled piping to freezing.
	Service heating systems.
	Make sure adequate supplies of alternate fuels are on hand if the heating systems are capable of dual fuel firing.
	Inspect and maintain the building exterior to minimize openings. Fix windows and doors so they close tightly. Caulk, insulate, and apply weather stripping as needed. Close and seal unneeded dampers, louvers, vents, and openings. Inspect roof drains for debris.

	Drain condensation from dry pipe sprinkler system piping by opening the priming water level drain valve until the water has been expelled. Also, make sure auxiliary drains installed at the system's low points are regularly inspected and drained.
	If there are any trapped sections of sprinkler branch line piping, it may be necessary to briefly shut down the system to drain the water. Shut off and drain automatic sprinkler systems only as a last resort. Use the Liberty Mutual Insurance Sprinkler Impairment Program to report impairments.
	Maintain and test standby electric generator(s) for emergency power (if applicable).
	Determine if portable heaters or other emergency equipment are needed.

### During Cold Spells

	Monitor temperatures every few hours in vulnerable areas. This can be done by regular watch tours or by providing low-temperature alarms that are connected to a constantly attended location.
	Verify that water-filled sprinkler piping is maintained at a minimum temperature of 40°F.
	Inspect valve enclosures for preaction and deluge valves on a daily basis to verify a minimum temperature of 40°F.
	Provide approved portable heaters for vulnerable areas that might fall below 40°F.
	Provide heat or steam tracing for exterior piping that contains liquids subject to freezing.
	Use tarps to erect temporary windbreaks. For a permanent windbreak, consider planting evergreen trees and hedges upwind (prevailing winter wind direction) of vulnerable buildings and equipment.
	For pipes that are vulnerable to freezing, open water faucets slightly to let them drip in order to keep water flowing. Ice may still form, but the open faucet helps prevent the pipe from bursting by allowing relief for any built up pressure.
	If pipes freeze, turn off the water supply and thaw or repair damaged piping. If the frozen piping affects fire protection systems, use the Sprinkler Impairment Program to notify Liberty Mutual Insurance.
	Do not use open flame devices to thaw frozen pipes or equipment.
	Verify that all fire protection equipment is in service.
	Constantly monitor any boilers or other heating systems that must remain online.
	Keep names and phone numbers of your heating contractor, plumber, and fire department easily accessible.

### Snow Loading and Roof Collapse

Most businesses plan for snow and severe weather by winterizing vehicles, contracting for snowplowing, etc. However, many businesses neglect to adequately plan for excessive snow loading on roofs. The potential for roof collapse or structural damage increases as the weight of accumulated snow and ice exceeds the snow load capacity of the roof.

Rain falling on accumulated snow is especially dangerous because snow-covered roofs do not drain well and accumulating water and ice can quickly exceed the design limits of the roof.

Even if you are in a warm area of the country, you should not ignore this hazard. In fact, your facilities may be more susceptible to an unusually severe winter storm because they are not designed for extreme weather and personnel are less accustomed to, and less prepared for extreme conditions. In addition, building codes in these areas have lower snow load requirements that can make roofs more susceptible to collapse from unusual snow loading.

Planning, preparation, and prompt action to remove accumulated snow can help minimize the potential risk of roof collapse.

## Planning and Preparation

	Be sure your Emergency Response Program covers winter emergencies, including appropriate response procedures for excessive snow loads.
	Determine the maximum safe snow depth for the roof based on its load capacity as indicated in the building plans and specifications or in an engineering analysis of the roof design.
	For new construction or when reinforcing roof load limits, follow the design guidelines in the American Society of Civil Engineers Standard for Minimum Design Loads for Buildings and Other Structures, ASCE 7.
	Inspect the roof structure for damage or deterioration and repair or reinforce as needed.
	Inspect all roof drains and downspouts and clean any accumulated debris from the roof to prevent clogging the drainage system.
	Look for evidence of past water ponding and eliminate the causes.
	Identify who is responsible for snow/ice removal from roofs.
	Establish a plan for elevating mechanized snow removal equipment to the roof.
	Determine what special tools, equipment, protective devices, clothing, and footwear will be needed to work on a snow covered roof. Make sure all the necessary gear is on hand and ready for use.
	Identify what types of fall protection will be needed to work on a snow covered roof. Guardrails, nets, or personal fall-arrest system for each worker may be necessary, depending on roof configuration and existing fall protection already installed.
	Determine if there are special hazards on the roof that may be hidden from view by the snow. Mark skylights, roof drains, vents, and other hazards or obstructions so that workers will be able to see and avoid them.
	Develop a plan for keeping all roof access points clear of snow.
	Teach workers the warning signs of overexposure and hypothermia.
	Read, understand, and follow all manufacturers' instructions for the safe use of snow blowers and similar mechanical equipment.
	Develop a plan to ensure that powered equipment is not used within 10 feet of any roof edge.
	Check with a roofing contractor before using mechanized equipment on the roof to ensure the equipment will not damage the roof membrane.
	Instruct workers on snow covered roofs to operate equipment at reduced speeds due to slippery roof conditions

### When the Snow Flies

Regularly monitor snow depth on the roof, paying close attention to areas where snow tends to drift and accumulate. Areas such as roof valleys (low sections adjacent to higher sections) and roof-mounted structures, such as tanks and penthouses, are particularly susceptible.

Remove snow accumulations from the roof before the snow reaches 50% of the safe maximum depth, (see Table 1) and use safe roof practices. Do not send employees on to the roof once the snow load approaches the load capacity. Remove snow during a storm only if the forecast indicates that the total snowfall will result in dangerous accumulations.

Remove snow in layers uniformly across the roof to prevent unbalanced loads that might cause a collapse. Avoid making snow piles on the roof during the removal process.

Clear snow and ice from storm drains and catch basins. Periodically inspect the roof drainage system to make sure that it is not clogged with ice or debris.

Use care with snow removal equipment (shovels, ice spades, snow blowers, etc.) to prevent roof cover damage. It is not necessary to clean completely down to the roof surface as long as melting snow and water can freely flow to the drains.

### Measuring the Snow Load

Table 1 is a guide that combines live load design (lbs/ft<sup>2</sup>) and the density (lbs/ft<sup>3</sup>) of accumulating snow, ice, or water to determine when to take corrective action. For example, a roof designed to handle a snow load of 20 lb/ft<sup>2</sup> could possibly withstand 11.5 inches of heavy wet snow. Therefore, you should remove it from the roof (if it is safe to do so) when it reaches approximately six inches.

**Table 1:**  
Equivalent  
Snow Load  
Table

Density Information	Light/Dry Snow	Heavy/Wet Snow	Ice	Water
Density (lb/ft <sup>3</sup> )	3.12	20/81	57.25	62.43
Percentage of Water Weight	5%	33%	92%	100%

### Equivalent Inches of Precipitation

Design Load	Light/Dry Snow		Heavy/Wet Snow		Ice		Water
	Depth	Consider Clearing Roof at	Depth	Consider Clearing Roof at	Depth	Consider Clearing Roof at	Depth
5 lb/ft <sup>2</sup>	19.2	10	2.9	1.5	1.0	0.5	1.0
10 lb/ft <sup>2</sup>	38.4	19	5.8	3	2.1	1	1.9
15 lb/ft <sup>2</sup>	57.7	28	8.6	4	3.1	1.5	2.9
20 lb/ft <sup>2</sup>	76.9	38	11.5	6	4.2	2	3.8
25 lb/ft <sup>2</sup>	96.1	48	14.4	7	5.2	2.5	4.8

### Post-Winter Storm Procedures

Following the storm, assess damage and notify all critical people (management, contractors, etc.) of next steps based on damage.
Secure the site and provide watch service if necessary.
Clear away the snow and ice from driveways, walkways, doorways, and roof access points.
Make sure heating systems and water pipes are working.
Close water faucets (if previously opened to prevent the pipe from bursting).
Cover broken windows and torn roof coverings immediately if damaged during the storm.
Separate damaged goods.
Clean roof drains and remove, snow, ice, and debris from roofs.
Make regular temperature and wind chill checks to prevent workers from overexposure to the cold.
Rotate workers to reduce their individual exposures to cold and to prevent back injuries from shoveling snow.
Visually check for open bus bars, conductors, and exposed insulators before reenergizing electrical systems.
In case of power failure, check refrigerated items for spoilage.
Limit access to freezers and refrigerated areas during periods of interrupted electrical service to maintain the temperatures as long as possible.
Look for safety hazards such as live electrical wires, leaking gas, flammable liquids, corrosive/toxic materials, and damage to foundations or underground piping.

	Repair automatic sprinkler protection and/or water supplies to get protection back in service as soon as possible (if necessary). Use Liberty Mutual Fire Protection Impairment Procedures whenever sprinkler protection and/or water supplies are impaired. Contact Liberty Mutual Insurance at 1-800-541-5224 to report impairments to fire protection systems or for assistance in restoring systems.
	Conduct 2 inch-main drain and alarm tests on automatic fire protection sprinkler systems to verify public water supply availability.

### For more information on winter storms

[www.weather.gov](http://www.weather.gov)

[www.ready.gov/winter-weather](http://www.ready.gov/winter-weather)

[www.nws.noaa.gov/om/winter/index.shtml](http://www.nws.noaa.gov/om/winter/index.shtml)

### References

American Society of Civil Engineers, *Standard for Minimum Design Loads for Buildings and Other Structures*. ASCE 7.

VanDevender, Karl; and Petty, Doug. *Ice and Snow Accumulations on Roofs*. University of Arkansas, Division of Agriculture, Cooperative Extension Service. March 2006.