

Winterizing Your Building



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As spring thaws uncover the ravages winter weather has wreaked on buildings and parking structures, owners and managers might scratch their heads and wonder, what might I have done to prevent this? Deicing chemicals, freeze-thaw cycling, snow removal, wind and snow loading and storm debris can cause significant damage to buildings and structures, in even one season's time.

While properties in colder climates can't escape the yearly onslaught of wind, icy rain and snow, prudent facility managers can work proactively to shield buildings from winter's deleterious effects. The key is a comprehensive annual winterizing program that prepares building components for freezing temperatures, combined with appropriate, ongoing storm management practices.

A small investment now in developing and implementing a coordinated seasonal plan can reap big rewards later by avoiding the expense of rehabilitating damaged materials. A well-sealed building also saves on energy and heating costs.

Roofs

Spring/Summer: Inspect and Repair

Because roofing systems are best repaired or replaced during temperate weather, inspect the entire roof area for tears, punctures, blisters and other signs of wear. Penetrations for mechanical systems tend to be weak spots, so pay particular attention to the membrane integrity at these areas. Bent or damaged flashings should be repaired or replaced. For high-slope roofs, check for and replace cracked or missing slates or tiles,

and repair open seams on metal roofing. Ensure that flashings at peaks and valleys are in good shape, secure loose gutters and repair bent snow guards or lightning rods. In short, perform a thorough check of the roof for possible points of water entry, which could allow the build-up of ice and the premature breakdown of building components—as well as leaks.

If you do not already keep a maintenance and repair record, establish a Winterizing Program document that you can use to collect and store information on maintenance evaluations, planning, repairs and methods.

Fall: Plan Snow Removal

During the autumn rains, check low-slope roofs for ponding water, a potential source of leaks. If water collects significantly, the excess weight could cause structural members to deflect, which will form a low point on the roof. This depression will then collect even more water, causing further deflection of roof support members in a self-perpetuating cycle.

If your roof accumulates snow or snow drifting, determine and plan for appropriate snow removal where necessary to prevent excessive or unbalanced loading. Where will you put the snow? Can it be safely removed to street level and then cleared, or will a more sophisticated snow management strategy be necessary? How can the snow be removed without causing damage to the roof?

Create a Winterizing Program log and outline the snow removal program you plan to use, including any equipment that may need servicing before the oncoming season. Check roof manufacturers' warranties to ensure that the snow removal methods you have selected do not violate any provisions. If any damage to the membrane does occur, detailed record keeping of your winter repair and maintenance strategies serves to document that you have acted within your warranty rights.

Finally, work with a structural engineer to establish a roof snow management plan.

Winter: Manage Storm Impact

With the roof area sealed against moisture intrusion, it's time to put the snow removal plan into action. Following a storm or high winds, inspect the roof for debris, remove it promptly and repair any damage. Next, check for areas where snow drifting may create excessive loads. This generally occurs where a low roof meets a higher roof, or where a roof meets a wall. Following your established snow management plan, distribute the snow as appropriate, or remove it from the roof to the ground level using techniques that won't damage the roof system.

Check storm drains for blockages so that melting snow doesn't lead to ponded water. Ice can block water runoff or damage roof membranes, so be sure that drains remain clear and supplementary drainage systems work.

On high-slope roofs, ice dams at the eaves indicate drainage problems, and they can be dangerous to passersby should the ice suddenly slide off. Large amounts of ice can break past snow guards, so these are

not failsafe against damage or injury. Furthermore, ice and water backed up at the eaves can penetrate under shingles and leak into the building. Where ice dams are recurrent, such as at valleys where two roof areas intersect, consider installing heat tracing, which warms eaves to melt accumulated snow and ice.

During periods of frequent precipitation, the roof should be checked regularly for adequate drainage and for build-ups of snow, ice, branches and wind-blown refuse.

Parking Garages

Spring/Summer: Prepare and Protect

Garages are exposed to harsh winter conditions inside and out and need extra care and protection to survive the colder months unscathed.

A thorough annual inspection for deteriorated concrete, corroded reinforcing bars, damaged expansion joints, cracks and areas of poor drainage is critical to preventing winter weather from exacerbating existing problems. These conditions provide sites for water intrusion into the concrete. In turn, trapped moisture accelerates deterioration through a number of mechanisms, including freeze/thaw cycling and corrosion of embedded steel.

Water in concrete freezes and expands, exerting outward pressure. This will eventually cause cracks to form, which act as further points for water entry. Water also carries dissolved salts and other compounds that are deleterious to the overall health of your parking structure. The end result: deterioration occurring at a continually increasing rate.

The best approach is to stop this cycle of damage before it gets rolling. If your parking structure has a surface treatment in place, check for areas of wear and repair or reapply as needed. Check manufacturers' recommendations for upkeep schedules. Untreated concrete also demands regular maintenance. Rout and seal small cracks, repair spalls, replace sealant at joints and check and clear drains.

Fall: Finalize Deicing Strategies

It's critical to choose and store deicing chemicals early, as low salt supplies in the past few years have driven up prices and sharply reduced availability. Building owners and managers who wait until snow arrives to shop for ice-melting materials might find that they are limited to what's on store shelves and that they have to settle for something more expensive or more corrosive than they'd intended.

Winter: Operate Safely and Continuously

The goal with parking structure snow and ice removal is usually to maintain full-capacity operation while protecting against hazardous conditions. Deicing compounds can be an important part of this process, but in areas of the garage not exposed to the diluting effects of precipitation, chemicals can accumulate and cause damage. Optimal drainage is crucial to preventing a stagnating mass of chemically saturated water from penetrating the deck and damaging vehicles below. Regular drain cleaning and deck washing to clear accumulated salts are important steps in minimizing the concentration of chemicals.

For multi-level freestanding parking garages, clearing snow from the top level expeditiously can be a challenge. Where will you put the snow? As with roofs, the decision must be made whether to drop the snow onto ground level for removal or to move it to a single area of the parking deck, which would then be closed to use. For the latter, be sure that the structure can accommodate the load of the mounded snow.

What if emergency repairs are needed? It is possible to fix dangerous or unstable conditions during the winter months. Heating small portions of the garage can permit the safe repair of problem areas. (Working with frozen building components can cause further damage.) Maintaining the Winterizing Program log with regular conditions checks will enable facility managers to identify hazardous conditions quickly, allowing time for correct remediation of the situation in a timely fashion.

Where is that water coming from? If you have ruled out drainage and water penetration problems, but large concrete members continue to show surface moisture, then you might have a simple case of seasonal condensation. Make observations during different weather conditions; condensation is likely to appear when weather heats up quickly.

Facades

Spring–Fall: Insulate

Cracks in masonry, deteriorated mortar, failed sealant and damaged or missing flashings and weather stripping create gaps in the building's shield against winter weather. When water penetrates these small openings, it can cause significant damage through rust, expansive forces and chemical degradation. But don't slather the building exterior indiscriminately with surface sealers, as these can actually trap moisture that penetrates the surface and accelerate rather than prevent deterioration.

Instead, routine maintenance is the best defense against cold weather damage. Inspect and repair mortar and sealant joints. Pay particular attention to facade weep holes, if present, when sealing windows or sliding doors; these should remain open and functional.

Recurrent or extensive damage during the winter months may be a sign of incorrect design or incompatible material assembly. All buildings move and change with the seasons and with time. A design professional can help determine the cause and solution to major cracking resulting from uncoordinated building movement. In the Winterizing Program log, note areas where repairs have been made, so that these spots can be checked again periodically to ensure that the repairs are holding up to winter conditions.

Winter: Manage Thermal Transfer

As with any horizontal building component exposed to the elements, entryways must be cleared and maintained using snow removal and deicing methods similar to those described for roofs.

Condensation on windows during the winter is a sign that some component of the thermal management system is not functioning correctly. If the condensation appears between the panes of double-paned windows, then the thermal seal has failed. If, however, the condensation is on the inside of the glass, then

the glass may be insufficiently insulating, the seals may have failed, or the HVAC system may need maintenance. A design professional can pinpoint the source of condensation and recommend a solution.

Let It Snow

With a little planning and prevention, you can stay a step ahead of the weather and avoid shelling out for serious repairs come spring. Invest a few hours in developing your Winterizing Program checklist and log book, which can act as a quick-reference guide as you prepare for winter each year.

Because each structure's situation, climate, usage and components are different, it might be worthwhile to retain a design professional in the first year to assist with developing your winter strategy.

The trick is to plan ahead, so that liability concerns and emergency situations don't force hasty decisions.

With the right preparation, winter maintenance can be simple, cost-effective and efficient.

About the Author

Steven J. Susca, PE, is Senior Engineer with Hoffmann Architects, Inc., an architecture and engineering firm specializing in the rehabilitation of building exteriors. As an expert in building system analysis, Susca often applies his structural design and detailing experience to the diagnosis, resolution, and prevention of winter season damage. Learn more about Hoffmann Architects by visiting www.hoffarch.com