

HAZARD ALERT

Falls and Other Hazards to Workers Removing Snow from Rooftops and Other Elevated Surfaces

Every year, workers are killed or seriously injured while performing snow or ice removal from rooftops and other building structures, such as decks. OSHA has investigated 16 such serious injuries or fatalities in the past 10 years – all of which could have been prevented.

Snow removal is performed for a number of reasons, such as to prevent overloading and collapse, or for construction or repair of decking or roofs. Often workers climb directly onto the roofs or structures and use equipment such as shovels, snow rakes, snow blowers, ladders, etc. Other times these operations may be performed from the ground level using snow rakes. Aerial lifts are sometimes used to access roofs and apply de-icing materials. Snow removal operations are often performed under extreme weather conditions (e.g., cold, high winds, icy surfaces). Workers who perform these activities (for example, building maintenance workers) may have little experience or training on the hazards of such operations or work.

Workers performing snow removal operations are exposed to many serious hazards. Based on the findings of OSHA investigations, falls cause the most worker fatalities and injuries during rooftop snow removal. Workers may fall off roof edges, through skylights, and from ladders and aerial lifts. Workers may also be injured or killed by a roof collapse. Examples of incidents investigated by OSHA include:

- A worker was removing snow from a roof, when he lost his balance and slid off the roof. He fell and struck his head on construction materials that were being stored below the roof, and sustained a fatal head injury.
- A worker was laying grid lines and shoveling snow on a second floor deck. An elevator shaft opening was covered with a plastic tarp with temporary guardrails installed around a portion of the shaft opening. The worker, who was not wearing any fall protection, fell 30 feet through



OSHA requires that employers plan ahead and use the proper protective measures to protect workers engaging in snow removal activities. This includes snow removal by workers from commercial and residential buildings, flat roofs and pitched roofs.

the unguarded portion of the elevator shaft opening and died.

- Four workers were building a second-floor room addition. One of the workers was standing on a 12-foot aluminum ladder attempting to clean snow from a low-slope roof, 10 feet above ground. The feet of the ladder slid, the worker fell, struck his head on the ladder and then on the concrete driveway. He died several days later.
- A worker was shoveling snow from the roof of a residential construction site. He fell from a height of more than 11 feet and was fatally impaled by a scaffold upright in the course of his fall.

Workers removing snow face other significant hazards in addition to falls from roofs, including:

- Amputations, eye injuries, and other injuries associated with the use of snowblowers and other mechanized equipment.

- Collapses or tip-overs when using aerial lifts.
- Entrapment and suffocation under falling snow drifts or snow piles.
- Shock/electrocution hazards from contacting power lines or damaged extension cords.
- Frostbite or hypothermia from cold and windy conditions.
- Musculoskeletal injuries from overexertion.

Under the OSH Act's general duty clause, employers have a duty to protect workers from recognized serious hazards in the workplace, including hazards associated with snow removal from roofs. This hazard alert describes the steps you can take to prevent injuries and deaths from these hazards.

Plan Ahead for Safe Snow Removal from Roofs

Before snow starts to accumulate, think about what will be needed to safely remove snow from roofs or other elevated surfaces:

- Can snow be removed without workers going onto the roof?
- Are there any hazards on the roof that might become hidden by the snow and need to be marked so that workers can see them (skylights, roof drains, vents, etc.)?
- How should the snow be removed, based on the building's layout, to prevent unbalanced loading?
- What are the maximum load limits of the roof and how do they compare with the estimated total weight of snow, snow-removal equipment, and workers on the roof?
- What tools, equipment, protective devices, clothing and footwear will workers need?
- What type of fall protection will be used to protect workers on roofs and other elevated surfaces?
- What training will workers need to work safely?
- How will mechanized snow removal equipment be safely elevated to the roof?
- How will you protect people on the ground from snow and ice falling off the roof during removal operations?

Preventing Falls during Snow Removal

Working on a roof with snow, ice, or wind carries a risk of a fall onto the roof, or a fall off the roof to the ground below or through a snow-covered skylight, all of which are often fatal. Therefore, employers should protect their workers from these hazardous work conditions by:

- Using snow removal methods that do not involve workers going on roofs, when and where possible.
- Evaluating loads exerted on roof or structure (e.g., total weight of snow, workers and equipment used), compared to the load limit of the roofs.
- Requiring that workers use fall protection equipment.
- Ensuring that workers use ladders and aerial lifts safely.

Remove Snow Without Going on the Roof

Whenever possible, use methods to clear ice and snow without workers going on the roof. For example:

- Use ladders to apply de-icing materials.
- Use snow rakes or drag lines from the ground.

These methods can pose various hazards to workers. Read the sections below on "Use Ladders Safely," "Use Aerial Lifts Safely," and "Avoid Electrical Hazards."



Snow rakes resemble a garden hoe with a long handle. Workers should be instructed to remove small amounts at a time to avoid strain or from being hit or buried by falling snow.

Evaluate Load Bearing on the Roof or Structure

Before workers access a roof or other elevated structure, the employer should confirm that the workers' weight and any equipment used can be supported by the roof or structure without causing a collapse. Workers should always use caution by remaining alert to unexpected sounds or movement around surfaces that have been weighed down by snow (or water from melted snow), because these surfaces could collapse.

Shoveling or raking a roof without using the proper procedures can also increase the risk of roof collapse by creating an unbalanced load on the roof. To prevent unbalanced loading during snow removal, workers should:

- Remove snow uniformly across the roof.
- Avoid making snow piles on the roof.

What is Snow Load and How Much Snow Can a Roof Support?

Snow load is the weight of the snow (generally reported in pounds per square foot). The weight of the snow will vary depending on its water content. Snow load on the ground can provide a rough indication of roof snow load, but roof snow loads also depend upon factors such as melting and re-freezing of snow and ice, drifting, roof slope, type of roof, and design features.

The amount of weight that a roof can safely support is based on local building code requirements and should be available within the design specifications for your building. If the structure or roof has structural deterioration, the roof might support less weight than would otherwise be expected.

Resources

- National snow load information, compiled by the U.S. Forest Service. Includes ground snow load information and links to state-specific data.
- National Weather Service, snow analysis data (searchable by region, state, city, and zip code).
- U.S. Department of Agriculture, National Resources Conservation Service, SNOWpack TELelemetry (SNOTEL) snow data for states in the western U.S. Shows example ground snow load calculations.
- For more in-depth information on roof snow load calculations and requirements, see American Society of Civil Engineers (ASCE) 7, Minimum Design Loads for Buildings and Other Structures.

Use Required Fall Protection

Falls cause most of the deaths and severe injuries that occur during snow removal operations. OSHA standards require employers to evaluate hazards and protect workers from falls when working at heights of 4 feet or more above a lower level (1910.23) or 6 feet or more for construction work (1926.501).

If workers access roofs and other elevated surfaces to clear snow:

- Train workers on fall hazards and the proper use of fall protection equipment, as required by 1910.132(f)(1) and 1926.503(a)(1).
- Provide and ensure that workers use fall protection equipment if they are removing snow in areas that are not adequately guarded (e.g., with a guardrail system or cover) as required by STD 01-01-013 and 1926.501(b) (see box: "Information on Fall Protection" and "Note" below.)
- Instruct workers who wear personal fall protection equipment to put on their harnesses and buckle them snugly before mounting the roof.
- Have a plan for rescuing a fallen worker caught by a fall protection system, as required by 1926.502(d)(20).
- Remove or clearly mark rooftop or landscaping features that could become trip hazards.

Information on Fall Protection

Personal fall arrest systems and *guardrails* are among the most commonly used forms of fall protection for work on roofs.

- Typical personal fall arrest systems involve an anchor point, a full-body harness, and a connector, such as a retractable lifeline or a shock-absorbing lanyard. Anchor points must be able to support at least 5,000 pounds for each worker attached to it (1926.502(d)(15)) or maintain a safety factor of at least two (twice the impact load) under the supervision of a qualified person (1926.502(d)(15)(i) and (ii)). OSHA believes that anchorages available on the market will meet the strength requirements if they are installed as per the manufacturer's instruction.
- Guardrails must be 42 inches high with a midrail (1910.23(e), 1926.502(b))

Other resources:

Personal Fall Arrest Systems, OSHA Construction e-tool

Fall Protection in Residential Construction, OSHA Safety and Health Topics Page

NOTE: Snow removal is typically a maintenance activity regulated under OSHA's general industry standards, 29 CFR 1910 (see general industry fall protection compliance guidance, Directive STD 01-01-013, for work from elevated surfaces). However, on construction sites where snow must be removed in order to begin or continue construction work, OSHA's standards at 29 CFR 1926 apply, including residential construction sites (see fall protection compliance guidance, Directive STD 03-11-002).

Use Ladders Safely

Workers may use ladders to access rooftops for snow removal. **Workers should not use a snow rake or shovel while on a ladder because this greatly increases the risk of losing one's balance and falling.**

To prevent falls from ladders used for accessing roofs:

- Make sure that workers know the route and method they should use to get up and down from a roof in a way that minimizes the risk of falling. The safest location for the ladder might not be the most obvious one, or an alternate method (e.g., an access door or lift) might be available to get on the roof. Safe roof access is as important as having effective fall protection while on the roof.
- Ensure that workers follow safe practices when working on ladders, such as:
 - Ensure that the ladder has level and secure footing, as required by (1910.25(d)(2)(xix), 1910.26(c)(3)(iii), and 1926.1053(b)(6).
 - Check the ladder rungs for ice. A slippery step can cause a fatal fall.
 - Position the ladder at the correct angle. Place the base of the ladder a distance from the vertical wall equal to one-fourth the working length of the ladder, as required by 1910.25(d)(2)(i), 1910.26(c)(3)(i), and 1926.1053(b)(5)(i).
 - Clean snow from shoes or boots before mounting the ladder.
 - Extend the ladder 3 feet above the upper level (i.e., the roof). If not possible, use ladder rail extensions and secure the ladder to prevent it from slipping or tipping, as required by 1926.1053(b)(1) and 1910.25(d)(2)(xv).
 - If using an A-frame ladder, do not stand on the top two steps – that location is not stable.
 - Always maintain three points of contact with the ladder (two feet and one hand, alternating with two hands and a foot), as required by 1926.1053(b)(21).

Protect People on the Ground during Snow Removal

Workers standing on the ground removing snow from the roof and bystanders can become trapped under snow falling from roofs and could suffocate.

- Mark a safe work zone in the area where snow is to be removed (e.g., keep people back 10 feet from the point where snow is expected to be blown or fall).
- Wear eye and head protection, especially when removing ice.
- When using snow rakes, remove small amounts of snow at a time.
 - Keep the centerline of the body inside the ladder rails. Do not lean or reach so that the body extends outside the rails – this position is unstable and could lead to a fall.
 - Do not carry heavy or bulky objects or loads up a ladder, as required by 1926.1053(b)(22). This could cause loss of balance and falling. To transport this type of equipment, workers should climb up the ladder first, and then pull the equipment up to the working level with a rope or other appropriate hoisting method.



An aerial lift is being used in a snow removal operation. The worker is using a restraining belt and lanyard for protection.

Use Aerial Lifts Safely

Aerial lifts may be used during snow removal operations to transport de-icing equipment or to push or scrape snow from a roof.

Take the following steps to ensure safe use of this equipment (also see “Avoid Electrical Hazards” below):

- Make sure that workers who operate aerial lifts are properly trained in the safe use of the

equipment, as required by 1910.67(c)(2)(ii) and 1926.454.

- Maintain and operate elevating work platforms according to the manufacturer's instructions.
- Never override hydraulic, mechanical, or electrical safety devices.
- Never move the equipment with workers in an elevated platform unless this is permitted by the manufacturer, as required by 1926.453(b)(2)(viii) and 1910.67(c)(2)(viii).
- Do not allow workers to position themselves between the rails of the basket and overhead hazards, such as joists and beams. Movement of the lift could crush the worker(s).
- Provide and ensure that workers use a body harness or restraining belt with a lanyard attached to the boom or basket to prevent the worker(s) from being ejected or pulled from the basket, as required by 1910.67(c)(2)(v) and 1926.453(b)(2)(v).
- Do not allow workers to climb or stand on the lift's railing.
- Set the brakes and use wheel chocks when on an incline, as required by 1910.67(c)(2)(vii) and 1926.453(b)(2)(vii).
- Use outriggers, if provided.
- Do not exceed the load limits of the equipment, as required by 1910.67(c)(2)(vi) and 1926.453(b)(2)(vi). Allow for the combined weight of the worker, tools and materials.

Preventing Injuries When Using Mechanized Equipment on Roofs

The unsafe use of mechanized equipment, such as snowblowers, while removing snow from roofs may cause injuries such as amputations and eye injuries. Accidents can also happen when workers are moving equipment used for snow removal to the rooftop.

- Train workers and ensure that they read, understand, and follow all manufacturers' instructions for the safe use of all mechanical equipment, as required by 1926.21(b)(2).
- Provide and ensure that workers wear eye protection – items thrown by powered equipment can ricochet and cause serious eye damage, as required by 1910.133(a)(2) and 1926.102(a)(1).
- Ensure that workers use safe work practices. For example:
 - Raise materials to the roof using equipment lifts, winches, pull ropes, or related equipment.

- Do not use powered equipment near the edge of any roof. Some snowblower manufacturers recommend maintaining a distance of 15 feet from the roof edge.
- Operate snow removal equipment at reduced speeds due to slippery roof conditions.
- Keep hands out of the collection or discharge openings on powered snow removal equipment—equipment such as snowblowers can cause amputations! If equipment becomes clogged, shut it off, wait until all moving parts have stopped, then use a clearing tool to unclog, as required by 1926.302(c).

Avoid Electrical Hazards

Workers may face electrical hazards such as electrocution and electric shock from power lines or snow removal equipment.

- Use extreme caution when working near power lines. Always treat power lines, wires and other conductors as energized, even if they are down or appear to be insulated.
- Maintain a distance of at least 10 feet from any power line, as required by 1910.333(c)(3).
- Make sure that all electrically powered equipment is grounded (third prong on a three-prong plug is not missing) and includes a ground-fault circuit interrupter (GFCI) in the circuit, as required by 1910.304(b)(3), 1910.334(a)(3), and 1926.404(b)(1)(ii).
- When using snow rakes, use extendable, nonconductive poles and designate workers as monitors to maintain 10 feet from snow rakes to overhead power lines.
- When using aerial lifts, maintain a minimum clearance of at least 10 feet away from the nearest energized overhead lines, as required by 1910.333(c)(3).
- If servicing equipment becomes necessary, isolate the energy following lockout/tagout procedures (for example, one method is to disconnect the spark plug wire and ground it against the machine), as required by 1910.147 and 1926.417).

Two workers were using a high reach truck to remove snow and ice from a university sorority house. As they were working, one of the workers reached out and accidentally grabbed a 12,000-volt electrical line. He was electrocuted.

Avoiding Other Hazards

Exposure to cold can cause injury and illness in workers removing snow. Cold exposure can cause frostbite (freezing in the deep layers of skin and tissue) and hypothermia (drop of body temperature to less than 95°F). For information on how to prevent these situations, see OSHA's Safety and Health Guide on Cold Stress.

Physical exertion during snow removal can also cause injuries and illnesses. Snow removal can be strenuous, particularly because cold weather can be taxing on the body, and can create the potential for exhaustion, dehydration, back injuries, or heart attacks, and can increase the risk of falls. Make sure that workers take steps to minimize overexertion and help prevent injuries, such as the following:

- Scoop or push small amounts of snow at a time. Use a smaller shovel or take smaller scoops of snow if snow is wet and heavy.
- Use proper form if lifting is necessary; keep the back straight and lift with the legs.
- Do not overload the snowblower; let it operate at a modest speed.
- Take frequent breaks and drink fluids (avoid caffeine or alcohol).

Help for Employers

OSHA's On-Site Consultation Program offers free and confidential advice to small businesses with fewer than 250 workers at a site (and no more than 500 employees nationwide). This program provides free on-site compliance assistance to help employers identify and correct job hazards as well as improve injury and illness prevention programs. On-site consultation services are separate from enforcement and do not result in penalties or citations. To locate the OSHA consultation office nearest you, visit www.osha.gov or call 1-800-321-OSHA (6742).

OSHA has **compliance assistance specialists** throughout the nation located in most OSHA offices. Compliance assistance specialists can provide information to employers and workers about OSHA standards, short educational programs on specific hazards or OSHA rights and responsibilities, and information on additional compliance assistance resources. Contact your local OSHA office for more information by calling 1-800-321-OSHA (6742) or visit OSHA's website at www.osha.gov.

Workers Rights

Workers have the right to:

- Working conditions that do not pose a risk of serious harm.
- Receive information and training (in a language and vocabulary they understand) about workplace hazards, methods to prevent them, and the OSHA standards that apply to their workplace.
- Review records of work-related injuries and illnesses.
- Get copies of test results that find and measure hazards.
- File a complaint asking OSHA to inspect their workplace if they believe there is a serious hazard or that their employer is not following OSHA's rules. When requested, OSHA will keep all identities confidential.
- Exercise their rights under the law without retaliation or discrimination.

Contact OSHA

For questions or to get information or advice, to report an emergency, report a fatality or catastrophe, order publications, or to file a confidential complaint, contact your nearest OSHA office, visit www.osha.gov, or call OSHA at 1-800-321-OSHA (6742), TTY 1-877-889-5627.

Disclaimer

This hazard alert is not a standard or regulation, and it creates no new legal obligations. It contains recommendations as well as descriptions of mandatory safety and health standards. The recommendations are advisory in nature, informational in content, and are intended to assist employers in providing a safe and healthful workplace. The Occupational Safety and Health Act requires employers to comply with safety and health standards and regulations promulgated by OSHA or by a state with an OSHA-approved state plan. In addition, the Act's General Duty Clause, Section 5(a)(1), requires employers to provide their employees with a workplace free from recognized hazards likely to cause death or serious physical harm.



U.S. Department of Labor
Hilda L. Solis, Secretary of Labor



**Occupational Safety
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