



SNOW LOAD CHECKLIST

Pre-Planning before the Winter Event:

- 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 (i.e., skylights, roof drains, vents, electrical, 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? Also pay attention to increased loads in drifting areas. ****Please see Appendix A for calculation****
- 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? [NOTE: Fall protection is required for any worker working at a height of 4 feet or more above a lower level (1910.23) or 6 feet or more for construction work (1926.501).]
- 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?
- Research the name and telephone number of a local snow removal contractor to keep handy in case of emergency.

NOTE: Be mindful of additional hazards workers removing snow face in addition to falls from roofs, including:

- Amputations, eye injuries and other injuries associated with the use of snow blowers 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

Evaluate Load Bearing on the Roof or Structure:

- Before workers access a roof or other elevated structure, the employer should confirm that the worker's 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 sounds or movement around surfaces that have been weighed down by snow (or water from melted snow), because these surfaces could collapse.
- Shovel or rake the roof using the proper procedure as not to increase the risk of roof collapse by creating an unbalanced load on the roof. **Please see the diagram included in Appendix C **
- Remove snow uniformly across the roof.
- Avoid making snow piles on the roof.

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 or damage, the roof might support less weight than would otherwise be expected.

Removing Snow with Personnel on the Roof:

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

- Use snow removal methods that do not involve workers going onto roofs when and where possible. Use a snow removal contractor, a roof rake or a drag line from the ground.
- Evaluate loads exerted on roof or structure: the total weight of snow, workers and equipment used. Compare these to the load limit of the roofs before accessing.
- Have a plan for rescuing a fallen worker caught by a fall protection system as required by OSHA 1926.502(d)(20).
- Ensure removal or clear marking of rooftop or landscaping features that could become trip hazards.

Removing Snow with Personnel on the Roof (continued):

- Require workers use fall protection equipment (per OSHA 1910.23 or 1926.501). Personal fall protection or guardrail systems are required.
- Ensure personnel are wearing harnesses and are buckled snugly before going onto the roof surface.
- Ensure workers use ladders and aerial lifts safely.
- Ensure workers know the route and method of access to the roof. Evacuate the roof structure in a way that minimizes the risk of falling.
- Ensure workers are properly trained for use of the necessary equipment and have read, understand and follow all manufacturers' instructions for the safe use of all mechanical equipment as required by OSHA 1926.21(b)(2). Only properly trained workers may be involved in the snow removal process.
- Ensure workers use eye protection as required by OSHA 1910.133(a)(2) and 1926.102(a)(1).
- Scoop or push small amounts of snow at a time.
- Use proper form if lifting is necessary. Keep the back straight and lift with the legs.
- Do not overload the snow blower; let it operate at a modest speed.
- Ensure the blower level is properly adjusted as not to damage the roof covering.
- Remove snow uniformly across the roof and avoid making snow piles on the roof surface.
**See diagram in Appendix C **
- Take frequent breaks and drink fluids.
- Mark areas with cones or caution tape to prevent access by other personnel on the ground during the snow removal process.
- Maintain a distance of at least 10 feet from any power line, as required by OSHA 1910.333(c)(3).
- Ensure all electrical equipment is grounded and includes a ground-fault circuit interrupter in the circuit as required by OSHA 1910.304(b)(3), 1910.334(a)(3), and 1926.404(b)(1)(9ii).
- If servicing equipment becomes necessary, ensure lockout/tagout procedures are followed as required by OSHA 1910.147 and 1926.417.

Removing Snow without Personnel on the Roof:

- Use ladders to apply de-icing materials
 - Ensure the ladder has level and secure footing as required by OSHA 1910.25(d)(2)(xix), 1910.26(c)(3)(iii), and 1926.1053(b)(6).
 - Check the ladder rungs for ice before use and on a regular basis during the process.
 - Position the ladder at the correct angle. Place the base of the ladder a distance from the vertical wall equal to $\frac{1}{4}$ the working length of the ladder, as required by OSHA 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 three feet above the upper level. If not possible, use ladder rail extensions and secure the ladder to prevent it from slipping or tipping, as required by OSHA 1926.1053(b)(1) and 1910.25(d)(2)(xv).
 - If using an A-frame ladder, do not stand on the top two steps as this makes the ladder unstable.
 - Always maintain three points of contact with the ladder as required by OSHA 1926.1053(b)(21).
 - Keep the centerline of the body inside the ladder rails.
 - Do not carry heavy, bulky objects or loads up a ladder as required by OSHA 1926.1053(b)(22).
- Use a snow rake or a drag line from the ground.
- Remove snow uniformly across the roof and avoid making snow pile on the roof surface.
**See diagram in Appendix C **
- Ensure rakes are constructed with extendable, nonconductive poles.
- Have a watchman in place during the snow removal process to ensure that workers maintain a safe distance of 10 feet from snow rakes to power lines.
- Scoop or push small amounts of snow at a time.
- Use proper form if lifting is necessary; keep the back straight and lift with the legs.
- Take frequent breaks and drink fluids.
- Mark areas with cones or caution tape to prevent access by other personnel on the ground during the snow removal process.

If roof collapse is imminent, EVACUATE THE AREA and MARK ALL AREAS "OFF LIMITS" with caution tape.

The information and suggestions contained in this guideline have been developed from sources believed to be reliable. Loss Control Representatives from Pennsylvania Lumbermens Mutual are available to assist you in your efforts to develop effective loss control programs. Pennsylvania Lumbermens Mutual accepts no legal responsibility for the correctness or completeness of this material or its application to specific factual situations or the ultimate effectiveness of a loss control program or accident prevention program developed based upon the material presented in this guideline.

Appendix A – One Approach to Estimating Roof Snow Loads

This recommended approach from Zurich Insurance for estimating roof snow load is intended to be applied without personnel going onto the roof. This alternative involves collecting a core sample of the roof snow from any accessible point. This may be near a roof access door, hatch, window, fixed ladder, or other safe means of approaching the roof area.

The core sample can be collected using a pipe of any diameter. An interesting element of the approach is that the pipe diameter does not impact the calculations. To keep the weight of the sample as light as possible, select the smallest diameter pipe available that will effectively collect the core sample.

To collect the snow core sample, use a capped section of clear plastic pipe having a length that exceeds the snow depth. Stick the pipe vertically down into the snow and collect a full depth sample. When taking the sample, note the depth of the snow at the sample location. This can be accomplished by marking the sampling pipe.

Take the collected sample into a heated area and allow the snow to melt inside the pipe. Once the snow has melted, measure the height of water in the pipe. Using the following formulas, calculate the “estimated roof snow load” and the “estimated snow density” at the sample location.

(1) $P=5.2 H$, where:

P = Estimated roof snow load in pounds per square foot

$D = 12 P/S$, where:

(2) H = Height of water in the pipe in inches

D = Estimated roof snow density in pounds per cubic foot

P = Estimated roof snow load in pounds per square foot

S = Measured snow depth at the roof sample point

To estimate the roof snow load at another location on the roof, one needs to identify the depth of snow at that location. This can be accomplished by using the heights of known rooftop features such as equipment, parapets, and penthouses. Pre-marking walls and equipment with elevations or measuring sticks can also facilitate identifying snow depths. The overall objective is to visually identify the snow depths without actually going onto the roof.

Once a snow depth is identified at another location, the roof snow load at that location can be estimated using the following formula:

(3) $P = D S / 12$, where:

P = Estimated roof snow load in pounds per square foot

D = Estimated roof snow density in pounds per cubic foot

S = Estimated snow depth at the desired point on the roof

As a caution, any ice present under the measured snow layer may go unaccounted if care is not taken to include the ice layer if present. Each inch of ice represents an added roof load of 4.8 psf.

Information and calculation courtesy of Zurich Insurance

Appendix B – Method of Snow Removal

- Removing snow completely from a roof surface can result in serious damage to the roof covering and possibly lead to leaks and additional damage. At least two inches of snow should be left on the roof.
- Do not use mechanical snow removal equipment. The risk of damaging the roof membrane or other rooftop items outweighs the advantage of speed.
- Do not use sharp tools, such as picks, to remove snow. Use plastic rather than metal shovels.
- Remove drifted snow first at building elevation changes, parapets, and around equipment.
- Once drifted snow has been removed, start remaining snow removal from the center portion of the roof.
- Remove snow in the direction of primary structural members (Appendix C). This will prevent unbalanced snow loading.
- Do not stockpile snow on the roof.
- Dispose of removed snow in designated areas on the ground.
- Keep snow away from building exits, fire escapes, drain downspouts, ventilation openings, and equipment.
- If possible, remove snow starting at the ridge and moving towards the eave for gable and sloped roofs.
- Use a non-metallic snow rake for steep roof slopes, if possible. Metal snow rakes can damage roofing material and should be avoided. Snow removal can be conducted from the ground, removing the risk to people on a hazardous roof.
- Upon completion of snow removal, the roofing material should be inspected for any signs of damage. Additionally, a quick inspection of the structural system may be prudent after particularly large snow events.

Appendix C – Snow Removal Diagram

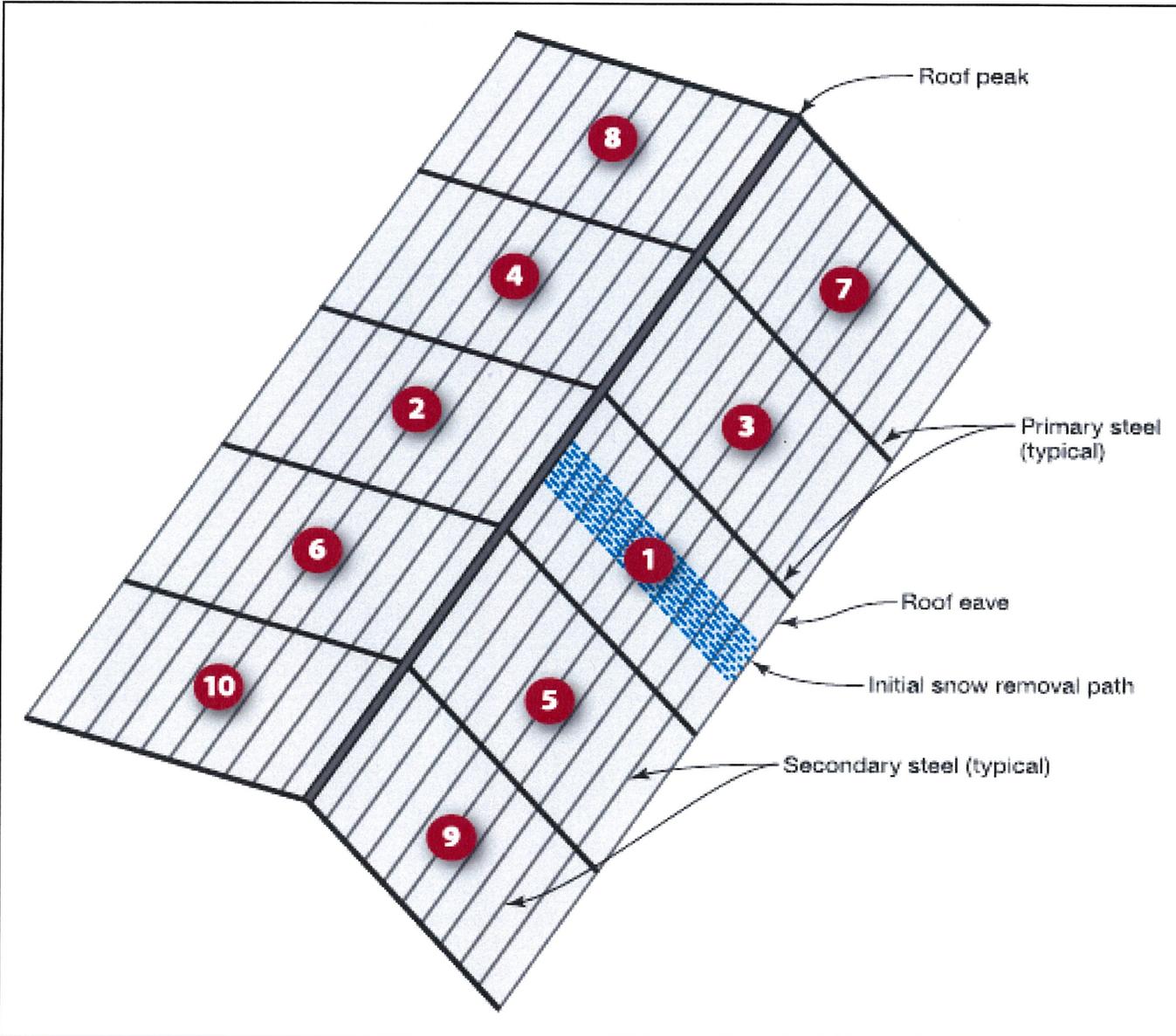


Diagram courtesy of FEMA