Reducing the Risk of Roof Collapse

PRIMEX³ RISK MANAGEMENT BULLETIN

Major winter storms can produce heavy, wet snow and drifting from high winds — the perfect scenario for roof collapse! But how much is too much and when should snow removal be considered?

As a general rule, snow/ice accumulation should be removed when one half of the "live load capacity" of the roof is reached. The live load capacity for a roof is the weight allowance for temporary or movable loads. Snow, ice and rain/water accumulation on a roof are included in the live load capacity of a roof. Live load capacity requirements for roof construction differ depending on a variety of factors including local snowfall history (ground snow load) and elevation. You will need to determine live load for each facility individually. If you don't already know the live load capacity for your facility(s), you may want to refer to your "as built" plans for the facility or consult with a structural engineer.

Once you have determined your roof's live load capacity, which is usually expressed in lb/ft^2, you will probably want to convert this to a measurable snow depth as this is easier to measure than the actual weight of the snow. The weight of moderately wet snow is often estimated to be one pound per square foot per inch of depth or 12 lb/ft^3. Using this number as an average, you can determine what is a safe depth of snow for your roof. Once this depth is reached, you should initiate your snow removal procedures. If snow tends to drift and accumulate on parts of the roof, take your depth measurements in the drifts to determine if it needs to be removed.

Example:

- **Live Load Capacity** (as determined through structural analysis) = 48 lb/ft2
- **One half Live Load Capacity** = 24 lb/ft2 = 2 ft of moderately wet snow, or 1 foot of heavy wet snow

IMPORTANT: Very wet, heavy snow can weigh as much as 24 lb/ft^3. *This type of snow will require you to initiate your snow removal process sooner.*

Preparation for Snowfall:

- Preparation for snowfalls should begin six to ten weeks before the start of winter.
- The roof's framework should be checked for damage or weakness and its capacity for snow loading should be reassessed.
- All shovels, snowblowers (if used), and other removal equipment should be examined and put into good working order.
- Never use any equipment that can damage a roof such as an ice chopper.
- Inspect all drains for debris (i.e., leaves, dirt, silt) and clean them. The downspouts should also be clear, especially at the outlets.

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Snow Removal Safety Guidelines:

- Provide safe access to the roof
- Plan safe means for lifting snow removal equipment onto the roof
- Clearly mark roof edges and provide fall protection where there is a risk of falls
- Ensure that employees wear proper clothing for cold weather, including proper footwear
- Never allow employees to work alone. Institute a buddy system to ensure everyone gets off the roof safely
- Care should be taken not to damage a roof during the snow removal process. Avoid removal within two inches of the roof membrane.

Types of construction and building features that are more susceptible to collapse:

- Structures with large spans such as auditoriums, gymnasiums and garages
- Unheated or intermittently heated structures
- Slightly sloped or flat roofs
- Roofs without drainage, poor drainage or poorly maintained drainage systems
- Structures that have previously collapsed
- Roofs that tend to collect drifting snow

Here are some additional things to look for to determine if your roof is at increased risk for collapse:

- Roof leaked during the winter or started to leak last spring
- Ripples or bends in metal supports, or cracks in wooden members
- "Popping" noises have been heard (this may indicate rivets have broken)
- Pooling of water on the roof where it has never accumulated before
- Obvious deformations in the roof

Plan to have staff perform regular, periodic inspections of all roofs as well as roof supports during and after heavy snowfall.

Remember, your employees' safety is paramount. Never allow anyone to enter a building or go up on a roof that you suspect may be unsafe.

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For a list of structural engineers in the State of New Hampshire who can assist you in determining your roof's live load capacity, see the **Membership Directory of the Structural Engineers of NH** at **www.SENH.org**.

Structural Engineers of New Hampshire (SENH) is a not for profit organization of structural engineers practicing in the State of NH. You can also find information about local structural engineers from the NH Board of Professional Engineers at 603-271-0607.

For more information, please contact your Primex³ Risk Management Consultant at 800-698-2364 or email *RiskManagement@nhprimex.org*.