Technical Guidance Document

Roof Snow Loads

Unbalanced roof snow loads occur when snow accumulates unevenly or drifts against roof obstructions, creating greater structural stress than a uniform load. The weight of snow and ice can also increase due to rain saturation, pooling in low areas, or ice dams, leading to water infiltration. Compressed surface areas may indicate insulation damage, allowing heat loss and further moisture issues. This Technical Guidance Document outlines best practices for monitoring snow loads, preventing structural damage, and managing drainage to reduce loss.

Prior to Snowfall Event

Prepare workers to inspect and maintain the roof - determine if the work requires fall protection training and use of fall protection equipment.

Establish a baseline condition of the roof and building structure - to be able to monitor changes.

- Determine design snow load. Note, the weight of ground snow is not the same as the roof snow load. If the construction drawings do not clearly identify the design snow load or the information is not available, contact a licensed Professional Engineer. Note that even minor renovations to an existing structure can reduce the carrying capacity when, for example, bracing is removed to add new ducts. Also, the addition of a new structure adjacent to existing structures can create new drift conditions.
- Building code provisions for design snow loads incorporate light rain on snow, but not heavy rainfall. (FEMA)

Mark the following on a layout on a roof:

- Access doors, all drains, penetrations, exhausts and intake vents and pipes, HVAC equipment, flashing, etc.
- Areas where snow tends to accumulate or where previous damage has occurred
- Columns, parapets, and primary structural members where drifts can form to to develop a snow removal sequence to maintain a balance snow load on the roof

Inspect the roof:

- Check the membrane for cracks, bubbles, compressed areas, splits in seams, or other conditions that could be exacerbated during a freeze-thaw cycle and potentially allow water penetration.
- Check the flashing for condition (e.g., rusty, missing) and level of seal (e.g., loose, not attached, bent) in areas where the roof plane meets vertical surfaces (e.g., around chimneys, valleys, vents, skylights, walls, roof edge eaves and rakes).
- Check seals and joints around all penetrations for cracking or damage.

Service any heat tracing equipment:

- Inspect and maintain equipment.
- Provide all heat tracing with indicator lights or other means to facilitate the daily inspection during freezing periods.

After a Snowfall Event

Inspect roofs to identify areas with uneven loads and extra weight:

- Check for compressed areas with pooling water and ice indicating that the insulation has been compromised.
- Check for ice dams and blocked drains, gutters, scuppers, and downspouts.
- Inspect drains, gutters, downspouts, and scuppers for damage and blockage.
- Identify locations of snow drifts and ice dams.
- Inspect heat tracing equipment.

Conduct internal inspections:

- Check for signs of roof weakness and damage inside the building, such as ceiling settling, leaks, or broken structural elements.

Contact professional assistance - when:

- The roof or structural integrity is in doubt. Determine if you need to evacuate the area until a structural engineer can assess the situation. See the Warning Signs of an Overstressed Building Structure During a Snow Event for signs to look for.
- The building's snow load has been exceeded.

Remove snow (It requires less effort to remove snow immediately, before it has had a chance to melt, condense, and freeze.)

- Factors to consider when snow removal should begin, include:
  - The pre-snow condition of the building structure and a documented consent of snow-induced structural failure
  - Snow from a previous snow event that is still on the roof. Snow exposed to sunlight and/or fluctuating temperatures can soften, become denser, and then harden when the temperature drops below freezing. Melt water may pool and subsequently freeze, creating a concentrated area of loading on the roof. Rain on snow increases the density and weight of the snow. Wind can also affect the amount of snow retained on a roof and its distribution on a roof.

    Consider that when snow accumulation is minor, the risk of damaging the roof during removal outweighs the benefits of removal.
  - The rate of snowfall

Know when to remove snow:

- When the existing snow load is close to the capacity of the roof structure
- When the existing snow load is somewhat close to capacity and additional forecasted snow could come close or exceed the capacity

Know how to remove snow safely:

- Consider hiring professional snow removal services for:
  - larger roofs or those with safety risks
  - when you do not have an adequate number of trained staff and types of equipment
- Position someone below the roof to keep people, vehicles, and equipment away from locations where falling snow and ice could cause injuries and damage.
- Using equipment
  - Use non-abrasive plastic shovels or brooms rather than metal shovels.
  - Keep a safe distance away from the eaves to remain outside of the sliding range if using a non-metallic snow rake as snow can slide at any moment.
- Focus on removing drifted snow at high-risk areas which can:
  - Accumulate snow unevenly (e.g., skylights, chimneys, HVAC units, equipment)
  - Block air intakes and exhausts (e.g., plumbing, chimney, HVAC)
- Once drifts are removed, start removing snow from the center of the roof to the edges of the roof.
  - Ensure the snow load stays balanced by removing it in layers to avoid sudden shifts in weight.
  - Leave at least 2 inches of snow to prevent damaging roof membrane.
  - Ensure that snow, ice, and icicles are cleared from roof edges and overhangs to prevent them from falling, injuring people, and accumulating onto lower roofs, and creating unbalanced snow loads.

Manage drainage:

- Clear all roof drains to ensure drainage and reduce weight from pooling water.
- Check drains, scuppers, gutters, and downspouts weekly for blockages in winter months.
- Ensure water can freely flow off the roof without accumulating at low points.
- Ensure snowmelt runoff is directed away from building foundations to prevent water infiltration, damage and ice buildup at the base of the structure.