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Roof Snow Load Concerns

A significant amount of snow has fallen this winter and it appears as though this may be a record breaking year. Roof snow loads can be substantial and they can put a real strain on a building, causing a partial or even a full roof collapse. To avoid potential roof collapse due to snow loading, building owners and property managers need to be aware of a few key elements.

From a design standpoint, snow loading on roofs is based upon the regional ground snow load, exposure factor of the building, geometry of the roof, slope of the roof, roof covering type, and whether the building is heated, insulated, or occupied. Buildings constructed prior to 1978 are particularly vulnerable, as the roof snow load design requirements of the MA State Building Code were less stringent. Very little consideration was given to surcharge loading (from rain & snow), sliding snow (from upper roofs onto lower roofs), and drifting snow (which occurs at low roof to high roof intersections, parapet walls, and around large rooftop units or penetrations).

Consider that a flat roof of a heated, occupied building in the Boston area has a design flat roof snow load of 31.5 pounds per square foot (psf). Meteorologists and Scientists agree that the average density of fresh fallen snow in the greater Boston area is approximately 6 lbs/ft^3, however, the average density of winter snowpack can increase to 13 lbs/ft^3 - 18 lbs/ft^3 over time. Add to this the weight of water, if it should rain, and the density of the snowpack could increase to as much as 30 lbs/ft^3, if not allowed to drain properly. So, to put this into perspective, at 30 lbs/ft^3, the design snow load of 31.5 psf could be reached when you have only 1 foot of wet snow. You can see how a roof, under certain conditions, could easily become overloaded.

What to do? In an effort to reduce the risk of a roof collapse due to snow loading, building owners and property managers should ask the following questions:

- **How was my building originally designed, and have any changes been made?** The focus is to determine the design roof live load, design snow load, and if drifting conditions were taken into account (this information is typically found on the structural drawings). Design roof drainage capacity should also be reviewed (this information is typically found on the roof drawings or on the plumbing drawings). If the building has been renovated then review of the renovation design documents should be conducted. Look for conditions that may impose additional loading (ponding water on the roof surface as a result of a rooftop unit or structure that blocks the flow of water to the roof drains or gutters), or that may cause drifting snow to occur (new above roofline structures or new rooftop unit screen walls).

- **Can I see any conditions that may indicate problems, or structural distress?** From the interior conduct visual inspections on a monitoring basis, looking for deflected or cracked roof decking, framing, and ceiling components (more than likely this will happen first at any drifting areas). Canopies and overhangs are especially susceptible to excessive snow loading. Any evidence of displaced ceiling grids, ceiling tiles, lighting, ductwork, and plumbing/sprinkler components may indicate deflection of the roof structure due to snow loading. Roof leaks may also be caused by excessive snow loads, as the roof covering may become breached due to the deflection movement. If the visual inspection yields any deflections or roof leaks, snow removal operations should commence as soon as possible (to be implemented by a professional roofing contractor). A structural engineer and a roofing design professional should be consulted

immediately to determine whether the building is safe to occupy and to determine the integrity of the roofing system. Analysis of any observed cracked beams, deflected framing members, and damaged or deflected roof decking should also be conducted.

- **Is my roof draining properly?** From the exterior, on the rooftop, inspect the roof drains, gutters, scuppers and downspouts to ensure they are free of blockage to allow for positive drainage. If leader pipes or downspouts are frozen, snake clear to ensure a free flowing drainage system. Heat cables may be an option to warm/unfreeze the pipes and downspouts. Consult a roofing design professional if ponding water is evident or if the drains appear to be undersized or not functional due to being located incorrectly. Ponding water on the rooftop can have a detrimental effect on the roofing membrane. Structural implications, known as ponding instability, can occur when deep or large areas of ponding water exist on the rooftop.

- **How can I safely remove snow from my roof?** Snow removal from the rooftop needs to be well though out. First determine if it is structurally safe to have people on the roof. Worker safety also needs to be considered; the roof surface will be slippery and the snow may be deep. Snow removal should be done by a professional roofing contractor that utilizes appropriate fall protection equipment. A professional roofing contractor will take the necessary precautions so as not to damage the roof membrane during snow removal operations. If breaches exist in the roof membrane, the roofing contractor can implement the necessary repairs. Never use open flames (torch) on the roof to melt snow/ice as this may create a fire hazard. Never use de-icing chemicals on the roof as these harsh chemicals may damage the roof membrane and/or roof drainage system

Russo Barr Associates, Inc. has qualified engineering professionals that are available to assist building owners and property managers in evaluating the effects of roof snow loading. If you have questions or would like more information, please contact James M. Russo at 781-273-1537 x21 or jrusso@russobarr.com