

Snow Loads on Roofs

By William Marcum, RRC

Property owners in snowbelt regions routinely prepare for clearing sidewalks, driveways, parking lots and other essential operation areas during and after snow storms. One or two times a season, a particular snow storm may dump more snow than anticipated, giving school children and the workforce at large an unscheduled day off while work crews diligently work to clear away the snow. For the northeastern part of the country—particularly New York, Pennsylvania, Maryland and part of Virginia—the winter season of 1995-1996 brought record snow storms, both in number of storms and depth of snow accumulations. For school children, it was a joy to get several days of unscheduled vacation. But for many building owners and facility managers, it became a nightmare as record snow accumulations caused partial or complete roof collapses, most notably in southeastern Pennsylvania.

Many owners were able to muster emergency crews to remove snow from rooftops, thus alleviating the threat of collapse. But for others, the combined team of Mother Nature and Old Man Winter was too much, and collapses occurred.

The frequency and intensity of snow storms in Pennsylvania prompted Lt. Gov. Mark S. Schweiker, chairman of the Pennsylvania Emergency Management Council, to publish a warning in Pennsylvania about the potential threat of roof collapse.

An assessment of more than 60 major roof collapses in Pennsylvania attributable to snow conditions revealed



Often, the best way to remove snow is the old-fashioned way—manual labor. Here, Mike DeFrancesco, RRC, Director of Region I, demonstrates the glamour of roof consulting.



Note drainage channeling from the high to the low roof to allow water melt to roll into gutter edge along front.

the following:

- Roof assembly design sub-standard to code.
- Roof construction not built to code standards.
- Snow, ice, and ponding water accumulations far exceeding expected/recorded levels caused collapses of properly designed and constructed facilities.

The dominant cause, however, was attributed to excessive snow/ice accumulation levels. Some insurance companies of fortunate property owners sent out roof overloading prevention and emergency action plan advisories on snow management which owners were able to implement, thus saving their respective roofs from collapse. Many others, however, were not so advised or were unable to implement an emergency action plan to manage the snow, and the result was painful and expensive, ranging from twisted steel framing and partial collapse, to whole roof structure sag and collapse.

Many owners responding to snow load concerns got whomever they could to get up on the roof and do whatever they could with whatever was available to remove the snow from the roof. While this approach did save some roofs from collapse, it subjected workers to extreme danger as they were, in most cases, unprepared,



Under three feet of snow, an unmapped gas line (in foreground) can be buried and dangerous.



Piling snow alongside a building can cause wall damage.

untrained, and working on an extremely dangerous work platform subject to slip and fall. Following are some of the typical rooftop-related conditions which necessitate the need for a snow removal plan. (Most of these will be buried under a blanket of snow).

- Gas supply lines to rooftop units.
- Electrical feed lines to rooftop units.
- Vent pipes.
- Expansion joints/control joints.
- Small rooftop units.
- Skylights.
- Roof drain positions.
- Monitor/sensor equipment.
- Roof membrane type and assembly.

The typical method to remove snow from a roof is to use a snow blower. The potential for disaster, should someone begin to operate a snow blower without knowing what is on the roof and where it is, can be imagined. The next thing to consider regarding the use of a snow blower is to bear in mind that, on average, the blower will blow snow approximately 20-30 feet and a typical commercial rooftop may be several hundred feet wide. Where will the snow go? A short distance, thus placing more weight on the adjacent roof area.



A snow blower will blow snow approximately 20-30 feet. A typical commercial rooftop may be several hundred feet wide. Most of the snow only adds to the load on an adjacent section of the roof.

The next consideration is what to do with the snow on the roof. The obvious solution is to blow it or dump it over the roof edge to the ground. This action, however, can subject wall assemblies to severe leakage if too much snow piles up against the wall.

The major lesson learned this past winter season was that most owners were not prepared for severe snow storm conditions. Workers responded to panic calls from owners and used whatever tools and methods they could devise to remove snow from roofs, often damaging rooftop equipment, roof surfaces and roof assemblies in the process—some so seriously that total roof replacement was then necessary.

Building owners need to implement a snow management plan to reduce snow load and minimize damage sustained to a roof assembly during snow removal. This plan needs to address:

- Rooftop conditions (mapping of roof protrusions, etc.).
- When to take action.
- What type of tools and equipment to use.
- How to move snow across the roof surface.
- Handling snow as it is transferred to the ground.
- Worker safety and training.
- Roof drainage and channeling.



About The Author

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