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Control of Snow Drifting about Buildings

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Please note

The effect of snow drifting about buildings ranges from a slight nuisance to a situation where it is impossible to keep access open. Deep snow deposits also take longer to melt in the spring, and may leave a wet and muddy ground condition for extended periods. It is usually possible, however, to orient buildings in relation to direction and other buildings and to topographic features so that drifting can be reduced.

Drifts are formed from falling snow carried in suspension by wind or from snow eroded from the ground surface, both effects occurring at wind velocities in excess of about 8 mph. The amount of snow carried by the wind is thus dependent on snowfall, on wind velocity, and on the sweep of snowcover upwind. Snow will be deposited when wind velocity is reduced or the wind direction is changed substantially. Erosion occurs when the velocity over the surface is increased or turbulence creates a scouring action of the snow surface. The deposition and erosion that create specific patterns are determined by these factors and by the slope and orientation of any obstruction in relation to the wind direction.

Snow drifting can thus be influenced by the shape and orientation of a building and by the use of snow fences and other devices to change the velocity and direction of airflow in the vicinity of the building. Consideration must be given, therefore, to the location of fences or other flow modifying features in relation to the building in order to provide for sufficient area for collection or removal of snow. Natural or artificial topography in the vicinity must also be recognized.

Drift Pattern about Buildings

Snow is deposited, often to considerable depth, on the lee side of isolated buildings, with a smaller amount on the windward side (Figure 1). A characteristic scoop or clear area is usually eroded in front of the building and at the sides. In time, the drifts tend to enclose it in a streamlined deposit and no further addition will take place as long as the wind direction does not change and the general snow surface is no higher than the walls of the building.

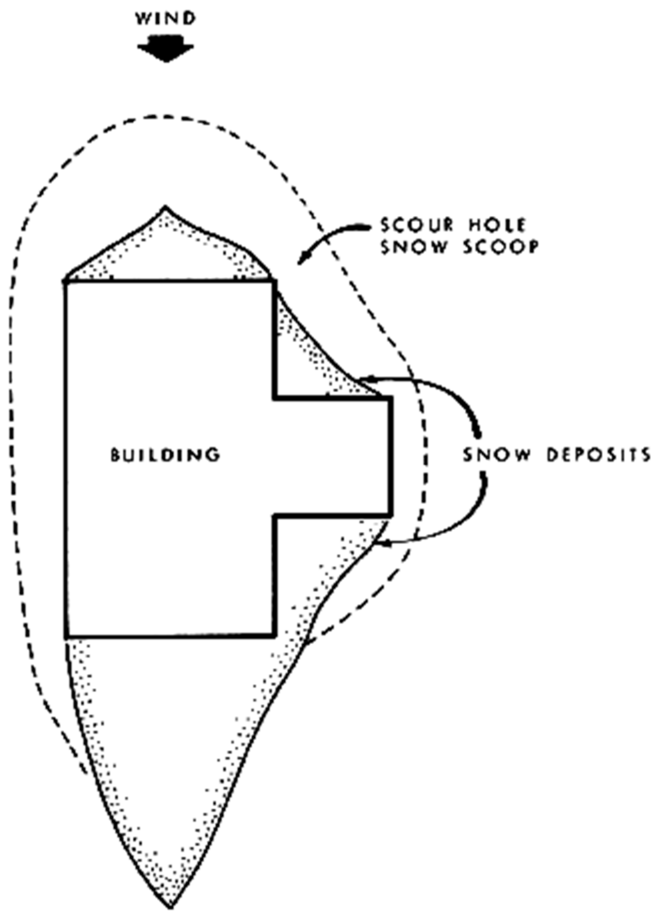

Figure 1. Typical pattern around isolated building.

Protection against Snow Drifting

The most important task in planning protection against snow drifting is to predict the direction of drift producing winds. When no reliable weather records are available, the direction of the wind can only be determined by observations taken at the site for at least one winter. Protective measures are usually designed for the prevailing wind, but wind from other directions must be kept in mind. Modifications to the terrain such as road cuts and fills, tree cutting and the construction of large buildings may also influence the direction and speed of wind. Such changes should therefore be considered carefully for the measures that are adopted should not produce adverse effects when the wind blows from another direction.

Location

Snow drifts are usually minimum at the top of exposed hills. When possible, buildings, access roads and parking areas should be located on such high points, for an elevation of even 4 to 6 feet above the surrounding terrain can reduce problems from snow. The lee side of hills, depressions or cuts are places where snow tends to accumulate and should be avoided.

Drifts form in front of and behind such features as hedges, groups of trees, fences, deposits from excavations and rubbish piles. These obstacles should not be located near roads, parking areas, building access or any location where formation of drifts would be a nuisance. Snow plowing also must be planned in such a way that no high snow deposits are formed to cause undesirable drifting.

Buildings should be located outside the area of drift formation when obstacles cannot be eliminated. Snow drifts behind obstructions such as road embankments have a length of six to nine times the height of the obstruction. Thus buildings should be located downwind of such obstacles a distance at least ten times their height.

Influence of Building Shape

Placing the long side of a building in the direction of the prevailing wind generally minimizes drifting problems. The drift formed behind the short side may be longer but it is usually less bothersome than one behind the long side. A simple, rectangular floor plan without internal corners and projections is best for minimizing undesirable accumulations. Large enclosed or semi-enclosed yards are traps for snow and should be avoided. It is difficult to operate mechanical equipment in such confined areas to remove deposited snow.

An extreme but effective measure to prevent drifting round a building is to elevate the building on stilts higher than the snow surface. Wind will keep the area underneath and around it clear of snow if no obstructions are present. This is an expensive measure, however, usually justified only in Arctic conditions where snow allowed to accumulate may not melt completely during the short summer.

Groups of Buildings

Where several buildings are close together, individual drifts usually join in one large deposit. Basically, the buildings should be placed close together in rows, their long direction parallel to the wind and the short ends close together. The most suitable location for roads is usually in the direction of the wind between the rows. Although terrain often restricts the layout of roads and building sites, this rule should be adhered to as closely as possible. In complex situations where irregular shapes are involved and there are obstacles such as hills or groups of trees the optimum arrangement may be determined by model tests in a wind tunnel or a water flume.

Collector Fences

It is the function of a collector fence to cause wind-blown snow to settle before it reaches a site that requires protection. The fence must be arranged perpendicular to the direction of the prevailing wind so that snow is deposited in front of and behind it. (Figure 2).

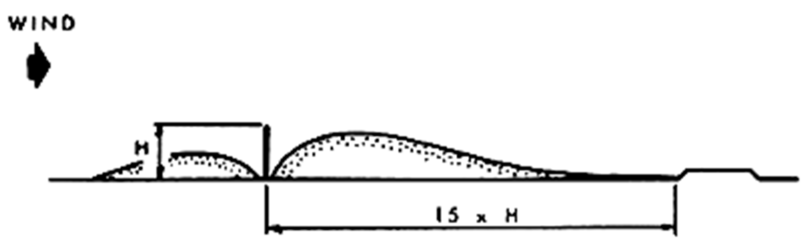

Figure 2. Collector fence.

Economics and availability determine the type and arrangement of materials used for fences. The smaller the ratio between solid area and total fence area, the longer and shallower the drift. Open fences with a density ratio between 40 and 60 per cent have maximum collecting capacity and this ratio should be adhered to whenever possible. A fence height between 4 and 6 feet is usually sufficient. At locations with heavy snow drifting, two parallel rows of low fences are usually more economical than one high fence. There should be a gap of about 6 inches near the ground. Tests in the field and in wind tunnels have demonstrated that it is not important whether the slats are arranged in vertical or horizontal direction, slightly inclined, or made of wood, metal, or other materials. Open fences should be placed at a distance about fifteen times the fence height from the object to be protected.

Solid fences or walls produce a shorter deposit behind but a larger one in front and for this reason are most suitable when space is limited. The length of the deposit behind a solid fence is about ten times the height of the fence, and this distance should be maintained between the fence and a building or a road. The major disadvantages of solid fences are the high cost of materials and the need for a strong foundation. When a solid fence is longer than the building to be protected and closer than five times its height, a strong eddy occurs between the fence and the building with the result that this space is usually kept snow-free. It could easily be filled, however, if the wind direction were at an angle to the fence rather than perpendicular to it.

Blower Fences

Blower fences (Figure 3), also called jet roofs, are like inclined table tops mounted on posts. The wind passing underneath is accelerated so that it erodes the snow behind the fence to a distance of 20 feet. Blowers are best used for preventing local snow accumulations behind ridges or in depressions. The incline of the roof should be about that of the slope on the lee side, but not less than 30 degrees.

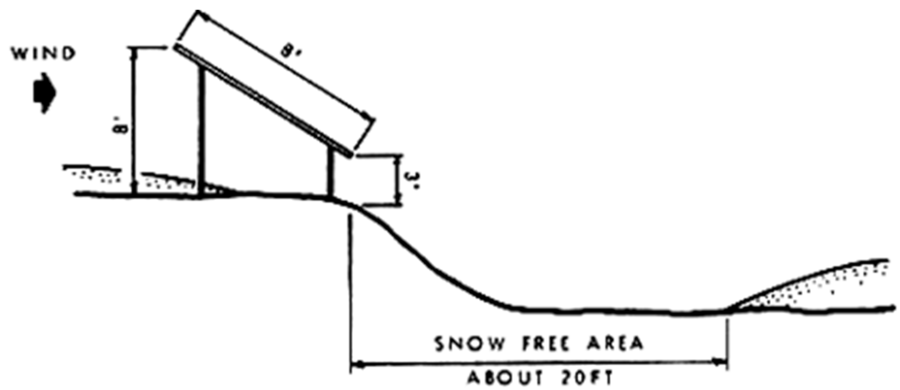

Figure 3. Blower fence.

Deflector Fences

Deflector fences (Figure 4) are vertical baffles or walls 8 to 10 feet high that deflect the wind in a horizontal direction to produce acceleration and local erosion of the snow. They can be used effectively near buildings to keep entrances free of snow. The principal objection to them is from the point of view of aesthetics. Their use and position must be given careful consideration because for some wind directions they can act as solid collector fences.

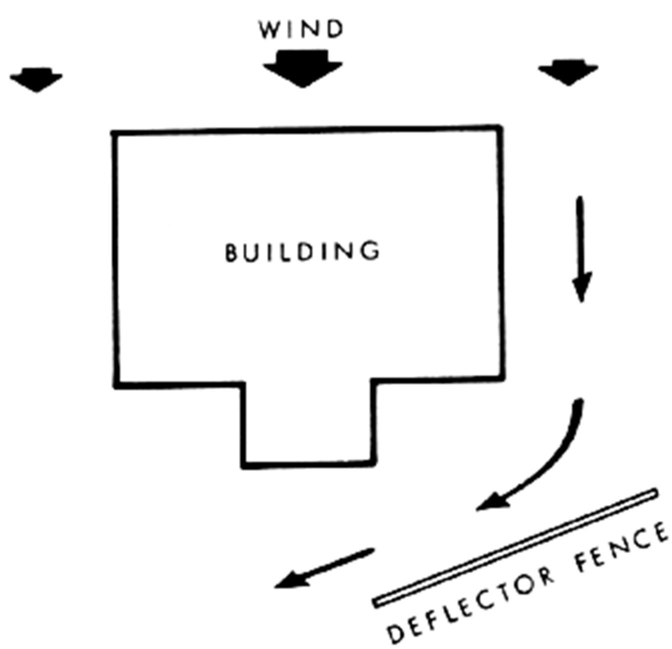

Figure 4. Deflector fence to keep front of building free of snow

Hedges

Hedges are essentially live collector fences and need little maintenance. The disadvantage is that they require several years to grow and once planted are not easily moved to correct for a wrong location. For this reason the optimum arrangement should be determined by movable fences before the trees are planted. Hedges need not be higher than 8 feet and the rules for the location of collector fences are applicable. The trees and shrubs need not be planted in long parallel rows; clumps work just as well if the space is available.

The variety of trees that should be selected will be governed primarily by the local climate and soil. The trees should retain a high density of foliage during the winter and have branches that cover the full height from the ground. Evergreens usually have a high density, but deciduous species with small branches may also be used. By the end of the winter the hedges may be covered with deep snow so that individual trees and shrubs must be able to carry the heavy load.

Earth and Snow Dams

Embankments and piles of plowed snow can cause undesirable snow drifts when they are too close to buildings or roads. They can, however, be used to advantage if properly located. If snow removal equipment and space are available, wind-rows of snow about 4 feet high may be plowed about 50 feet to windward of the object to be protected. Naturally, the snow piles can only be built after a certain amount of snow has fallen, and they have to be rebuilt when they become covered with drifting snow.

Summary

Snow drifting is a phenomenon that cannot be avoided in the open areas of most regions of Canada, but troublesome drifts round buildings can be minimized by proper location and shape of building and by suitable landscaping. Special protective measures include fences that collect snow in predetermined places or assist in blowing it away. Careful consideration must be given to the direction of the snow-bearing wind when action is planned to prevent the formation of drifts.

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