CRCA CANADIAN ROOFING CONTRACTORS ASSOCIATION

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Roof Vents

When faced with a wet roof, it has been a common practice in recent years to install breather vents in an attempt to remove the moisture from the insulation. Some roofers and consultants claim great success in drying out roofs with this approach, while some owners insist that breathers only made a bad situation worse.

If vents are used, how is moisture removed from the roof? There are three mechanisms that may be involved in such drying out: air flow through the insulation; diffusion; and pumping action (or breathing).

For air flow to take place, the air must come in at some vents and out through others, which requires a difference of pressure between the vents. Wind can cause such difference of pressure, or a stack effect can be created if some vents are higher than others. On most flat roofs, there will be no stack effect since the vent openings will all be at approximately the same level and generally only small pressure differences from wind. Air flow will also be affected by the resistance to lateral flow through the insulation and the joints or intentional passages provided.

Diffusion is the movement of water vapour through the insulation and to the outside under a vapour pressure difference. Resistance to diffusion through the insulation and even through the column of air in the vent tube will be very high due to the long paths involved, so this effect is likely to be small although generally outward.

Heating and cooling of the roof and changes in air pressure which expand and contract the air in the insulation will cause exhalation and inhalation, which may be described as breathing or pumping. Under favourable conditions, this is the mechanism that is most likely to move moisture out of the insulation. There is a fear by some that it can also deposit water in the insulation. This is very unlikely since even when outside air is at 100% outside moisture content, it will tend to be warmed as it is drawn in, and the relative humidity will drop so condensation is unlike to take place.

The Division of Building Research of NRC have been doing some small scale testing in relation to this. They made up some small panels of various wetted insulations, completely sealed except for a single vent, and then placed them on the test building to form a roof. This allows for diffusion and breathing only. The loss of moisture from these panels has varied considerably between panels, but in all cases, steady slow drying has taken place over a three or four year period. These small panels do not accurately simulate the roof situation with a large expanse of roof and a number of vents, but do indicate that vents may sometimes be useful. Two field problems were encountered in the test installation that could also be a problem with vents in an actual roof. A considerable amount of difficulty was experienced in securing a good seal between the vent and the panel to prevent water leakage. Also, drifting of snow into the panel through the vent was found to occur until special covers were added.

The significant point of the above explanation and the NRC tests is that drying by venting is possible, but likely to be a slow process. For a new roof that has a vapour barrier and a membrane to form a sealed

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sandwich type of roof, it is logical to use stack venting, combined with perimeter venting to take care of small quantities of construction moisture that may be trapped or small quantities that may get in through the vapour barrier. Intentional venting passages through the insulation are necessary to obtain the full benefit of the venting system. For old roofs where the insulation is wet, it is unlikely that they will be successful in drying out the insulation if the source of wetting is due to leaks around the flashings or through the roofing membrane. If the source of wetting is eliminated in some instances, it may be possible to dry out the roof over a number of years, and may well be a logical course of action instead of replacing the roof. It may be the only course of action on some process type buildings where the owner does not wish the roof opened for replacement.

It should be recognized that the projecting vents are vulnerable to damage. Every projection through a roof is a course of leakage if flashing is improperly done or opens up due to building or flashing movement or is damaged by people using the roof. This is particularly the case when vents are installed in older existing roofs where it may sometimes be difficult to make a seal around such penetrations. Most roofers will be aware of the difficulties due to dirt, deteriorated bitumen and moisture, and will take the necessary steps to assure proper adhesion of flashing materials, but it does present a real hazard.

The size and spacing of the vents are probably not of too much consequence and the usual recommendations of the industry appear reasonable. Small stack vents of 2" diameter pipe are spaced about one every 1000 square feet. Larger box type vents spaced further apart are unlikely to be any more effective than the smaller vents, but may be more logical for some types of constructions such as lightweight aggregate concretes for which they are usually recommended. Lateral moisture transfer is likely to be the most important mechanism in relation to the success of the venting.

If there is no vapour barrier, the installation of breathers through the roofing membrane could create air leakage paths from inside the building directly to the outside through the vents. In such cases, large quantities of water might be deposited in the insulation to increase the wetting as moist inside air moves outward. Generally, when there is no vapour barrier, vents should not be used unless it can be definitely established that no air leakage paths will be created.

In summary, while vents may be of help in removing moisture from double membrane roofs, they are not a panacea, and must be used with considerable discretion and understanding.

Consult your CRCA member roofing contractor for guidance.