

Slating & Tiling

TIPS 28

Roof ventilation for a cold loft space

In the pitched roofing industry we all know that British Standard 5250, the *Code of Practice for the Control of Condensation in Buildings*, and the Building Regulations Approved Document F2, have for many years recommended that the way to control the build up of condensation in roofs is through the use of ventilation. While systems that avoid the use of ventilation have been marketed by some companies, ventilation is still the most popular system for complying with Building Regulation F2.

How it works

The basic requirements for ventilating a traditional cold loft space are that air should enter the loft at the lowest point on one side of the roof and exit on the opposite side of the roof. Water vapour rises up through quilt or fibrous insulation, and meets the air in the loft, where some of the moisture is absorbed – the quantity depends on the air temperature.

Warm air can absorb more water vapour than cold air. If the air layer directly above the insulation is constantly changing it stands a good chance of absorbing most or all of the water vapour and take it outside.

The warmer the air in the rooms below the insulation the higher the amount of moisture that can be absorbed. The cooler the loft the less moisture that can be held before condensation forms. Consequently if air leakage into the loft is full of moisture then the risk of condensation forming in the loft increases. This can be reduced if a vapour check layer is introduced below the insulation such as foil backed plasterboard, or a layer of polythene, along with sealed holes and openings.

Over time it is almost impossible to keep out all water vapour from the loft. The most vulnerable period for condensation forming in a cold loft is immediately after occupation of a new building when the plaster walls and ceilings are drying out. Excess water vapour finds its way into the cold loft. During cold

weather the risk of condensation forming is greater.

Extreme conditions

Air flow through the loft can discourage condensation.

Most days we have a slight breeze causing a small positive wind pressure on one side of a roof and a small negative pressure on the opposite side. This pressure difference can drive a flow of air through the loft provided there are suitable air gaps on each side of the roof linked to the loft space. But if there is no wind, then there will be no positive or negative pressure to drive the air through the loft.

Therefore, air that leaks through the insulation will be warmer than the air in the loft and will try and rise to the top of the roof. It will become trapped under the ridge and start to cool, where it will form condensation on cold surfaces. If there was a vent at the ridge, the air would be carried outside and cease to be a problem.

Air should never be allowed to enter at a ridge, only leave. It is for this reason that most roof tile manufacturers will recommend eaves to ridge ventilation as it will cope with both the wind and no wind situations. (Eaves to eaves ventilation is designed to work with a slight breeze.)

There are occasions when all buildings will experience hurricane force winds. Wind pressure will be such that the air will pass through the loft very quickly and over-ventilate the loft. The faster the air passes over the quilt, or fibre insulation, the less efficient the insulation is.

Quilt insulation works by trapping air between the fibres, which forms the insulating layer. If the air passing over the quilt can wash through the fibres then a percentage of the air in the insulation will be washed out and not be as efficient. It is possible to encapsulate the insulation or cover it with a layer of material such as a vapour permeable underlay (VPU) which keeps the air in the insulation and separates it from the colder ventilation air. Alternatively if a building is in a



~ One vent tile in a roof slope is not adequate ventilation to comply with either British Standards or Building Regulations. This roof had no low level ventilation, and a vent tile too low to be effective as a high level vent – it should have been installed in the second course below the ridge tiles.

very windy location it may be more appropriate to reduce the cross sectional area of the ventilation grills to reduce the airflow through the loft.

Recommendations

The size of the grills through which air enters and leaves a roof is prescribed as a continuous 10mm gap at eaves or low level, with a continuous 5mm gap at ridge or high level.

These figures are a compromise. On calm days they are too small, on very windy days they are too large. Temperature and moisture levels constantly change, making a precise level of ventilation almost impossible to achieve. Although over time more water vapour should leave the loft than enters it from below.

There is an argument that states that if you do not have any underlay, or boarding under the tiles, and there has been no history of condensation problems, there is no need to introduce ventilation. The present roof ventilation requirements relate to roofs covered with BS 747 type 1F or 5U bitumen underlay. Therefore, if a VPU is used the amount of ventilation should be less than for a bitumen underlay and more than for no underlay. There is no test data to determine the correct level of ventilation. Therefore, the levels of low and high level ventilation should remain unchanged for VPUs.

Things to avoid

There are some practices that should be avoided:

- ~ Having ventilation tiles halfway up the roof slope. This practice can allow condensation to form below the level of the vents and in calm conditions still traps air up close to the ridge
- ~ Having a few very large vent tiles or grills rather than a continuous slot or grill. The larger

the vent or grill, the greater the distance between the vents or grills resulting in a massive localised air flow close to the vent and little or no air flow as you move away from the vents

- Placing large vents on one side of the roof directly in line with vents on the opposite side. This can create a wind tunnel across the roof between the large vents and no air movement as little as 600mm away
- Installing more high level ventilation than there is low level ventilation. It is important to ensure that air enters at low level and exits at high level and not the other way around. If there is more ventilation at high level, air will enter the loft at high level and drag, or suck in fog, mist or rain

The worst combination is four large vent tiles positioned at mid span on each face of a pyramid roof in an exposed location.

Conclusion

- Always install low level roof space ventilation into a pitched roof
- Always try and install a continuous grill or strip ventilator rather than large individual grills or vents, as they provide a more even flow of air through the loft
- Where possible install high level ventilation to reduce condensation in calm conditions
- In very exposed locations use a VPU over the insulation to improve the quilt insulation's performance, or reduce the ventilation area to prevent over-ventilation of the loft.

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