INTRODUCTION

The National Construction Code (NCC) 2019 introduced new provisions to help minimize the impacts of condensation within houses and apartments.

The new provisions include provisions for the installation of pliable building membrane (sarking) to control ingress of moisture through the external wall, the discharge of exhaust fans and ventilation of the roof space.

These new provisions are the first step through the NCC in providing provisions to assist in the mitigation of condensation within Class 1, 2 and 4 buildings. Further measures are being considered for NCC 2025.

WHAT IS CONDENSATION?

Condensation can be attributed to changes in climatic conditions resulting in increase in humidity and seasonable temperatures. An increase in the build-up of condensation in the home can lead to mould growth that can have an effect to the health of the occupants in the building.

Many practitioners have raised concerns that with the increasing levels of energy efficiency provisions in buildings and the greater levels of insulation and buildings being built to be more air tight, the design and construction of buildings is resulting in increased levels of condensation in homes.

It is important to note that the new provisions are seeking to minimize the health impact through the management of condensation. It does not look at eradication of condensation as it acknowledges that dealing with condensation in buildings is a complex matter and is much about how the building is used as it is about how it is built.

This is reflected in the NCC Performance Requirement which states:

P2.4.7 Condensation and water vapour management

Risks associated with water vapour and condensation must be managed to minimise their impact on the health of occupants.

EFFECT OF CONDENSATION (MOISTURE) IN BUILDINGS

It has been documented that moisture in buildings can be associated with a range of adverse health and wellness issues including upper respiratory (nasal and throat) symptoms, coughs, wheezing and asthma symptoms in sensitised persons with asthma.

In addition to potentially causing health problems, moisture can damage building materials and components.

For example:

- Prolonged damp conditions can lead to the colonization of building materials and HVAC systems by moulds, bacteria, wood-decaying moulds and insect pests (e.g., termites and carpenter ants).
- Chemical reactions with building materials and components can cause, for example, structural fasteners, wiring, metal roofing and conditioning coils to corrode and flooring or roofing adhesives to fail.
- Water-soluble building materials (e.g., gypsum board) can return to solution.
- Wooden materials can warp, swell or rot.
- Brick or concrete can be damaged during freeze-thaw cycles and by sub-surface salt deposition.
- Paints and varnishes can be damaged.
- The insulating value (R-value) of thermal insulation can be reduced.

MAIN CAUSES OF CONDENSATION IN ROOF SPACES

There are three main causes of condensation in roof cavities;

1. Vapour passing into roof spaces through the ceiling or through exhaust fans which are not externally ducted. This is a particular problem in kitchens and bathrooms.
2. Thermal bridging:
   • between roofing and sarking materials
   • between sarking and ceiling insulation
   • between uninsulated and insulated areas of the ceiling
   • from metallic and vented ceiling lamps
3. Lack of ventilation to remove unwanted water vapour

**KEY WAYS TO MINIMISE CONDENSATION IN ROOF SPACES**

1. Extraction systems which duct moist air outside the building
2. Installing ventilation to remove water vapour from roof space
3. Moving sarking to underneath battens to minimise thermal bridging
4. Ventilating the sarking space
5. Considered and correctly detailed use of vapour permeable sarking

**VENTILATION OF ROOF SPACES (4)**

Considerable amendments have been made to the ventilation requirements in NCC 2019. Clause F6.4 (NCC Volume One) and 3.8.7.4 (NCC Volume Two) outline the minimum requirements of an adequately ventilated roof space. These amendments remove ambiguity around what constitutes an adequately ventilated roof space by providing detailed information regarding the amount of ventilation required and their locations.

Where an exhaust system covered by F6.3 or 3.8.7.3 discharges into a roof space, the roof space must be ventilated to outdoor air through evenly distributed openings. The total area of the openings required for ventilation will vary depending on the pitch of the roof and the ceiling area of the roof space being ventilated.

Roofs with a pitch greater than 22° requires a total unobstructed area of 1/300 of the respective ceiling area. This means that a large house with a ceiling area of 300 m2 would require 1 m2 of unobstructed ventilation, with 30% or 0.3 m2 to be located not more than 900 mm below the ridge or highest point of the roof space, measured vertically.

Similarly roofs with a pitch equal to or less than 22° requires a total unobstructed area of 1/150 of the respective ceiling area. This means that a small house with a ceiling area of 150 m2 would also require 1 m2 of unobstructed ventilation, with 30% or 0.3 m2 to be located not more than 900 mm below the ridge or highest point of the roof space, measured vertically.

**ROOF VENTILATION SYSTEMS**

There are a number of rooftop ventilations systems available that can be used to meet the requirements of the NCC.

These include:

- Turbine style ventilators – these are also known as “whirlybirds” and are a semi-mechanical vent comprising a cylindrical dome with fins that spin in the wind creating a vacuum, drawing out air from the roof cavity. Various brand names are readily available and also supplied by Lysaght.
- “Ridge Vent” systems – Ridge vents have been widely used throughout Europe for many years and comprise an integrated addition under the ridge vent that utilises natural upward air flow facilitated by air intake via soffit vents that draws air through the roof cavity out the (slightly) raised ridge. VENT-A-ROOF® is a leading example of this technology and is available from Lysaght.
- Roof fan systems – a wide variety of solar and mains powered ventilation fans systems are available.

**VENTILATION CALCULATIONS (SAMPLE)**

The following examples show how to calculate the ventilation requirements for both whirlybirds and VENT-A-ROOF under the new rules:

**CALCULATION EXAMPLE FOR A “TYPICAL” RESIDENTIAL BUILDING WITH BATHROOMS AND KITCHEN EXHAUST VANS VENTING INTO ROOF SPACE.**

House ceiling m2 = 250 m2

Roof pitch = 22.5 degrees

Therefore,

250 m2 ceiling area x requirement > 220 i.e.

1/300 (0.003) = 0.833 m2 of ventilated opening.

This may be split 30/70 between ridge and eave vents

Therefore,

0.833 m2 x 30% = 0.250 m2 Ridge vent

0.833 m2 x 70% = 0.583 m2 Ridge vents

**Ventilation capacities,**

- 1m of VENT-A-ROOF® (VAR) ridge provides 0.019008 m2 of unobstructed area for ventilation.
- Generally, a 300mm diameter whirlybird (WB) provides an unobstructed area for ventilation of 0.07 m2 ea
- A 400mm x 200mm eave vent (EV) will provide 0.08 m2 of unobstructed area for ventilation

Therefore,

**Whirlybird calculation**

- 0.250 m2 ridge ventilation requirement / 0.07 m2 WB capacity = 3.6 whirlybirds i.e. 4 whirlybirds
- 0.833 m2 eaves ventilation requirement / 0.08 m2 EV capacity = 10.4 i.e. 11 eave vents

**VENT-A-ROOF® CALCULATION – WITH EAVE VENTS**

- 0.250 m2 ridge / hip ventilation requirement / 0.019008 m2 VAR capacity = 13.15 meters of VENT-A-ROOF® ridge ventilation
- 0.833 m2 eaves ventilation requirement / 0.08 m2 EV capacity = 10.4 i.e. 11 eave vents

**VENT-A-ROOF® CALCULATION – NO EAVE VENTS**

- 0.833 m2 ridge / hip ventilation requirement / 0.019008 m2 VAR capacity = 43.82 meters of VENT-A-ROOF® ridge / hip ventilation
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References
1. HIA Information Sheet Ref: BCA 20-11 – Condensation management NCC 2019 changes explained
2. EPA 402-F-13053 : Moisture Control Guidance for Building Design, Construction and Maintenance
4. ACBC Handbook: Condensation in buildings

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