Building Information Bulletin
BUILDING RESEARCH ASSOCIATION OF NEW ZEALAND

245 (1985)

CI/SfB (13.1) (L2)+(L3)
UDC 692.52:699.828:697.92

Subfloor Ventilation

- Subfloor ventilation is essential to keep subfloor timber and floor decking dry.
- Indications that subfloor ventilation is inadequate include:
  - a musty smell
  - cupped floorboards
  - stains in particle board floors
  - blistering of vinyl sheets
- Check that vents are properly located and provide enough draught.
- Large buildings and those with party walls may require a moisture-proof cover on the subfloor soil.
- Do not allow path and drive levels or plants and landscaping to obstruct vents.

Many New Zealand buildings have timber strip or particle board flooring supported on timber joists and bearers. On flat sites the space between the underside of the bearer and the ground may be only 300 to 400mm. Such suspended floor systems sometimes suffer from distortion, cupping of strip flooring, and occasionally even decay and failure.

These problems are caused by moisture being taken-up by the timber and/or particle board. The major cause of this increase in moisture content is prolonged high moisture levels in the subfloor air and occasional or frequent condensation on cold subfloor supporting timbers or the cold underside of floor decking.

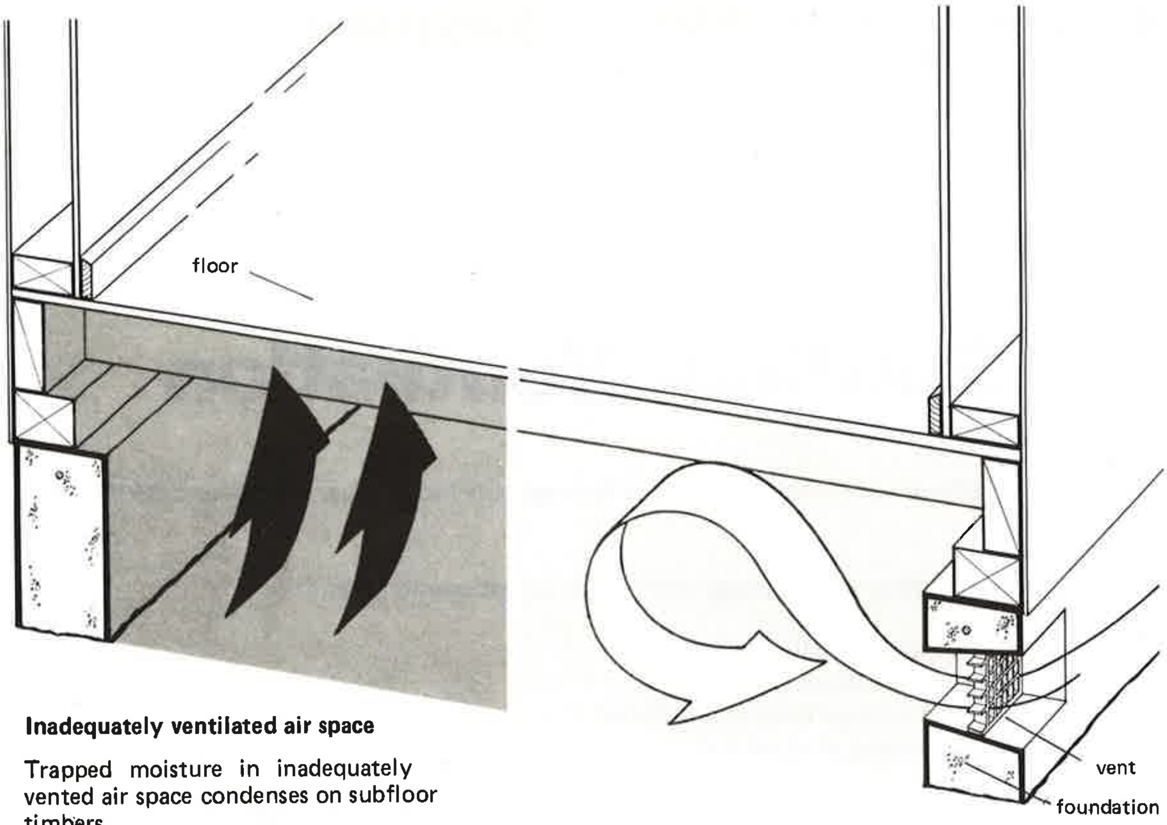
Good ventilation is the most effective way to remove moisture from the subfloor air space and keep the moisture content of the timber structure at safe levels.

MOISTURE SOURCES

The ground below the subfloor space is often warmer in winter than the air above it. Under these conditions water will evaporate from the ground. If the subfloor timber and underside of the floor decking are cold enough, this water vapour in the air can condense on their cold surfaces and be absorbed.

This condensation can often be observed in winter on bearers and floor joists on the cold south end of a building with poor subfloor ventilation. The ground may appear dry but water vapour will readily pass through most soils and water vapour can come from damper soil beneath the surface.

Measurements made of the rate of moisture release from various soil types at different locations around the country show that 0.4 litres of water can evaporate from a square metre of ground in 24 hours. In terms of a house with a $100m^2$ floor area this amounts to 40 litres in 24 hours. About 3% only of this moisture can be absorbed by subfloor timber without it becoming excessively wet. The rest has to be removed by subfloor ventilation if progressive damage is to be avoided. Preservative-treated timbers are not an alternative to good ventilation as the type and level of treatment is such that frequent and prolonged wetting can still result in decay.



Inadequately ventilated air space

Trapped moisture in inadequately vented air space condenses on subfloor timbers

Properly ventilated air space

Continuous circulation of air and removal of moisture in properly ventilated air space

Figure 1: Ventilate to prevent moisture damage

Other sources of subfloor moisture which may occur are leaking waterpipes and defective waste pipes. In some cases exhaust hoses from clothes driers have been found expelling large quantities of water vapour into the subfloor space, sometimes with spectacular and disastrous results. Overflowing of appliances such as tubs and washing machines can substantially add to subfloor dampness problems.

SIGNS OF DAMPNESS

One common indication that all is not well below a floor is a musty smell inside the building. Other signs of subfloor problems are: cupping of stripflooring; patchy brown-coloured stains on particle board floors with a clear finish; and blistering of sheet vinyl.

If one or more of these signs is present the subfloor space should be checked. Excessive dampness can often be detected without a moisture meter by the presence of mould on subfloor timber or particle board. In some cases white fungi may grow on subfloor soil. If the soil itself sticks to the hand when rubbed conditions are too damp. If these signs and checks indicate dampness, the subfloor ventilation will need increasing.

BYLAWS AND CODES

The Codes of Practice usually relevant require the equivalent of a 100 x 35mm clear ventilation opening for every 1 m^2 of floor area.

Common ways of providing subfloor ventilation are:

- Vents (grilles) through the concrete perimeter foundation wall or through base cladding. Vents should start 750mm from corners and be spaced no more than 1.8m apart. It is important to distribute ventilation openings around the perimeter so as to prevent pockets of dead air.
- Base boards fixed to the perimeter piles and framing with 20mm gaps between boards. This method usually meets the Code requirements with ease.
- Cantilevered floor joists and bearers providing a continuous gap into the top of the subfloor space.

POSITION OF VENTS

The commonly used ventilation grille in concrete perimeter foundation walls is approximately 250 x 150mm set in formed openings. The vents should be as close as practicable to the underside of the bearers and wall plates — bearing in mind that if a reinforcing rod is used in the top of the wall, the top of the vent opening must be 100mm below the wall plate to maintain adequate concrete cover for the reinforcing steel.

In veneer construction the vents are often set in the lower courses of veneer bricks or blocks at the same level as the wall plates and joists. This is bad practice and should be avoided as proper airflow is effectively blocked. Furthermore, such openings are usually made to suit brick or block sizes and are thus considerably smaller than the usual 250 x 150mm vents.

With veneer construction, as for other types of cladding, the vents should be placed in the foundation walls. Unless the veneer starts at a level well below the underside of the bearers this will normally mean it is not interrupted by vents.

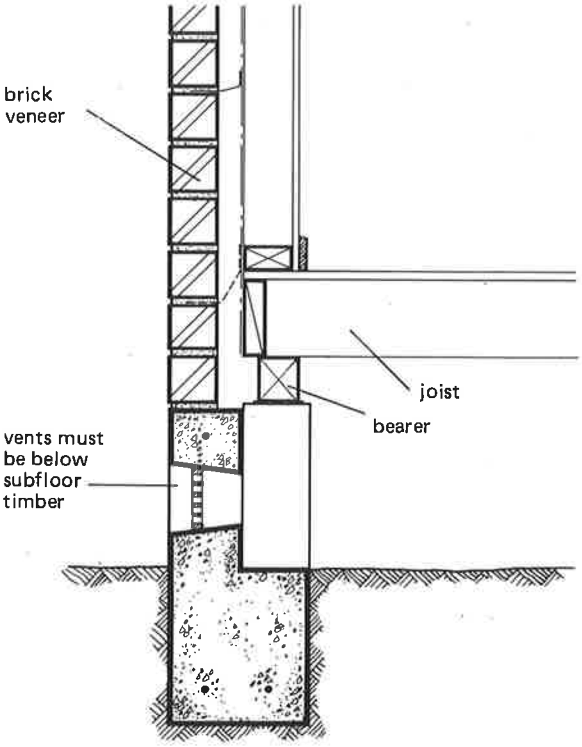


Figure 2: Correct vent location

Ventilation grilles in base sheathing attached to piles are often made of pressed metal. The effective opening size, number and location of these must be adequate to meet ventilation requirements.

VENT SIZES

Vents are made in a variety of sizes but this alone is not an indication of their effectiveness. It is vital to distinguish between the overall dimensions of the ventilation fixture and the clear airway it allows. Some poor designs have only 21% perforations to 79% solid material, while others have close to a 50:50 ratio. Fixtures with less than 50% perforation may fail to meet the minimum Code requirements of $3500mm^2$ of clear opening per $1m^2$ of floor area if used at the usual 1.8m spacing.

It may thus be necessary to use larger vents — such as those designed for use in concrete masonry foundation walls (390 x 190mm) — or to increase the number of smaller or less effective ones.

There are some parts of New Zealand where continuous concrete perimeter walls are not used. In such areas the foundation system may be sheathed with sheet cladding. Metal or plastic vents are used with this system and it is important that these are not obstructed by the framing behind the cladding.

Open base boarding is another common and very effective way of providing airflow below suspended floors. It is often used with corner wall and pile foundation systems.

OBSTRUCTIONS

When concrete porches and terraces are attached to the foundation walls, normal subfloor ventilation methods are usually not possible. In such cases it is important to install air ducts under terraces or larger porches to subfloor spaces. Earthenware pipes, 100mm in diameter, are often used for this purpose.

Rows of flats separated by party walls often suffer dampness problems because only the outside walls are available for ventilation openings. It is often not possible to meet the minimum Code requirements, especially if concrete entrance steps also take up some of the outside wall.

It is also difficult to ensure an adequate flow of air under buildings enclosing large spaces such as halls. The current Code of Practice, NZS 3604, recognises this and calls for a moisture-proof cover over the ground if any point under the floor is more than 7.5m from a ventilation opening. The same solution can be applied to rows of flats where party walls prevent adequate ventilation. Polythene is the most commonly used material, it should be laid out neatly against the walls and cut and fitted around piles. Bricks or rocks can be used to secure it in place.

LANDSCAPING

The area around the building should be graded to prevent water from accumulating under it. The land immediately around the building must be lower than subfloor levels and should slope away from the walls for at least 1m to drain water away from the foundations.

Paths, driveways and paving should never be laid so that ventilation openings are obstructed or so that water can flow through vents into the subfloor space.

Shrubs and plants must be kept clear of vents so that airflow is not blocked.

If the building is close to a bank (say within 1m) subfloor ventilation may not be very effective. If draught is obviously poor or dampness signs show, cover the ground under the building with polythene or similar material as described above.

DRAINAGE

If the general slope of the land presents risks after grading or if the ground can become waterlogged, field drains should be installed to intercept and divert ground water.
Good subfloor ventilation is not a solution under these conditions. There must, in addition, be proper site drainage.

Drains should be carefully graded to falls and be of adequate capacity to cope with the worst conditions known to occur at the site.

Subfloor ventilation can sometimes be improved by also changing the subfloor access door from a solid to an open, slatted construction.

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ISSN 0110-4845