



SUSPENDED TIMBER FLOOR INSULATION

As the levels of insulation for walls, roof and windows increase, heat loss through the floor, particularly suspended timber floors, becomes more significant. What are the options to insulate these?

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The space under a suspended timber floor may be classified as either open/exposed or closed.

An open subfloor has a significant air movement that reduces the effectiveness of, and increases the risk of wind damage to, any insulation installed.

A closed subfloor has limited air movement, which improves the thermal performance of the ground under the building and adds to the performance of the floor. However, as the ventilation of the subfloor space increases, the contribution of the ground under the building will decrease until it is negligible, such as with pole houses or similar structures.

Minimum R-values

The Acceptable Solution H1/AS1 refers to NZS 4218 *Energy efficiency – small building envelope* as a means of determining compliance with the performance requirements of New Zealand Building Code Clause H1 *Energy efficiency*. When using the schedule method, NZS 4218 sets minimum R-values for all climate zones as:

- R1.3 for unheated floors with non-solid (timber-framed) construction
 - R1.9 for heated floors (all construction types).
- BRANZ recommends that designers consider providing more than these minimum levels of insulation.

Insulation options

Insulation options under suspended timber floors include:

- bulk insulation installed between the floor joists in accordance with the manufacturers instructions – installing a lining may be required

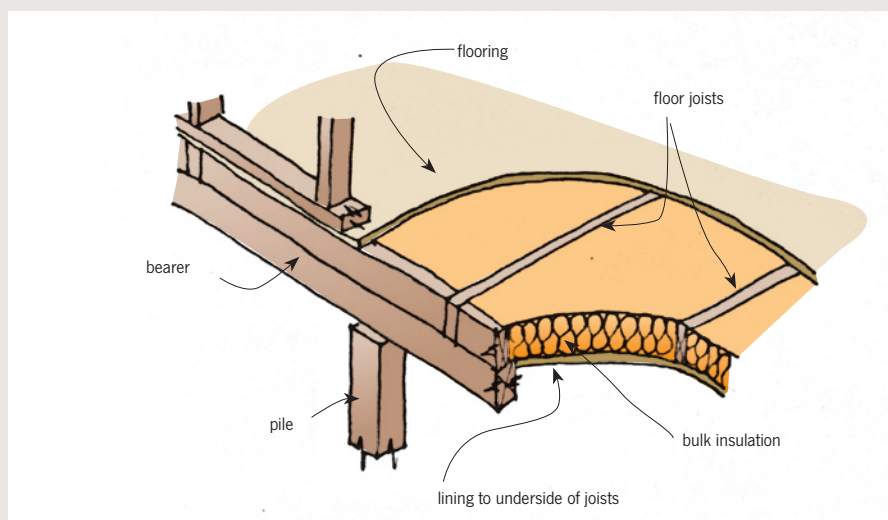


Figure 1: Suspended timber floor with bulk insulation and lining.

- proprietary expanded polystyrene panels installed between the floor joists
 - reflective foil draped over the floor joists before the flooring is laid and used in combination with a sheet lining fixed to the underside of the joists to create a still air space on either side of the foil
 - reflective foil and a sheet lining fixed to the underside of the floor joists
 - a combination of polystyrene and bulk fill.
- Reflective foil draped over floor joists on its own does not achieve the minimum R-value required by the Code. For example, for a closed subfloor with 140 × 45 mm joists at 600 mm centres and foil installed with a 100 mm drape, the R-value of the floor is R1.1, which is no longer acceptable as a means of underfloor insulation. One of the reasons is the difficulty in achieving a still air space between the foil and the flooring,

particularly where foil is simply butted to framing at the end of the drape.

Bulk insulation

Bulk-fill segmented insulation such as glass fibre, wool, wool blends, mineral wool and polyester can be inserted between floor joists. The R-value provided depends on the:

- joist depth
- R-value of the insulation
- quality of the installation
- joist spacing (the closer the joists, the greater the effect of thermal bridging)
- subfloor construction (if an open subfloor, lining will be required).

Although new buildings can have a larger joist size if a higher performance is required, in retrofit situations, the achievable insulation value may be limited by the joist depth. →

Before installing bulk insulation, the joists must be dry (laying polythene sheeting over the ground is recommended for damp closed subfloor spaces). Use of the insulation in a subfloor space must be permitted by the manufacturer.

Some bulk-fill insulation materials can be installed without using tape or a lining material to keep the insulation in place, but if a standard bulk-fill insulation is used in a closed subfloor space, fixing a sheet material to the underside of the joists to hold the insulation in place is recommended. The use of a sheet material will increase the insulation value and protect from dampness. For open subfloors, a sheet lining material such as plywood, tempered hardboard or fibre-cement must be used to protect the insulation (see Figure 1).

Expanded polystyrene

Expanded polystyrene panels specifically designed for insertion between floor joists are readily available. The R-value provided depends on the:

- polystyrene type, thickness and grade
- quality of the installation, for example, poor installation, such as leaving a gap between the insulation and the flooring or framing, will reduce the performance of the insulation
- joist spacing (the closer the joists, the greater the effect of thermal bridging)
- subfloor construction (whether it is open or closed).

The panels may be installed from:

- above before the floor is laid ideally after the building is weathertight, or
- below after the floor is laid if there is access.

Ideally, in new construction the insulation (and flooring) should be installed after the building has been made weathertight. Where the building is not weathertight there is a risk of water being trapped on top of the installed polystyrene.

If the subfloor is exposed, a lining material fixed to the underside of the joists will provide protection to the insulation and, as it adds another still air space, further improve the thermal performance of the floor.

Polystyrene is often used for retrofitting into existing suspended timber floors as panels are lightweight and self-supporting between joists. In open subfloors clips or battens may be required to hold the insulation in place and prevent wind damage.

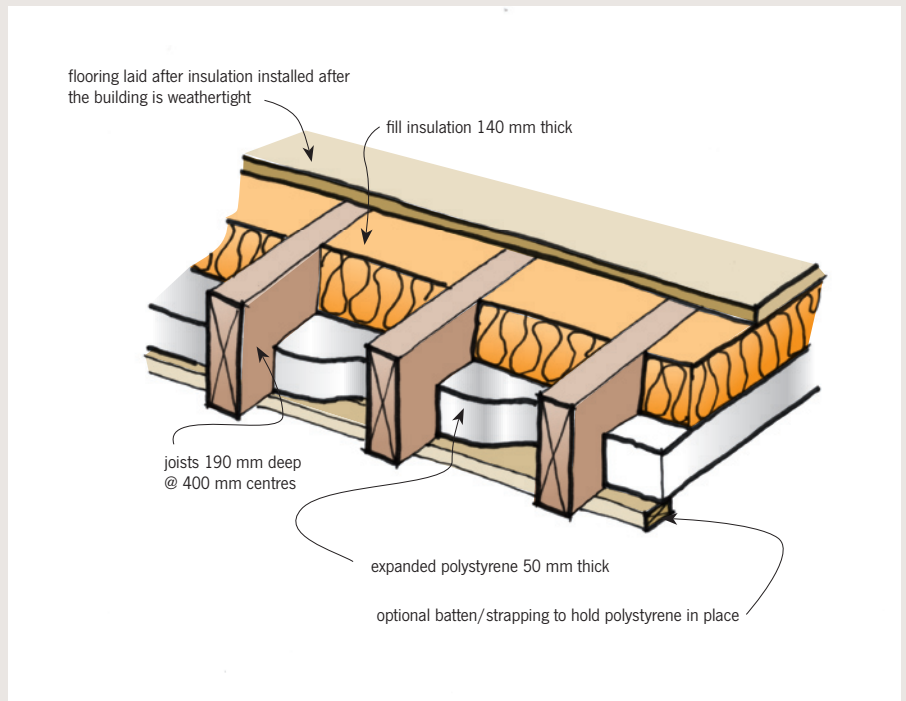


Figure 2: Composite floor insulation option.

Draped foil

Reflective foil may still be used provided it is installed so that it achieves the minimum R-value required by the Code. For example, it can be fixed with a lining to the underside of 145 × 45 floors joists at 600 mm spacings to achieve R1.3. It can also be draped over the joists with a lining fixed to the underside of the joists, to give an R-value of 2.0. In both cases, if the subfloor is closed, the R-value may increase, depending on the level of subfloor ventilation.

Composite construction beneficial

Composite construction will give higher performance values than the individual materials and will generally more than meet minimum Code requirements. For example, Figure 2 shows the use of expanded polystyrene and a bulk-fill material such as glass wool or polyester. A total insulation value of R3.6 (150 mm bulk-fill) plus R1.4 (50 mm of extruded polystyrene) = R5.0, minus the thermal bridging of the framing, gives an as-constructed floor R-value of approximately R4.7 for 190 mm joists.

Quality installation critical

The quality of insulation installation is significant in the long-term thermal performance of the floor.

When installing insulation under a suspended timber floor, ensure that:

- the insulation remains dry
- a polythene ground cover is laid if there is any ground moisture
- the insulation is installed against the floor – if there is a gap between the insulation and the floor, air will flow in the space, reducing the R-value
- the edges of rigid or semi-rigid materials are sealed to the framing to avoid air gaps and air movement above the insulation
- insulation is tightly fitted around pipes
- the air between foil and floor is still.

Precautions during installation

The following precautions must be taken when installing insulation under a suspended timber floor:

- Where wiring passes through polystyrene, it must be sleeved.
- Take care to isolate the power when installing and stapling foil. A number of people have been electrocuted while installing underfloor foil after accidentally stapling into power cables. Plastic staples are recommended. ◀