GETTING CLEAR ON VAPOUR BARRIERS AND UNDERLAYS

A wall or roof underlay is very different from a vapour barrier. One lets moisture through and out of a building and the other doesn’t. Using the wrong one will trap moisture where you don’t want it.

By Stephen Sargent, BRANZ Technical Writer

All air contains water vapour. Air inside houses however carries more water vapour than the outside air because it is warmer, and moisture is produced by normal living activities, such as breathing, cooking, showering, washing and perspiring. In summer when the windows are open, natural ventilation clears away this moisture but in cold weather with the windows closed, condensation problems can occur.

Water vapour can also rise up from the soil beneath a floor and may find its way into a building. If there is a wall cavity directly linking the subfloor space to the roof space, moist air may find its way to the underside of a cold roof.

If warm air laden with moisture meets a cold surface, the vapour will condense on the cold surface – most will be familiar with the condensation on traditional single glazed windows and how this can be minimised (see Figures 1 and 2).

Walls and roofs need to breathe

What is not so obvious is that vapour laden air also moves through exterior walls via minute gaps and cavities, and by diffusion through the lining. Water vapour can also form in the wall space if exterior wall linings are installed before the framing timber is sufficiently dry. For these reasons a breather type wall underlay (building paper or synthetic wall wrap) should almost always be installed in walls in New Zealand, not a vapour barrier (see Figures 3 and 4).

A breather type wall underlay should almost always be installed in walls in New Zealand, not a vapour barrier. For roofs, a roof underlay should be used, not a vapour barrier.
For roofs, a roof underlay should be used, not a vapour barrier. The only buildings that may require a vapour barrier are those in very cold climates (ski lodges for example) or if there is a wet process in the room below (such as a spa pool or a wet industrial process).

**Where to use vapour barriers**

The designer will need to decide if a vapour barrier-like material is required as part of a total building system (i.e. floor/wall/roof) for the building consent application. The New Zealand Building Code Acceptable Solutions provide guidance.

A ‘vapour barrier’ is defined in the NZBC Handbook as a ‘Sheet material or coating having a low water-vapour transmission, and used to minimise water-vapour penetration into buildings.’ Its definition is referred to in compliance documents Clauses B2 Durability and E2 External moisture. The term is also mentioned in the definitions of ‘damp-proof membranes’ (DPM) and ‘damp-proof courses’ (DPC). Perforated reflective vapour barrier-like materials are also sometimes used to fulfil the performance requirements for underfloor insulation in suspended timber floors required under Clause H1 Energy efficiency.

However vapour barrier specification and details, together with those for DPC and DPM, are only mentioned in relation to the two generic floor construction types of suspended timber floors and concrete slab-on-ground in E2/AS1 Section 10.0 Floors.

Neither NZS 3604: 1999 Timber framed buildings or NZS 4229: 1999 Concrete masonry buildings not requiring specific engineering design define the term ‘vapour barrier’. The term is mentioned only in relation to the similar industry tested specifications and details as already provided in E2/AS1.

As these standards are referred to in a number of the NZBC compliance documents by Verification Methods and/or Acceptable Solutions (i.e. Clauses B1 Structure, B2 Durability and E2 External moisture). This indicates that in the majority of typical new houses it is not necessary to use vapour barriers as part of wall and roof systems.

**Keeping moisture out of the roof space**

Generally a better solution is to use an air barrier to prevent the movement of water vapour from internal building activities into confined skillion or flat roof spaces as shown in Figure 5. This meets the performance requirements of NZBC Clause E3 Internal moisture. Care needs to be taken when installing any penetrations, such as recessed lighting, to ensure the air barrier is maintained (refer to BRANZ Bulletin 482 Downlights and Build, October/November 2006, pages 24–25).
VAPOUR BARRIERS ≠ UNDERLAYS

Vapour barriers are not the same as wall or roof underlays which are referred to frequently in E2/AS1 and defined as follows:

A roof underlay is an absorbent permeable building paper that absorbs or collects condensation or water that may penetrate the roof cladding or metal wall cladding.

A building wrap (wall underlay) is a building paper, synthetic wrap or sheathing used as part of a wall cladding system to assist the control of moisture by ensuring moisture which occasionally penetrates the wall cladding is directed back to the exterior of the building.

For more information see BRANZ publications:

- Bulletin 368 Preventing moisture problems in timber framed skillion roofs
- Bulletin 439 Condensation risk in walls
- Bulletin 457 Ventilation of enclosed subfloor spaces
- Bulletin 463 Aluminium windows and E2/AS1
- Bulletin 469 Damp-proof membranes to concrete slabs
- Bulletin 470 Wall underlays
- House insulation guide.

E2/AS1 Section 10 Floors gives vapour flow resistances to be met in the different situations, how this is measured as well as providing typical installation figures and acceptable materials that are already known to perform. A vapour barrier is installed under concrete slab-on-ground as a DPM (refer to E2/AS1 Figure 132).

To protect timber from absorbing moisture from concrete elements and to minimise the required *Pinus radiata* timber treatment levels, one option is to separate them using a DPC (refer to E2/AS1 Figure 131 (a) and (b) and Clause 10.3.6).

For a suspended timber floor where the subfloor space cannot be ‘adequately ventilated’ then the ground is required to be entirely covered with a vapour barrier (see E2/AS1 Clause 10.2.7 and NZS 3604: 1999 Section 6.14).

This method can also be used as a retrofit solution to lower the relative humidity of the subfloor floor air in existing houses after ensuring adequate subfloor ventilation is also provided (see *Build*, October/November 2006, pages 34–36 or BRANZ Bulletin 457 Ventilation of enclosed subfloor spaces). Installation is described in section 9 of NZS 4246: 2006 Energy efficiency – Installing insulation in residential buildings.