AB is for air barriers

Draughty, cold homes have been a perennial problem in New Zealand. Now, thanks to science, air barriers are a key component of the cladding systems in modern homes. Their careful design will keep air in and water out.

BY TREVOR PRINGLE, ANZIA, BRANZ PRINCIPAL WRITER

WHY WE STARTED installing wall underlays originally is uncertain, but they were being used in the 1920s. I certainly wasn't around at that time, but a bungalow I renovated had black building paper behind the totara weatherboards.

Probably to deal with draughts

One hypothesis is that wall underlay was installed to restrict draughts through the cladding. By default, it is also likely to have stopped some water getting into the framing cavities since black building paper has a degree of water resistance.

While their use waxed and waned through the 1930s to the 1960s, wall underlays became common from the 1970s onwards. The installation of a flexible or rigid wall underlay is now enshrined in details in Building Code Acceptable Solution E2/AS1.

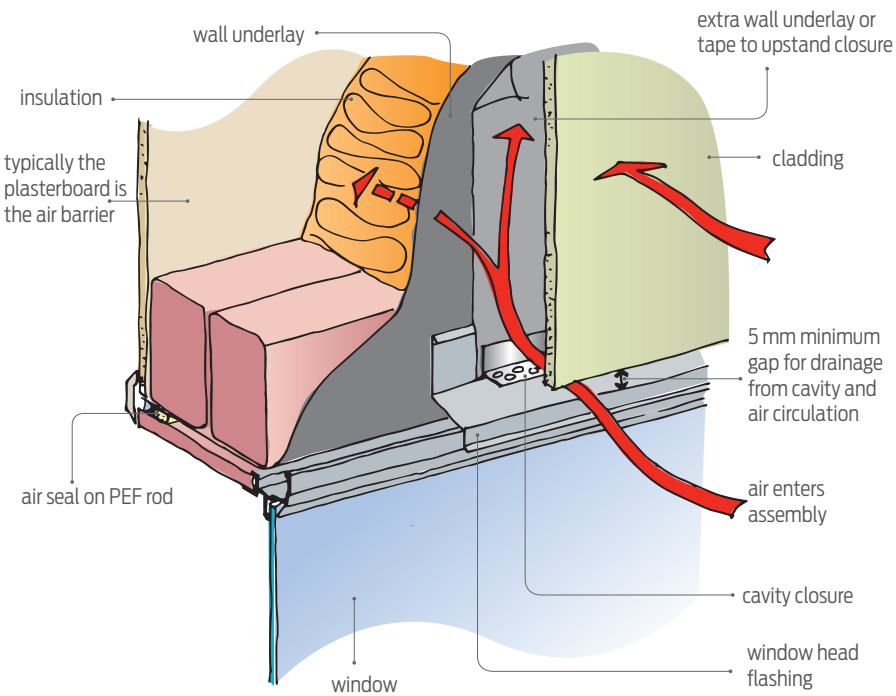


Figure 1: Plasterboard lining moderates the air pressure within the wall framing and behind the cladding so it is closer to the outside air pressure.

Science explains air and moisture movement

Over the years, science has given us a better understanding of what is happening with our wall construction when the wind blows and the rain falls.

As we see on weather maps, wind flows from the H (high pressure) to the L (low pressure). It's the same with air pressure differences - air moves from areas of higher pressure (usually outside a building) to those areas where the pressure is lower (usually inside a building). If water is present, the airflow generated through gaps in the cladding system can carry any water present into parts of the building where we really don't want it.

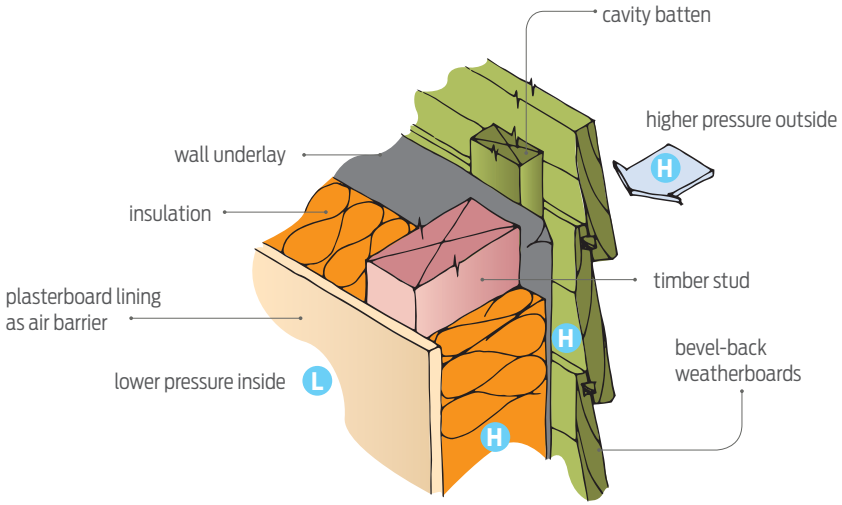
Air barrier equalises the air pressure

Our modern wall systems must incorporate an air barrier so that the air pressure within the wall framing and behind the cladding is the same as the outside air pressure. This is called pressure moderation or equalisation.

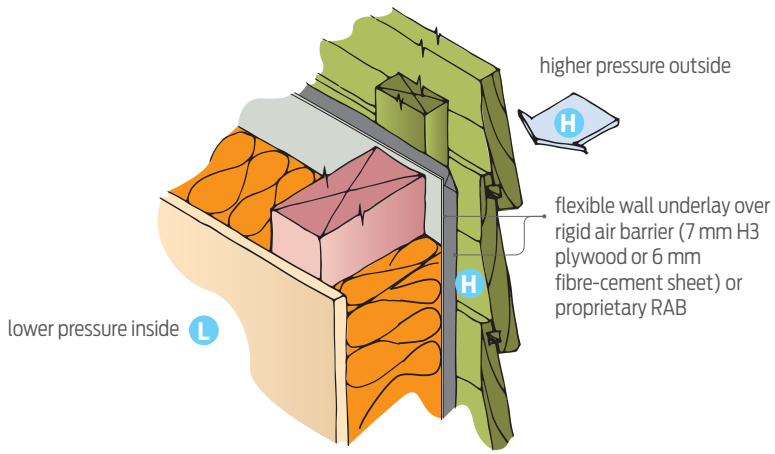
The widespread use of sheet linings means they, by default, have become an air barrier (see Figure 1). An air barrier may also be:

- a flexible wall underlay meeting specific airtightness given in Table 23 of E2/AS1
- a rigid wall underlay
- a proprietary air barrier system.

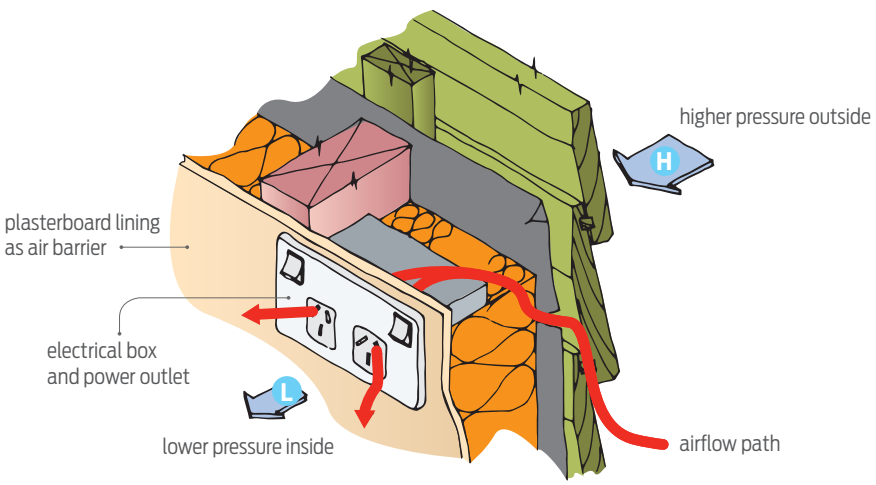
Where the wall underlay is the air barrier, the air pressure behind the cladding will be the same as outside the cladding. The air pressure within the framing cavity can be lower without any detrimental effects.



a) Plasterboard is the air barrier. No drop in pressure across cladding or inside framing.



b) With rigid air barrier. No drop in pressure across cladding.



c) Problem – potential air leakage path from warped weatherboard and damaged wall underlay adjacent to breach in plasterboard air barrier.

Figure 2: Pressure gradients across external wall.

Air seals stop airflow paths

Once we have an air barrier, any path from the outside to the interior, such as around a window, creates an airflow path (see Figure 3). This is a potential water entry path along which the concentrated air and water may flow through the gap (see Figure 3(b)).

To stop this, E2/AS1 requires continuous air seals around doors and windows, meter boxes and for all penetrations through the wall underlay to be sealed (see Figure 3a).

Other places for air barriers

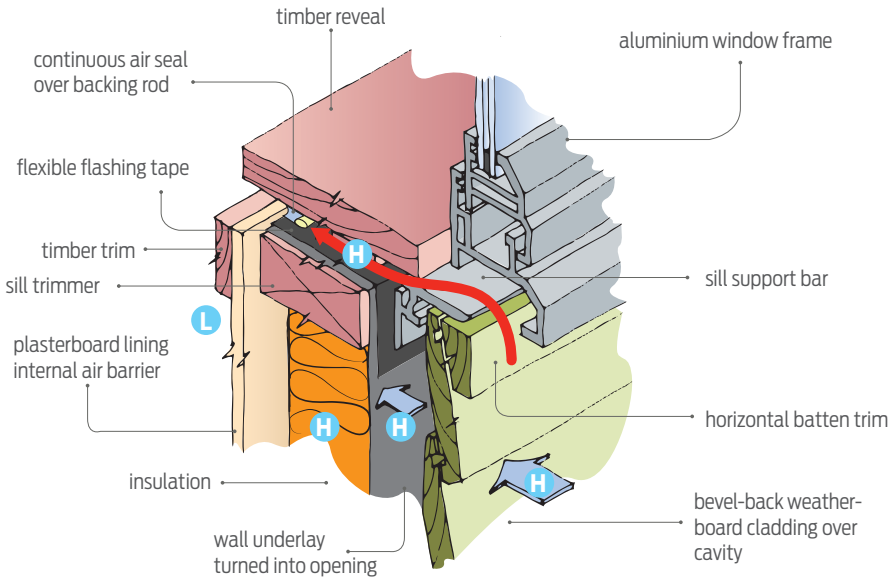
E2/AS1 also requires:

- a rigid wall underlay or air barrier in extra high wind zones, as potential pressure difference between outside and inside will be greater
- an air barrier to be installed to unlined gable end walls so that airflow does not deposit water into the roof space.

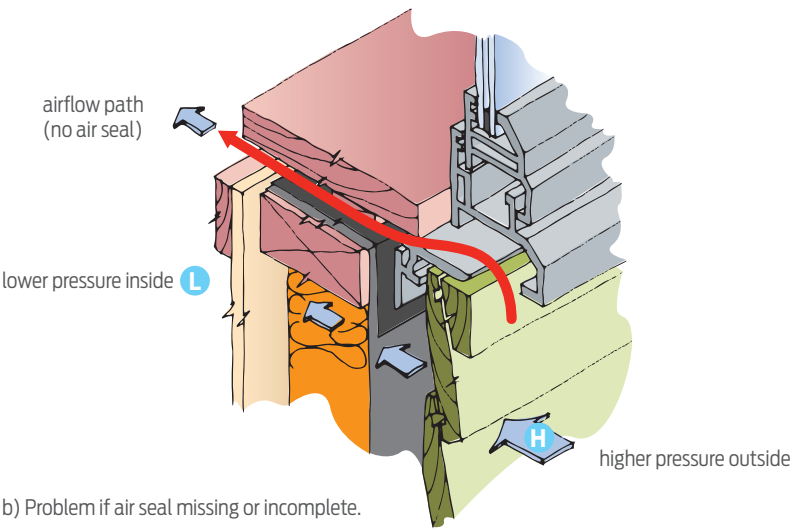
Pressure important for other details too

Achieving pressure moderation is the reason why several other details work such as:

- open vented rainscreens
- open drained joints
- commercial window and cladding details.



a) Correct construction with an air seal.



b) Problem if air seal missing or incomplete.

Figure 3: Air seals to control pressure around openings.