2 Common air leakage paths

Air leakage paths, which are commonly found in dwellings, can be easily avoided by careful design and good quality construction practice (Fig. 1).

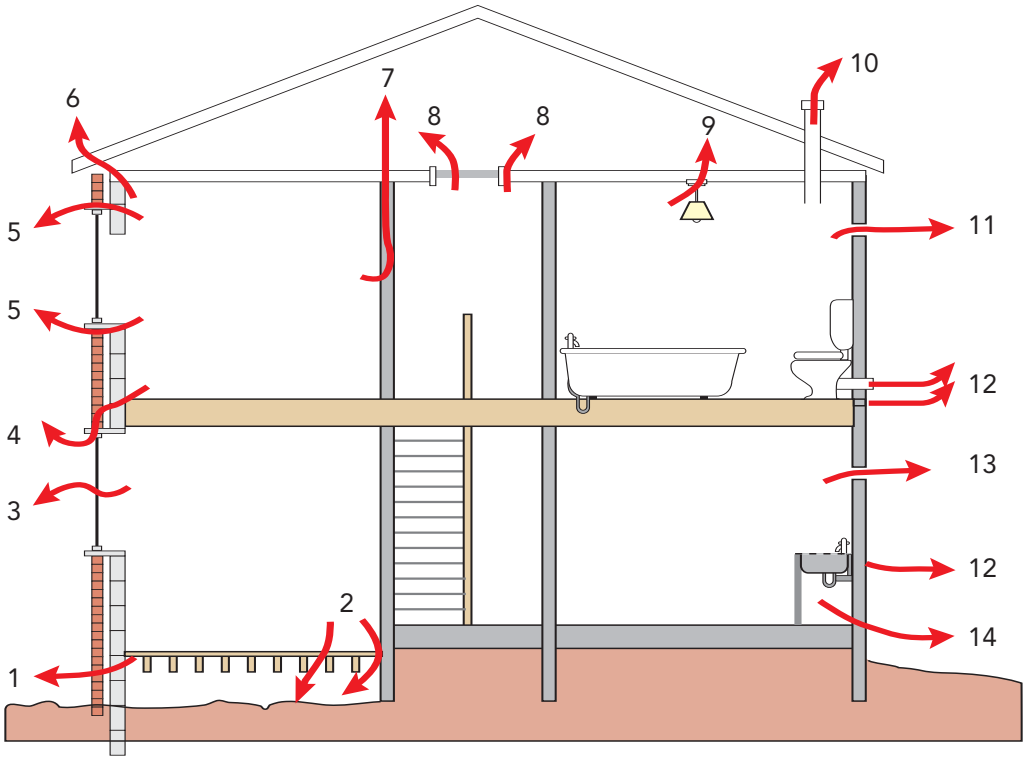

Figure 1 Potential air leakage paths (the numbered points in section 2.1 give a description for each path).

2.1 Descriptions of air leakage paths

1 Suspended floors (timber and concrete beam and block):

- Gaps between floorboards or concrete blocks around the perimeter of the dwelling/junction between floor and walls.
- Large gaps left around services that penetrate through the floor (eg soil vent pipes).

2 Gaps left between floorboards or blocks and also gaps around services (eg pipes and cables).

3 Window/door components:

- Windows and doors that do not close tightly resulting in large air leakage paths.

4 Joists that penetrate into wall construction:

- Masonry walls: Gaps left around joists that penetrate into the inner leaf of external walls. Air leakage from the cavity into the upper floor void leaking into the dwelling through gaps between flooring and through any penetrations in the ceilings, eg recessed lights and ceiling light roses.
- Timber frame construction: Gaps left around joists, where they penetrate through the air barrier, allowing air leakage into the dwelling through penetrations in the walls and ceilings.

5 Window sills and reveals:

- Air can leak directly to the outside or into the cavity through gaps between the window frame and wall reveals.
- Gaps around window casements (component air leakage).
- Gaps between doors and frames.
- Gap at bottom of door across threshold.

6 Gaps between dry lining and ceilings:

- Gaps and insufficient sealing at the wall to ceiling junction allowing air to leak into, and out of, the unheated loft void.

7 Internal partition walls:

- Air leakage can occur through internal partitions if the detailing or location of the air barrier leaves a pathway between indoors and outdoors. Gaps in the air barrier allowing air into the partition which then leaks through penetrations such as light switches and power sockets.

8 Loft hatches:

- Loft hatches that do not fit properly (prefabricated loft hatches can become twisted as they are installed) (Fig. 2).
- Inadequate seals between the hatch and the frame.

(Note: condensation can be an issue if the loft hatch does not fit – warm moist air from the dwelling rises into the loft and condenses on cold surfaces, such as roof timbers and roof underlay.)

Figure 2 Air leakage through gaps around a loft hatch.

9 Ceiling roses and recessed ceiling lights:

- Holes made through the upper ceiling for lights creating air leakage paths into the loft space.

10 Gaps around soil and vent pipes and flue stacks:

- Gaps in ceilings around soil vent pipes and passive flue stacks allowing air leakage paths.

11 Gaps around extractor fans and cooker hoods:

- Poorly fitted extractor fans and cooker hoods allowing air leakage through gaps left between the wall and the ventilation duct.

12 Gaps around service pipes (these gaps can often provide the largest air leakage paths in dwellings) (Fig. 3):

- Gaps left around service pipes, cables and ducts that pass through the dwelling's external fabric can be a major contributor to poor airtightness.
- Large holes often created for much smaller diameter pipes to pass through.
- Gaps and holes around service penetrations often hidden from view behind baths, vanity units and kitchen units.
- Cuts and holes in vapour control membranes (used as air barrier for framed construction) made to accommodate pipes, cables and ducts as they penetrate through the dwelling's external walls resulting in large air leakage rates.

Figure 3 Gap around soil pipe at back of toilet.

13 General air leakage through walls (Fig. 4):

- Gaps in mortar joints (or in some cases missing mortar joints) between concrete blocks on the inner leaf allowing significant air leakage from the cavity (Fig. 5).
- Figure 5 shows cold external air being drawn in through gaps and missing mortar joints in the blockwork wall behind the dry lining. Draughts will be felt at the base of the wall (under skirting boards), through electric sockets, around light switches and light roses/recessed light fittings.

Figure 4 Air permeability through gaps in a blockwork wall.

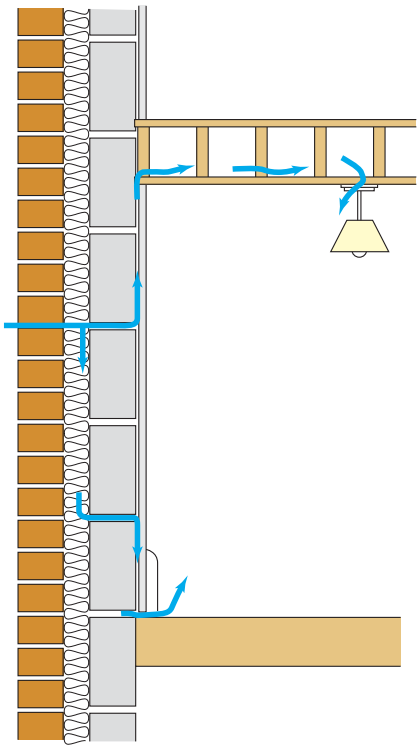

Figure 5 Air leakage through gaps and missing mortar joints in a blockwork wall.

The infrared image in Figure 6 shows the effect of cold air leaking in behind the dry lining. Cold air has been drawn in through missing mortar joints. (Coldness shows up as dark coloured patches in this image). The cold dots that can be seen are the plaster dabs used to fix the plasterboard to the blockwork.

The reasons for the air leakage may be:

- Gaps left around the service pipes.
- Air barriers (vapour control membrane – timber frame or dry lining – steel frame) that have been cut to allow services to penetrate through the wall creating air leakage paths into the dwelling.
- Cuts in membrane are often unnecessarily large for service penetrations making sealing difficult afterwards.
- The wrong tape may have been used to seal the membrane material. Some tapes may not provide a robust seal and could peel off soon after being applied.

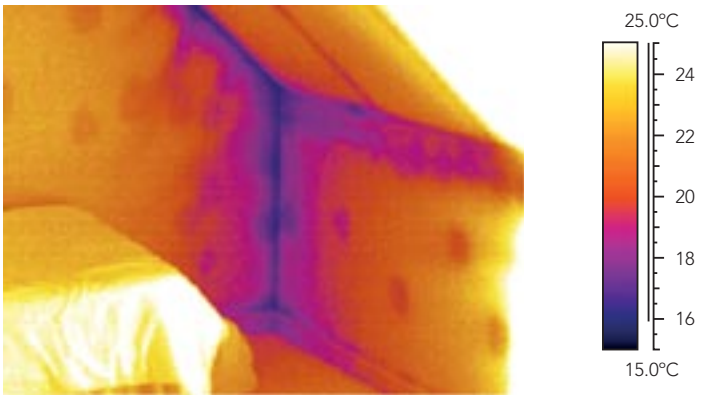

Figure 6 The effects of cold air behind dry lining attributed to air leakage.

14 Gaps between walls and solid ground floors:

- Gaps left between the sole plate of a frame and the ground slab due to undulations in the concrete surface.