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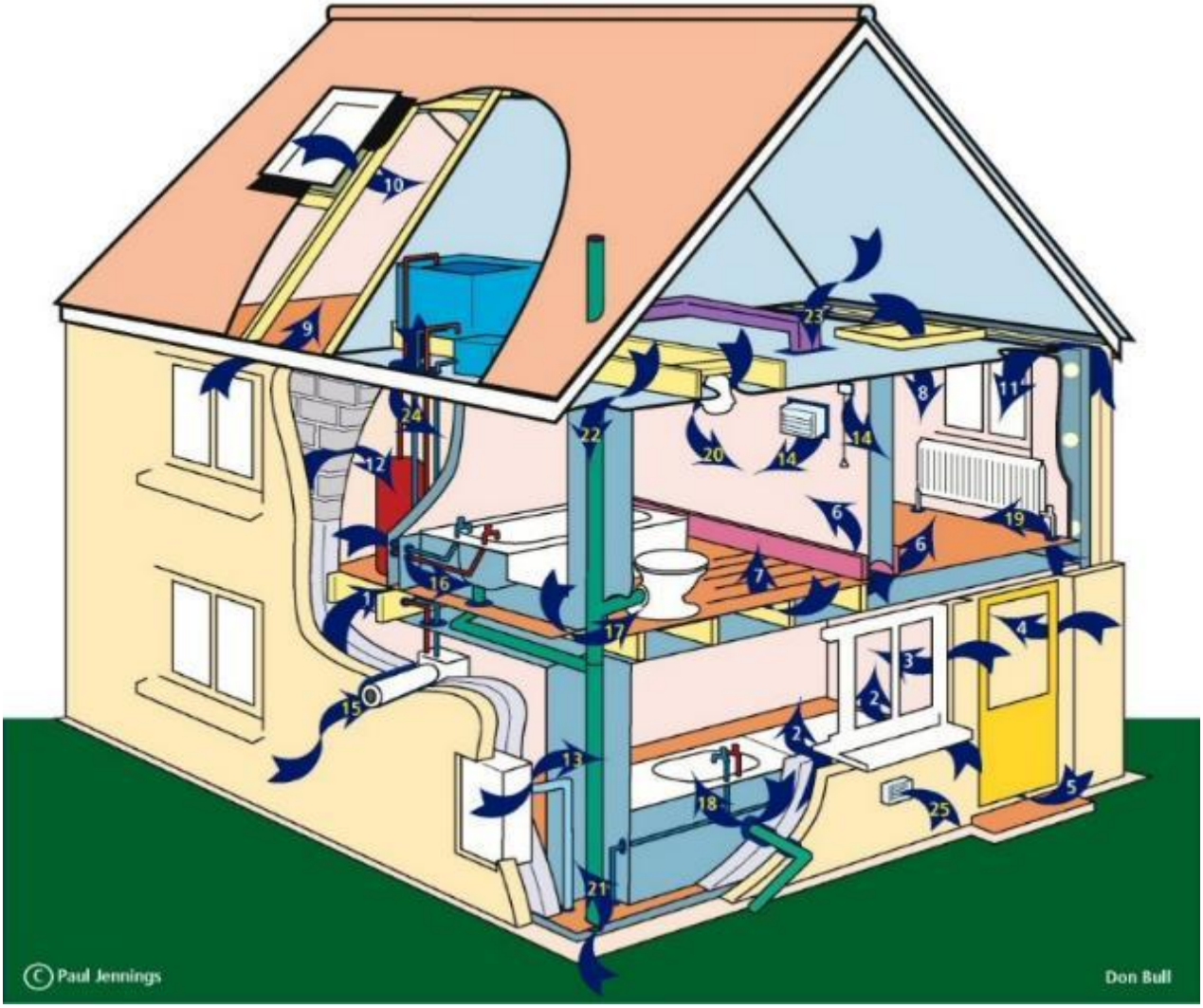
Where do our Buildings Leak?

The short, but not very helpful, answer: almost everywhere!

For ease, we subdivide leakage into (1) those issues with the building fabric – e.g. through masonry, around windows and doors – and (2) leakage associated with building services – pipes, cables, ducts and the like – that penetrate through the airtight elements of the building fabric.



The above illustration was originally prepared as part of an article in Building for a Future Magazine, over 20 years ago. Each arrow represents a type of leakage site, and by clicking on the arrow you can move to a range of photographs and/or illustrations of the issue. A key to the arrows on the diagram is provided on the following pages.

Many of the photographs are accompanied by thermographic images, which we have found to be a very important tool in identifying and documenting leakage sites.

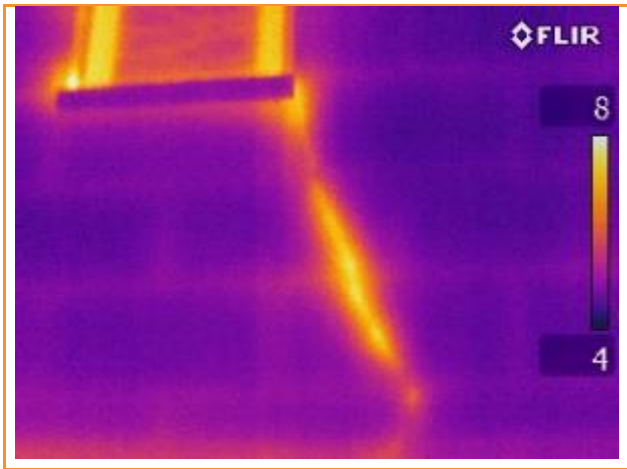
However, thermographic images require care in interpretation, so is explained further below:

During pressurisation airtightness testing, we will normally blow air into the property under test and look for the escape of warm internal air, showing up as white or yellow, from outside the building.

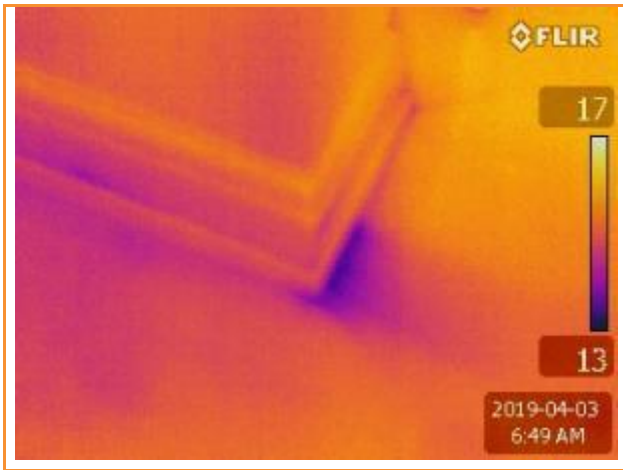
If we are depressurising the building, we are blowing warm internal air out through the fan system, and this is being replaced by cold external air entering the building through the various leakage sites. Hence, we inspect internally with the thermographic camera, searching for dark blue or black cold spots demonstrating air leakage.

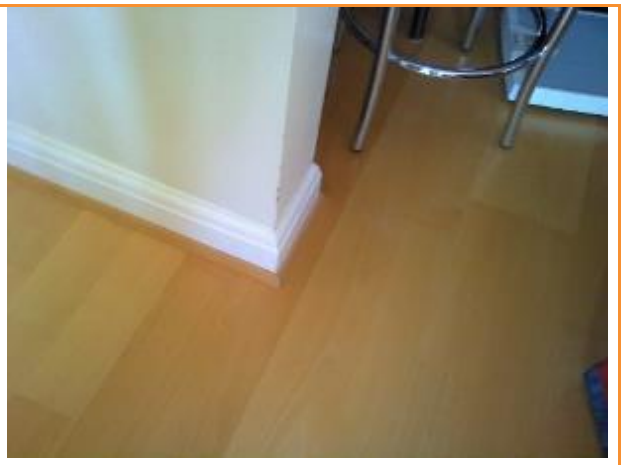
A word of caution, however. The thermographic camera shows hot or cold spots, and the nature of the surface affects the apparent temperature. A shiny metal surface will generally look hotter than an adjacent section of masonry at the same temperature, because of the high emissivity of the surface. Hence in interpreting thermographic images we need to check that we are not identifying cold bridges, or sections of building fabric where insulation is missing, as air leakage. In looking at internal thermographic images, we commonly look for "feathering" at the edges of the dark blue or black colder areas, which indicates air movement and therefore definite air leakage.

The pictures below illustrate these points:



This is an external thermographic image of the section of wall shown, recorded with the existing house pressurised using our door fan. Significant heat loss can be seen through the crack in the render, and at the sides of the window sill. The pattern of the blockwork behind the render is also visible, showing the mortar joints forming cold bridges. Whilst there was some air leakage on the window itself, the bright yellow vertical stripes on either side of the window are actually showing both the higher emissivity of the aluminium window frame and the substantial cold bridge occurring because the frame is not thermally broken.

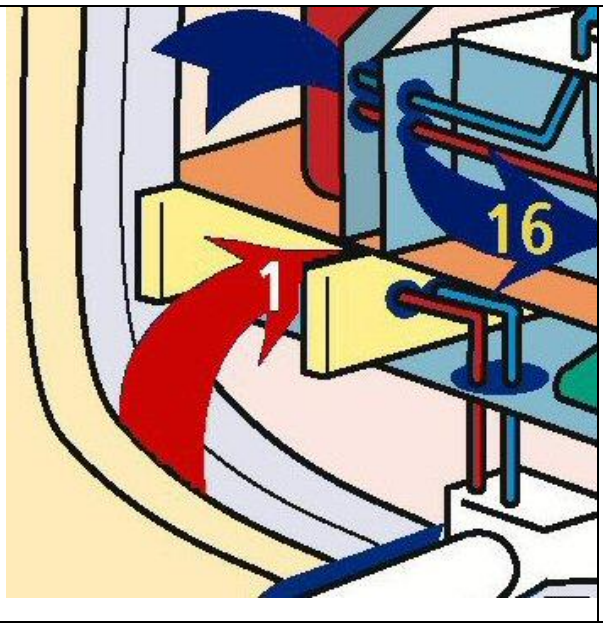
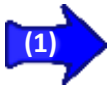


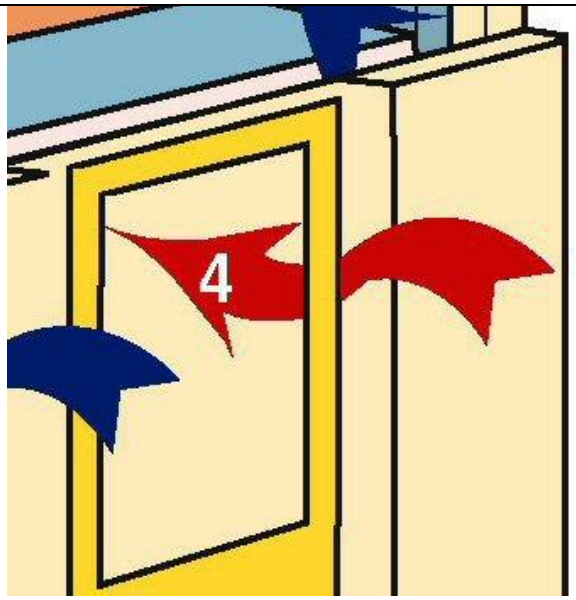


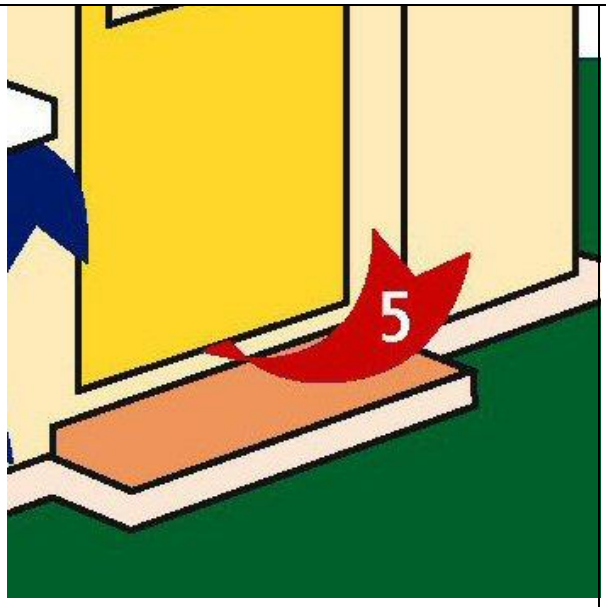
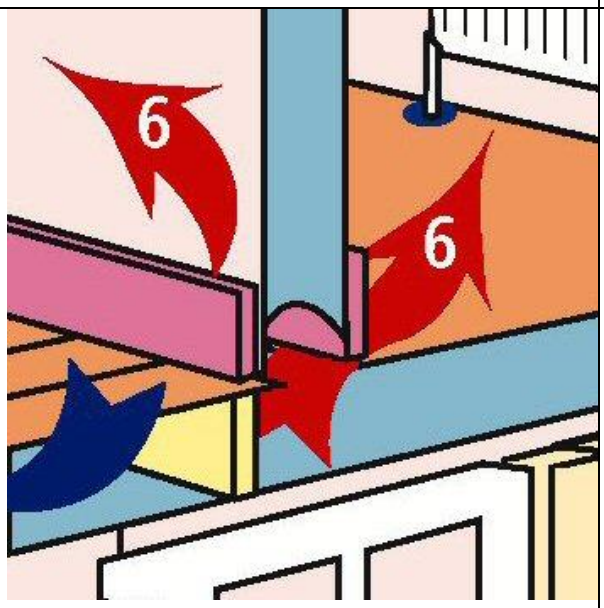
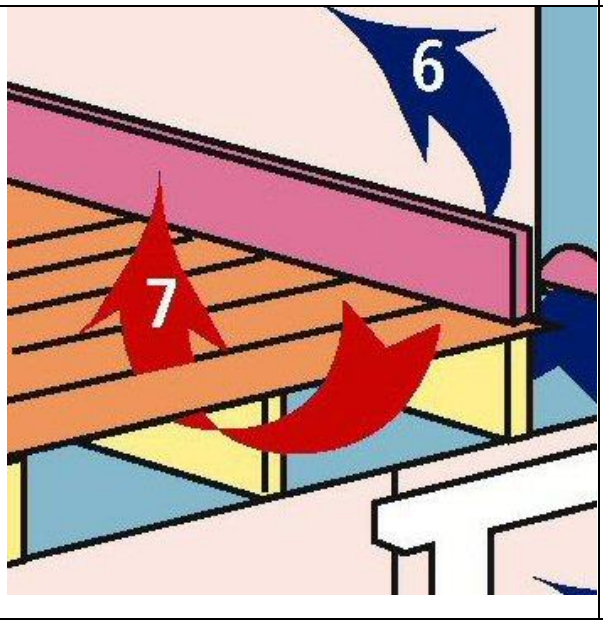
This internal thermographic image of an existing house whilst it is depressurised. It shows low-level leakage at the end of an internal stub wall in the living room, probably connecting to the unheated subfloor void. The "feathering" at the edges of the dark blue leakage is a clear indication of air leakage – which was confirmed by feeling air movement at this location

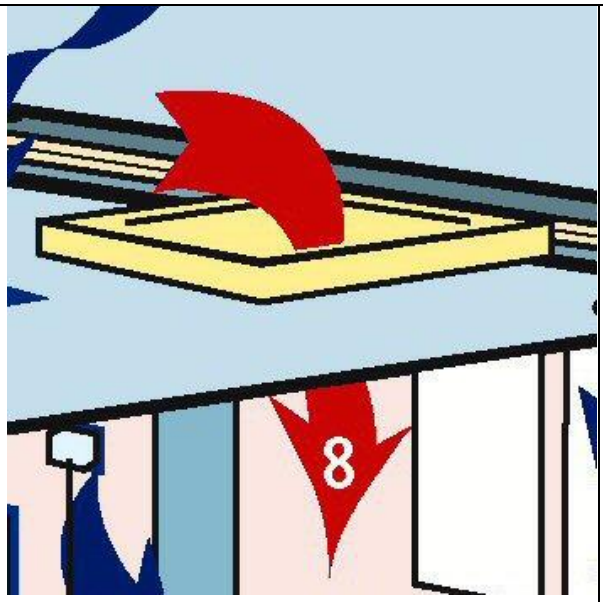
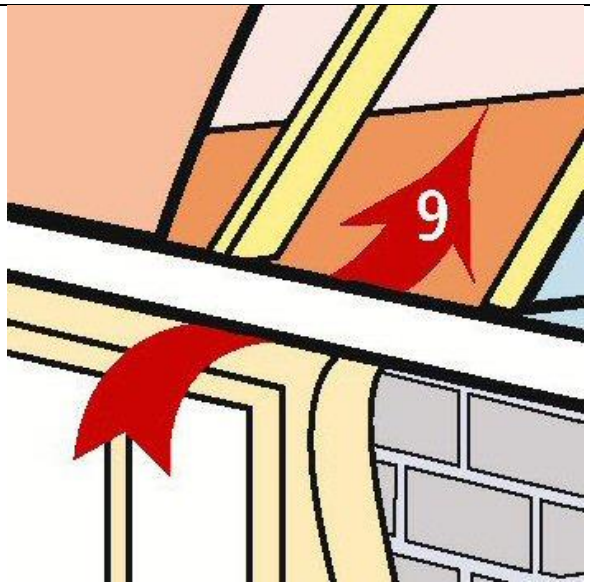
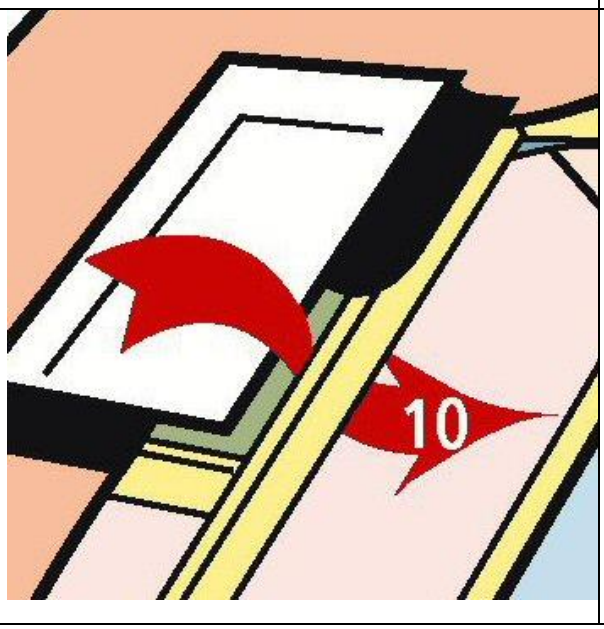
Key to "Where do buildings leak?" diagram

Building Fabric Leakage Sites (white numbering):

(1)		**Around the ends of floor joists or hangers, generally through the intermediate floor void**	

(2)		Beneath window cills and around window frames	(2)
(3)		Through windows joints and/or hollow window frames	(3)
(4)		Through doors – particularly double doors	(4)

(5)		Beneath doors and doorframes	(5)
(6)		Along the top and bottom edges of skirting boards	(6)
(7)		Between sections of suspended floors, usually timber	(7)

(8)		Around and through loft hatches and access hatches	(8)
(9)		Through the eaves	(9)
(10)		Around rooflights, including controls, sensors & power supplies if applicable	(10)

(11)		Air leaks from a cavity in the external wall, usually masonry, into the room via gaps behind dot-and-dab plasterboard, or hollow studwork walls. Often occurs through electricity sockets and light switches, and cable TV and similar media outlets are commonly very poor.	(11)
(12)		Through masonry walls. Air leaks from the wall cavity into a room through porous blockwork, which has been noted as an issue with blocks made using fuel ash from power stations. It can also apply in reverse where the external sealing of the wall, such as a render coat, is cracked and allows warm air from the room to escape to the outside.	(12)

Building Services Leakage Sites (yellow numbering):

(13)		Around supplies from external meter boxes	(13)
(14)		Through and around ceiling roses and pull-switches, also electrical sockets and light switches mounted on both external and internal partition walls	(14)
(15)		Around boiler flues	(15)
(16)		Around water and heating pipes that penetrate into hollow floor voids and partition walls, also ceilings	(16)

(17)		Around waste pipes passing into floor voids or ceiling voids	(17)
(18)		Around waste pipes passing through external walls	(18)
(19)		Around heating pipes into floor voids, including underfloor heating pipes	(19)
(20)		Around and often through recessed spotlights	(20)
(21)		Around waste pipes, gas pipes, incoming water supplies, electricity and data cables, which penetrate the lower floor, often through subfloor ducts	(21)
(22)		At the top of the soil stack and any ducts passing through the ceiling	(22)
(23)		Through MVHR systems, around distribution or extract ductwork - NB Can also be major leaks around and through subfloor warm air heating ducts, if present	(23)
(24)		Cracks and gaps, sometimes large holes, around any or all water and heating pipes where they pass into a loft	(24)
(25)		Leaks through vents for tumble driers Through airbricks and partially closable hit-and-miss vents	(25)