

## Airtightness IS a construction issue

- Airtightness needs to be addressed at every stage in the construction process. Waiting until completion places a misconceived reliance on secondary sealing.
- Operatives need to know what they are required to achieve and what constitutes an acceptable standard.
- The importance of high levels of workmanship in hidden areas should be stressed and quality control should be capable of verifying the standard achieved.
- Sealants should only be applied in a controlled way based on effective joint design. Operatives need to know the type of sealant required and the requirements for surface preparation.
- The number of service penetrations should be minimised by coordinating service routes and synchronizing trades.
- At times of increased or accelerated production management processes should provide additional resources and training to ensure that airtightness performance does not suffer.

## Maintaining the air barrier's integrity

- **Awareness:** All construction staff need to be aware of what constitutes the air barrier, where it is positioned and how its continuity is to be maintained.
- **Workmanship:** Just because you can't see it doesn't mean it's not important; workmanship should be of an equally high standard throughout.
- **Accountability:** All staff are accountable for airtightness, not just those trades whose work directly impinges on the air barrier.
- **Responsibility:** If anyone damages the air barrier, it is their responsibility to repair it.
- **Effort:** Airtight dwellings don't just happen, they require a conscious effort by all concerned.

Much historical guidance focussed on secondary

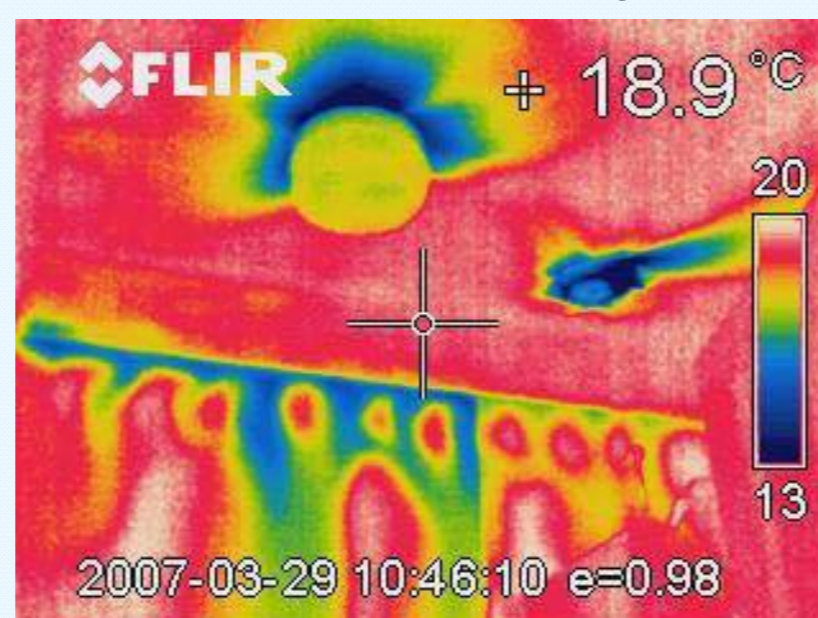
## Dangerous misconceptions

sealing and less-robust options such as relying on continuous ribbons of plasterboard adhesive to form the air barrier. Modern guidance now concentrates on a designed-in air barrier. Still, many operatives (and other building professionals) seem unaware of this. **However, if the primary air barrier on the walls, floor and ceiling is continuous and complete, secondary sealing and continuous ribbons are superfluous.**



When you seal and inspect the air barrier can be as important as how you do it. In this example the electrical penetration (upper left) has been sealed at the 1<sup>st</sup> fix stage, with a suitable mastic, and looks airtight. However, somewhere between then and the 2<sup>nd</sup> fix (lower left) the sealant has become dislodged and not been replaced.

The thermal image of the detail (right), taken under depressurisation, illustrates the air leakage at this point, as well as showing cold air being drawn in from the loft around gaps in the "continuous" plasterboard dabs.



## Sequencing



A change in sequence from partitioning-first to ceilings-first dramatically improved airtightness for Bryant Homes at Stamford Brook.

The build sequence adopted can present problems of accessibility when constructing the air barrier and maintaining its continuity. The lack of detailed planning of work sequences can lead to a completed detail being constructed then damaged for a subsequent installation, before being repaired. This "build – damage – install – repair" approach is both inefficient and unnecessary.

- The primary air barrier should be completed before it is obscured and its accessibility compromised.
- Where possible services penetrations should be fitted with sleeves and sealed as construction proceeds to avoid the need for breaking out new construction.
- Sealing of services penetrations should be robust enough to enable later fitting work to be carried out without damage to the seal.

## Hidden air leakage paths

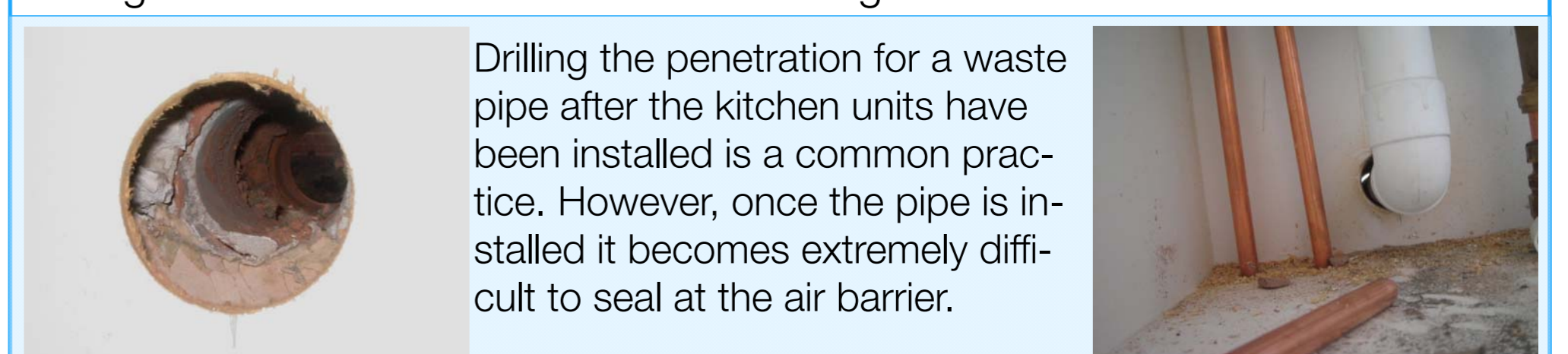
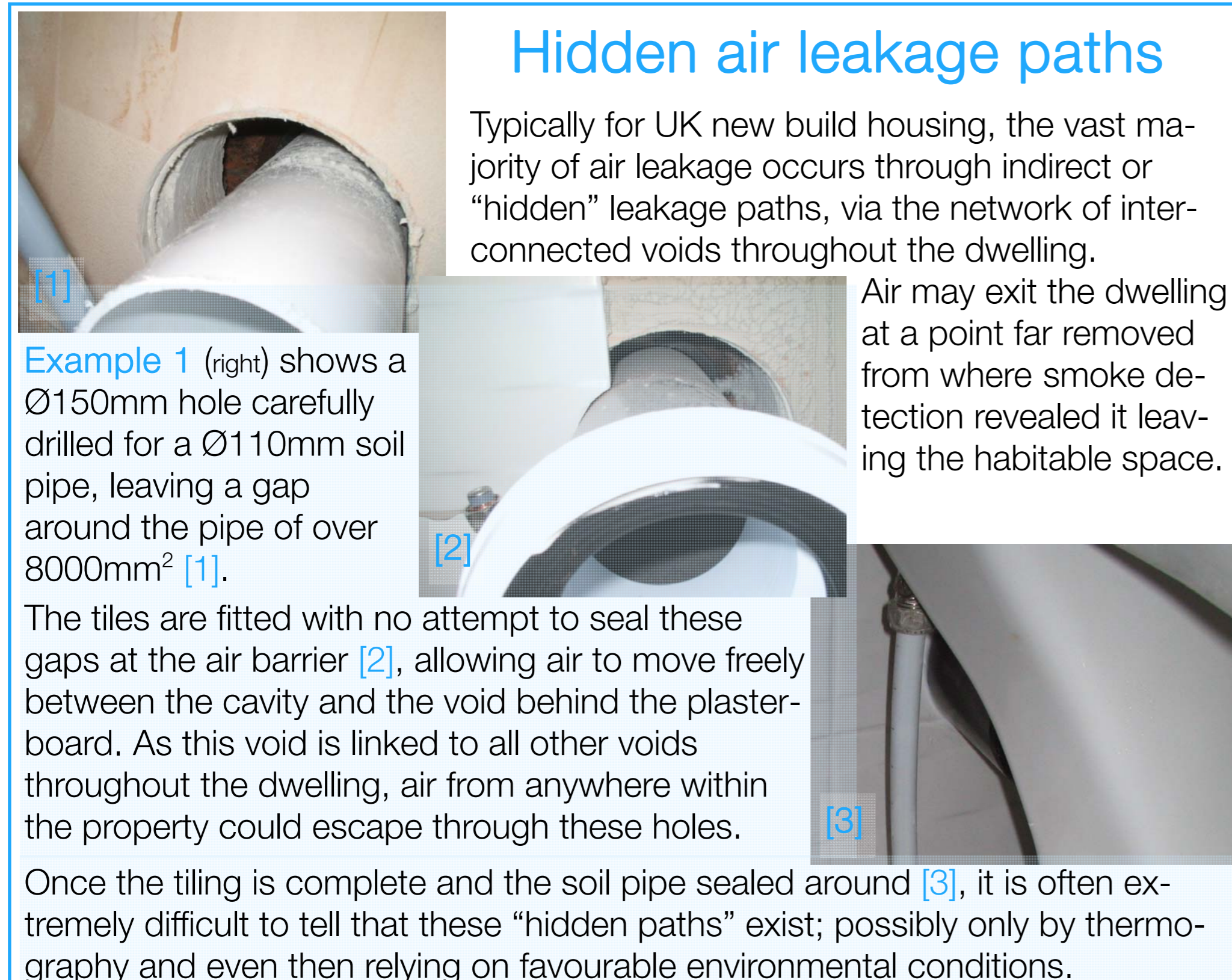
Typically for UK new build housing, the vast majority of air leakage occurs through indirect or "hidden" leakage paths, via the network of interconnected voids throughout the dwelling.

Air may exit the dwelling at a point far removed from where smoke detection revealed it leaving the habitable space.

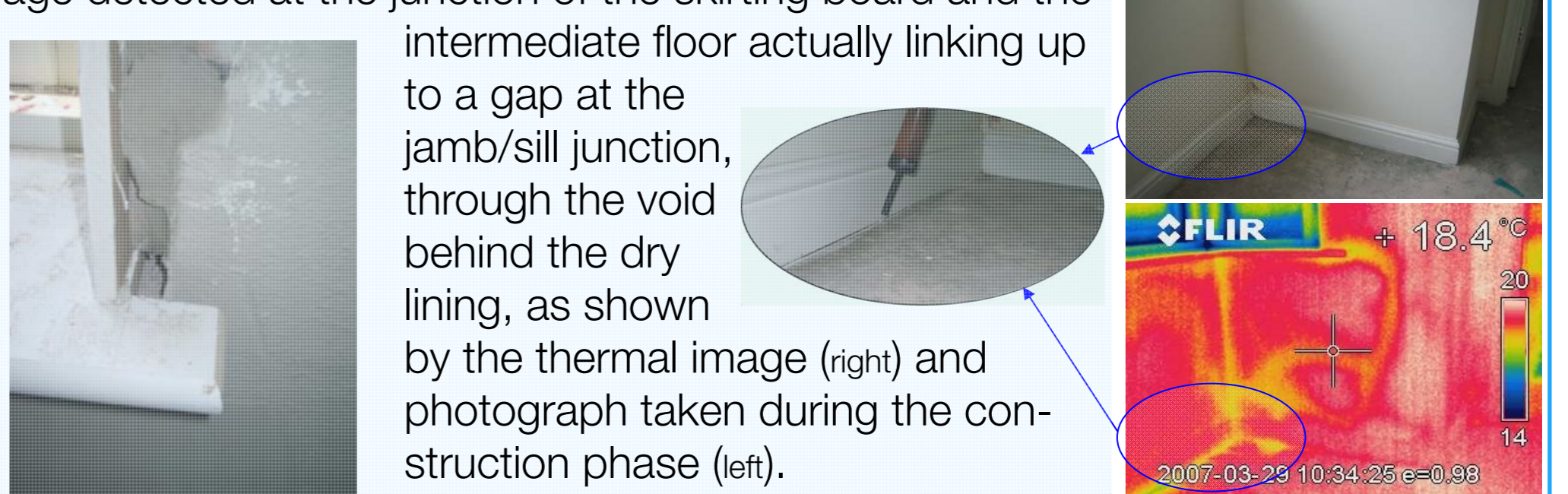
**Example 1** (right) shows a Ø150mm hole carefully drilled for a Ø110mm soil pipe, leaving a gap around the pipe of over 8000mm<sup>2</sup> [1].

The tiles are fitted with no attempt to seal these gaps at the air barrier [2], allowing air to move freely between the cavity and the void behind the plasterboard. As this void is linked to all other voids throughout the dwelling, air from anywhere within the property could escape through these holes.

Once the tiling is complete and the soil pipe sealed around [3], it is often extremely difficult to tell that these "hidden paths" exist; possibly only by thermography and even then relying on favourable environmental conditions.



**Example 2** shows a simple "hidden" path, with air leakage detected at the junction of the skirting board and the intermediate floor actually linking up to a gap at the jamb/sill junction, through the void behind the dry lining, as shown by the thermal image (right) and photograph taken during the construction phase (left).



## Constructing airtight dwellings - Staff training and awareness

1. Developers should ensure that training materials are readily available and of a desired quality. All staff should be encouraged to utilise the training materials.
2. Site and trade specific training on airtightness should be a compulsory part of the site induction, with explanations of what happens when things go wrong.
3. Training should be targeted, for all site staff, rather than just creating a general awareness of the issues.
4. Refresher courses should be regularly scheduled to maintain focus.

