LowCarb4Real; Design collection: GHA Bladon: Airtightness IS a Design Issue

Primary Air Barrier — Design it with CARE

Kingerlee had understood the importance of good thermal design and were aware of some of the early findings from Stamford Brook. Their search to maximise their own build quality took them to Germany to understand their systems better. They wanted a system that could consistently deliver air tightness performance twice as efficiently as demanded by Building Regulations – so they targeted 5m/h ach@50Pa

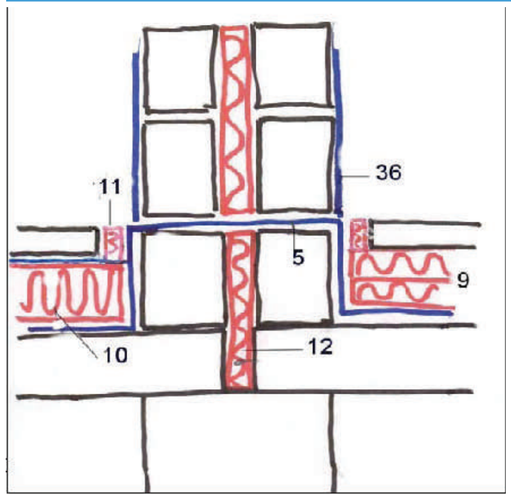
This research and learning on thermal design was fed through to the entire design team and the site operatives. Indeed the whole design team visited Germany and when the new site manager started, he also was taken over.

Further training at NBT for sub contractors laying the blocks on site helped improve understanding of good thermal design and helped ensure the design was actually constructed with this in mind as a priority.

The architects ALP also received training on the principles of good thermal design and airtightness. Complex areas like junctions, steel bedding and wall junctions and openings such as doors, windows and balconies were fully detailed and discussed and drawn – drawings were also annotated with EcoHomes credits . Detailed drawings referred to how continuity of the air barrier would occur on site. Complex detailing was removed where possible and complex areas like junctions and wall junctions and openings such as doors, windows and balconies are fully detailed and drawn – if you can't draw it you can't build it.

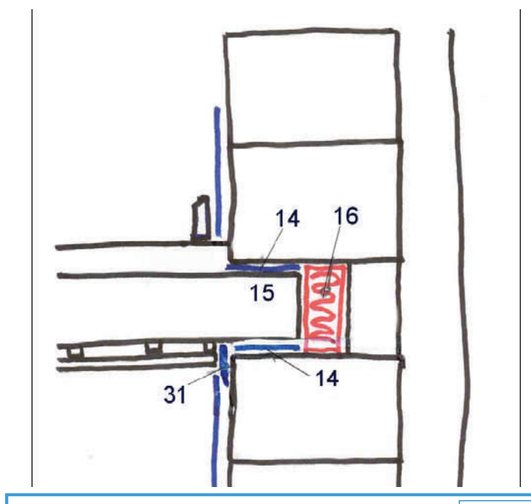
Working with Peter Warm and NBT consult, an airtightness schedule and 37 point checklist was devised to make sure that detailed checks on all complex junctions were made at the following stages of the build

- Completion of radon barrier
- First joist of the first floor construction
- First purlins
- Final membrane roof sealing



Airtightness around DPM/Radon barrier
1. Check seal around service entries - stove air (B)
2. Check seal around service entries - Electrical & BT incomer duct(s) (B)
3. Check seal around service entries - Drains (B)
4. Check seal around service entries - Water incomer duct (B)
5. Check continuous and sealed through insulated party wall (A)
6. Check seal to external wall/DPC (B)
7. Check seal where dropped around external doors (B)
8. Check under slab ventilation present to external air for Radon and combustion air (B)

Continuity of insulation
9. Either: uses 2 sheets 75mm polystyrene and offset joints (A)
10. Or: use 150mm polystyrene and extra DPM over top to prevent screed filling gaps (A)
11. Check 25mm polystyrene Edge insulation correctly installed before screed pour (A)
12. Check cavities filled with 75mm acoustic insulation, no snots or ties bridging (A)



Measurement and Feedback

Lesson - Test for air tightness at an early stage in the construction process – remedial action is cheaper AT THIS STAGE– and testing more than once will lead to better final figures

1) Completion of shell

Air tightness testing at this stage when the walls and roof were completed but before the render gave a result at Bladon of 22 m/h@50Pa. The tests showed that there was an unexpected significant air loss under the timber window sills, where the dpc was rounded off under the window sill, allowing air movement in the small gap between the dpc and the blocks. Testing at this stage allowed this problem to be easily solved at an early stage.

If you can't easily trace your finger around the air barrier on the plans, then you will have problems with thermal bridging

2) Once the thermal envelope has been completed and services are in

The plaster finish on the inside will provide the bulk of the airtightness so need to ensure that you have a cohesive shell which includes rendering behind fitted kitchen cupboards and appliances. The render has to follow round the inside and form a continuous unbroken layer. If walls cannot be plastered before fit out then they should be parged whilst still accessible.

Punctures in walls from service runs are the most common form of air leakage. Careful attention should be given to all service layouts and pipe runs minimised, but remedial action may be required to improve these figures. At Bladon, it was also noted that there was some leakage externally, where the dpc was dressed into the block joint, and so a polystyrene seal was placed over the joint

Testing at this stage revealed that air tightness was a range of 6.2 – 7 ach

3) Final testing

The above remedial action ensured that the final figures at completion showed a figure of 3.8 – 4.8 m/h@50Pa, comfortably within the target of 5

General testing

Acoustic testing at an early stage also showed that any penetrations through party walls rapidly reduces acoustic performance. This resulted in ensuring that electrical sockets were placed on external walls where possible and any sockets on party walls were surfaced mounted

Kingerlee have invested in a **thermographic camera** as a quick and easy way to understand how buildings are operating and which areas of the building are performing and which aren't.

Designing Airtight Dwellings– Guidelines

- Understand the subject area and train your design team
- If you can't draw it, you can't build it.
- Ensure the design and construction team, including sub contractor, understand the importance of good thermal design
- Help make energy visible by explaining about CO_2 emissions and homes

UrbanBuzz Project—Developing Low Carbon Housing: Lessons from The Field—LowCarb4Real
Lead Organisations: Leeds Metropolitan University and University College London
Project Partners: Good Homes Alliance, National Trust, Taylor Wimpey, Redrow, University of Leeds.
Contacts: Prof. Malcolm Bell, Leeds Metropolitan University (m.bell@leedsmet.ac.uk), Prof. Bob Lowe, Bartlett School of Graduate Studies, UCL (robert.lowe@ucl.ac.uk)