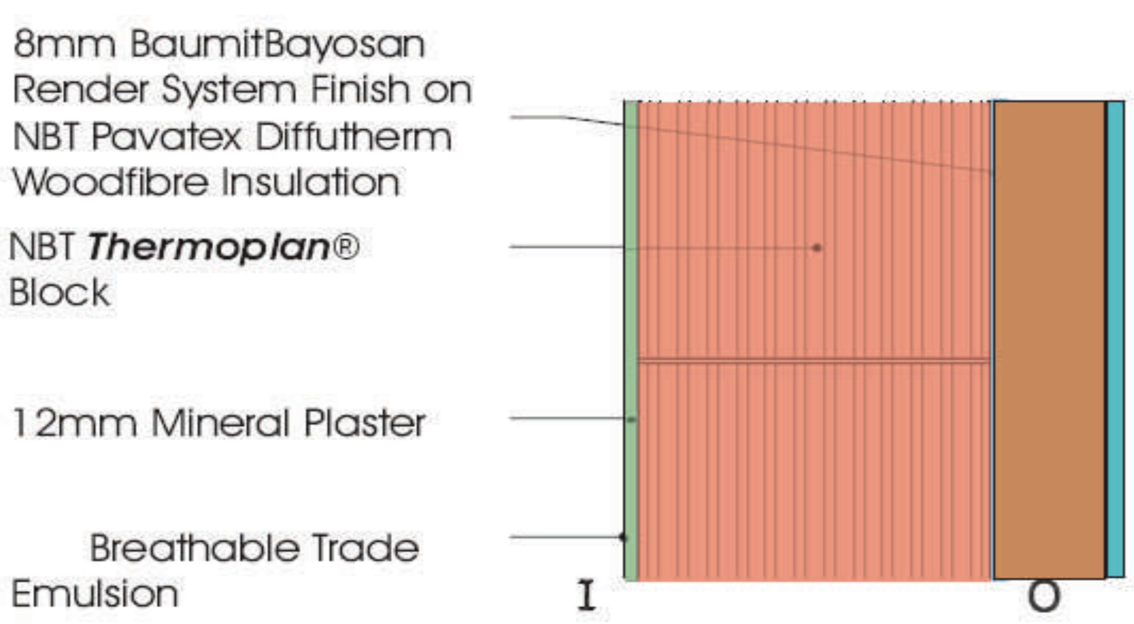
LowCarb4Real; GHA Design collection One Brighton: Airtightness

Air tightness and health

With very low level of air tightness, internal air quality can deteriorate unless there is a viable ventilation strategy. At air tightness levels of less than 3 m3/h/m2@50 Pa, some form of mechanical ventilation will generally be required. One Brighton will benefit from mechanical ventilation with heat recovery. MVHR will operate most efficiently and quietly at air change rates of 1-1.5 and it is now intended to aim for these lower targets at One Brighton. In addition to the MVHR, this build offers a breathable construction and so moisture and condensation can also migrate through the wall to the outside, so helping ensure comfortable internal air quality.

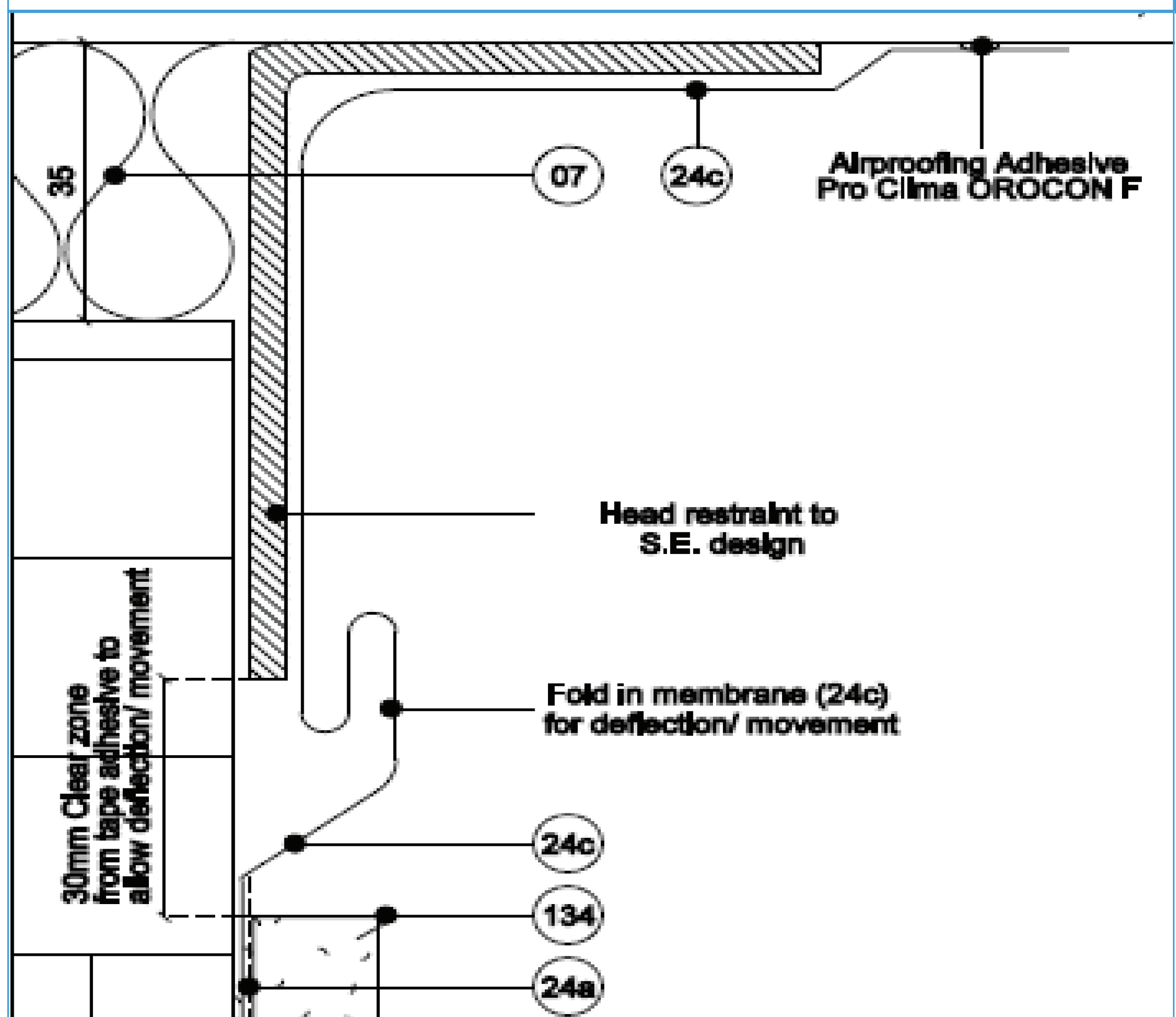


Primary air barrier— Design it with CARE

One Brighton is being built under a design and build contract. The thermal efficiency and airtightness targets of 5 m3/h/m2@50 Pa were set by the developers as part of the extensive sustainability action plan for the site.
The construction is a lean concrete frame , with a single skin infill wall from Thermoplan blocks. These monolithic blocks are extruded with vertical perforations.

Continuous The primary air tightness barrier is provided by the internal parging coat on the Thermoplan blocks.
In addition, the frame and infill blocks are wrapped externally with insulation of compressed interlocking T&G 100mm wood-fibre boards and rendered or clad.
Accessible: Sequencing was changed to ensure that all areas to be parged are accessible—to prevent discontinuity.
Robust: The parged coat gives a robust and long lasting air tightness.
Explicit: The importance of the continuity of this parging layer has been emphasised to site staff and a first test has been completed and reported and a check list compiled of areas that require particular attention.

Leakage where section of external wall within services boxing remains unplastered.



Detail of expansion joint

Complexity

Although CO_2 savings in the frame build have been significant, it has added complexity to the air tightness detailing. This is because the building's maximum frame deflection is increased to up to 25mm which has required 35mm movement joints at the top of the infill wall to allow for this movement. A bespoke tape had to be sourced, wider than standard, to be able stick onto the soffit, over the movement joint and stuck on the blocks.

Leakage where membrane is poorly sealed around cables—use of grommets was recommended

Crack leakage beneath bottom of door frame where membrane seal along base of plaster board is discontinuous.

Measuring, Learning and Improving

The main contractor, Denne, employed NBT Consult (see www.nbtconsult.co.uk) to advise them on detailing for airtightness. A first air tightness test of the show home was completed in July 2008, with encouraging results at just under 2.8 m3/h/m2@50 Pa . An inspection and report was compiled. The construction team had been a little concerned that the target of 5 was already very tough. However, this test allayed their concerns, and the team realised that in fact this target was not only achievable , it could be bettered. They now have the renewed confidence to revise the target downwards, to an average between 1 and 2. Further tests are scheduled for end October 2008.
The report drew attention to several categories of leakage sites:
a) Associated with the membrane system providing the seal between the walls and the concrete slab floor and roof at both low and high level;
b) Around door and window openings, including the boxing-in adjacent to most openings;
c) Around and through the electrical sockets and switches, both on external walls and on party walls to adjacent dwellings;
d) Around pipe penetrations, both vertically and horizontally, where the use of timber pattresses, or similar, was suggested to provide a robust surface against which an effective seal to the pipe penetration can be achieved.
Recommendations:
(1) utilising a more robust membrane system and ensuring that it is fully adhered and properly overlapped at joints, and is mechanically trapped behind plaster(board) or other elements wherever possible;
(2) Ensuring that any foam sealing is cut back and sealed over with mastic to ensure the most effective seal;
(3) Cleaning all surfaces, particularly at low level, to remove dust before mastic or sealant is applied, and ensuring that all mastic joints are tooled in place to give a good finish and the best possible adhesion;
(4) Providing a continuous mastic seal around all window and door frames, including between the slab and the plywood cill, and extending this to include all vertical joints in the boxing in found adjacent to window and door openings. We estimate that Air Permeability values of as low as 1.0 (m3/hr/m2 @ 50 Pa) should be achievable.

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 www.goodhomes.org.uk, 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)
Jon Bootland, Good Homes Alliance (info@goodhomes.org.uk)