

# The airtightness learning curve

Schools present their own unique challenges with respect to airtightness. Tom Gregory, head of Chiltern Dynamics' new Energy Services Department, highlights the key areas to focus on during the approval process



The 'Building Schools for the Future' initiative has meant an increase in the number of schools being built, with pressure on designers to create sustainable buildings which offer first class thermal performance. Further pressure is coming from Building Regulations to reduce carbon emissions by improving heat loss.

Approved Document L2A requires that new school

buildings be pressure tested to determine their air permeability. School buildings with a total useful floor area of less than 500m<sup>2</sup> have the option to avoid testing, but if they do, they must assume a poorer air permeability of 15m<sup>3</sup>/h/m<sup>2</sup>.

In our experience, this has not been a favoured option because it is likely to require over-specification of other aspects, such as insulation, heating or glazing, which affect

**"FURTHER PRESSURE IS COMING FROM BUILDING REGULATIONS TO REDUCE CARBON EMISSIONS BY IMPROVING HEAT LOSS"**

*Test fans installed in entrance to school building (below) and close up of fans in extension (top right).*

the Building Emission Rate calculated by the Simplified Building Energy Model (SBEM) or Standard Assessment Procedure (SAP). Public buildings like schools are intended to set the performance standards for construction, so should not take the 'soft option'. And in the long term, lower air permeability requirements should minimise running costs, so it is wise to aim at a lower target.

Approved Document L2B requires that 'large' extensions to school buildings - ie those greater than 100m<sup>2</sup> and 25% of the total useful floor area of the existing building - must likewise be tested for airtightness.

It should not be difficult to achieve the maximum air permeability requirements of Part L if close attention to detail is paid at the design stage and during construction - and if high quality workmanship is demanded on site. However, where calculated Building Emission Rates require lower air permeability based on SAP or SBEM calculations, more effort may be required to pass. The design air permeability needs to be identified as soon as possible and communicated to all involved in the process.

A relatively high proportion of school construction work is in extensions and refurbishment of existing buildings. Extensions can create complications. If the intention is to treat the air tightness of the extension separately, the connections between the new building and the existing one require careful consideration when designing,



Extensions can create complications



◀ constructing and testing the building:

- Are there connecting doors?
- Are services continuous between the old and new buildings?
- Do they share a roof space?
- Does the new building directly abut the existing building?

Doors can be relatively easily sealed temporarily for testing but other areas are likely to be more difficult.

If the extension is not distinct, the barrier between the buildings needs to be treated with as much care as the external walls, if not more. It can prove more complicated to seal against the external wall of an existing building rather than building a complete new wall. Abutments require careful design consideration to ensure that every connecting detail is not only airtight, but also keeps the weather out and/or meets regulations for fire and

acoustic performance.

If the decision is taken to test the entire building, or all of the new and part of the existing (up to where it can reasonably be separated), be mindful that the existing building is likely to achieve a lower performance.

#### SIZE MATTERS!

It is important to ensure internal surface area has been verified by the accredited test body or by the Building Control Body. The building envelope area has a significant impact on the final air permeability and measurement needs to be accurate.

School buildings tend to include 'unconditioned' (ie not heated or cooled) areas such as plant rooms. Designers, developers and above all the airtightness testing body must be absolutely clear which areas are conditioned and where precisely the lines of the air barrier are drawn. Plant rooms tend to be cooled by

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louvred doors and/or panels and in this case they would be considered to be outside the building envelope, as any air permeating into these areas would readily leak outside. If they are to be ventilated mechanically they could therefore be considered within the conditioned space of the building.

Modular construction is an effective solution for providing additional classroom space. Modular buildings, being primarily constructed under factory conditions, should offer improved levels of airtightness. Part L allows provision for a combined test programme of factory testing and on-site performance. However, in reality, this is not likely to happen. Unit size is restricted by what can be transported and this tends to be less than schools will require. Therefore, units must be assembled on site and it is important that the connection between units is tested for airtightness.

The relatively high



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occupancy levels of school buildings mean a higher proportion of services (water, data, electrical cables, heating/cooling and waste). More services mean more penetrations through the air barrier and therefore more opportunities for air leakage.

Often these services may run 'out of sight' above suspended ceilings, below raised floors or through service ducts. It is areas like this that have to be carefully monitored. Out of sight should not mean 'out of mind' – a 'surface level' inspection may suggest the absence of any air leakage paths, but the crunch will come when poor finishing 'hidden' above suspended ceilings or behind will cause failure.

Largely, measures to address other aspects of the regulations should also help to improve air tightness, for

example, fire sealing for Part B.

However, it is not always safe to assume that achieving one aspect addresses the other, for example, continuity of insulation for Part L. It is commonly assumed that achieving a continuous layer of insulation will also provide an airtight barrier.

Unfortunately, mineral wool is permeable to air and even if packed tightly will not alone provide an airtight barrier.

In some cases, measures to meet the requirements of one regulation may adversely affect airtightness. A good example is a perforated ceiling in a school hall for acoustic performance – this will require additional sealing above because clearly a layer that is full of holes does not provide an effective air barrier.

Finally, the Building Control Body should be presented

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with the air permeability test results. It is important that testing is carried out correctly and accurately. The only way to be sure of this is to insist evidence is provided by a suitably qualified test body, independently accredited by the United Kingdom Accreditation Service (UKAS) and/or, the Air Tightness Testing and Measurement Association (ATTMA). Accreditation verifies the competence of test engineers, accuracy of equipment and appropriateness of test procedures.

A single page certificate from an accredited test body should be sufficient evidence, as that body's accuracy and competence has been independently verified.

For non-accredited bodies, inspection of the full report is likely to be necessary to ensure that the test method, measurements and calculations meet the numerous criteria of the test standard (ATTMA TS1).

For more information on air tightness matters, visit [www.chilterndynamics.co.uk/F AQairtight](http://www.chilterndynamics.co.uk/F AQairtight) or telephone 01494 569812.

- Chiltern Dynamics is running a series of 'Air Tightness Testing Explained' training events on June 6, September 13 and November 13. Cost is £100 + VAT (TRADA members) and £125 + VAT (non-members); group discounts available. Email: [training@chilternfire.co.uk](mailto:training@chilternfire.co.uk)

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