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Achieving Air Tightness on Buildings other than Dwellings

Design & Planning

Factor	What to look out for	Addressed
Know your airtightness performance target	This is found on your SBEM/BRUKL calculation. This will enable you to plan how best to achieve or exceed this target. Bear in mind that the ventilation system (e.g. mechanical ventilation with heat recovery) may also have air tightness targets associated with it.	
Ensure air barrier is defined	The airtightness barrier needs to be designed into the building envelope. Continuity is key and often careful consideration is required as to how different elements of the air barrier are connected so key details should be considered with air tightness in mind. It can be useful to mark up plans and sections with a continuous red line that passes through all the elements that separate heated and unheated spaces. The air barrier typically is made up of existing, impermeable parts of the construction e.g. vapour control layer/membrane, parged/painted/plastered block work, fire-sealed concrete or plasterboard but needs identifying and tracing through the building in 3D to ensure continuity.	
Ensure air barrier materials are impermeable	Check the materials that make up the air barrier impermeable, i.e. a skim of plaster is preferable to taped and jointed plasterboard, but either will give a reasonable level of air tightness across its surface, with the proper attention to detail. However, many materials may be permeable: • Mineral wool (remember that a well-insulated building does not guarantee air tightness) • Block work may be permeable depending on its density (it may need plastering, parging or painting for improved performance). .	
Ensure products that interrupt the air barrier are impermeable	Check that products that make up the air barrier are impermeable. Check with the manufacturers for test evidence and/or technical specifications relating to air tightness for products that interrupt the air barrier e.g. loft/access hatches, vents, doors and windows	

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Ensure air barrier is communicated	Appoint an Air tightness Champion with the responsibility to coordinate between consultants and contractors.
	• Ensure everyone knows where the air barrier is - the main contractor will oversee the construction of the building fabric and must co-ordinate the work of their own staff and sub-contractors to ensure key details are followed.
	• Communication is vital - if plumbers, electricians, etc. are not aware of the air barrier, they cannot maintain it.
	• Timely inspection is also important
	• Be mindful of areas that may not be visible at the end of the project e.g. above suspended ceilings, below raised floors, etc
	• In many buildings the air barrier is the internal finish, but there may be complications:
	  ○ Voids and risers for services can act as 'chimneys' if air can enter them and they are not sealed top and bottom
	  ○ Ventilated, unconditioned spaces such as plant rooms, the internal walls of which will need to be treated as if they were external	

Construction

Factor	What to look out for	Addressed
Ensure continuity of the air barrier – junctions between elements	The most significant air leakage paths are likely to be where a small gap is repeated along a length of the building. So detailing, finishing and sealing the junctions between the walls, floors and ceilings/roof that make up the air barrier is critical to achieving air tightness. For example, where the air barrier is: • Dry-lining - if the plasterboard is 'dot and dab' and there are likely to be gaps in the ribbon of adhesive/plaster along the edges of the board, air can move up behind the plasterboard and potentially find a path out. Seal the joint between the ceiling and the external wall and seal the joint between drylining and skirting board. The priority is the external walls but bear in mind that internal walls will interrupt the external seal and may allow air to escape into floor voids/roof spaces so, for tighter targets, it is often preferable to seal all walls. Carpets may provide some sealing but will not be as affective as mastic so are unlikely on their own to be sufficient to achieve tighter targets. • Block work – parge, paint or plaster where possible, fire seal if appropriate • Membranes - run a layer of double-sided tape between the membranes at the overlap and run tape over the leading edge of the outer sheet.	

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	Ensure that laps are positioned over a supporting area e.g. studs that can be battened for added security. Special wind and airtight membranes are available complete with adhesives, adhesive tapes and service penetration seals	
Ensure continuity of the air barrier – services .	Seal holes around services passing through the external wall and through suspended timber floors: • Plumbing – heating, water and waste pipes may allow air to leak around them if not tightly sealed. Where the pipes run into boxing that leads into unconditioned spaces (such as the loft) a significant air path may be created through the building. • Electrical fittings/Comms – sockets and light switches are unlikely individually, to contribute a great deal to air leakage, but in combination their impact can add up so it is important to emphasise the importance of good workmanship behind them, especially on external/party walls. Seal holes around light fittings and pull cords in the ceiling. If the light fitting is not airtight then install an airtight box over the light fitting in the ceiling void. Choose airtight light fittings • Downlighters in ceilings below unventilated space such as lofts and floor voids can also present a problem, as can other electrical fittings and cables e.g. the consumer unit. • Ventilation – although the grilles of mechanical ventilation, extraction, air supply/exchange and air conditioning can be sealed during testing, it is important to ensure that they are well fitted and that where they run through voids or risers, air does not leak around them into these spaces and then find a path outside or into plant rooms at their termination. • Ensure fire sealing has been completed and provides an air tight seal as well as fire seal e.g. many fire seals are intumescent and will only fully seal in the case of fire.	
Ensure continuity of the air barrier – openings .	Poorly fitted and/or sealed openings in the air barrier can undermine other efforts to achieve continuity: • Roller shutters/panel doors – roller shutters will leak so are not appropriate on smaller buildings that need to achieve good levels of air tightness. Panel doors with rubber seals perform better but ensure the seals make continuous contact with the floor and surround. • Pedestrian doors and windows – good quality products, professionally installed should perform well, but poor/defective products that do not close sufficiently to compress the seals will leak. Ironmongery should be specified, fitted and adjusted to ensure seals are compressed. When installing a window/door frame, ensure that the gaps around the frame	

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	are sealed. Gunned in compatible sealant is suitable for small joints, not forgetting joint cleaning and priming to ensure a good bond. Where the openings are larger, use a pre-compressed flexible expanding foam strip. If using an airtight membrane, ensure it meets and overlaps the seal to maintain the airtight layer overall. Do not use foaming gap-filling adhesives, they shrink and break the seal after the tests are complete. Use compatible gunned in sealant to seal joints between door/window frames and the surrounding wall externally. Internally, apply sealant to gaps between the wall reveals/window boards and the window/door units. Thresholds should be fitted and sealed around • Trickle vents – the opening part can be sealed for the test but it is still important to check that they create a good seal with the frame and are not damaged/distorted/dirty. • Access panels/loft hatches – ensure panels are well-fitted and sealed around the frame. Ideally the panel would have a draught strip. If there are doors into ventilated eaves spaces, these should be treated like access panels (they are generally a bad idea when targeting tighter levels of performance)	

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Testing

Pre-test Preparation Checklist for Air Tightness Testing of Buildings other than Dwellings

Site Name:			
Our reference:		**Test Date:**	

Item	Considerations	Date/Initial
1) Design	Is the air barrier impermeable, continuous and defined? Has it cleared been communicated to the site team? *See Guidance Above* *ALT can conduct design reviews, where required.*	
2) Construction	Is the air barrier known by all that need to know? Has someone checked everything has been done correctly at a time when it can be seen and addressed? *See Guidance Above* *ALT can conduct site inspections, where required.*	
3) Testing		
a. Book the test	Is the air barrier complete? *See Guidance Above* Testing typically occurs in the last days/weeks of the project to achieve the best result. If a completion/handover date can be provided well in advance then ALT can contact site to confirm a test date closer to the time. Otherwise it is best to allow 2 weeks' notice to ensure a specific test date and 1 weeks' notice to re-arrange a test date. The test shouldn't be completed until all penetrations have been made in the building envelope. It is best to wait as late as you reasonably can – most failures are the result of work not being completed.	
b. Provide drawings	To allow ALT to accurately calculate the total area of the internal surface area of the external walls, ground floor and structural ceiling. *PDF general arrangement floor plans and sections*	
c. Confirm air test result required	Based on Air Permeability allowance in SBEM/BRUKL calculations, in $m^3/(h.m^2)$ at 50Pa	
d. Access	• Access to site to unload test equipment and to units for set up.	

Item	Considerations	Date/Initial
	• Work can continue within the units but access/egress will be restricted during testing, so please advise other trades in advance. • Our blower door fan is designed to fit a door opening of between 700mm x 1300mm and 1100mm x 2400mm, there are no doors within this size range, please inform test engineer in advance of arrival	
e. Power	Mains 240V power within 10m of the fan(s) installation location (if only 110V power available, please inform test engineer in advance of arrival). Each fan requires a separate socket. If generators need to be used, please ensure 4kVa is allowed for each fan, check this with your test engineer in advance of their arrival.	
f. Pre-test preparation	Mechanical ventilation and air conditioning systems turned off and temporarily sealed (e.g. extractor fans, cooker hoods) Large air handling systems may need shuttering off, please consult with your M&E consultant about the best way of closing off these systems	
	Background trickle ventilators, passive ventilation systems and permanently open uncontrolled natural ventilation openings should be sealed (e.g. air bricks and chimney/burner flues)	
	All internal doors within the 'conditioned' (heated/cooled) spaces wedged open	
	External doors, windows and loft hatches should be closed but not sealed (including thresholds)	
	External doors and windows in adjacent units/communal areas should be open	
	Drainage traps contain water (other services should be permanently sealed)	

Contact Details

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