Specification for achieving an airtightness (n50) below 0.6 air changes (≤0.6 AC/hr @ 50 Pa) by the application of a liquid-applied airtight coating.

The Blowerproof® airtight coating is to be applied on the outside of the inner masonry leaf, directly inside the insulation layer. The masonry may be block, brick, concrete or other masonry material. The insulation layer is fixed to the masonry by mechanical means, or by a glue system, or even both, however this fixing system must be compatible with the airtight coating.

The application of this outside airtight screen will create an effective air, vapour and radon barrier, reducing heat loss, minimising interstitial condensation and alleviating a variety of health risks resulting from the inhalation of dangerous substances carried by infiltrating air.

A. General provisions

a. Expressing and measuring airtightness indicators

For Passivhaus certification, immediately prior to handover a building must generally achieve an airtightness of ≤0.6 AC/hr @ 50 Pa for newbuild properties and ≤1.0 AC/hr @ 50 Pa for properties refurbished to the EnerPHit standard. Other, less onerous, standards may also be specified e.g. the Passivhaus Low Energy Standard (≤1.0 AC/hr @ 50 Pa for newbuild) or the AECB Building Standard (≤1.5 AC/hr @ 50 Pa). It must be noted that the volume of the building under test must be calculated in conformance with the requirements of the Passivhaus Institute (PHI) – and this can be as much as 25% less than the ATTMA-conforming volume in the UK.

For some large and complex Passivhaus builds, and commonly for UK Building Regulations, the airtightness of a building is expressed in terms of the air permeability, commonly termed the v50 value. This is the airflow per square metre of surface area (the totality of floor, walls & roof), expressed in $m^3/hr/m^2$, again at an imposed pressure differential of 50 Pa. The ratio between the air permeability and the air change rate for a particular building will depend upon the building's size and built form.

For Passivhaus and AECB acceptance airtightness testing the result quoted must be an average of pressurisation and depressurisation testing. For Passivhaus and AECB preliminary airtightness testing, and for general UK Building Regulations airtightness testing, testing in a single direction is usually sufficiently, commonly depressurisation testing (since this facilitates identifying leakage within the building).

Testing carried out in the UK is primarily regulated by ATTMA, the Air Tightness Testing and Measuring Association. For further information go to www.bcta.group/attma. Testing shall be in conformance with TSL1(2016) for dwellings, TSL2 (2010) for non-dwellings and TSL4 (2018) for Passivhaus and low-energy buildings. Note that these standards are currently being revised and new editions are expected to be issued later this year.

The results of the acceptance airtightness testing, with all required supporting information as detailed in the relevant ATTMA standards, should be entered on the ATTMA on-line lodgement system, and will be handed over to the construction management/client. But they must also be made available to any stakeholder in the project upon request, as stated in ATTMA TSL1 Section 3.1.1.

Preliminary or interim airtightness testing, possibly of sub-sections of the whole building, will be carried once the building (or parts thereover) has reached the wind and watertight stage. This will generally be after specific airtightness works (see below) have been carried out and will provide an indicative airtightness assessment on the building under construction. In doing so, provisional v50 and n50 values will be established. The testing shall be carried out by an accredited independent airtightness specialist. This preliminary measurement must be accompanied by a detailed report describing and identifying the location of any significant air leakage issues identified.

The airtightness specialist may then work with the architect, contractor or client as necessary to determine whether any additional airtightness works are required in order to reach the target airtightness standard.

b. General points of note for achieving airtightness.

The Blowerproof® air barrier plane must be positioned relative to the various elements of the building envelope. This is considered to be the loss surface area according to the Energy certificate for the building.

In this case the air barrier plane is formed by the Blowerproof® liquid-applied airtight paint on the outside of the building's inner leaf.

To achieve the required airtightness, the Blowerproof® air barrier plane must be complete around the whole of the building, and particular care and attention must be paid to the following elements of the building (non-exhaustive list):

ii. All interfaces between walls and other elements, such as floor/wall joints and wall/ceiling joints
iii. To include interfaces between walls or roofs and the doors, windows and rooflights which penetrate the envelope as applicable. Care must be taken with all external joinery, including specific attention on the reveal edges of the windows and doors, the adjustment of the joinery and the provision of sills on the entry doors
iv. All penetrations for pipes, ducts or cables that pass through the building envelope or insulation shell (vapour barrier)
v. All other building envelope elements, seams, cracks and crevices, etc. that cause a reduction in airtightness.

These elements are described in more detail in specific implementation guidelines for airtightness (see below).

Generally speaking, products for achieving airtightness must always be applied as follows:

i. On the warm side of the insulation, as tight as possible against the warm side. Convection currents between the airtightness layer and the adjoining masonry or insulation elements will exacerbate heat loss and must be avoided. In the case of an airtight layer sprayed or painted onto the outside of a masonry, often loadbearing, inner leaf, it will be placed directly under the insulation of that wall.
ii. All elements of an airtightness layer must be completely filled, bonded, glued or sprayed to connect with other adjoining airtight elements over a contact width of at least 5 cm

B. Specific guidelines for achieving the required airtightness.

a. Materials to be used

The degree of airtightness described above is readily achieved by installing Blowerproof® liquid-applied airtight coating to the outside of the inner masonry leaf (directly underneath the insulation layer). The liquid-applied airtight coating is applied evenly to the surface, once any holes or gaps > 5mm in diameter or width have been filled. The liquid-applied airtight coating is spray applied using an airless paint spraying system or may be roller applied. This will ultimately depend upon the nature of the surface to which the airtight paint is being applied. On more porous blockwork an initial coat may be spray applied and a second coat roller applied to be worked into all the gaps.

In locations where airtight surfaces intersect, additional work is always required in order to make these transitional areas airtight. This can be achieved by using a thixotropic fibre-reinforced variant of the coating mentioned above - Blowerproof® Liquid Brush. This coating needs to be applied using a flat paintbrush (one suitable for acrylic paints) and then allow it to dry to form an airtight, flexible membrane that also acts as a vapour barrier.

All Blowerproof® airtightness sprayed coatings, be it, the basic version, as well as the Thixotropic version carry the BBA certificate.

Both of the membrane variants mentioned above have the following properties:

µ-value and Sd-value:

- Liquid spray version: Total coating thickness to be applied: 0.75 to 1 kg per m². This results in a coating thickness (wet) of 625 to 830 microns and an Sd-value of 20 to 30 metres.
- Thixotropic brush version (Brush): Total coating thickness to be applied: 0.75 to 1 kg per m². This results in a coating thickness (wet) of 750 to 1000 microns and an Sd-value of 15 to 20 metres.

The application thickness needs to be measured afterwards when still wet with a thickness gauge.
The Sd or µd-value is calculated as follows: µ x membrane thickness (in metres).
µ = vapour diffusion resistance factor.
µ-value: this needs to be demonstrated via a test report by an accredited architectural laboratory according to current British standards for airtightness.

Flexibility

To accommodate possible movement, it must be possible to demonstrate sufficient elasticity in the airtight membrane based on an independent test report from an accredited architectural laboratory according to current British standards for airtightness.
Minimum required elasticity:

- airless sprayed version: 200%.
- brushable version: 120%.

Adhesion

Sufficient adhesion of the airtight membrane to the project-specific substrates needs to be demonstrated independent test reports from an accredited architectural laboratory according to standard ISO 4624(2002):
Minimum requirement: adhesion value: > 1 N per mm² or > 20% partial break in the substrate (tensile test).
Sufficient adhesion after ageing, according to the minimum requirement mentioned above, must also be shown through a similar test report (standard: ISO 4624(2002)).
Sufficient adhesion, according to the minimum requirement mentioned above, on the specific substrate that is damp (touch-dry) on application – if applicable for the specific project – must also be shown through a similar test report (standard: ISO 4624(2002)). This is important in the event of any water or damp problems during the construction phase. It must be possible to apply the airtight membrane to the following substrates: aerated concrete, concrete block, concrete, breeze block, metal, OSB, plywood, solid wood, EPDM, roofing, insulation sheets (PUR, rockwool, XPS, wood wool, glass wool).

Fire resistance:

Minimum fire class C

VOC (Volatile Organic Components) SHARE

An independent report – type M1 – must be submitted demonstrating that the airtight membrane does not contain any VOCs, tar, bitumen or other harmful substances. This to be based on a healthy internal climate within the building.

Adhesion strength of the plaster coat on the airtight coating

Sufficient adhesion of the finishing plaster on the airtight membrane must be demonstrated based on independent test reports from an accredited architectural laboratory, according to standard ISO 4624(2002): Minimum requirement: adhesion value: > 30% partial break in the plaster (tensile test). Sufficient adhesion after ageing, according to the minimum requirement mentioned above, must also be shown through a similar test report (standard: ISO 4624(2002)). Application of the plaster coating on the airtight membrane must always be after the application of an adhesive layer between the membrane and the plaster (plaster primer).

When gluing on to the airtight membrane:

Sufficient adhesion of the adhesive used (state the type of adhesive used) on the airtight membrane must be demonstrated based on independent test reports from an accredited architectural laboratory, according to standard ISO 4624(2002): Minimum requirement: adhesion value: > 30% partial break in the plaster (tensile test). Sufficient adhesion after ageing, according to the minimum requirement mentioned above, must also be shown through a similar test report (standard: ISO 4624(2002)).

Test reports can be viewed at http://www.blowerproof.co.uk/technical-data/

b. Surfaces to be treated:

Making wall and entire surfaces airtight

In order to achieve the required level of airtightness, to prevent heat losses via air leaks and internal damage to the building cased by condensation, the walls must be described in the measurement data under heading (XXXX) and indicated on the plans under (YYYY) and made totally airtight by way of a seamless airtight membrane that can be plastered or glued, sprayed or brushed.

Substrate temperature MUST be greater than 5°C

Preparatory works

- Make the substrate dust-free and remove any loose particles, application on a damp (touch-dry) substrate is not a problem.
- Cavities (caused for example by drilling holes) must be sealed using Blowerproof® Rapid Setting Non Shrink Gap Filling Mortar or a self-expanding mono-component polyurethane foam (which after hardening is trimmed off with the substrate).
- If when adding edging/ribbon joints are not sufficient pointed (apertures > 5 mm), these can be sealed using Blowerproof® Rapid Setting Non Shrink Gap Filling Mortar or a self-expanding mono-component polyurethane foam.
- For slots and technical cables connecting creating larger (>5 mm) cavities a mortar bridge needs to be laid. Use Blowerproof® Rapid Setting Non Shrink Gap Filling Mortar.

All preparatory works (see above) must be carried out in full.

- The brush version of the coating is applied to the joints/openings between 2 and 5 mm in the substrate.
- The liquid version of the coating is applied with a 1K airless paint sprayer or roller.
- Application in two coats: an initial undercoat is applied; after < 15 minutes the topcoat can be applied that give full cover.
- Liquid spray version: Total coating thickness to be applied: 0.75 to 1 kg per m². This results in in a coating thickness (wet) of 625 to 830 microns and an Sd-value of 20 to 30 metres.
- Clean the airless sprayer or roller with water.

Drying time

- When it has dried fully to an airtight membrane, a further topcoat is applied. The drying time depends on the weather conditions, but in general takes up to 24 hours, drying times are weather dependent so may be shorter in dry warm weather and longer in damp cold conditions.
- Any contact with rain/water/water-based products/other products and liquids should be avoided while the airtight coating applied is drying.

----------ENDS----------