**Specification information for obtaining an airtightness (n50) of 0.6 air volume changes per hour for a building through the application of an outside airtight coating**

The goal of this description is to explain the application of an airtight coating system, to be applied on the outside of the insulated envelope walls.

The coating is to be applied on the outside of the silicate, concrete, or brick wall, but directly underneath the insulation layer of this part of the building envelope.

The insulation layer is fixed to this envelope wall by means of a mechanical fixing, or by a glue system, compatible with the airtight coating.

The application of this outside airtight screen will create an effective air, vapour and radon barrier, preventing energy losses, condensation of water vapour, and health risks by inhaling dangerous substances carried along with the infiltrating air.

1. **General provisions**
   1. **Expressing and measuring airtightness indicators**

The airtightness indicator (n50 value) of the structure at the time the building is handed over must be lower than 0.6 air volume changes per hour. If this is the case, an energy score for the building of A++ will be achieved.

The corresponding v50 value for this is: 0.6m³ per hm²

These values always need to be expressed with an overpressure and underpressure of 50 Pascal in relation to the outside environment.

This airtightness must be demonstrated by a pressurisation test included in the contract, based on the requirements of current British standards for airtightness and in line with the various additional regional and/or federal specifications so that the measurement results can be included in the Energy performance certificate for the building. The measurement results will be handed over to the construction management/client.

In the interim, once the building has reached the wind and watertight stage and after the specific airtightness works (see below) have been carried out, an indicative airtightness measurement needs to be carried out (known as the B-test) on the building under construction.

In doing so, provisional v50 and n50 values will be established. The measurements must be carried out by an accredited independent airtightness expert.

This indicative measurement must be accompanied by a detailed report describing and identifying the location of the various existing air leaks.

This report consists mainly of a series of thermographic images (in colour) of the building skin on the inside and/or outside of the building, accompanied by a measurement report stating the v50 and n50 airtightness values.

It is then the responsibility of the airtightness expert, after assessing the indicative measurements, to advise the architect or client as to whether any additional airtightness works are required in order to reach the airtightness standard set.

1. **General points of note for achieving airtightness.**

The airtight screen is placed in relation to the building envelope. This is considered to be the loss surface area according to the Energy certificate for the building.

The airtight screen is in this case achieved outside of the building. Areas of the loss surface that are on the inside of that same building then need to be connected seamlessly to the screen on the outside of the building, thus preventing air losses, and reducing hygrothermal risks.

To achieve the required airtightness, the necessary care and attention must be paid to the following elements of the building (non-exhaustive list):

* + 1. All joints and surfaces on the outer walls, such as floor/wall joints and wall/ceiling joints
    2. All external joinery, including specific attention for the reveal edges of the windows and doors, the adjustment of the joinery and the provision of sills on the entry doors
    3. All holes for cables and/or pipe penetrated through the building envelope or insulation shell (vapour barrier)
    4. 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:

1. To the warm side of the insulation, as tightly as possible against this warm side. In order to obtain a certain distance between the warm side of the insulation and the air screen, any form of convection inside this interstitial space must be avoided. In the case of an airtight screen on the outside of the loadbearing wall, it will be placed directly under the insulation of that wall.
2. All airtight screens must be completely filled, bonded, glued or sprayed on to other airtight surfaces over a contact width of at least 5 cm
3. **Specific guidelines for achieving the required airtightness.**
   1. **Materials to be used**

The degree of airtightness described above is achieved to a large extent by installing an evenly (using an airless paint spraying system) sprayed or roller applied airtight coating to the outside of the inner masonry leaf (directly underneath the insulation layer).

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. 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 airtightness sprayed coatings, be it, the basis version, as well as the Thixotropic version will 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: 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 fireclass 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/>

* 1. **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.

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 a self-expanding mono-component polyurethane foam (which after hardening is trimmed off with the substrate) or with a quick-setting cement-based product.
* If when adding edging/ribbon joints are not sufficient pointed (apertures > 5 mm), these can be sealed using a self-expanding mono-component polyurethane foam or a quick-setting cement-based product.
* For slots and technical cables connecting creating larger (>5 mm) cavities a mortar bridge needs to be laid. This can also be done with a self-expanding mono-component polyurethane foam.
* Liquid version of the coating – application with 1K airless sprayer or roller
  + 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 one to three days.
* Any contact with rain/water/water-based products/other products and liquids should be avoided while the airtight coating applied is drying.