Performance Characteristics and Legislation

Xtralite ROOFLIGHTS

Overview

In the previous section we considered the role of rooflights as an important, energy-efficient lighting source. There are no specific regulatory requirements determining lighting levels as such, although guidelines are available for specific applications and building types—for example Building Bulletin 90—*'Lighting Design for Schools'*, discussed earlier. Also, useful information can be found in CIBSE's *Lighting Guide LG10: 1999—'Daylighting and window design.'*

The following aspects are discussed in more detail later in this section. Directly linked to lighting performance is Energy Efficiency, which is the subject of Building Regulations. Similarly, certain aspects of rooflights can influence the Fire Safety of buildings, again controlled by Building Regulations. Although not covered by Building Regulations, Non-Fragility of rooflights is an important consideration for building designers where responsibilities for safety are determined by the Construction (Design and Management)—CDM—Regulations 2007.

As a secondary consideration, rooflights may be required to provide ventilation, perhaps to meet the requirements of Building Regulations Part F. Where ventilation is a **primary** consideration for energy-efficient environmental management or smoke control during fires, refer to the **Smoke & Ventilation Systems** section later in this Guide.

There are a number of other regulations and standards detailing the required performance of rooflights not covered here:

- Wind load suitability is defined by *BS 6399: Part 2:1997—'Code of Practice for Wind Loads.'*
- Support for snow loadings is defined by *BS 6399:Part 3: 1988—'Code of Practice for Imposed Roof Loads.'*
- BS 8217 (formerly CP144-3) advises a minimum 150 mm clearance from the top of the finished roof to the top of the upstand or the underside of a vent module.

In this section, detailed reference is made to the current Building Regulations for England and Wales. In many cases—for example Energy Efficiency—similar principles will apply to the other national regulations guidelines:

- Scottish Building Standards Agency—Domestic and Non-Domestic Handbooks.
- Northern Ireland Government—Technical Booklets.
- Government of Ireland—Technical Guidance Documents.

If you have specific queries about the requirements for rooflights in any of these documents, contact us on **01670 354157** or email **sales@xtralite.co.uk**.

Xtralite ROOFLIGHTS

Explaining Part L

Despite the complex array of building regulations that apply around the British Isles, those related to energy saving and reduction of carbon emissions are becoming more unified. Primarily, this is because they must all conform with the European Directive on the Energy Performance of Buildings—2002/91/EC.

At first sight, the 2006 Building Regulations Approved Document L2A—*'Conservation of Fuel and Power in New Buildings other than Dwellings'*—and other national regulations appear to take a limiting approach to rooflights as less well insulated elements than roofs. Rooflights are limited to 20% of floor area and the area-weighted average U value of all the rooflights must not exceed 2.2 W/m²K, whilst the U value in an array must not exceed 3.3 W/m²K, providing the average U value overall does not exceed 2.2 W/m²K. So, if all the rooflights across a roof are the same, they must all have a U value of 2.2 W/m²K or better.

It is important to remember that the 2.2 W/m²K applies to the average insulation value of the entire rooflight, after allowing for the effects of any glazing bars, kerbs or other thermal bridges. Actual U values for rooflights should be established in accordance with BRE publication BR 443 (2006 Edition) *'Conventions for U value calculations'* which can be particularly difficult unless independent, accredited testing has been carried out. A Rooflight Technical Bulletin is available via the Xtralite website **www.xtralite.co.uk** providing full information on this important topic.

The Directive methodology and Part L will generally be satisfied using certain calculation software such as the Simplified Building Energy Model (SBEM). This creates the target carbon dioxide emissions rate (TER). Once the designer is satisfied that all the input data accurately reflects the proposed building design, a Building Emissions Rate (BER) is created. BER must be equal to or less than TER for compliance to be achieved.

It is important to note that the SBEM software recognises the need for greater use of electric lighting if rooflight area reduces from 20% and calculates an increase in energy demand and carbon emissions—making it more difficult for the building to comply with less rooflights. So, use of 20% rooflights with properly verified low U values combined with good artificial lighting control is an important step towards meeting the required TER. This corresponds with the independent research discussed earlier (in **Designing with Daylight—Maximising Energy Efficiency**) which is being promoted by NARM. Approved Document L2A also recommends that: 'for guidance on daylighting see BS 8206 Part 2 and NARM technical guidance.'

For extensions and refurbishment work, Approved Document L2B provides detailed, complex guidance. If you have a specific query on works to existing buildings, contact us on **01670 354157** or email **sales@xtralite.co.uk**.

Xtralite has developed a comprehensive range of rooflights and other glazed products that not only meet, but exceed the minimum requirements of building regulations.

Fire Safety

Context

Building fire safety rules are set out in the Building Regulations Approved Document B (2006 Edition, updated 2007). Within this, the key aspects affecting rooflights are:

- *'That sufficient provision is made in the design of a building that, in the event of a fire, the occupants can escape to a place of safety by their own efforts.'*

  Therefore it is incumbent on the building designer to ensure that if rooflights form any part of the escape route (in the ceiling above the route or if the route is across a roof featuring rooflights) then the rooflights must meet the appropriate standards. For instance, if a rooflight has acrylic glazing, the acrylic materials could ignite and cause burning droplets to fall on the escape route below.

  The only specification that will satisfy this situation is a rooflight with a 30 minute or one hour fire rating. Glass is the main glazing material to achieve this.

- *'That the internal linings of a building do not support a rapid spread of fire.'*

  Modern rooflights are usually double or triple skinned in thermoplastic or double glazed in glass. The internal skin and the inside faces of the rooflight upstand are internal linings and therefore within the scope of section B2. This states that the internal linings shall inhibit the spread of fire within a building and resist the flame over their surfaces. It also states that *'they shall if ignited have a rate of energy release which does not significantly contribute to the fire'*.

- *'That the structure of the building should not collapse prematurely and should slow the spread of fire through the building and in unseen cavities and voids by providing fire-resisting walls and partitions where necessary.'*

  Correctly made and fitted rooflights do not impact on the structural integrity of a building.

- '*That the spread of fire between buildings be discouraged by spacing them apart sufficiently and by controlling the number, size and performance of the openings on boundaries.'*

  This can be affected by the choice of glazing materials. The building regulations are very clear about applicable restrictions.

- '*That the building be designed in such a way that it aids the emergency services to fight the fire and effect rescue of persons caught inside.'*

There is mixed opinion as to the role of rooflights in aiding the emergency services. One opinion is that the inclusion of polycarbonate in a roof will aid the situation by melting and producing a vent for the escape of hot and toxic fumes from the fire below. Conversely, others argue that the opening of a vent in the roof will feed the fire with oxygen and thus make the situation worse.

It is reassuring to know that the polycarbonates used in Xtralite rooflights give off very low toxicity fumes in a fire and do not produce flaming droplets that could spread a fire to a lower level.

Xtralite does not use acrylic materials due to poor fire ratings and fragility.

Xtralite ROOFLIGHTS

Fire Safety

Personal interpretation enables rooflights to be classified from two different perspectives: either it is an insertion into a roof and therefore clearly a rooflight, or it may be viewed as an integral part of the roof construction. Different requirements cover each opinion. However, the common requirements for each are very similar:

- BS 476 part 7: Test for surface spread of flame.

  This tests the flammability of a material and its ability to spread a fire and so endanger life. Materials are classified class 1, class 2, class 3 or class 4 with class 4 being the worst and class 1 the best.

  All polycarbonate thickness' from 1.5 mm up to 6 mm have either a class 1 or class 1Y rating (dependent on the test date: earlier tests are rated 1, later tests are rated 1Y).

- BS 476 part 6: Test for fire propagation.

  This measures the contribution that the tested material will make to a fire in the event of it burning.

  The material performance is calibrated into sub-indices of i1 and i2. An acceptable result gives an i1 rating of less than 6 and an i2 rating of less than 12.

  All material thickness' from 1.5 mm up to 6 mm have performance results where i1 is less than 6 and i2 is less than 12.

- Class 0

  This gives an overall indication of fire performance and can only be applied to materials that have achieved the appropriate standards. The classification was created as part of the 1985 Building Regulations approved document B but is not part of the British Standard fire testing regime. A material is classified as class 0 if it achieves:

  BS 476 part 7: class 1

  BS 476 part 6: where i1 is less than 6 and i2 is less than 12.

  Although still referred to, the class 0 classification is no longer current.

- TPa

  This classification was developed to allow for anomalies in the test methods described above that do not wholly suit the testing of thermoplastic materials. Any material classified as TPa may be regarded as class 0.

  All polycarbonate materials 3 mm or thicker are classified as TPa according to the building regulations (PVC is also thus classified).

  Multiwall polycarbonates may be classified as TPa if it has BS 476 part 7 class 1 performance.

- TBb

  This includes all polycarbonates that cannot be classified as TPa.

Restrictions

- Rooflight linings

  Class 0 materials can be used without exemption. No area limit.

  TPa materials can be used over any space except protected stairwells. No area limit.

  TPb materials can only be used up to certain maximum areas.

- Roof coverings

  Rooflights, and particularly Xtralite systems, are considered to be roof coverings or part of the roof. Therefore all of the polycarbonate materials used by Xtralite are tested to BS 476 part 3. BS 476 provides a designation for the performance of the assembly with AA, AB and AC being the highest performance and DD the worst. Building regulations regard polycarbonates with a class 1 rating as having an AA designation and thus may be used up to boundaries without restriction.

Xtralite uses only polycarbonate—with TPa and AA ratings—or glass for its rooflights and other glazed products.

Non-fragility

The Health and Safety at Work Act and the Construction (Design and Management) Regulations 2007 both require that worker safety should be addressed within the design of a building. This applies during the construction of the building and, once built, its maintenance, repair and demolition.

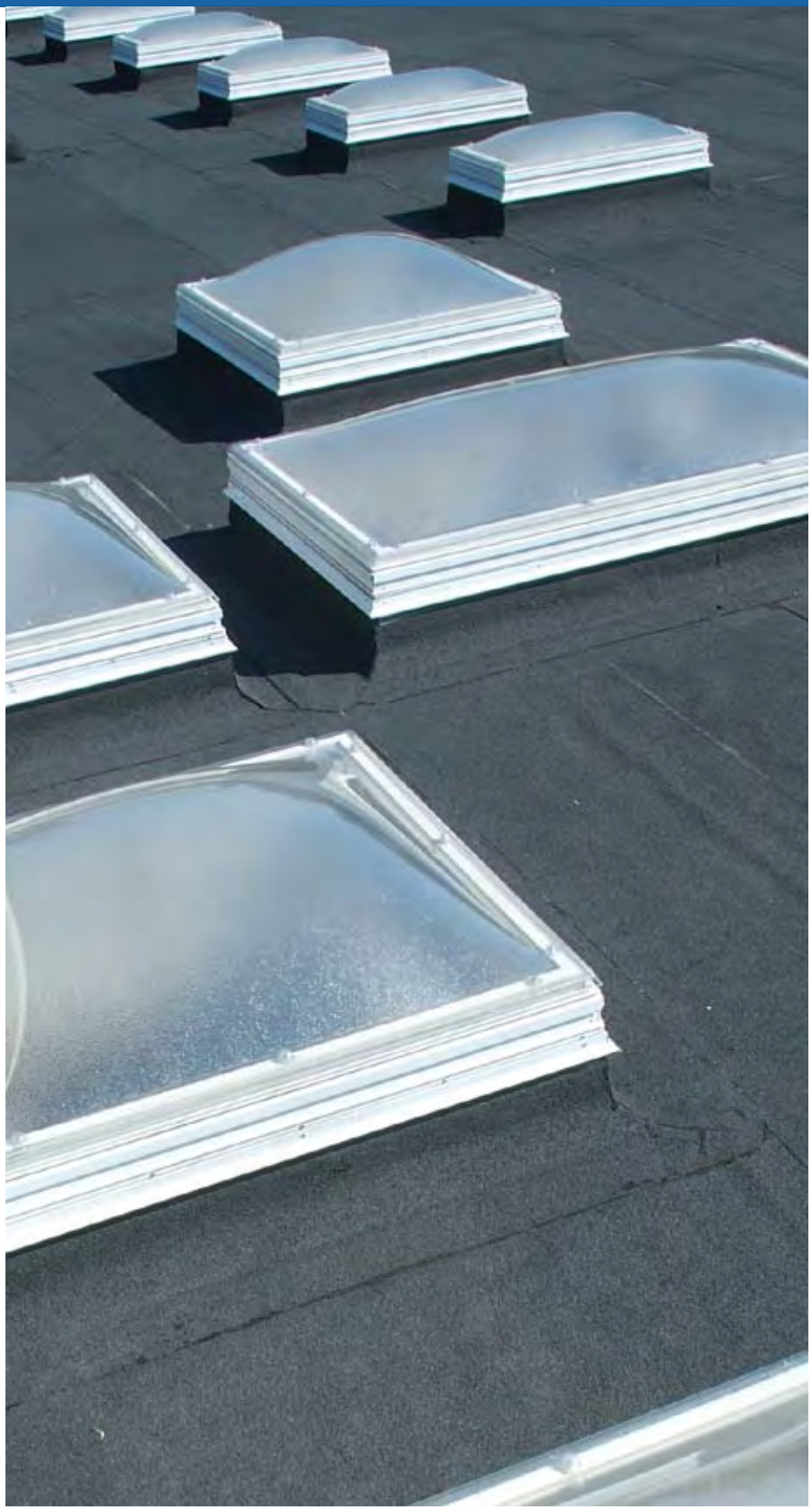
The HSG33 Health and Safety in Roofwork booklet specifically states that:

'Where rooflights are required, it is obligatory for designers to consider:

- Specifying rooflights that are non-fragile.
- Fitting rooflights designed to project above the plane of the roof and which cannot be walked on (these reduce the risk but they should still be capable of withstanding a person falling onto them).

Rooflights, including modular units should be classified to ACR[M]001:2005 *'Test For Non-Fragility of Profiled Sheeted Roofing Assemblies'*, Edition 3—the "Red Book". Consideration to prEN1873 is also required (using 1200 joules energy rating). Barrel vaulting and patent glazing derivatives can be also be classified but will require negotiation with the customer.

Rooflights are not intended for walking on and the fragility criteria relate to accidental access—clearly to be avoided and discouraged. Even non-fragile rooflights are susceptible to damage by impact and are not usually intended to support foot traffic—crawling boards must be used. Micro scratches can affect the thin UV protective layer resulting in deterioration over time, potentially rendering 'non-fragile' rooflights fragile. Therefore, any rooflights which have been impacted should be replaced – which is why it is unrealistic for rooflights to be classified as 'Class A' (i.e. "no signs of significant damage that will affect the long terms strength" following the test).



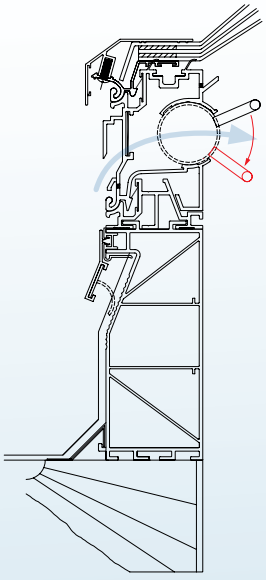
When tested to the Red Book test procedure, all Xtralite modular rooflights have been rated as 'Non-fragile, Class B'. Any technical issues highlighted by non-fragility should be discussed with us.

Xtralite ROOFLIGHTS

Ventilation

This section refers to rooflights which, as a secondary consideration, may be required to provide ventilation, perhaps to meet the requirements of Building Regulations Part F. Where ventilation is a primary consideration for energy efficient environmental management or smoke control during fires, refer to the **Smoke & Ventilation Systems** section later in this Guide.

Rooflights, as well as introducing light to the interior of a building can be used to provide ventilation, extraction of stale and the introduction of fresh air. Xtralite provide a range of differing systems with varying performance levels, see table below.



Rotary vent

A unique rotary action vent controller offers variable ventilation, distinctive internal appearance and smooth, silent operation, and prevents 'in-blown' roof debris and water ingress.

Rotary Ventilation Performance Chart

Rooflight Side Length	Max Number of Vents / Side	Total Area Per Rooflight (2 Sides Vented) cm²
450	1	70
500	1	70
600	1	70
750	1	70
800	1	70
900	1	70
1000	2	140
1100	2	140
1200	2	140
1250	2	140
1350	2	140
1500	3	210
1800	3	210
2000	4	280
2400	4	280

Total area for each rotary vent = 35 cm². Should a greater degree of ventilation be required, vents can be added to the other 2 sides. Obviously, this will double the quoted ventilation areas/rooflight, and will affect the price. Please specify number of vents required.

Xtralite offers a wide choice of product options to achieve the ventilation performance levels shown in the table— see PRODUCT PORTFOLIO section.

Mechanical Ventilation

There are occasions when a more positive form of ventilation, with a known, and quantifiable air exchange performance may be required, under such circumstances a power fan can be fitted to the rooflight unit. There are two ways of achieving this:

- With a power fan unit built into the polycarbonate glazing skins. This option allows either a 150 mm or 225 mm power fan unit to be specified.
- With a smaller fan mounted into the side wall of the kerb. In such an arrangement the kerb will necessarily be higher, to provide the required 150 mm clear upstand height to the base of the fan unit.

The choice of which fan option to use, is entirely at the discretion of the specifier. Such a decision could be based upon performance.

A requirement for an air movement above 230 m^3/h will, by inspection of the table below, dictate a power fan set into the dome. Alternatively, if noise is a consideration, the 225 mm power fan provides the quietest performance.

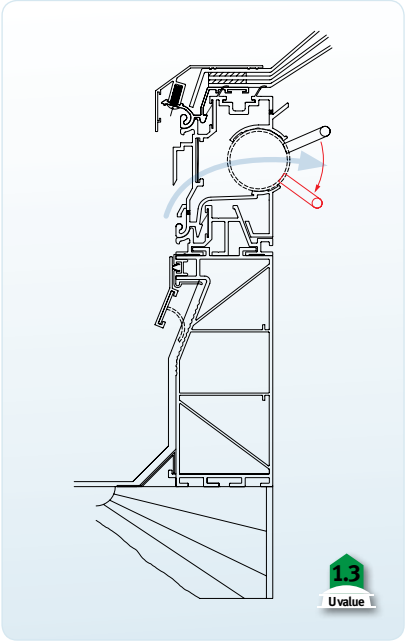
Ventilation Performance Chart

Rooflight Size mm	Permanent cm^2	Hit and Miss cm^2	Controlled Louvre cm^2	Hinged m^2
600 x 600	80	46	240	0.36
750 x 750	80	46	240	0.45
900 x 900	160	92	480	0.54
900 x 600	160	92	480	0.45
1050 x 1050	160	92	480	0.63
1200 x 1200	160	92	480	0.72
1350 x 1350	160	92	480	0.81
1500 x 1500	160	92	480	0.90
1800 x 1800	240	138	720	1.08
1200 x 600	160	92	480	0.54
1200 x 900	160	92	480	0.63
1350 x 900	160	92	480	0.68
1500 x 900	160	92	480	0.72
1500 x 1200	160	92	480	0.81
1800 x 900	320	184	960	0.81
1800 x 1200	320	184	960	0.90
1800 x 1200	320	184	960	0.90
2000 x 1000	320	184	960	0.90
2400 x 1200	320	184	960	1.08

Mechanical Ventilation Performance Chart

Fan Options	Air Displacement Litres/sec	Volume m^3/h	Sound db(A)
150 mm power fan in dome	105	380	49.6
225 mm power fan in dome	194	700	43.6
150 mm side-mounted in kerb	69	248	40.0

Ventilation



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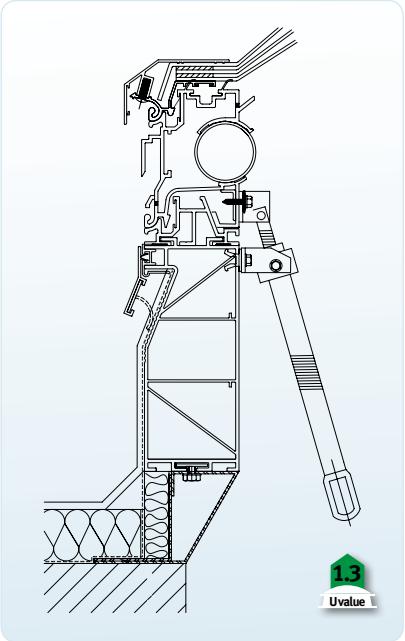
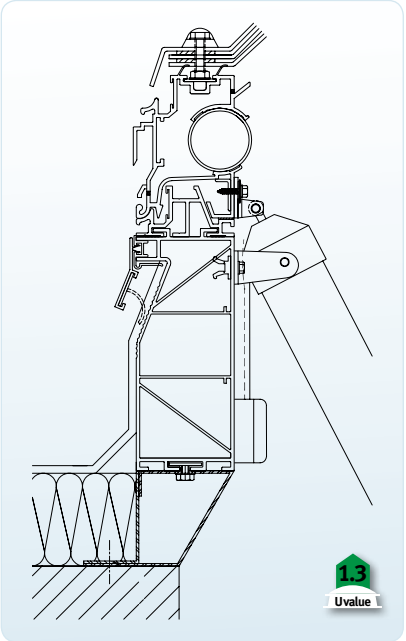


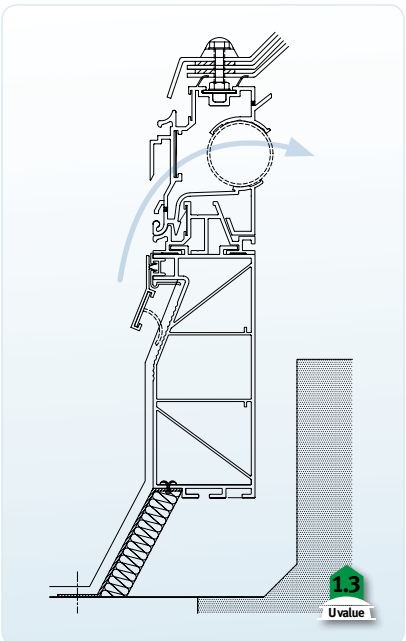
Manual Hinge Vent

The whole rooflight top hinges to allow ventilation through the open vent area.



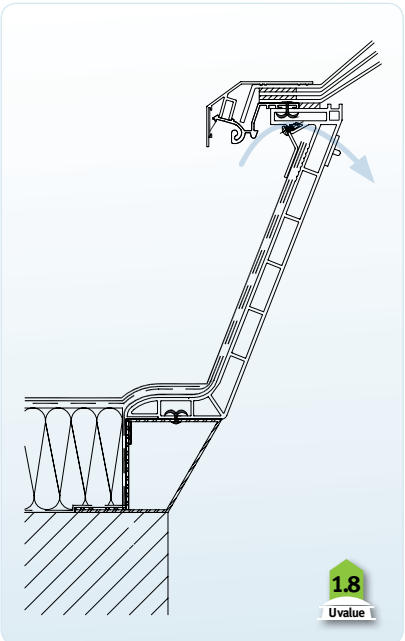
Electrical Hinge Vent

The whole rooflight top hinges to allow ventilation through the open vent area.



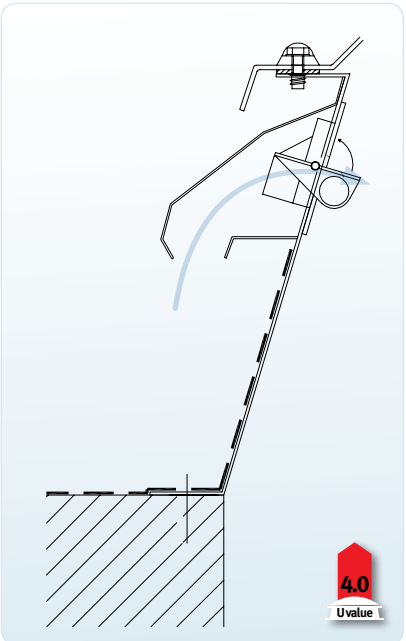
Permanent Vent

As the name suggests, this option is permanently open and shielded from the elements by an external shroud which cannot be tampered with.



Hit and Miss Vent

Low level ventilation for 'background' air change.



Controlled Louvre

Louvre inset into side wall of unit, this can be manually operated to provide anything from 'trickle' to 'full on'.