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Agrément Certificate

06/4385

Product Sheet 3

BRETT MARTIN MARDOME ROOFLIGHTS AND KERBS

MARDOME TRADE ROOFLIGHT

This Agrément Certificate Product Sheet⁽¹⁾ relates to the Mardome Trade Rooflight, for use on flat roofs of new and existing buildings, to provide natural light and ventilation.

(1) Hereinafter referred to as 'Certificate'.

CERTIFICATION INCLUDES:

- factors relating to compliance with Building Regulations where applicable
- factors relating to additional non-regulatory information where applicable
- independently verified technical specification
- assessment criteria and technical investigations
- design considerations
- installation guidance
- regular surveillance of production
- formal three-yearly review.

KEY FACTORS ASSESSED

Light and solar transmittance — the product provides natural lighting to the interior of a building (see section 6).

Thermal properties — for a typical 1.2 by 1.2 m roof opening, a triple-skin product achieved a U value of between 1.9 and 2.2 W·m⁻²·K⁻¹ (depending on the kerb used) when calculated according to BS EN 1873 : 2005 (see section 7).

Condensation risk — the risk of condensation on the product's internal surface will depend on the product selected, the building humidity class and ventilator used (see section 8).

Strength and stability — the product can withstand wind and snow loads likely to be experienced in the UK (see section 9).

Watertightness — the product will provide satisfactory resistance to moisture ingress (see section 10).

Behaviour in relation to fire — the rigid, solid, 3 mm thick polycarbonate sheets can be classified as TP(a) rigid in accordance with national Building Regulations. When classified to BS EN 13501-1 : 2007, the polycarbonate sheets achieved Class B-s1, d0 and can be regarded as having a B_{ROOF}(t4) classification (see section 11).

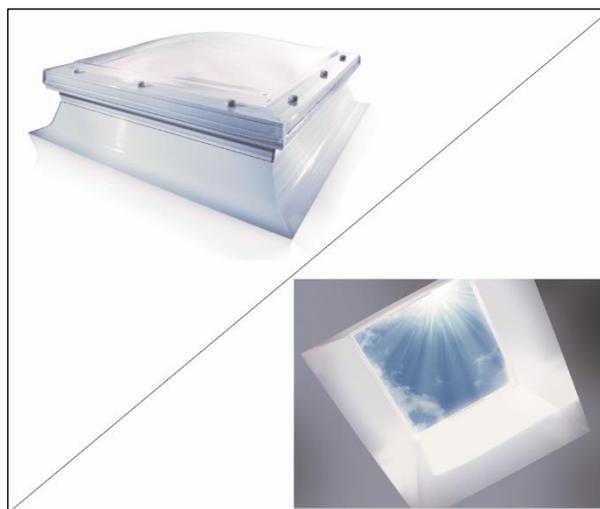
Safety — the rooflight assembly is rated as Class B, non-fragile assembly (see section 12).

Ventilation — opening rooflights can provide rapid ventilation and, when fitted, ventilators can provide background ventilation (see section 13).

Unauthorised access — some rooflights from within the range can contribute to preventing unauthorised access (see section 14).

Acoustic properties — triple-skin polycarbonate rooflights resist the passage of sound generated by falling rainfall (see section 15).

Durability — under normal service conditions, the product will have a life of at least 25 years for the polycarbonate material and 35 years for the PVC-U kerb (see section 18).



The BBA has awarded this Certificate to the company named above for the product described herein. This product has been assessed by the BBA as being fit for its intended use provided it is installed, used and maintained as set out in this Certificate.

On behalf of the British Board of Agrément

Date of Second issue: 18 March 2020

Originally certificated on 29 June 2007

Hardy Giesler
Chief Executive Officer

The BBA is a UKAS accredited certification body – Number 113.

The schedule of the current scope of accreditation for product certification is available in pdf format via the UKAS link on the BBA website at www.bbacerts.co.uk

Readers MUST check the validity and latest issue number of this Agrément Certificate by either referring to the BBA website or contacting the BBA directly.

Any photographs are for illustrative purposes only, do not constitute advice and should not be relied upon.

British Board of Agrément

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Regulations

In the opinion of the BBA, Mardome Trade Rooflight, if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying the relevant requirements of the following Building Regulations (the presence of a UK map indicates that the subject is related to the Building Regulations in the region or regions of the UK depicted):



The Building Regulations 2010 (England and Wales) (as amended)

Requirement: A1	Loading
Comment:	The product can have sufficient strength and stiffness to sustain the design loads. See sections 9.1 to 9.3 of this Certificate.
Requirement: B2(1)	Internal fire spread (linings)
Comment:	The polycarbonate sheets used in the rooflights can be classified as TP(a) rigid material and Class B- s1, d0 to BS EN 13501-1 : 2007, and the use of the product is restricted by this Requirement. See sections 11.1, 11.2, 11.4 and 11.5 of this Certificate.
Requirement: B4(2)	External fire spread
Comment:	The polycarbonate sheets used in the rooflights can be classified as TP(a) rigid material and can be regarded as having a B _{ROOF} (t4) classification to BS EN 13501-5 : 2016, and the use of the rooflights is restricted by this Requirement. See sections 11.1, 11.2, 11.4 and 11.5 of this Certificate.
Requirement: C2(b)	Resistance to moisture
Comment:	The product provides adequate resistance to the ingress of precipitation. See section 10.1 of this Certificate.
Requirement: C2(c)	Resistance to moisture
Comment:	The risk of surface condensation on the product will depend on the building humidity class. Ventilators incorporated in the kerbs will provide airflow to alleviate surface condensation in the rooflights. See section 8.2 of this Certificate.
Requirement: F1	Means of ventilation
Comment:	Opening rooflights and, when fitted, ventilators incorporated in the kerbs, can contribute to satisfying this Requirement. See section 13 of this Certificate.
Requirement: K2(a)	Protection from falling (applicable to England only)
Comment:	Provisions must be made for pedestrian guarding. See section 12.2 of this Certificate.
Requirement: K5.3	Safe opening and closing of windows etc (applicable to England only)
Comment:	Opening rooflights can satisfy this Requirement. See section 12.1 of this Certificate.
Requirement: K5.4	Safe access for cleaning windows etc (applicable to England only)
Comment:	Provisions must be made regarding the safe cleaning of rooflights. See section 12.2 of this Certificate.
Requirement: L1(a)(i)	Conservation of fuel and power
Comment:	The product can contribute to satisfying this Requirement although compensating fabric measures may be required. See sections 6.1 and 7.3 to 7.5 of this Certificate.
Requirement: N3	Safe opening and closing of windows, skylights and ventilators (applicable to Wales only)
Comment:	Opening rooflights can satisfy this Requirement by the use of manual or powered actuators. See section 12.1 of this Certificate.

Requirement:	N4	Safe access for cleaning windows etc (applicable to Wales only)
Comment:		Provisions must be made regarding the safe cleaning of rooflights. See section 12.2 of this Certificate.
Requirement:	Q1	Unauthorised access
Comment:		Non-opening rooflights can satisfy this Requirement for new dwellings. See section 14.2 of this Certificate.
Regulation:	7(1)	Materials and workmanship
Comment:		The product is acceptable when used in accordance with this Certificate. See section 18.1 and the <i>Installation</i> part of this Certificate.
Regulation:	26	CO₂ emission rates for new buildings
Regulation:	26A	Fabric energy efficiency rates for new dwellings (applicable to England only)
Regulation:	26A	Primary energy consumption rates for new buildings (applicable to Wales only)
Regulation:	26B	Fabric performance values for new dwellings (applicable to Wales only)
Comment:		The product can contribute to satisfying these Regulations when appropriate compensating fabric and/or service measures are taken. See section 6.1 and 7.3 to 7.5 of this Certificate.



The Building (Scotland) Regulations 2004 (as amended)

Regulation:	8(1)(2)	Durability, workmanship and fitness of materials
Comment:		The product can contribute to a construction satisfying this Regulation. See sections 17 and 18.1 and the <i>Installation</i> part of this Certificate.
Regulation:	9	Building standards applicable to construction
Standard:	1.1(b)	Structure
Comment:		The product can have sufficient strength and stiffness to sustain design loads, with reference to clause 1.1.1 ⁽¹⁾⁽²⁾ of this Standard. See sections 9.1 to 9.3 of this Certificate.
Standard:	2.5	Internal linings
Comment:		The polycarbonate sheets used in the rooflights can be classified as TP(a) rigid material, with reference to clauses 2.5.4 ⁽¹⁾⁽²⁾ and 2.5.6 ⁽¹⁾⁽²⁾ of this Standard, and the rooflights are unrestricted by this Standard. See sections 11.1, 11.3, 11.4 and 11.5 of this Certificate.
Standard:	2.8	Spread from neighbouring buildings
Comment:		The polycarbonate sheets used in the rooflights can be classified as TP(a) rigid material. The external glazing is classified 'low vulnerability' and the rooflights are unrestricted by this Standard, with reference to clauses 2.8.1 ⁽¹⁾⁽²⁾ , 2.C.3 ⁽¹⁾ and 2.F.3 ⁽²⁾ . See sections 11.1, 11.3, 11.4 and 11.5 of this Certificate.
Standard:	3.10	Precipitation
Comment:		The product provides adequate resistance to the ingress of precipitation, with reference to clause 3.10.1 ⁽¹⁾⁽²⁾ of this Standard. See section 10.1 of this Certificate.
Standard:	3.14	Ventilation
Comment:		Opening rooflights and, when fitted, ventilators incorporated in the kerbs, can contribute to satisfying this Standard. Additionally, the rooflights can be opened using manual or powered actuators fitted to the kerbs. See section 13 of this Certificate.
Standard:	3.15	Condensation
Comment:		The risk of surface condensation on the product will depend on the humidity class of the building. When fitted, ventilators incorporated in the kerbs will provide airflow to alleviate surface condensation on the rooflights, with reference to clauses 3.15.1 ⁽¹⁾ and 3.15.4 ⁽¹⁾ of this Standard. See section 8.2 of this Certificate.

Standard: Comment:	3.16	Natural lighting In calculating the contribution of the product to natural lighting, with reference to clauses 3.16.1 ⁽¹⁾ and 3.16.3 ⁽¹⁾ of this Standard, the area of glazing given in Table 1 of this Certificate can be used.
Standard: Comment:	4.8(c)	Danger from accidents The provisions described in clause 4.8.3 ⁽¹⁾⁽²⁾ of this Standard, regarding the safe cleaning of rooflights, must be taken into account. See section 12.2 of this Certificate.
Standard: Comment:	4.8(e)	Danger from accidents When fitted, manual or powered actuators incorporated in the kerbs can satisfy or contribute to satisfying this Standard, with reference to clauses 4.8.5 ⁽¹⁾ and 4.8.6 ⁽²⁾ . See section 12.1 of this Certificate.
Standard: Comment:	4.13	Security Non-opening rooflights can satisfy this Requirement for new and existing dwellings. See section 14.2 of this Certificate.
Standard: Standard: Comment:	6.1(b) 6.2	Carbon dioxide emissions Building insulation envelope The product can contribute to satisfying this Standard when appropriate compensating fabric and/or service measures are taken. See section 6.1 of this Certificate.
Standard: Comment:	7.1(a)(b)	Statement of sustainability The product can contribute to satisfying the relevant requirements of Regulation 9, Standards 1 to 6, and therefore contribute to a construction meeting a bronze level of sustainability as defined in this Standard when appropriate compensating fabric and/or service measures are taken. See section 6.1 of this Certificate.
Regulation: Comment:	12	Building standards applicable to conversions All comments given for the product under Regulation 9, Standards 1 to 6, also apply to this Regulation, with reference to clause 0.12.1 ⁽¹⁾⁽²⁾ and Schedule 6 ⁽¹⁾⁽²⁾ .

(1) Technical Handbook (Domestic).
(2) Technical Handbook (Non-Domestic).



The Building Regulations (Northern Ireland) 2012 (as amended)

Regulation: Comment:	23(a)(b)	Fitness of materials and workmanship The product is acceptable. See section 18.1 and the <i>Installation</i> part of this Certificate.
Regulation: Comment:	28(b)	Resistance to moisture and weather The product will not adversely affect the resistance of the roof to the passage of moisture. See section 10.1 of this Certificate.
Regulation: Comment:	30	Stability The product can have sufficient strength and stiffness to sustain the design loads. See sections 9.1 to 9.3 of this Certificate.
Regulation: Comment:	34	Internal fire spread — Linings The polycarbonate sheets used in the rooflights can be classified as TP(a) rigid material and Class B- s1, d0 to BS EN 13501-1 : 2007, and the use of the rooflights is restricted by this Regulation. See sections 11.1, 11.2, 11.4 and 11.5 of this Certificate.
Regulation: Comment:	36(b)	External fire spread The polycarbonate sheets used in the rooflights can be classified as TP(a) rigid material and the use of the rooflights is restricted by this Regulation. See sections 11.1, 11.2, 11.4 and 11.5 of this Certificate.

Regulation:	39(a)(i)	Conservation measures
Comment:		The product can contribute to satisfying this Regulation. See sections 6.1 and 7.3 to 7.5 of this Certificate.
Regulation:	40(2)	Target carbon dioxide emission rate
Comment:		The product can contribute to satisfying this Regulation when appropriate compensating fabric and/or services measures are taken. See sections 6.1 and 7.3 to 7.5 of this Certificate.
Regulation:	65(1)	Means of ventilation
Comment:		Opening rooflights and, when fitted, ventilators incorporated in the kerbs can contribute to satisfying the requirements of this Regulation. Additionally, the rooflights can be opened using manual or powered actuators fitted to the kerbs. See section 13 of this Certificate.
Regulation:	98	Safe opening and closing of windows, skylights and ventilators
Comment:		Opening rooflights can satisfy this requirement of this Regulation by the use of manual or powered actuators. See section 12.1 of this Certificate.
Regulation:	99	Safe means of access for cleaning glazing
Comment:		Provisions must be made regarding the safe cleaning of rooflights. See section 12.2 of this Certificate.

Construction (Design and Management) Regulations 2015 Construction (Design and Management) Regulations (Northern Ireland) 2016

Information in this Certificate may assist the client, designer (including Principal Designer) and contractor (including Principal Contractor) to address their obligations under these Regulations.

See sections: 3 *Delivery and site handling* (3.3 and 3.6), 5 *Practicability of installation* (5.2), 12 *Safety*, and 16 *Provision of an electrical supply and electrical safety* of this Certificate.

Additional Information

The Electrical Equipment (Safety) Regulations 2016

The Electrical Equipment (Safety) Regulations 2016 implement Directive 2014/35/EU⁽¹⁾ of the European Parliament relating to the making available on the market electrical equipment designed for use within certain voltage limits. The BBA has not assessed the product for compliance with these Regulations.

(1) This Directive repeals and replaces Directive 2006/95/EC which was implemented in the United Kingdom by the *Electrical Equipment (Safety) Regulations 1994* (S.I. 1994/3260). The Electrical Equipment (Safety) Regulations 2016 revoke and replace the 1994 Regulations.

The Electromagnetic Compatibility Regulations 2016

The Electromagnetic Compatibility Regulations 2016 implement Directive 2014/30/EU⁽¹⁾ of the European Parliament relating to electromagnetic compatibility. The BBA has not assessed the systems for compliance with these Regulations.

(1) This Directive repeals and replaces Directive 2004/108/EC of the European Parliament which was implemented in the United Kingdom by the *Electromagnetic Compatibility Regulations 2006*.

CE marking

The Certificate holder has taken the responsibility of CE marking the product in accordance with harmonised European Standard BS EN 1873 : 2005.

1 Description

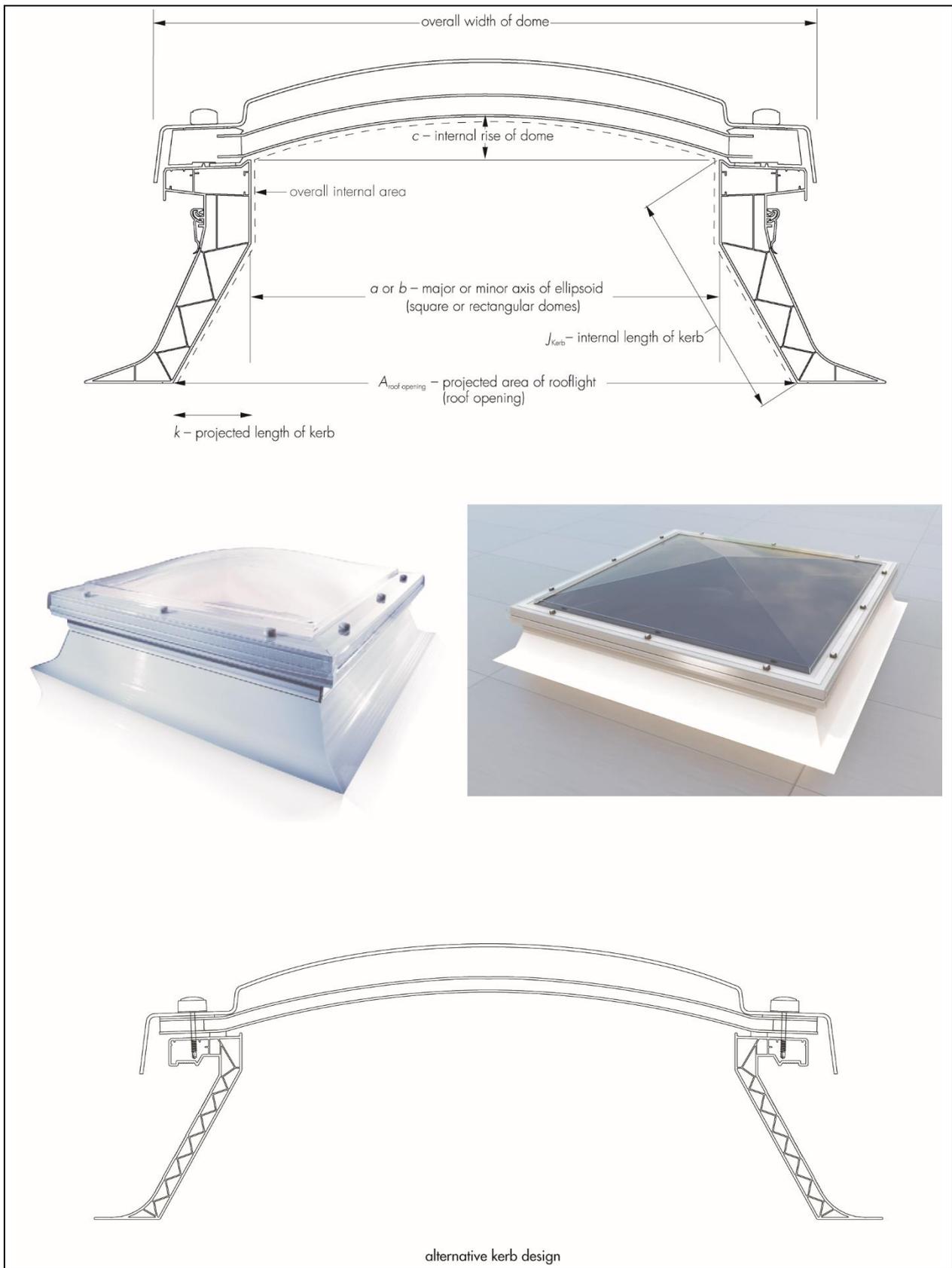
1.1 The Mardome Trade Rooflight is designed and thermoformed from polycarbonate sheets (3 mm minimum thickness), with a co-extruded Marlon FSX UV protection.

1.2 The polycarbonate rooflights have an unplasticised polyvinyl chloride (PVC-U) frame and multi-walled PVC-U kerbs (slimline and standard) and are available as double- or triple-skin, in clear (smooth and textured finish), bronze and opal colours, and are screw fixed onto PVC-U kerbs. The rooflight is available as fixed or opening (see section 1.8).

1.3 The polycarbonate glazing is available in a curved dome or a pyramidal shape and in a range of sizes (listed in Table 1 and shown in Figure 1). Kerb adaptors are available from the Certificate holder when non-standard roof openings exist, in order to provide a suitable fit onto the prepared builder's kerb.

<i>Table 1 Typical sizes and styles of rooflights</i>			
	Dome or pyramid rectangular base (mm)	Daylight opening (mm)	Internal rise (mm)
Square	600 x 600	600 x 600	39
	750 x 750	750 x 750	46
	900 x 900	900 x 900	54
	1050 x 1050	1050 x 1050	62
	1200 x 1200	1200 x 1200	72
	1350 x 1350	1350 x 1350	83
	1500 x 1500	1500 x 1500	93
	1800 x 1800	1800 x 1800	155
Rectangular	600 x 900	600 x 900	39
	600 x 1200	600 x 1200	39
	600 x 1500	600 x 1500	39
	750 x 900	750 x 900	46
	750 x 1050	750 x 1050	46
	900 x 1200	900 x 1200	54
	900 x 1500	900 x 1500	54
	900 x 1800	900 x 1800	54
	1050 x 1350	1050 x 1350	62
	1050 x 1500	1050 x 1500	62
	1200 x 1500	1200 x 1500	72
	1200 x 1800	1200 x 1800	72
	1200 x 2400	1200 x 2400	72

Figure 1 Mardome Trade Rooflight



- 1.4 A foam glazing tape is fitted between the PVC-U kerb and the polycarbonate dome to provide a weatherseal.
- 1.5 75 mm fixing screws are used to fix the kerb to the roof (see section 21.1).
- 1.6 Other sizes within this size range can also be fabricated on request and are covered by this Certificate.

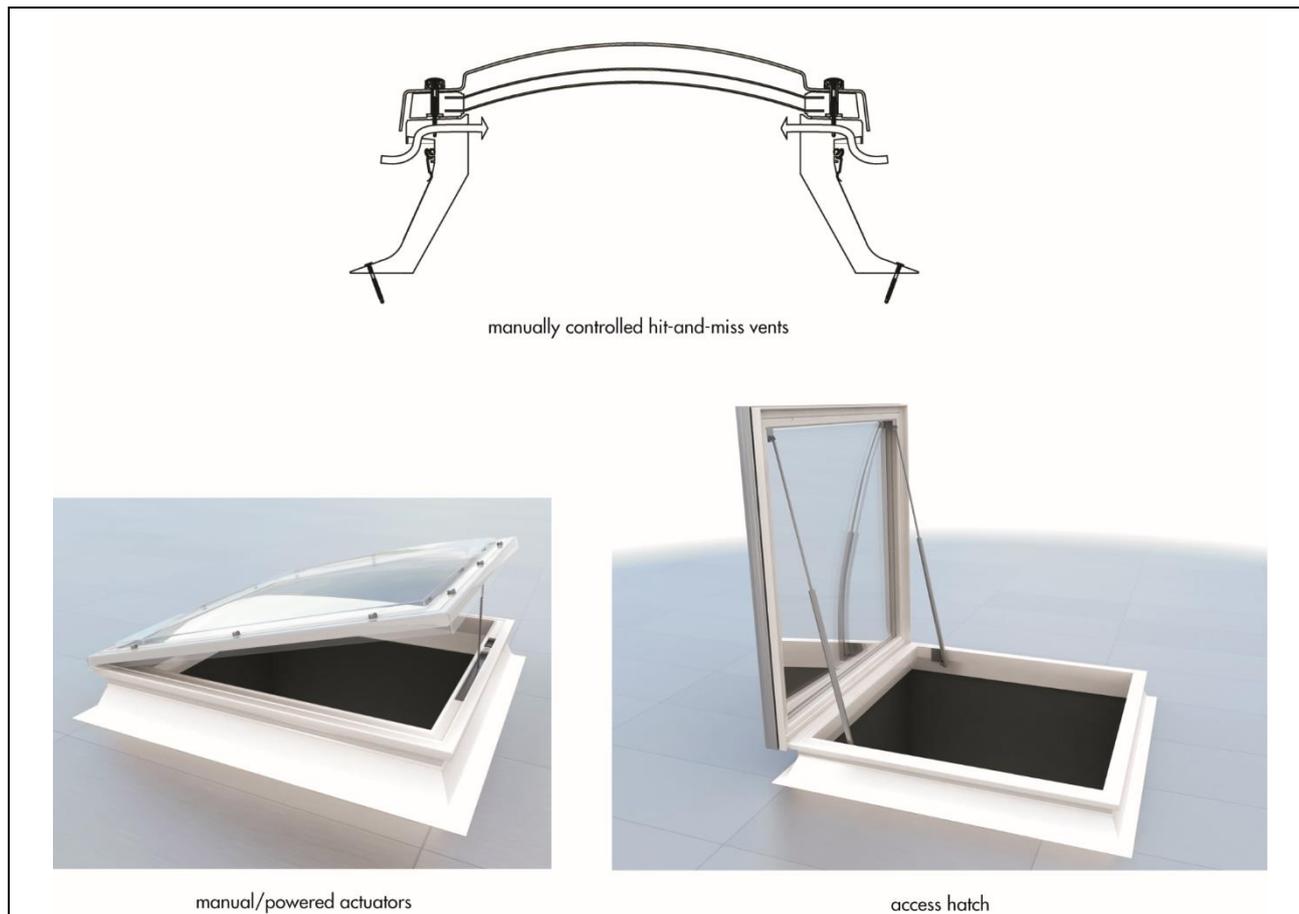
1.7 The product is supplied as a rigid PVC-U kerb and pre-drilled glazing, allowing the installer to screw fix the glazing into the kerb.

1.8 The height of the PVC-U kerb is 216 mm and includes an integral factory fitted clamp which snaps closed to secure the roof covering in place.

1.9 Rooflight kerbs may be unvented or can incorporate vents [either hit-and-miss manually controlled, or automatic humidity controlled⁽¹⁾]. The rooflights can also be opened on concealed hinges using actuators (manual or powered) to create a large ventilation area, or on telescopic stays to provide an access hatch (see Figure 2).

(1) Outside the scope of this Certificate

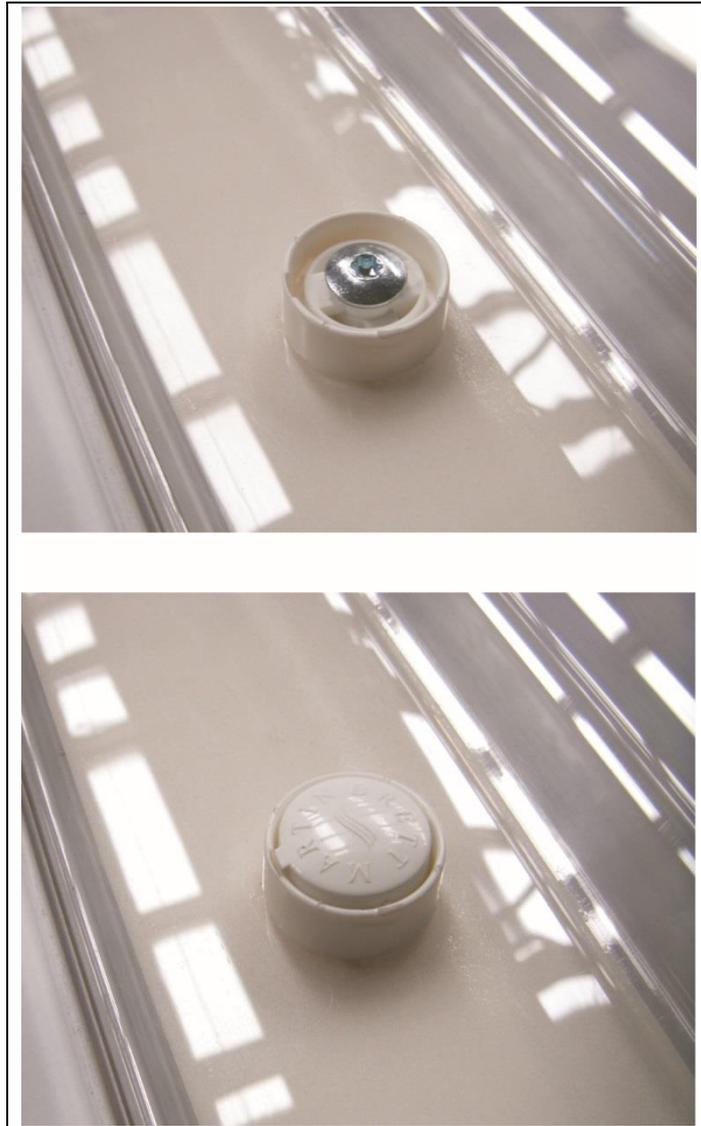
Figure 2 Mardome Trade Rooflight ventilation options



1.10 The product can be supplied complete with factory supplied Mardome Trade PVC-U Kerb, or the dome can be supplied with an adaptor kerb for fitting onto an existing upstand. Vented or opening options are supplied with an adaptor kerb for fitting onto an existing upstand; fixed unvented products will fit directly onto an existing upstand.

1.11 For extra security, the rooflight fixings are concealed within security caps making removal and access extremely difficult (see Figure 3).

Figure 3 Mardome Trade Rooflight security caps



2 Manufacture

2.1 Polycarbonate sheets are vacuum formed to the appropriate size and fitted with glazing tape between the polycarbonate sheets. Opening frames and kerbs are fabricated from white PVC-U profiles produced by conventional extrusion techniques, which are cut and welded together, and hinges and other fittings attached to form the rooflight.

2.2 As part of the assessment and ongoing surveillance of product quality, the BBA has:

- agreed with the manufacturer the quality control procedures and product testing to be undertaken
- assessed and agreed the quality control operated over batches of incoming materials
- monitored the production process and verified that it is in accordance with the documented process
- evaluated the process for management of nonconformities
- checked that equipment has been properly tested and calibrated
- undertaken to carry out the above measures on a regular basis through a surveillance process, to verify that the specifications and quality control operated by the manufacturer are being maintained.

2.3 The management system of Brett Martin Daylight Systems Ltd has been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2015 by SGS (Certificate GB92/1201).

3 Delivery and site handling

3.1 The rooflights and kerbs are delivered to site wrapped in bubble wrap protective sheet, ready assembled or in kit form, ready for installation.

3.2 Each rooflight carries a label bearing the company's mark, the job identification mark and the BBA logo incorporating the number of this Certificate.

3.3 The Certificate holder's recommendations for site handling and installation are provided with each delivery.

3.4 If the rooflights are to be stored on site, they should be stacked on edge with an air gap between each rooflight on a dry, flat, level surface under cover. Multi-skin rooflights must not be nested at any time.

3.5 Before installation, the kerbs should be laid on timber packers placed on a level surface, to avoid damage to finishes and accessories.

3.6 Smaller units may be lifted by hand to roof level but larger units will require lifting by crane. The weight of specific rooflights can be obtained by the Certificate holder.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on the Mardome Trade Rooflight.

Design Considerations

4 General

4.1 The Mardome Trade Rooflight is suitable for use on flat roofs of new and existing buildings (see section 14.2) to provide natural light and ventilation. New roofs should be designed and constructed in accordance with the relevant national Building Regulations.

4.2 The product is suitable for use on most existing roofs but it is important that the roof structure is checked by a suitably competent and experienced individual to ensure that the possible removal of roof-supporting members will not cause any undue weakening of the structure and that it can bear additional loads imposed upon it by the installation of the product.

4.3 The product is suitable as a replacement for existing rooflights. The suitability of existing kerbs must be checked, and replaced if necessary. If the rooflight is to be fitted onto a kerb other⁽¹⁾ than those shown in Figures 1 and 2, an adaptor kerb from the Certificate holder can be used.

(1) Outside the scope of this Certificate.

5 Practicability of installation

5.1 The product is designed to be installed by a competent general builder, or a contractor, experienced with this type of product.

5.2 The provision of a new electrical circuit (and its connection to the supply) must only be carried out by a suitably qualified electrician, in accordance with the requirements of Approved Document P and BS 7671 : 2018. See section 16 and the *Installation* part of this Certificate.

6 Light and solar transmittance



6.1 For design purposes, the approximate light and solar transmission characteristics of new polycarbonate at normal incidence are given in Table 2. These figures, and the daylight opening dimensions given in Table 1, may be used in SAP and SBEM calculations.

Table 2 Light and solar transmittance⁽¹⁾

Polycarbonate finish	Light transmittance ⁽²⁾ (%)		Solar transmittance ⁽³⁾ (g_{\perp})	
	Double-skin	Triple-skin	Double-skin	Triple-skin
Clear	77	68	0.7	0.5
Opal	33	29	(4)	(4)
Bronze	51	45	(4)	(4)
Clear/textured	70	62	(4)	(4)

(1) Values for other skin combinations must be calculated in accordance with BS EN 410 : 2011.

(2) In accordance with BS EN ISO 13468-1 : 2019.

(3) Default values taken from SBEM.

(4) This is to be determined by calculation according to BS EN 410 : 2011.

6.2 The methods outlined in CIBSE Guide A (2006) *Environmental design*, Sections 5.7 and 5.8 and Appendix 5, should be used if the total solar gain of the building incorporating the product present a significant heat input.

7 Thermal properties

7.1 Thermal transmittance (U) values should be derived in accordance with BS EN 1873 : 2014 or NARM NTD 2 : 2014 (amended 2017), or measured in accordance with BS EN ISO 12567-2 : 2005.

7.2 In Scotland, thermal transmittance (U) values should be derived in accordance with BR 443 : 2006, Section 11.1.



7.3 The thermal transmittance value (U value) of a Mardome Trade Rooflight measuring 1.2 m wide by 1.2 m deep, incorporating a PVC-U Mardome Trade non-vented kerb and triple-skin (polycarbonate / polycarbonate/ polycarbonate), when measured by the Guarded Hot Box method according to BS EN ISO 12567-2 : 2005, was $2.4 \text{ W}\cdot\text{m}^{-2}\cdot\text{K}^{-1}$ ⁽¹⁾. This corresponds to a U_a value of $1.6 \text{ W}\cdot\text{m}^{-2}\cdot\text{K}^{-1}$ ⁽²⁾.

(1) Based on the opening in the roof using horizontal heat flow.

(2) Based on internal rooflight surface area.

7.4 Using a calculation method according to BS EN ISO 10077-2 : 2017, the thermal transmittance (U value) of a Mardome Trade triple-skin polycarbonate rooflight measuring 1.2 x 1.2 m is given in Table 3 and is based on internal surface area. The information supplied can be used as input in the Simplified Building Energy Model (SBEM) to calculate the energy used by non-domestic buildings. When required, for example in SAP calculations, the U value associated to the opening area in the roof can be calculated by multiplying the U value given in Table 3 by the surface area ratio.

Table 3 Thermal transmittance (U value)

Size		NARM NTD2 : 2014			BS EN 1873 : 2005		
		$U_{\text{rooflight}}$ ($\text{W}\cdot\text{m}^{-2}\cdot\text{K}^{-1}$)	U_{opening} ($\text{W}\cdot\text{m}^{-2}\cdot\text{K}^{-1}$)	Area of internal surface (m^2)	$U_{\text{rooflight}}$ ($\text{W}\cdot\text{m}^{-2}\cdot\text{K}^{-1}$)	U_{opening} ($\text{W}\cdot\text{m}^{-2}\cdot\text{K}^{-1}$)	Area of internal surface (m^2)
1.2 width (m) x 1.2 length (m)	Trade Double skin	2.7	3.7	2.51	2.5	3.7	2.68
	Trade Triple skin	2.1	2.8		1.9	2.8	
	Slimline kerb Double skin	2.9	4.0	2.46	2.9	4.0	2.46
	Slimline kerb Triple skin	2.2	3.0		2.2	3.0	

7.5 For rooflights with dimensions other than those in section 7.3 and Table 3, the U values can be calculated using the following equations and glazing U values:

Rooflight U value suitable for SBEM input is given by:

$$(1) U_{\text{rooflight}} = \frac{(\phi_{\text{kerb}} l_{\text{kerb}} + U_{\text{glazing}} A_{\text{glazing}} + \phi_{\text{interaction}} \times l_{\text{interaction}})}{A_{\text{internal}}}$$

Opening area U value suitable for SAP input is given by:

$$(2) U_{\text{opening}} = U_{\text{rooflight}} \times S$$

Internal area of the rooflight is given by:

$$(3) A_{\text{internal}} = A_{\text{glazing}} + l_{\text{kerb}} \times J_{\text{kerb}}$$

The surface area ratio of internal and projected areas of the rooflight is given by:

$$(4) S = \frac{A_{\text{internal}}}{A_{\text{roof opening}}}$$

where:

ψ_{kerb}	is the linear thermal transmittance of the kerb (given in Table 5)
l_{kerb}	is the perimeter of the kerb over which the linear thermal transmittance is taken. Calculated to equation (5) for square/rectangular domes or equation (9) for square/rectangular pyramids
U_{glazing}	is the thermal transmittance of the polycarbonate sheets or glass units (given in Table 4)
A_{glazing}	is the internal area of the glazing. Calculated to equation (6) for square/rectangular domes, or equation (10) for square/rectangular pyramids
A_{internal}	is the overall internal area of the rooflight (including kerb, glazing and opening frame)
S	is the surface area ratio between the internal and projected areas of the rooflight
$A_{\text{roof opening}}$	is the projected area of the rooflight. Calculated to equation (7) for square/rectangular domes or equation (11) for square/rectangular pyramids
J_{kerb}	is the internal length of the kerb (given in Table 5).

Table 4 Glazing U values

	Double-skin ($\text{W}\cdot\text{m}^2\cdot\text{K}^{-1}$)	Triple-skin ($\text{W}\cdot\text{m}^2\cdot\text{K}^{-1}$)
Polycarbonate dome	2.68	1.67
Glass	1.1	–

Table 5 Linear thermal transmittance of kerb

Rooflight kerb	Glazing option	Height (mm)	Linear thermal transmittance, ψ_{kerb} ($\text{W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$)	Linear thermal transmittance, $\psi_{\text{interaction}}$ ($\text{W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$)	Internal length of kerb, j_{kerb} (m)	Projected length of kerb, k (m)
Standard kerb	Double	216	0.496	0.047	0.23	0.08
	Triple		0.496	0.030		
Slimline kerb	Double	172	0.558	0.055	0.19	0.07
	Triple		0.534	0.044		

Dome (square rectangular):

$$(5) l_{\text{kerb}} = 2(a + 2k + b)$$

$$(6) A_{\text{glazing}} = ab - \pi(ab/4) + 2\pi \left[\left\{ \left(\frac{a}{2} \right)^p \left(\frac{b}{2} \right)^p + \left(\frac{a}{2} \right)^p c^p + \left(\frac{b}{2} \right)^p c^p \right\} / 3 \right]^{1/p}$$

$$(7) A_{\text{roof opening}} = ab + 2k(a+b) + 4k^2$$

$$(8) L_{\text{interaction}} = 2(a+b)$$

Pyramid (square and rectangular base):

$$(9) l_{\text{kerb}} = 2(a + 2k + b)$$

$$(10) A_{\text{glazing}} = (ab/\cos\upsilon) + 2a [\{(b/2)^2 + (a \tan\upsilon/2)^2 \}^{1/2}$$

$$(11) A_{\text{roof opening}} = ab + 2k(a+b) + 4k^2$$

$$(12) L_{\text{interaction}} = 2(a+b)$$

Where:

- k is the projected length of the kerb (given in Table 5)
- a is the major axis of the ellipsoid (see Table 1 for rooflight ranges)
- b is the minor axis of the ellipsoid (see Table 1 for rooflight ranges)
- c is the internal rise of the dome (see Table 1 for rooflight ranges)
- υ is the nominal angle of pitch in pyramidal rooflights = 15°
- p is a constant = 1.6075
- π is a constant = 3.14159.

Note: for square domes $a = b$

7.6 Rooflight assemblies are permeable to air at the junctions between the rooflight and kerb, particularly where an opening mechanism is present. Air permeability is beneficial for control of condensation but can also have an effect on heat loss and may affect the airtightness of the building envelope.

7.7 Care must be taken in the design and detailing of kerb/roof junctions to minimise excessive heat loss.

8 Condensation risk

8.1 The risk of condensation forming on an internal surface of the rooflight is dependent on its temperature, and the temperature and humidity of the adjacent air. The minimum temperature factor is dependent on the building type, external temperature and external relative humidity for the location, and can be calculated for a particular situation in accordance with BS EN ISO 13788 : 2012. Alternatively, default critical temperature factors for limiting the risk of surface condensation and mould growth values can be obtained from BRE Information Paper IP 1/06.



8.2 Modelling of the rooflights in accordance with BS EN ISO 10211 : 2017 indicates the minimum temperature factors⁽¹⁾ shown in Table 6.

(1) The ratio of temperature drop between the internal rooflight surface and the external environment, and the total temperature drop between internal and external environments.

Table 6 Minimum temperature factors for Mardome Trade Rooflight

Kerb type		Minimum temperature factor
Standard kerb	Double-skin	0.55
	Triple-skin	0.62
Slimline multiwalled kerb	Double-skin	0.47
	Triple-skin	0.53

8.3 Where the temperature factors in Table 6 are less than the calculated or default values for the relevant building type, there is a risk of surface condensation forming. However, limited intermittent condensation, appearing initially on the kerb, frame or glazing, will not be detrimental to the rooflight. By way of comparison, the minimum temperature factors for typical PVC-U windows are between 0.50 and 0.65.

8.4 In all cases, the risk of surface condensation can be reduced by limiting activities which produce large amounts of moisture and providing means for adequate ventilation; in particular, air flow from kerb-mounted ventilators can alleviate localised surface condensation.

9 Strength and stability



9.1 The product can be selected to have adequate resistance to wind loads calculated in accordance with BS EN 1991-1-4 : 2005 and its UK National Annex.

9.2 When tested under laboratory conditions, the rooflights withstood an imposed load of 1125 N·m⁻². The magnitude of the actual snow load imposed will depend upon a number of factors, such as height above sea level, geographical location, roof arrangement, and type and configuration of rooflights. In situations where a load greater than 1125 N·m⁻² can be expected, the Certificate holder can advise on a suitable product for a particular application.

9.3 Resistance to imposed snow and wind loads is dependent on size and configuration of the rooflight. As a guide, small pyramid-shape rooflights are more resistant to imposed loads, whilst large, domed rooflights are the least resistant. The results of tests for an individual rooflight carried out in accordance with BS EN 1873 : 2014 are given in Table 7 of this Certificate.

Table 7 Example resistance to downward and upward loads

Rooflight type	Dimensions (mm)	Downward load (DL) (N·m ⁻²)	Upward load (UL) (N·m ⁻²)
Dome	1200 x 2400	1125 ⁽¹⁾⁽²⁾	1500 ⁽³⁾
Pyramid	1500 x 1500	1750 ⁽¹⁾	3000 ⁽³⁾

(1) Downward load. Snow load was simulated by the use of air pressure.

(2) Buckling occurred at this load, but the shape of the rooflight was restored after the load was removed. Snow load was simulated by the use of air pressure.

(3) Upward load. Wind load was simulated by the use of air pressure.

9.4 Appropriate connections between the kerb and the roof for a particular application must be determined by a suitably competent and experienced individual. Guidance is available from the Certificate holder.

9.5 The polycarbonate rooflight material has a good resistance to impact from hard bodies, such as hailstones, or impacts due to vandalism. Tests on typical rooflight samples showed that an impact energy of 2.5 J did not cause damage when applied at various points of the rooflights.

9.6 The product has adequate resistance to soft body impacts, such as a person accidentally falling against it. The results of soft body impact tests for selected rooflights, carried out in accordance with ACR[M]001 : 2014, are given in Table 8 of this Certificate.

Table 8 Resistance to soft-body impact

Rooflight type	Dimensions (mm)	Classification (non-fragility)
Domed polycarbonate	1200 x 2400	Class B
Pyramid polycarbonate	605 x 605	Class B

10 Watertightness



10.1 When installed in accordance with the Certificate holder's instructions and this Certificate, the rooflights and kerbs will provide adequate resistance to the ingress of moisture.

10.2 Particular attention must be paid to the correct fitting of all components and to the detailing of sealants and roofing materials.

10.3 The installation of vents will affect the air permeability performance. The type of vent specified should take into account the prevailing weather conditions (for example, in locations when driving snow is likely). All vents are closeable.

11 Behaviour in relation to fire



11.1 When classified in accordance with BS EN 13501-1 : 2007 the polycarbonate material achieved a European Class B-s1, d0⁽¹⁾ classification.

(1) Test Report P189635, issue number DE/6 refers, available from the Certificate holder.



11.2 In England, Wales and Northern Ireland, the polycarbonate sheets can be regarded as having a BROOF(t4) classification in accordance with the relevant regulatory guidance and should not be used within 1500 mm of a boundary with a compartment wall.



11.3 In Scotland, the rooflight's external glazing is classified as 'low vulnerability'.



11.4 The rooflight's internal glazing (3 mm) is classified as TP(a) rigid material. For the purposes of classifying the performance of ceiling linings, the frame and kerb need not be considered.

11.5 The rooflights may therefore be used in accordance with the documents supporting the national Building Regulations as follows:

England, Wales and Northern Ireland — the product may not be used over a protected stairway.

Scotland — the product is unrestricted.

11.6 The external rating of the kerb will depend on the performance of the roof weatherproofing system covering it. The performance of individual roof weatherproofing systems is outside the scope of this Certificate.

12 Safety



12.1 Opening rooflights feature manual or powered actuators that can be operated from ground level, allowing the rooflight to be opened for ventilation or as an access hatch (as shown in Figure 2).

12.2 Under no circumstances should anyone venture onto a polycarbonate rooflight. The external surfaces of the rooflight cannot be cleaned from the inside the building. For maintenance and cleaning purposes special precautions must be taken, such as the provision of a catwalk, to allow safe access and to prevent the possibility of falling through the polycarbonate rooflight.

12.3 If the rooflight is located on a roof which is generally accessible to the public, provision must be made to prevent people falling onto the glazed component (eg guard rails). If, as the result of an accidental fall, contact is made with the glazing, the polycarbonate material shows good resistance to impact and the rooflight is rated a Class B non-fragile assembly (see section 9.6).

13 Ventilation



13.1 Opening rooflights can contribute to providing purge (natural) ventilation. This contribution will depend on the daylight area of the rooflight (see Table 1), the accessibility of the actuator and the floor area of the ventilated space.

13.2 If fitted, ventilators installed in pairs on opposite sides of the long edges of kerbs will provide ventilation to the room below the rooflight. The ventilator openings can provide or contribute to providing the background ventilation (trickle ventilation) open area requirements given in the documents supporting the national Building Regulations. Additionally, the rooflights can be opened using manual or powered actuators fitted to the kerbs.

14 Unauthorised access

14.1 The design of the rooflight is such that individual fixings are concealed inside security caps. Removal of these caps to gain access to the fixings is extremely difficult (see Figure 3).



14.2 Non-opening Mardome Trade Rooflights have been tested generally in accordance with PAS 24 : 2016, Annex C, and can contribute to satisfying the regulatory requirements for unauthorised access in new dwellings in England and Wales, and new and existing dwellings in Scotland.

14.3 Polycarbonate rooflights have good resistance to impact, making breakage difficult.

15 Acoustic properties

15 Triple-skin polycarbonate rooflights resist the passage of sound such that when subjected to heavy rainfall at a rate of 38 to 42 mm·h⁻¹ the global area-weighted sound intensity level (L_{IA}) is 62 dB when tested according to BS EN ISO 140-18 : 2006.

16 Provision of an electrical supply and electrical safety

16.1 For electrical safety, the provision of an electrical supply and the connection of the unit to the supply should be carried out by a qualified electrician.

16.2 The product should be connected to a suitable mains electrical supply. The provision of the electrical supply should be in accordance with the IET Wiring Regulations.

16.3 In England and Wales, all installations must satisfy the requirements of The Building Regulations 2010 (England and Wales) (as amended), Part P *Electrical Safety*. Notification should be made to the Local Authority Building Control in advance of installation. As an alternative to this procedure, electrical connections can be carried out by a person registered with a government-approved Competent Persons Scheme (CPS) for electrical work, using materials suitable for the purpose.

16.4 In Scotland, to satisfy the requirements of Mandatory Standard 4.5, with reference to The Building (Scotland) Regulations 2004 (as amended), clause 4.5.1⁽¹⁾, all installations should be designed, constructed and tested in accordance with the requirements of BS 7671 : 2018.

(1) Technical Handbook (Domestic).

17 Maintenance



17.1 If damage occurs, the rooflights can be re-glazed and the fixings replaced, but these operations should be carried out using the materials recommended by the Certificate holder.

17.2 Cleaning of the rooflights should be carried out using water containing non-abrasive, neutral household detergent. To avoid scratching of the surface, only soft cloths should be used when cleaning.

18 Durability



18.1 Under normal service conditions, the polycarbonate material and the PVC-U kerb will have a service life of at least 25 years and 35 years respectively.

18.2 After natural weathering, some slight change in colour of the polycarbonate will occur. However, the change will be even across the sheet and will not significantly decrease properties, although light transmittance haze may be slightly affected.

18.3 Fittings, as described in this Certificate, may need to be replaced within the life of the rooflights, particularly when exposed to corrosive environments, such as coastal or industrial locations.

18.4 The electrical components may need replacing within the overall life of the rooflight.

19 Reuse and recyclability

The product comprises PVC-U and polycarbonate, each of which can be recycled.

Installation

20 General

20.1 Installation of the Mardome Trade Rooflight and kerbs must be carried out in accordance with the Certificate holder's installation instructions and this Certificate.

20.2 Prior to installation of the rooflight, the roof must be checked by a suitably competent and experienced individual to ensure that it can carry the additional loads the installation may impose, and the roof must be strengthened if necessary.

20.3 The rooflight kerb should be checked dimensionally to ensure the fit, and the rooflight should be checked for size before the unit is lifted to the roof.

20.4 A rooflight should never be left in position without ensuring all of its fixings are present and fully tightened.

20.5 Where the roof covering is dressed below the rooflight and on top of an existing upstand, precautions should be taken to prevent bitumen damaging internal finishes.

20.6 Fixings for securing Mardome Trade Kerbs or kerb adaptors onto the roof structure are supplied by the Certificate holder.

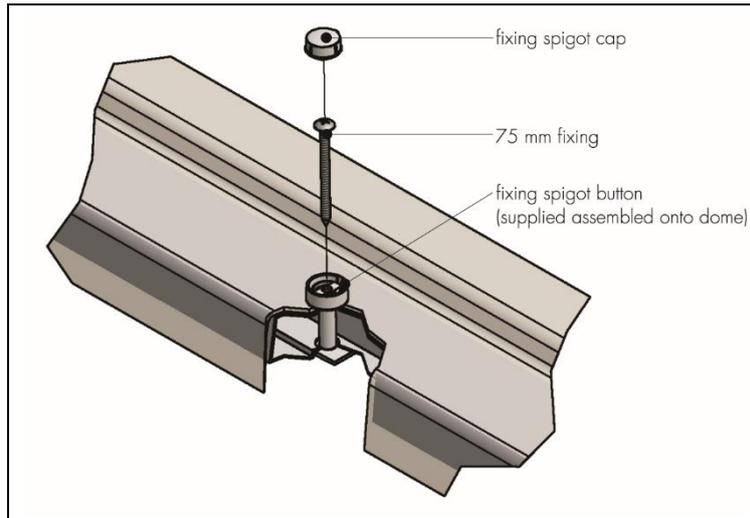
21 Procedure

21.1 The Mardome Trade Kerb is placed over the roof opening and fixed through the foot of the kerb using 75 mm fixings (see Figure 4).

21.2 The roofing membrane is installed as specified in the manufacturer's instructions. For improved weathering, the roof covering cap sheet can be terminated horizontally on the top surface of the kerb. The membrane should be mitred (rather than lapped) on the top surface at the corners to provide a flat surface for the rooflight to seal to.

21.3 The polycarbonate section is placed squarely onto the kerb. The foam washer, fixing button and M6 flat washer are assembled together and the bottom fixing button section placed into the predrilled holes of the dome. The 75 mm fixing is inserted through the assembly and screwed down into the kerb. The fixing button cap is then snapped in place in the top of the fixing button (see Figure 4).

Figure 4 Typical installation detail



Technical Investigations

22 Tests

22.1 Tests were carried out to determine:

- air infiltration
- watertightness
- resistance to upward load
- resistance to downward load
- effect of snow loads
- light transmission and haze
- resistance to intrusion
- endurance of rooflight open/close devices
- effect of impacts
- suitability of materials.

22.2 Tests were carried out on triple-skin polycarbonate rooflights in accordance with BS EN ISO 140-18 : 2006 to determine the rain generated impact sound transmission.

23 Investigations

23.1 The manufacturing process was evaluated, including the methods adopted for quality control, and details were obtained relating to the quality and composition of the materials.

23.2 The thermal performance and temperature factors of glazed rooflights were assessed using thermal simulation.

23.3 An examination was made of existing data in relation to the PVC-U kerb material and performance in fire.

23.4 Components were assessed for resistance to corrosion.

Bibliography

BRE Information Paper IP 1/06 *Assessing the effects of thermal bridging at junctions and around openings*

BRE Report 443 : 2006 *Conventions for U-value calculations*

BS 7671 : 2018 *Requirements for electrical installations — IET Wiring Regulations*

BS EN 410 : 2011 *Glass in building. Determination of luminous and solar characteristics of glazing*

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BS EN 1279-3 : 2018 *Glass in building — Insulating glass units — Long term test method and requirements for gas leakage rate and for gas concentration tolerances*

BS EN 1873 : 2005 *Prefabricated accessories for roofing — Individual roof lights of plastics — Product specification and test methods*

BS EN 1873 : 2014 + A1 : 2016 *Prefabricated accessories for roofing — Individual roof lights of plastics — Product specification and test methods*

BS EN 1991-1-4 : 2005 +A1 : 2010 *Eurocode 1 : Actions on structures — General actions — Wind actions*

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BS EN ISO 9001 : 2015 *Quality management systems — Requirements*

BS EN ISO 10211 : 2017 *Thermal bridges in building construction — Heat flows and surface temperatures — Detailed calculations*

BS EN ISO 10077-2 : 2017 *Thermal performance of windows, doors and shutters — Calculation of thermal transmittance — Numerical method for frames*

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BS EN ISO 13468-1 : 2019 *Plastics — Determination of the total luminous transmittance of transparent materials — Single-beam instrument*

BS EN 13501-1 : 2007 *Fire classification of construction products and building elements — Classification using test data from reaction to fire tests*

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BS EN ISO 13788 : 2012 *Hygrothermal performance of building components and building elements — Internal surface temperature to avoid critical surface humidity and interstitial condensation — Calculation methods*

PAS 24 : 2016 *Enhanced security performance requirements for doorsets and windows in the UK — Doorsets and windows intended to offer a level of security suitable for dwellings and other buildings exposed to comparable risk*

ACR[M]001 : 2005 *Test for Non-Fragility of Profiled Sheeted Roofing Assemblies [third edition]*

NARM Technical Document NTD 2 (2014) (amended 2017) *Assessment of thermal performance of out-of-plane rooflights*

24 Conditions

24.1 This Certificate:

- relates only to the product/system that is named and described on the front page
- is issued only to the company, firm, organisation or person named on the front page – no other company, firm, organisation or person may hold or claim that this Certificate has been issued to them
- is valid only within the UK
- has to be read, considered and used as a whole document – it may be misleading and will be incomplete to be selective
- is copyright of the BBA
- is subject to English Law.

24.2 Publications, documents, specifications, legislation, regulations, standards and the like referenced in this Certificate are those that were current and/or deemed relevant by the BBA at the date of issue or reissue of this Certificate.

24.3 This Certificate will remain valid for an unlimited period provided that the product/system and its manufacture and/or fabrication, including all related and relevant parts and processes thereof:

- are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA
- continue to be checked as and when deemed appropriate by the BBA under arrangements that it will determine
- are reviewed by the BBA as and when it considers appropriate.

24.4 The BBA has used due skill, care and diligence in preparing this Certificate, but no warranty is provided.

24.5 In issuing this Certificate the BBA is not responsible and is excluded from any liability to any company, firm, organisation or person, for any matters arising directly or indirectly from:

- the presence or absence of any patent, intellectual property or similar rights subsisting in the product/system or any other product/system
- the right of the Certificate holder to manufacture, supply, install, maintain or market the product/system
- actual installations of the product/system, including their nature, design, methods, performance, workmanship and maintenance
- any works and constructions in which the product/system is installed, including their nature, design, methods, performance, workmanship and maintenance
- any loss or damage, including personal injury, howsoever caused by the product/system, including its manufacture, supply, installation, use, maintenance and removal
- any claims by the manufacturer relating to CE marking.

24.6 Any information relating to the manufacture, supply, installation, use, maintenance and removal of this product/system which is contained or referred to in this Certificate is the minimum required to be met when the product/system is manufactured, supplied, installed, used, maintained and removed. It does not purport in any way to restate the requirements of the Health and Safety at Work etc. Act 1974, or of any other statutory, common law or other duty which may exist at the date of issue or reissue of this Certificate; nor is conformity with such information to be taken as satisfying the requirements of the 1974 Act or of any statutory, common law or other duty of care.