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Agrément Certificate

02/3890

Product Sheet 1

XTRALITE ROOFLIGHTS AND KERBS

X-TWO ROOFLIGHTS AND KERBS

This Agrément Certificate Product Sheet⁽¹⁾ relates to X-Two Rooflights and Kerbs, 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 products provide natural lighting to the interior of a building (see section 6).

Thermal properties — for a typical 1.2 m by 1.2 m roof opening, triple-skin fixed X-Two and X-2V dome rooflights achieved a U value of 1.5 W·m⁻²·K⁻¹ and 1.7 W·m⁻²·K⁻¹ respectively, when calculated in accordance with BS EN 1873 : 2014 + A1 : 2016 (see section 7).

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

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

Watertightness — the products 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 material in accordance with the national Building Regulations. When classified to BS EN 13501-1 : 2007, the 2 mm and 3 mm polycarbonate sheets achieved Class B-s1, d0 and can be regarded as having a B_{ROOF}(t4) classification (see section 11).

Ventilation — opening rooflights can provide rapid ventilation (see section 13).

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

Durability — the polycarbonate material and the other components will have a life of at least 25 and 20 years respectively in non-corrosive environments (see section 16).



The BBA has awarded this Certificate to the company named above for the products described herein. These products have been assessed by the BBA as being fit for their intended use provided they are installed, used and maintained as set out in this Certificate.

On behalf of the British Board of Agrément

Date of First issue: 20 June 2019

Hardy Giesler
Chief Executive Officer

Certificate amended on 11 March 2020 to revise sections related to fire.

Certificate amended on 27 July 2021 to update company name.

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, X-Two Rooflights and Kerbs, 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 products will have sufficient strength and stiffness to sustain the design loads. See sections 9.1, 9.2 and 9.5 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 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 products provide 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 products will depend on the building humidity class. See section 8.2 of this Certificate. |
| Requirement: | F1 | Means of ventilation |
| Comment: | | Opening rooflights 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 products can contribute to satisfying this Requirement although compensating fabric measures may be required. See sections 6.1, 7.3 to 7.5 and 7.8 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. 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. |

| | | |
|--------------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Regulation: | 7(1) | Materials and workmanship |
| Comment: | | The products are acceptable when used in accordance with this Certificate. See section 16.1 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 products can contribute to satisfying these Regulations when appropriate compensating fabric and/or services measures are taken. See sections 6.1, 7.3 to 7.5 and 7.8 of this Certificate. |



The Building (Scotland) Regulations 2004 (as amended)

| | | |
|--------------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Regulation: | 8(1)(2) | Durability, workmanship and fitness of materials |
| Comment: | | The products can contribute to a construction satisfying this Regulation. See sections 15.1, 15.2 and 16.1 and the <i>Installation</i> part of this Certificate. |
| Regulation: | 9 | Building standards applicable to construction |
| Standard: | 1.1(b) | Structure |
| Comment: | | The products will 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, 9.2 and 9.5 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 products provide 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 can contribute to satisfying this Requirement. See section 13 of this Certificate. |
| Standard: | 3.15 | Condensation |
| Comment: | | The risk of surface condensation on the products will depend on the humidity class of the building, with reference to clauses 3.15.1 ⁽¹⁾ and 3.15.4 ⁽¹⁾ of this Standard. See section 8.2 of this Certificate. |
| Standard: | 3.16 | Natural lighting |
| Comment: | | 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: | 4.8(c) | Danger from accidents |
| Comment: | | 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 The products can 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: | 6.1(b) | Carbon dioxide emissions The products can contribute to satisfying this Standard when appropriate compensating fabric and/or services measures are taken. See sections 6.1, 7.5 and 7.8 of this Certificate. |
| Standard: Comment: | 6.2 | Building insulation envelope The products can contribute to satisfying this Standard when appropriate compensating fabric measures are taken. See sections 6.1, 7.3 to 7.5 and 7.8 of this Certificate. |
| Standard: Comment: | 7.1(a)(b) | Statement of sustainability The products can contribute to satisfying the relevant requirements of Regulation 9, Standards 1 to 6, and therefore will contribute to a construction meeting a bronze level of sustainability as defined in this Standard when appropriate compensating fabric and/or services measures are taken. See sections 6.1, 7.5 and 7.8 of this Certificate. |
| Regulation: Comment: | 12 | Building standards applicable to conversions All comments given for these systems 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 | Fitness of materials and workmanship The products are acceptable. See section 16.1 and the <i>Installation</i> part of this Certificate. |
| Regulation: Comment: | 28(b) | Resistance to moisture and weather The products 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 products have sufficient strength and stiffness to sustain the design loads. See sections 9.1, 9.2 and 9.5 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 can be regarded as having a B _{ROOF} (t4) classification. See sections 11.1, 11.2, 11.4 and 11.5 of this Certificate. |
| Regulation: Comment: | 39(a)(i) | Conservation measures The products can contribute to satisfying this Regulation. See sections 6.1, 7.3 to 7.5 and 7.8 of this Certificate. |
| Regulation: Comment: | 40(2) | Target carbon dioxide emissions rate The products can contribute to satisfying this Regulation when appropriate compensating fabric and/or services measures are taken. See sections 6.1, 7.3 to 7.5 and 7.8 of this Certificate. |

| | | |
|--------------------|--------------|--------------------------------------------------------------------------------------------------------------------------|
| Regulation: | 65(1) | Means of ventilation |
| Comment: | | Opening rooflights can contribute to satisfying the requirements of this Regulation. See section 13 of this Certificate. |
| Regulation: | 98 | Safe opening and closing of windows, skylights and ventilators |
| Comment: | | Opening lights can satisfy this Regulation. 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 section: *3 Delivery and site handling* (3.6) of this Certificate.

Technical Specification

1 Description

1.1 X-Two Rooflights are thermoformed from 2 mm minimum thickness polycarbonate sheets (UV stabilised) and 3 mm minimum thickness polycarbonate sheets (coated on both sides with a UV protective film), and are for use as described in this Certificate. The 2 mm thick polycarbonate sheets are for use as internal skins only.

1.2 The products are available in two versions, X-Two and X2V, which sit at 45° and 90° to the roof structure respectively.

1.3 The rooflights are triple-skin and are available in clear (smooth and stipple), bronze and opal finishes, and are fixed onto a kerb or opening frame (see Figures 1, 2 and 3). The rooflights are available as fixed or opening (the latter featuring a manual worm gear).

1.4 The glazing is available in a curved dome or pyramidal shape. Kerb adaptors⁽¹⁾ are available from the Certificate holder for non-standard roof openings, in order to provide a suitable fit onto the prepared builder's kerb⁽¹⁾. Rooflights are available in the styles and sizes listed in Table 1 and shown in Figures 1 and 2.

(1) Outside the scope of this Certificate.

Figure 1 X-Two components

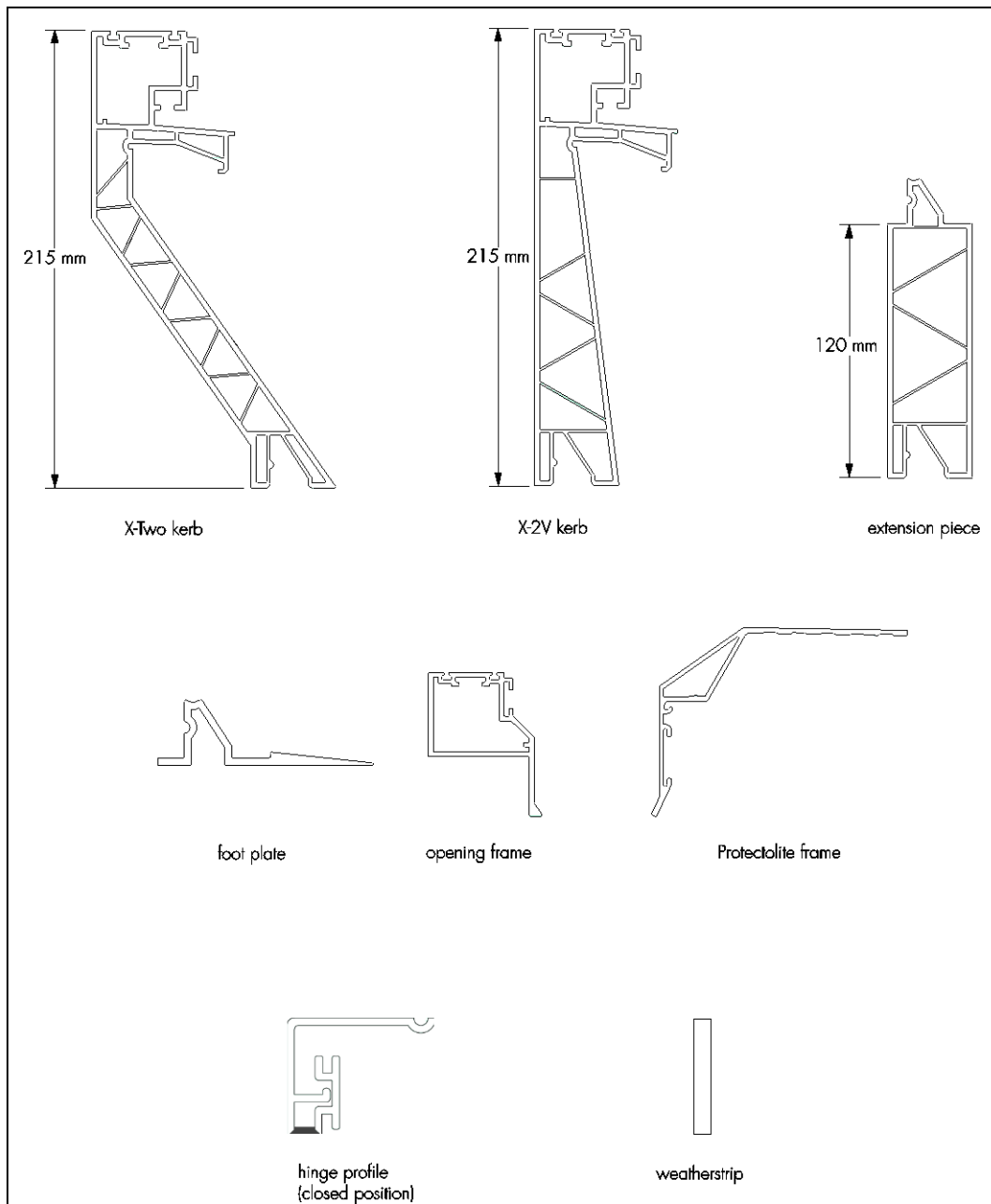
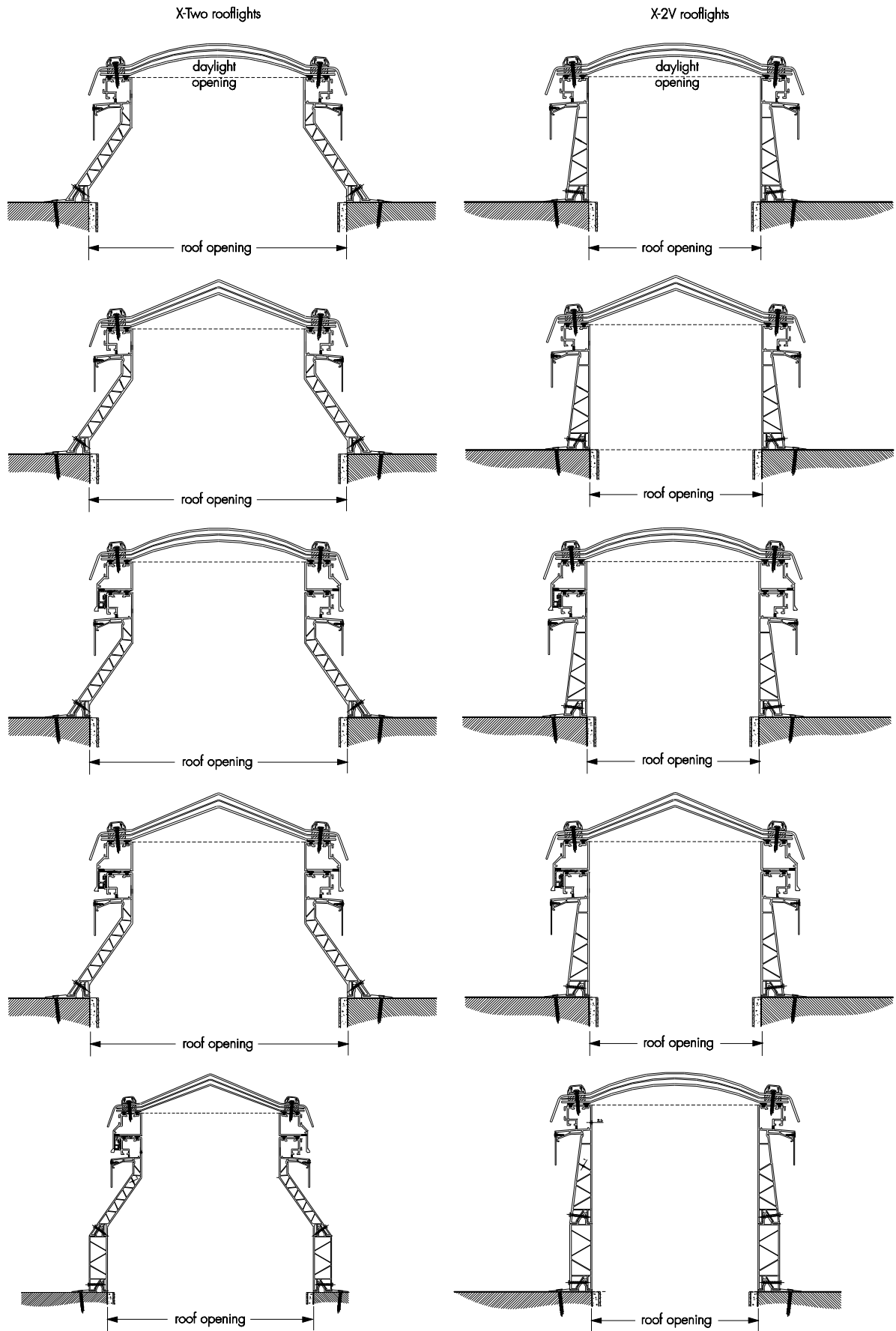
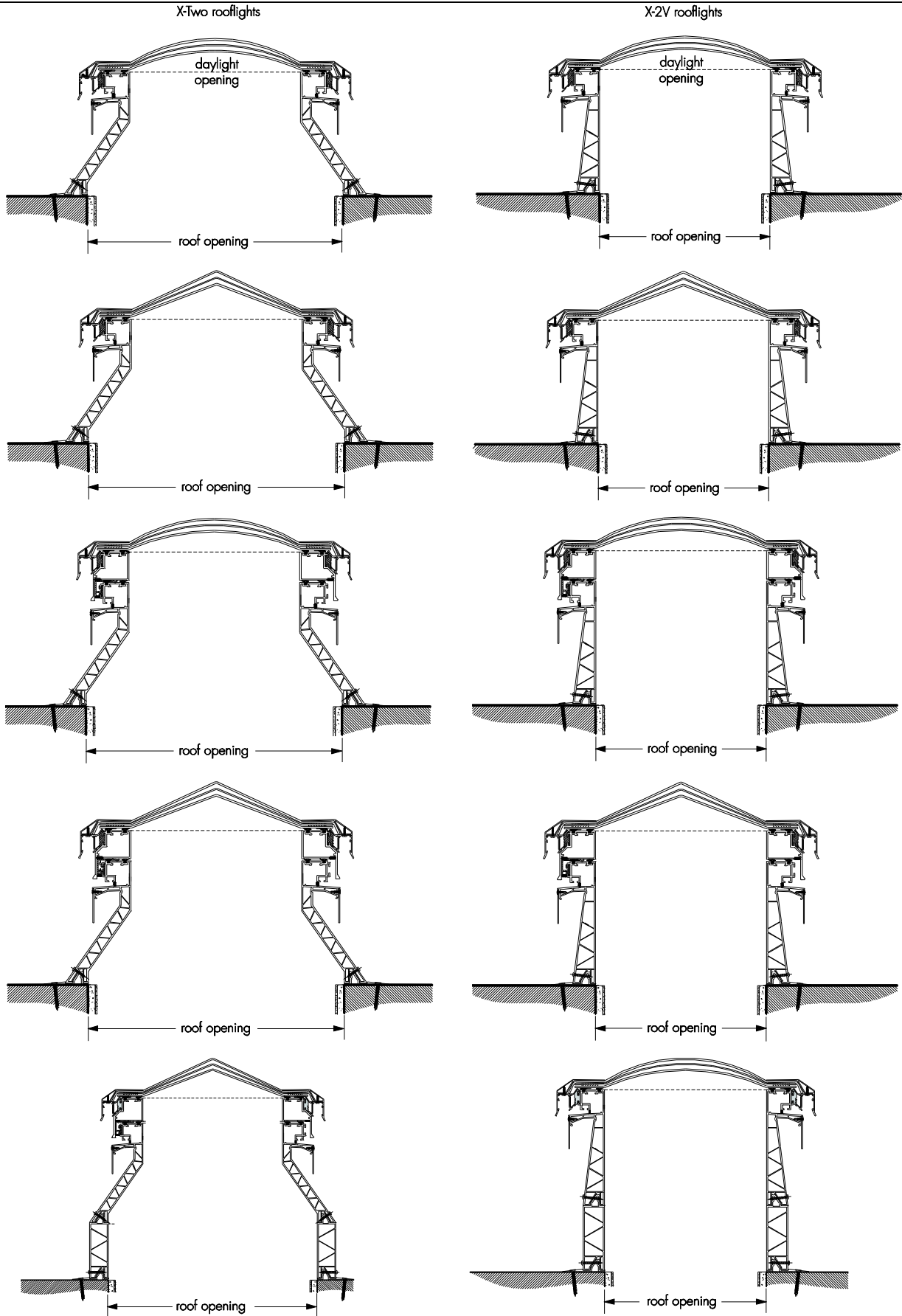


Figure 2 X-Two Rooflights and Kerbs



Note: Fixings for securing the floor plate to the roof deck are outside the scope of this Certificate.

Figure 3 X-Two Rooflights and Kerbs fitted with Protectolite frame



Note: Fixings for securing the floor plate to the roof deck are outside the scope of this Certificate.

Table 1 Sizes of rooflights

| X-Two kerb | | | | |
|-------------------|-------------------------------------------|---------------------------------------------------------------------------|----------------------------------------------------------------------|-------------------------------|
| | Dome and pyramid base (mm) | Daylight opening (mm) | Roof opening with or without extension piece (mm) | Internal rise (mm) |
| Square | 600 x 600 | 450 x 450 | 600 x 600 | 90 |
| | 750 x 750 | 600 x 600 | 750 x 750 | 120 |
| | 900 x 900 | 750 x 750 | 900 x 900 | 150 |
| | 1050 x 1050 | 900 x 900 | 1050 x 1050 | 180 |
| | 1200 x 1200 | 1050 x 1050 | 1200 x 1200 | 210 |
| | 1350 x 1350 | 1200 x 1200 | 1350 x 1350 | 240 |
| | 1500 x 1500 | 1350 x 1350 | 1500 x 1500 | 270 |
| | 1800 x 1800 | 1650 x 1650 | 1800 x 1800 | 330 |
| Rectangular | 600 x 900 | 450 x 750 | 600 x 900 | 90 |
| | 600 x 1200 | 450 x 1050 | 600 x 1200 | 90 |
| | 600 x 1500 | 450 x 1350 | 600 x 1500 | 90 |
| | 600 x 1800 | 450 x 1650 | 600 x 1800 | 90 |
| | 600 x 2400 | 450 x 2250 | 600 x 2400 | 90 |
| | 900 x 1200 | 750 x 1050 | 900 x 1200 | 90 |
| | 900 x 1350 | 750 x 1200 | 900 x 1350 | 150 |
| | 900 x 1500 | 750 x 1350 | 900 x 1500 | 150 |
| | 900 x 1800 | 750 x 1650 | 900 x 1800 | 150 |
| | 900 x 2400 | 750 x 2250 | 900 x 2400 | 150 |
| | 1000 x 1500 | 850 x 1350 | 1000 x 1500 | 150 |
| | 1000 x 2000 | 850 x 1650 | 1000 x 2000 | 170 |
| | 1200 x 1500 | 1050 x 1350 | 1200 x 1500 | 210 |
| | 1200 x 1800 | 1050 x 1650 | 1200 x 1800 | 210 |
| | 1200 x 2400 | 1050 x 2250 | 1200 x 2400 | 210 |
| X-2V kerb | | | | |
| | Dome and pyramid base (mm) | Daylight/roof opening with or without extension piece (mm) | Internal rise (mm) | |
| Square | 600 x 600 | 600 x 600 | 120 | |
| | 750 x 750 | 750 x 750 | 150 | |
| | 900 x 900 | 900 x 900 | 180 | |
| | 1000 x 1000 | 1000 x 1000 | 200 | |
| | 1050 x 1050 | 1050 x 1050 | 210 | |
| | 1200 x 1200 | 1200 x 1200 | 240 | |
| | 1350 x 1350 | 1350 x 1350 | 270 | |
| | 1500 x 1500 | 1500 x 1500 | 300 | |
| | 1800 x 1800 | 1800 x 1800 | 360 | |
| Rectangular | 600 x 900 | 600 x 900 | 120 | |
| | 600 x 1200 | 600 x 1200 | 120 | |
| | 600 x 1500 | 600 x 1500 | 120 | |
| | 600 x 1800 | 600 x 1800 | 120 | |
| | 600 x 2400 | 600 x 2400 | 120 | |
| | 900 x 1200 | 900 x 1200 | 180 | |
| | 900 x 1350 | 900 x 1350 | 180 | |
| | 900 x 1500 | 900 x 1500 | 180 | |
| | 900 x 1800 | 900 x 1800 | 180 | |
| | 900 x 2400 | 900 x 2400 | 180 | |
| | 1000 x 1500 | 1000 x 1500 | 200 | |
| | 1000 x 2000 | 1000 x 2000 | 200 | |
| | 1200 x 1500 | 1200 x 1500 | 240 | |
| | 1200 x 1800 | 1200 x 1800 | 240 | |
| | 1200 x 2400 | 1200 x 2400 | 240 | |

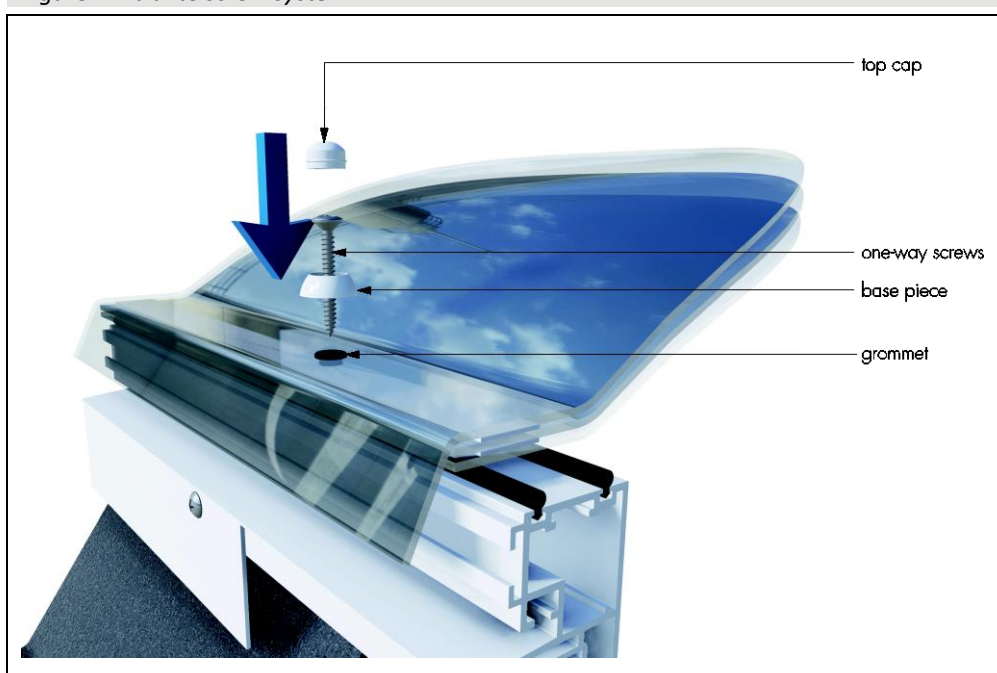
1.5 Other sizes within this size range can also be fabricated on request.

1.6 The X-Two and X-2V PVC-U kerbs, extension pieces and foot plates (see Figures 1, 2 and 3) are manufactured from rigid, white unplasticised polyvinyl chloride (PVC-U) profiles. The kerbs are 215 mm high and may be unvented or can incorporate vents⁽¹⁾. Where a taller kerb is required, an extension piece can be fitted by clipping it into the kerb and securing it with zinc-coated carbon steel screws (Phillips 4.3 x 31 mm or 25 mm). The foot plate is clipped into the kerb or the extension piece and secured using zinc-coated carbon steel screws (Phillips 4.3 x 31 mm). The decorative weather strip⁽¹⁾ is fixed to the kerb using stainless steel screws (4.2 x 16 mm). Holes for fixing kerbs onto the roof structure are drilled on site.

(1) Outside the scope of this Certificate.

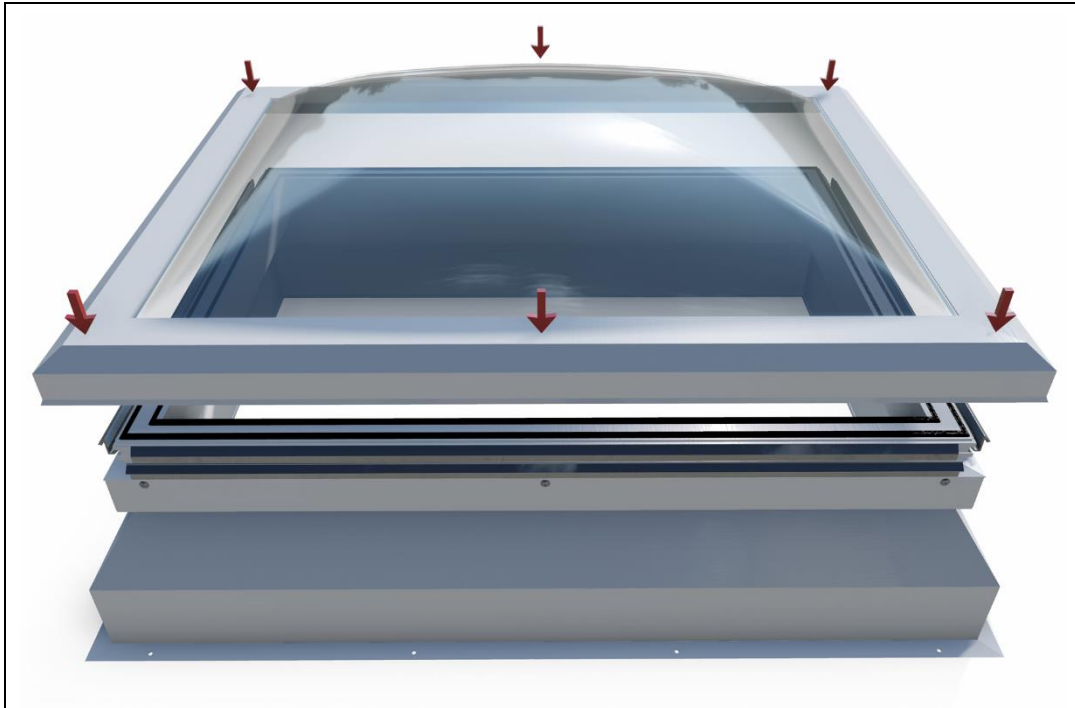
1.7 The rooflight glazing (supplied with 8 mm pre-drilled holes) is fixed on the kerbs or opening frames (supplied with corresponding pre-drilled pilot holes of 3 mm diameter) using the Xtralite screw system (see Figure 4), ensuring that the swarf is removed from the kerb/opening frame after drilling. Fixings are delivered separately. TPE gaskets are rolled into the kerb to provide an inner seal between the kerb and the rooflight glazing.

Figure 4 Xtralite screw system



1.8 The rooflights can be pre-assembled with Protectolite, a welded aluminium framework (see Figures 1, 3 and 5). In this application, the glazing is fixed to the top of the kerb using the one way screws.

Figure 5 Protectolite frame



1.9 An opening frame is available in white PVC-U (see Figures 1, 2 and 3). The hinges and worm gear are attached using steel/aluminium peel-head rivets. Rolled-in TPE gaskets in the opening frame provide an inner seal between the opening frame and the polycarbonate rooflight.

1.10 A grid, 75 by 75 mm, made from steel bar (5 mm diameter) to BS 1052 : 1980 with galvanized finish to BS EN ISO 1461 : 2009, welded onto a welded steel framework (typically 100 mm wide), can be fitted between the roofing deck and the kerb. The grid is polyester-powder coated in white. The grid is fixed to the roofing deck at 300 mm centres.

2 Manufacture

2.1 Polycarbonate sheets are thermoformed to the appropriate size. Opening frames and kerbs are fabricated from white PVC-U profiles produced by conventional extrusion techniques, which are cut and welded together. Protectolite frames are fabricated from aluminium profiles which are cut and welded together. Assembly of the triple-skin polycarbonate rooflights is carried out using a double-sided adhesive PVC strip and features a polycarbonate spacer between skins. Fittings are attached where required.

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 Velux Commercial Xtralite Limited has been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2015 and BS EN ISO 14001 : 2015 by Alcumus ISOQAR Limited (Certificates 17585-QMS-001 and 17585-EMS-001 respectively).

3 Delivery and site handling

3.1 Opening frames and kerbs and Protectolite products are supplied to site ready assembled; glazing can be supplied separately. Fixed rooflights and kerbs can be supplied to site ready assembled or with separate glazing. Components are packaged in bubble wrap.

3.2 Each rooflight carries a label bearing the company's 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 unit, 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 from the Certificate holder.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on X-Two Rooflights and Kerbs.

Design Considerations

4 General

4.1 X-Two Rooflights and Kerbs are suitable for use on flat roofs of new and existing buildings (see section 14.1), to provide natural light and ventilation. New roofs should be designed in accordance with the relevant national Building Regulations.

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

4.3 The products are suitable as replacements for existing rooflights. The suitability of existing kerbs must be checked and replaced if necessary. If the rooflights are to be fitted onto a kerb other⁽¹⁾ than those shown in Figures 1, 2 and 3 an adaptor kerb⁽¹⁾ from the Certificate holder can be used.

(1) Outside the scope of this Certificate.

5 Practicability of installation

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

6 Light and solar transmittance



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

Table 2 Light and solar transmittance⁽¹⁾

| Polycarbonate finish | Light transmittance ⁽²⁾⁽³⁾ (%) | Solar transmittance (g_{\perp}) |
|-------------------------------------------------------------------|-------------------------------------------|-------------------------------------|
| <i>Single-skin</i> | | |
| 2 mm clear finish | 88 | 0.81 |
| 2 mm clear stipple finish | 85 | 0.78 |
| 3 mm clear finish | 87 | 0.79 |
| 3 mm stipple finish | 87 | 0.78 |
| <i>Triple-skin</i> | | |
| 3 mm clear finish / 3 mm clear finish / 3 mm clear finish | 69 | 0.62 ⁽⁴⁾ |
| 3 mm clear finish / 2 mm clear finish / 2 mm clear finish | 70 | 0.63 ⁽⁴⁾ |
| 3 mm clear finish / 2 mm clear finish / 2 mm clear stipple finish | 68 | 0.60 ⁽⁴⁾ |
| 3 mm clear finish / 3 mm clear finish / 3 mm clear stipple finish | 68 | 0.61 ⁽⁴⁾ |

(1) Values for other skin combinations must be calculated in accordance with BS EN 410 : 1998.

(2) In accordance with BS EN ISO 13468-1 : 1997.

(3) Other variations must be tested in accordance with BS EN ISO 13468-1 : 1997.

(4) Values calculated in accordance with BS EN 410 : 1998 for triple-skin rooflights separated by 15 mm air gaps.

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 products presents a significant heat input.

7 Thermal properties

7.1 Thermal transmittance (U) values should be derived in accordance with BS EN 1873 : 2014 + A1 : 2016 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_{hole}) of an X-Two Rooflight, without extension piece, measuring 1.2 m by 1.2 m and incorporating a triple-skin polycarbonate dome, when measured by the Guarded Hot Box method according to BS EN ISO 12567-2 : 2005, was $2.8 \text{ W}\cdot\text{m}^{-2}\cdot\text{K}^{-1}$ based on the opening area in the roof and using horizontal heat flow.

7.4 The thermal transmittances for complete rooflights calculated for standard daylight openings are given in Table 3 (derived from a Hot Box test – see section 7.3) and Tables 4 and 5 (derived from numerical analysis), or may be derived in accordance with section 7.5 of this Certificate.

Table 3 Complete square dome triple-skin X-Two Rooflight U values⁽¹⁾ at standard daylight opening size 1.2 m by 1.2 m

| Kerb reference | BS EN 1873 : 2014 + A1 : 2016 | | NARM NTD 2 : 2014 (amended 2017) | |
|----------------|----------------------------------------------------------------|------------------------------|---------------------------------------------------------------|--------------------------------|
| | $U_{\text{rc}} (\text{W}\cdot\text{m}^{-2}\cdot\text{K}^{-1})$ | $A_{\text{rc}} (\text{m}^2)$ | $U_{\text{d}} (\text{W}\cdot\text{m}^{-2}\cdot\text{K}^{-1})$ | $AD_{\text{Tot}} (\text{m}^2)$ |
| X-Two (fixed) | 1.5 | 2.62 | 1.6 | 2.54 |

(1) Derived from Hot Box test result of $U = 2.8 \text{ W}\cdot\text{m}^{-2}\cdot\text{K}^{-1}$, relating to area of the aperture in the roof.

Table 4 Complete triple-skin fixed rooflight U values at standard daylight opening sizes to BS EN 1873 : 2014 + A1 : 2016

| Kerb reference | Square dome | |
|-------------------------|-------------------------------------------------------------------|-------------------------------------------|
| | Daylight opening size | |
| | 1.2 m by 1.2 m | |
| | U_{rc}-value (W·m⁻²·K⁻¹) | A_{rc} (m²) |
| X-Two with extension | 1.9 | 3.38 |
| X-Two without extension | 1.9 | 2.80 |
| X-2V with extension | 1.8 | 3.89 |
| X-2V without extension | 1.7 | 3.72 |

Table 5 Complete triple-skin fixed rooflight U values at standard daylight opening sizes to NARM NTD 2 : 2014 (amended 2017)

| Kerb reference | Square dome | |
|-------------------------|-------------------------------------------------------------------|-------------------------------------------|
| | Daylight opening size | |
| | 1.2 m by 1.2 m | |
| | U_{rc}-value (W·m⁻²·K⁻¹) | A_{rc} (m²) |
| X-Two with extension | 2.4 | 2.72 |
| X-Two without extension | 1.9 | 2.73 |
| X-2V with extension | 2.2 | 3.19 |
| X-2V without extension | 1.8 | 3.64 |



7.5 For rooflights with dimensions other than those in Tables 3, 4 and 5, U values must be calculated using Tables 6 and 7 and the subsequent equations, (1) to (8).

Table 6 Rooflight kerb parameters

| Rooflight type | X_{kerb,u} (m) | X_{kerb,l} (m) | e_{kerb} (m) | e_{e,v} (m) | e_{e,h} (m) | U_{kerb,e} (W·m⁻²·K⁻¹) | ψ_t (W·m⁻²·K⁻¹) |
|----------------------------------|-----------------------------------|-----------------------------------|---------------------------------|--------------------------------|--------------------------------|-----------------------------------------------------------------|------------------------------------------------------------|
| X-Two with extension, fixed | -0.025 | 0.040 | 0.338 | 0.026 | 0.050 | 2.015 | 0.015 |
| X-Two without extension, fixed | -0.02 | 0.040 | 0.218 | 0.026 | 0.050 | 2.005 | 0.009 |
| X-2V with extension, fixed | 0.050 | 0.040 | 0.338 | 0.026 | 0.050 | 1.824 | 0.009 |
| X-2V without extension, fixed | 0.050 | 0.040 | 0.218 | 0.026 | 0.050 | 1.728 | 0.009 |
| X-Two with extension, opening | -0.025 | 0.040 | 0.391 | 0.026 | 0.050 | 2.062 | 0.018 |
| X-Two without extension, opening | -0.025 | 0.040 | 0.271 | 0.026 | 0.050 | 2.070 | 0.010 |
| X-2V with extension, opening | 0.050 | 0.040 | 0.391 | 0.026 | 0.050 | 1.872 | 0.011 |
| X-2V without extension, opening | 0.050 | 0.040 | 0.271 | 0.026 | 0.049 | 1.858 | 0.011 |

Table 7 Rooflight glazing thermal transmittance

| Glazing option | U_t (W·m⁻²·K⁻¹) |
|------------------------------------------------------|------------------------------------------------------------|
| Triple-skin polycarbonate (3/15/2/15/3) – air filled | 1.72 |

Rooflight U value, U_{rc}, is given by:

(1)

$$U_{rc} = \frac{(A_{kerb} + A_e) \times U_{kerb,e} + A_t \times U_t + I_t \times \psi_t}{A_{kerb} + A_e + A_t}$$

Where:

A_e is the outer exposed surface of the edge profile, in m^2

A_{kerb} is the outer exposed surface of the kerb, in m^2

A_t is the outer exposed surface of the translucent part, in m^2

l_t is the length of the transition between glazing and edge profile ($=P_t$), in m

$U_{kerb,e}$ is the thermal transmittance of the kerb and edge profile, in $Wm^{-2} \cdot K^{-1}$

U_t is the thermal transmittance of the translucent part, in $W \cdot m^{-2} \cdot K^{-1}$

Ψ_t is the linear heat transfer coefficient in the transition zone of the translucent part and edge profile, in $W \cdot m^{-1} \cdot K^{-1}$

(2)

$$A_{kerb} = \frac{(P_{kerb,l} + P_{kerb,u})}{2} \times e_{kerb}$$

Where:

$P_{kerb,u}$ is the upper outer perimeter of the kerb

$P_{kerb,l}$ is the lower outer perimeter of the kerb

e_{kerb} is the vertical height of the kerb which equates to the distance of $P_{kerb,u}$ and $P_{kerb,l}$

(3)

$$A_e = P_{kerb,u} \times (e_{e,h} + e_{e,v})$$

Where:

$e_{e,h}$ is the horizontal distance between the upper outside border of the insulation in the case of a kerb or the upper outside border of the joint sealing, if there is no kerb, and the clear opening of the translucent part

$e_{e,v}$ is the vertical distance between the upper level of the translucent part and the upper level of the kerb

Dome or pyramidal (square/rectangular):

(4)

$$A_t = ab - \pi \frac{ab}{4} + 2\pi \left[\frac{\left(\frac{a}{2}\right)^p \left(\frac{b}{2}\right)^p + \left(\frac{a}{2}\right)^p c^p \left(\frac{b}{2}\right)^p c^p}{3} \right]^{1/p} \quad \text{for domes only}$$

(5)

$$A_t = 2 \left[\sqrt{\left(\frac{a}{2}\right)^2 + c^2} \times \frac{b}{2} \right] + 2 \left[\sqrt{\left(\frac{a}{2}\right)^2 + c^2} \times \frac{a}{2} \right] \quad \text{for pyramids only}$$

(6)

$$\begin{aligned} a &= L_A + 2x_{kerb,l} - 2e_{e,h} \\ b &= L_B + 2x_{kerb,l} - 2e_{e,h} \\ P_{kerb,u} &= 2(L_A + 4x_{kerb,u} + L_B) \end{aligned}$$

(7)

$$P_{kerb,l} = 2(L_A + 4x_{kerb,l} + L_B)$$

(8)

$$l_t = 2(L_A + 4x_{kerb,l} - 4e_{e,h} + L_B)$$

Where :

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)

Note: for square domes, $a = b$

L_A is the major axis of the rectangle

L_B is the minor axis of the rectangle

Note: for square domes, $L_A = L_B$

c is the internal rise of the dome (see Table 1 for rooflight ranges)

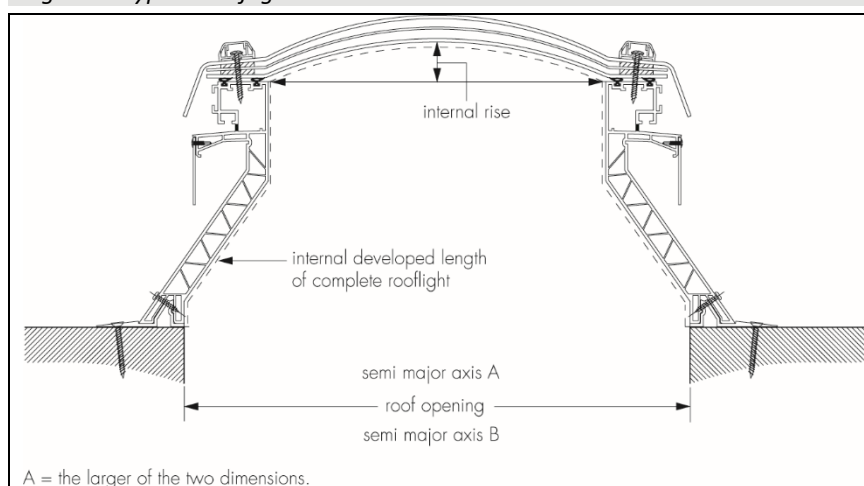
p is a constant = 1.6075

π is a constant = 3.14159

$x_{kerb,l}$ is the horizontal displacement from start point, P, to $P_{kerb,l}$

$x_{kerb,u}$ is the horizontal displacement from start point, P, to $P_{kerb,u}$ (if this falls to the right of start point P, then enter as negative value).

Figure 6 Typical rooflight cross section



7.6 Rooflight assemblies are permeable to air at the junction between rooflight and kerb, particularly where an opening mechanism is present. Air permeability is beneficial for the 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 kerbs/roof junctions in order to minimise excessive heat loss.



7.8 In the opinion of the BBA, the U values of rooflights fitted with the Protectolite frame would be the same as those given in Tables 3 to 5.

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 : 2007 indicates a minimum temperature factor⁽¹⁾ of 0.57 for all rooflight sets⁽²⁾.

- (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.
- (2) Triple-skin

8.3 Where the temperature factor given in section 8.2 of this Certificate is 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, 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, airflow from trickle ventilators⁽¹⁾ can alleviate localised surface condensation.

(1) Outside the scope of this Certificate.

9 Strength and stability



9.1 The products 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 $800 \text{ N}\cdot\text{m}^{-2}$ for 60 minutes. 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. Therefore, it is recommended that BS EN 1991-1-3 : 2003 and its UK National Annex are used to calculate the actual snow load when the roof is used in situations where a load greater than $800 \text{ N}\cdot\text{m}^{-2}$ can be expected.

9.3 Details of the connections between the kerb and the roof must be determined by a suitably competent and experienced individual. Guidance is available from the Certificate holder.

9.4 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 to various points on the rooflights.



9.5 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 8 of this Certificate.

Table 8 Example resistance to downward and upward loads

| Rooflight type | Dimensions (mm) | Downward load (DL) ($\text{N}\cdot\text{m}^{-2}$) | Upward load (UL) ($\text{N}\cdot\text{m}^{-2}$) |
|----------------------------------|-----------------|-----------------------------------------------------|---------------------------------------------------|
| Dome, opening frame, triple-skin | 1200 x 2400 | 750 ⁽¹⁾ | 1500 ⁽²⁾⁽³⁾ |

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

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

(3) During the test, the opening corners were bent upwards by the internal pressure and the weatherseal had to be heavily taped up to maintain the pressure.

9.6 The products have adequate resistance to soft body impacts, such as a person accidentally falling against them. The result of a test for an individual rooflight, carried out in accordance with BS EN 1873 : 2014, is given in Table 9 of this Certificate.

Table 9 Resistance to soft body impact

| Rooflight type | Dimensions (mm) | Designation to BS EN 1873 : 2014 |
|-----------------------------------|-----------------|----------------------------------|
| Domed, opening frame, triple-skin | 600 x 600 | SB 1200 |

10 Watertightness



10.1 When installed in accordance with the Certificate holder's instructions and sections 18 and 19 of 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⁽¹⁾ 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).

(1) Outside the scope of this Certificate.

11 Behaviour in relation to fire



11.1 When classified in accordance with BS EN 13501-1 : 2007 the polycarbonate material (2 and 3 mm thick) achieved a European Class B- s1, d0 classification.



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 rooflights' external glazing is classified as 'low vulnerability'.



11.4 The rooflights' 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 products may not be used over a protected stairway.

Scotland – the products are unrestricted.

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

12 Safety



12.1 Opening rooflights feature manual worm gear that can be operated from ground level, allowing the rooflight to be opened for ventilation.

12.2 Under no circumstances should anyone venture onto a polycarbonate rooflight. The external surfaces of opening rooflights cannot be cleaned from the inside of 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 part (eg guard rails). However, if, as a result of an accidental fall, contact is made with the glazing, the polycarbonate material shows good resistance to impact (see section 9.6 of this Certificate).

13 Ventilation



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 worm gear and the floor area of the ventilated space.

14 Unauthorised access

14.1 The rooflights are suitable for use:

England and Wales and Northern Ireland – other than as easily accessible rooflights in new domestic buildings
Scotland – other than as easily accessible rooflights in new and existing domestic buildings.

14.2 The rooflights are supplied with one-way fixings to make removal of the rooflight from the kerb more difficult (see Figure 3). The rooflights can be fitted with the grid described in section 1.10 of this Certificate.

14.3 The rooflights have a good resistance to impact, making breakage very difficult.

15 Maintenance



15.1 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 and covered by this Certificate.

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

15.3 If damage occurs, the peel-head rivets used to attach the hinges and the worm gear cannot be replaced.

16 Durability



16.1 The polycarbonate material and the other components will have a service life of at least 25 and 20 years respectively in non-corrosive environments.

16.2 Under normal conditions, the polyester-powder coating will have an anticipated decorative life of at least 15 years in heavily polluted areas and at least 20 years in other areas.

16.3 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.

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

17 Reuse and recyclability

The products comprise PVC-U, aluminium and polycarbonate, each of which can be recycled.

Installation

18 General

18.1 Installation of the rooflights and kerbs must be carried out in accordance with the Certificate holder's instructions.

18.2 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.

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

18.4 Fixings for securing the kerbs or kerb adaptors onto the roof structure must be selected so as to be structurally adequate and suitably corrosion resistant. These fixings are not supplied by the Certificate holder and are outside the scope of this Certificate.

18.5 Where the roof covering is dressed below the rooflight and on top of an existing kerb, precautions should be taken to prevent bitumen or other agents damaging internal surfaces.

18.6 All packaging is removed, apart from the packaging protecting the glazing.

19 Procedure

Fixing X-Two/X-2V Kerb or pre-assembled X-Two/X-2V rooflights to roofs

19.1 Silicone sealant is applied around the roof opening, and the kerb/extension piece (if used)/foot plate combination is placed on the roof deck and screwed to the roof at a maximum distance of 50 mm from corners and at approximately 300 mm centres, using appropriate corrosion-resistant fixings⁽¹⁾. The weather strip is unscrewed from the kerb, the roof covering is dressed to the external face of the top flange of the kerb, and the weather strip is screwed back onto the kerb.

(1) Details of appropriate fixings are available from the Certificate holder and are outside the scope of this Certificate.

Fixing X-Two polycarbonate glazing to the X-Two opening frame or kerb

19.2 The polycarbonate glazing is placed on the kerb or opening frame. The TPE grommets are inserted in the holes of the polycarbonate glazing; the one-way screws are inserted through the white base piece, through the polycarbonate, and screwed into the opening frame/kerb (see Figure 4). The screws are tightened and the caps clicked into place. Alternatively, if the Protectolite frame is fitted to the polycarbonate rooflight, the assembly is pressed evenly around the perimeter and clicked into place. The weather strip is unscrewed from the kerb, the roof covering is then dressed to the external face of the top flange of the kerb and the weather strip is then screwed back onto the kerb.

Technical Investigations

20 Tests

Tests were carried out to determine:

- watertightness
- resistance to upward load
- resistance to downward load
- resistance to snow load
- resistance to impact load: small, hard body impact
- resistance to impact load: large, soft body impact
- endurance of hinge
- basic security
- suitability of materials.

21 Investigations

21.1 The manufacturing process was examined, including the methods adopted for quality control, and details were obtained of the quality and composition of the materials used.

21.2 Thermal performance and temperature factors of glazed rooflights were assessed using thermal simulation.

21.3 An examination was made of existing data in relation to:

- performance in fire
- luminous transmittance.

Bibliography

BS 1052 : 1980 *Specification for mild steel wire for general engineering purposes*

BS EN 410 : 1998 *Glass in building — Determination of Luminous and Solar Characteristics of Glazing*

BS EN 1873 : 2014 *Prefabricated accessories for roofing — Individual roof lights of plastics — Specification and test methods*

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

BS EN 1991-1-3 : 2003 + A1 : 2015 *Eurocode 1 : Actions on structures — General actions — Snow loads*

NA to BS EN 1991-1-3 : 2003 UK National Annex to *Eurocode 1 : Actions on structures — General actions — Snow loads*

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

NA to BS EN 1991-1-4 : 2005 UK National Annex to *Eurocode 1 : Actions on structures — General actions — Wind actions*

BS EN 13501-1 : 2007 + A1 : 2009 *Fire classification of construction products and building elements — Classification using test data from reaction to fire tests*

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

BS EN ISO 1461 : 2009 *Hot dip galvanized coatings on fabricated iron and steel articles — Specifications and test methods*

BS EN ISO 10211 : 2007 *Thermal bridges in building construction — Heat flows and surface temperatures — Detailed calculations*

BS EN ISO 12567-2 : 2005 *Thermal performance of windows and doors construction — Determination of thermal transmittance by hot box method — Construction — Roof windows and other projecting windows*

BS EN ISO 13468-1 : 1997 *Plastics — Determination of the total luminous transmittance of transparent materials — Single-beam instrument*

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*

BS EN ISO 14001 : 2015 *Environmental management systems — Requirements with guidance for use*

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*

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

22 Conditions

22.1 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.

22.2 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.

22.3 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.

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

22.5 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.

22.6 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.

