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**Agrément
Certificate
No 04/4141**

Designated by Government
to issue
European Technical
Approvals

SKY TUNNEL

Lucarne
Dachoberlicht

Product



• THIS CERTIFICATE RELATES TO SKY TUNNEL⁽¹⁾, A COMPLETE ROOF-TO-CEILING SKYLIGHT SYSTEM INCORPORATING A POLYCARBONATE DOME FITTED ONTO A METAL UPSTAND ATTACHED TO A REFLECTIVE, FLEXIBLE, METALLISED POLYESTER TUBE PROVIDING NATURAL LIGHT TO A DIFFUSER IN THE CEILING BELOW.

• The product is for use on roofs of domestic and commercial buildings, to provide natural light inside the buildings.

• It is essential that the product is installed and used in accordance with the conditions set out in the Design Data and Installation parts of this Certificate.

(1) Also manufactured under the name of Sola Skylight.

Regulations

1 The Building Regulations 2000 (as amended) (England and Wales)



The Secretary of State has agreed with the British Board of Agrément the requirements of the Building Regulations to which skylights can contribute in achieving compliance. In the opinion of the BBA, Sky Tunnel, if used in accordance with the provisions of this Certificate, will meet or contribute to meeting the relevant requirements.

Requirement:	A1	Loading
Comment:		When installed in accordance with the provisions of this Certificate, the product will have sufficient strength and stiffness to sustain the design load. See sections 9.1 and 9.2 of this Certificate.
Requirement:	B2	Internal fire spread (linings)
Comment:		The diffuser can be classified as Tp(b) rigid material and can meet this Requirement. See section 11.1 of this Certificate.
Requirement:	B4(2)	External fire spread
Comment:		The dome can be classified as Tp(a) rigid material and can meet this Requirement. See sections 11.1 and 11.2 of this Certificate.
Requirement:	C4	Resistance to weather and ground moisture
Comment:		When installed in accordance with this Certificate, the product will not adversely affect the resistance of the roof to the passage of moisture. See sections 10.1 to 10.3 of this Certificate.

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Requirement:	F1	Means of ventilation
Comment:		The product can meet or contribute to meeting the background ventilation requirements in Tables 1 and 2 of Approved Document F. See section 13.1 of this Certificate.
Requirement:	F2	Condensation in roofs
Comment:		The risk of interstitial condensation will depend on the environmental conditions. See sections 14.2 and 14.3 of this Certificate.
Requirement:	Regulation 7	Materials and workmanship
Comment:		The product is acceptable when used in accordance with this Certificate. See section 17 of this Certificate.

2 The Building Standards (Scotland) Regulations 1990 (as amended)



In the opinion of the BBA, Sky Tunnel, if used in accordance with the provisions of this Certificate, will satisfy or contribute to satisfying the various Regulations and related Technical Standards as listed below.

Regulation:	10	Fitness of materials and workmanship
Standard:	B2.1	Selection and use of materials, fittings, and components, and workmanship
Comment:		The product can contribute to a construction meeting this Standard. See the <i>Installation</i> part of this Certificate.
Standard:	B2.2	Selection and use of materials, fittings, and components, and workmanship
Comment:		The product is an acceptable material. See section 17 of this Certificate.
Regulation:	11	Structure
Standard:	C2.1	Stability
Comment:		When used in accordance with the provisions of this Certificate, the product will have sufficient strength and stiffness to sustain design loads depending on the geographical location. See sections 9.1 and 9.2 of this Certificate.
Regulation:	12	Structural fire precautions
Standard:	D7.2	Fire spread on internal linings — Principles
Comment:		The diffuser can be classified as Tp(b) rigid material and can be used in accordance with the area and separation distances required by (D7.2). See section 11.1 of this Certificate.
Standard:	D9.1	Fire spread from an adjoining building
Comment:		The external dome is assessed as having low vulnerability in accordance with (D9.1) and is subject to limitations with respect to proximity to boundaries in accordance with Table to D9.1. See sections 11.1 and 11.2 of this Certificate.
Regulation:	17	Resistance to moisture
Standard:	G3.1	Resistance to precipitation — Resistance to precipitation
Comment:		When installed in accordance with the provisions stated in this Certificate, the product will not adversely affect the resistance of the roof to the passage of moisture. See sections 10.1 to 10.3 of this Certificate.
Regulation:	18	Resistance to condensation
Standard:	G4.1	Condensation — Interstitial condensation
Standard:	G4.2	Condensation — Surface condensation
Comment:		The risk of condensation will depend on the environmental conditions. See sections 14.2 and 14.3 of this Certificate.
Regulation:	23	Ventilation of buildings
Standard:	K2.1	Ventilation of buildings other than garages
Standards:	K4.1 and K4.2	General ventilation requirements — Natural ventilation
Comment:		The product can satisfy or contribute to satisfying the trickle ventilation requirements of Table to (K2.1). See section 13.1 of this Certificate.

3 The Building Regulations (Northern Ireland) 2000



In the opinion of the BBA, Sky Tunnel, if used in accordance with the provisions of this Certificate, will satisfy or contribute to satisfying the various Building Regulations as listed below.

Regulation:	B2	Fitness of materials and workmanship
Comment:		The product is acceptable when used in accordance with this Certificate. See section 17 of this Certificate.
Regulation:	C4	Resistance to ground moisture and weather
Comment:		When installed in accordance with the provisions stated in this Certificate, the product will not adversely affect the resistance of the roof to the passage of moisture. See sections 10.1 to 10.3 of this Certificate.
Regulation:	C5	Condensation
Comment:		The risk of interstitial condensation will depend on the environmental conditions. See sections 14.2 and 14.3 of this Certificate.

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Regulation:	D1	Stability
Comment:		When installed in accordance with the provisions of this Certificate, the product will have sufficient strength and stiffness to sustain the design loads. See sections 9.1 and 9.2 of this Certificate.
Regulation:	E3	Internal fire spread — Linings
Comment:		The diffuser can be classified as Tp(b) rigid material. See section 11.1 of this Certificate.
Regulation:	E5	External fire spread
Comment:		The dome can be classified as Tp(a) rigid material. See sections 11.1 and 11.2 of this Certificate.
Regulation:	K2	Means of ventilation
Comment:		The product can satisfy or contribute to satisfying the background ventilation requirements in Tables 2.1 and 3.1 of Technical Booklet K. See section 13.1 of this Certificate.

4 Construction (Design and Management) Regulations 1994 (as amended) Construction (Design and Management) Regulations (Northern Ireland) 1995 (as amended)

Information in this Certificate may assist the client, planning supervisor, designer and contractors to address their obligations under these Regulations.

See section: 6 Delivery and site handling (6.1) of this Certificate.

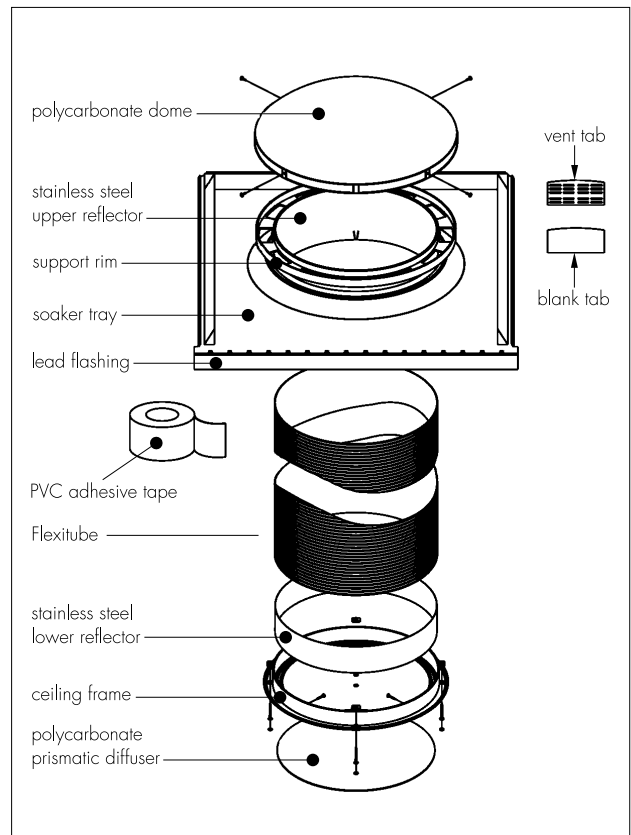
Technical Specification

5 Description

5.1 Sky Tunnel is available as a kit of parts and makes up into a roof-to-ceiling skylight (see Figure 1). The components include:

- dome — transparent polycarbonate, available in clear or opal, and coated with an ultraviolet (UV) stabiliser. It is attached to the top moulded support rim of the upstand
- upstand, soaker tray, flashing panel and upper ring — ready-fixed unit. The top rim of the injection-moulded plastic upstand incorporates a ring of holes in which ventilation tabs or blanking tabs are clipped into place to suit the ventilation requirements. Attached to the lower edge of the metal soaker tray is a lead flashing, which is formed to the contour of the slates or tiles. The soaker tray is manufactured from zincalume, a zinc and aluminium alloy which is corrosion resistant. The alloy is powder coated and then heat bonded on the visual side. The reflective ring is of polished, 28 SWG grade 430 stainless steel with four bendable tabs for attaching the Flexitube
- Flexitube — reflective, flexible, metallised polyester tube
- lower ring — polished, 28 SWG grade 430 stainless steel
- ceiling frame — injection-moulded, white ABS
- diffuser — transparent polycarbonate, available flat or dished with a prismatic or opal finish, or an egg-crate design in opal finish
- fixings:
 - dome to upstand — corrosion-resistant, galvanized screws
 - ceiling frame to ceiling — zinc-plated screws with fixing blocks
 - lower ring to ceiling frame — bright zinc self-drilling screws.

Figure 1 Sky Tunnel — semi-exploded view of tiled roof application



5.2 The product is available in a range of sizes (see Table 1).

Table 1 Sizes

Product code	Tube diameter (mm)
ST 350	350
ST 400	400
ST 500	500
ST 550	550

6 Delivery and site handling

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

6.2 The product is delivered to site in kit form, wrapped in bubble wrap protective sheet and boxed ready for installation. Each box carries a sticker bearing the customer's name, details, order number and delivery documentation.

Design Data

7 General

7.1 Sky Tunnel is suitable for use on pitched roofs of domestic or commercial buildings.

7.2 Principally, two variations exist in which the soaker trays are manufactured differently to allow for tiles or slates (see Figure 2).

Figure 2 Tile and slate configurations



tile roofs



slate roofs

7.3 The product is suitable for most existing pitched or tiled roofs. The minimum pitch for a tile or slate roof is 1.5° and the maximum is 65°. Other custom-designed

flashings are available from the Certificate holder for pitches of 66° to 90°, but these are outside the scope of this Certificate. Cutting of structural members of the roof should be avoided, but where it is necessary, it is important that the roof is checked by a suitably-qualified person.

7.4 The Flexitube is designed to extend through the roof space into the diffuser in the ceiling below. Tight bends are not recommended due to the loss of light transmission. The straighter and tauter the tube the more light is transmitted.

7.5 In areas where external noise levels might be considered intrusive, users should consider the siting of the product and use of the ventilation option, with care.

8 Practicability of installation

The product is practicable to install using the methods and procedures described in this Certificate and in accordance with the recommendations given in the Certificate holder's installation guide.

9 Strength and stability



9.1 The product can be selected to have adequate resistance to wind loads calculated in accordance with BS 6399-2 : 1997.

9.2 The product is designed to support an imposed load of 750 Nm⁻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, type and configuration of rooflights. Therefore, BS 6399-3 : 1988 should be used to calculate the actual snow load when the roof is used in situations where a load greater than 750 Nm⁻² can be expected.

9.3 Details of the connections between the upstand and the roof must be entrusted to a suitably-qualified person. Guidance is available from the Certificate holder.

9.4 The polycarbonate dome 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 2.4 J did not cause damage when applied at various points of the skylight dome.

10 Weathertightness



10.1 When installed in accordance with the manufacturer's instructions and this Certificate, the product will provide a weatherproof construction.

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 number of vents specified should take into account the prevailing weather conditions. For example, in locations when driving rain or snow is likely, the selection of a suitable vent position around the upstand is recommended.

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11 Behaviour in relation to fire

11.1 The polycarbonate dome used in the rooflights may be classified as Tp(a) rigid and the polycarbonate diffuser classified as Tp(b) rigid in accordance with the national Building Regulations:

England and Wales

Approved Document B

Scotland

Technical Standards, Part D

Northern Ireland

Technical Booklet E.

11.2 Aluminium and zincalume upstand materials can be considered as non-combustible.

12 Light transmittance

12.1 For design purposes, the approximate light transmission characteristics at normal incidence are given in Table 2.

Table 2 Light transmission

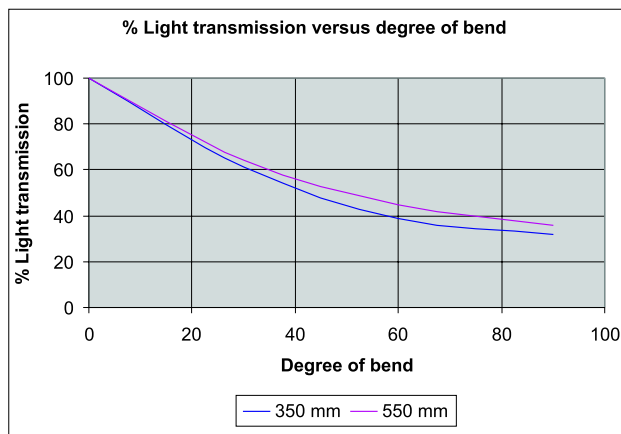
Material	Light transmission ⁽¹⁾ (%)	Haze (%)
Clear dome	89	2
Prismatic flat diffuser		
smooth side closest to light source	70	≤100 ⁽²⁾
rough side closest to light source	94	95 ⁽²⁾

(1) In accordance with ASTM D 1003 : 2000.

(2) Results are due to the prismatic nature of the diffuser.

12.2 For design purposes the loss in light due to bending of the Flexitube is illustrated in the graph in Figure 3.

Figure 3 Loss in light due to bending



13 Ventilation

13.1 The dome upstands incorporate cut outs which are fitted with blanking tabs and at least two ventilation grilles (see Figure 4). The ceiling diffuser is fitted flush with the ceiling frame. The rooflight can be configured to provide background trickle ventilation to a room, in accordance with the following guidance and Table 3 of this Certificate, by fitting additional grilles in the dome upstand and mounting the diffuser with a 5 mm annular gap with the ceiling frame:

England and Wales

Approved Document F, Tables 1 and 2

Scotland

Provisions deemed to satisfy the Standards, Table to (K2.1)

Northern Ireland

Technical Booklet K, Tables 2.1 and 3.1.

Figure 4 Fitting vent/blank tabs



Table 3 Ventilation open areas

Product code	Ceiling frame open area (mm ²)	Dome upstand	
		Area per grille (mm ²)	No of grilles ⁽¹⁾ required
ST350	5400	2130	3
ST400	6200	630	10
ST500	7770	2130	4
ST550	8560	630	14

(1) The number of grilles can be reduced if the ceiling frame open area is greater than required.

13.2 In some circumstances, risk of reverse air flow or rain ingress may indicate the need to consider other means of providing trickle ventilation to a room (see sections 7.5 and 10.3).

14 Hygrothermal

14.1 For buildings subject to national Building Regulations, the U value of the rooflight should be taken into account when estimating area weighted U value requirements or glazing area provisions for doors, windows and rooflights, and may be taken as 4.8 Wm⁻²K. Where the Flexitube passes through an unheated space, additional heat loss may be limited by increasing the level of sheathing insulation from that stated in section 14.2.

14.2 The risk of interstitial condensation forming within the rooflight or surface condensation forming on the underside of the diffuser will depend on internal and external environmental conditions (see section 14.3). Where the Flexitube passes through an unheated space, it should be sheathed with insulation having a thermal resistance of at least 0.6 m²KW⁻¹⁽¹⁾.

(1) BR 262 : 2002 *Thermal Insulation: Avoiding Risks*.

14.3 The components of the rooflight are durable and will not be damaged by occasional, limited condensation events that may occur in normal use. However additional preventative measures may need to be considered in unusual circumstances.

15 Safety

15.1 If the product 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). If, as the result of an accidental fall, contact is made with the polycarbonate skylight, the material shows good resistance to impact.

15.2 When subjected to normal atmospheric agents, movement of the structure, hygrothermal stresses, or vibrations, the polycarbonate skylight will not collapse or result in falling debris that would cause injury to occupants or passers-by.

16 Maintenance

16.1 If damage occurs, the product can be re-glazed and the fixings replaced, but these operations should be carried out using the materials approved by the BBA.

16.2 Cleaning of the diffuser or dome should be carried out using water containing household detergent. To avoid scratching the surface, only soft cloths should be used when cleaning.

16.3 Under no circumstances should anyone venture onto a skylight.

17 Durability

Available test data and knowledge of the materials suggest that the product, when installed in accordance with this Certificate, should have a life of 10 years. Minor changes in surface appearance and a reduction in light transmission of the polycarbonate domed material may occur during this period.

Installation

18 General

Installation of the Sky Tunnel should be carried out in accordance with the Certificate holder's installation instructions.

19 Procedure

Fixing skylight to exterior roof

19.1 An area of approximately 1 m by 1 m needs to be clear of tiles or slates to allow for installation at the dome/soaker tray assembly. The assembly should be located above the nearest point to where the ceiling diffuser will be positioned and as high as practicable on the roof. This allows for the Flexitube to be perpendicular and thus achieve the best transmission of light.

19.2 The tile/slate battens are sawn through and any roofing felt/insulation is cut to allow for insertion of the product. Sizes of holes required depend on the model being installed (see Table 4).

Table 4 Installation requirements

Product Code	Hole size required (mm)
ST 350	360 to 375
ST 400	410 to 425
ST 500	510 to 525
ST 550	560 to 575

19.3 The Flexitube is carefully fed through the hole in the roof and the dome/soaker tray is positioned onto the battens, ensuring that the lead flashing sits flat onto the tiles or slates below (see Figure 5).

Figure 5 Installation of Sky Tunnel



19.4 The soaker tray is fastened into place to the battens using galvanized nails ensuring that they are partly hammered in, adjacent to the tray edge and tapped over to secure the tray. Nailing through the tray will cause leakage and affect weathertightness (see Figure 6).

Figure 6 Installation of soaker tray



19.5 Tiles/slates are repositioned into place over the soaker tray, ensuring that the bottom right and left edge tile lips are positioned on top of the lead flashing (see Figure 7). The lead flashing is then dressed to mould the shape of the adjacent tile. For alternative slate/tile designs refer to the Certificate holder's installation instructions.

Figure 7 Lower tile lip detail



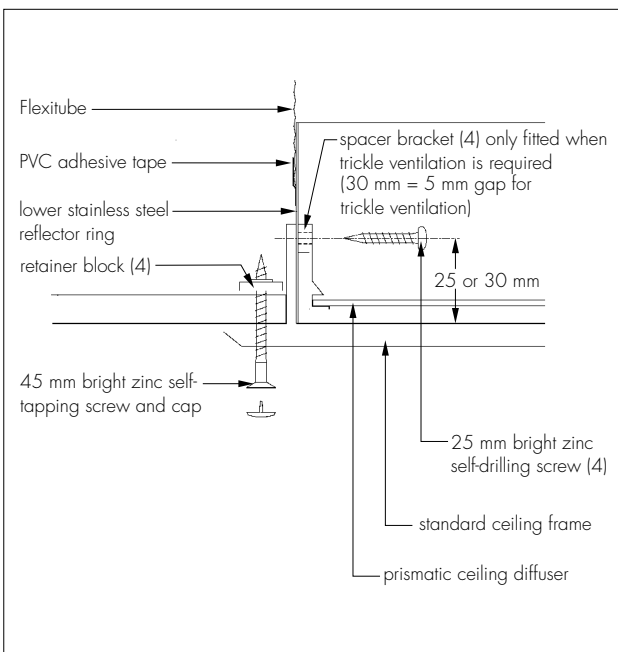
19.6 It is important to remove the protective film from the dome and the inside surface of the stainless steel reflector within the upstand as this will affect the light transmission.

Fixing interior section of skylight

19.7 Inside the room, the diffuser shape is cut out of the ceiling using a keyhole saw.

19.8 The ceiling frame unit is located into the hole and secured into place using screws and plastic retainer blocks supplied in the kit (see Figure 8).

Figure 8 Screw detail in ceiling frame unit



19.9 From inside the attic, the Flexitube is carefully stretched and cut to the correct length, ensuring that the Flexitube is well stretched and taut to maximise light transmission.

19.10 The reflector ring is positioned inside the end of the Flexitube and sealed into place with PVC adhesive tape. The protective tape must be removed from the inside surface of the reflector ring to maximise light transmission. Insulation, as described in section 14.2, is then fitted, if required.

19.11 From inside the room, the reflector ring/Flexitube end is pulled down and located into the ceiling diffuser upstand and secured into place with screws.

19.12 The polycarbonate diffuser panel is flexed slightly and passed through the ceiling frame and dropped into position (see Figure 9). With trickle vent arrangement a gap of about 5 mm exists between the ceiling frame and the diffuser panel.

Figure 9 Installation of diffuser panel



Technical Investigations

The following is a summary of the technical investigations carried out on Sky Tunnel.

20 Tests

Tests were carried out to determine:

- watertightness
- effect of wind loads
- effect of snow loads
- effect of impacts
- light transmission and haze
- loss of light due to bending
- suitability of materials.

21 Investigations

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

21.2 A site visit was conducted to establish the product's performance and durability in service.

21.3 Existing data was examined in relation to performance in fire.

21.4 The rooflight U value and risk of condensation was evaluated.

Bibliography

BS 6399-2 : 1997 *Loading for buildings — Code of practice for wind loads*

BS 6399-3 : 1988 *Loading for buildings — Code of practice for imposed roof loads*

ASTM D 1003 : 2000 *Test Method for Haze and Luminous Transmittance of Transparent Plastics*

Conditions of Certification

22 Conditions

22.1 This Certificate:

- (a) relates only to the product that is described, installed, used and maintained as set out in this Certificate;
- (b) is granted only to the company, firm or person identified on the front cover — no other company, firm or person may hold or claim any entitlement to this Certificate;
- (c) is valid only within the UK;
- (d) has to be read, considered and used as a whole document — it may be misleading and will be incomplete to be selective;
- (e) is copyright of the BBA;
- (f) is subject to English law.

22.2 References in this Certificate to any Act of Parliament, Regulation made thereunder, Directive or Regulation of the European Union, Statutory Instrument, Code of Practice, British Standard, manufacturers' instructions or similar publication, are references to such publication in the form in which it was current at the date of this Certificate.

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

- (a) are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA;

(b) continue to be checked as and when deemed appropriate by the BBA under arrangements that it will determine; and

(c) are reviewed by the BBA as and when it considers appropriate.

22.4 In granting this Certificate, the BBA is not responsible for:

- (a) the presence or absence of any patent, intellectual property or similar rights subsisting in the product or any other product;
- (b) the right of the Certificate holder to market, supply, install or maintain the product; and
- (c) the actual works in which the product is installed, used and maintained, including the nature, design, methods and workmanship of such works.

22.5 Any recommendations relating to the use or installation of this product which are contained or referred to in this Certificate are the minimum standards required to be met when the product is used. They do not purport in any way to restate the requirements of the Health & Safety at Work etc Act 1974, or of any other statutory, common law or other duty which may exist at the date of this Certificate or in the future; nor is conformity with such recommendations to be taken as satisfying the requirements of the 1974 Act or of any present or future statutory, common law or other duty of care. In granting this Certificate, the BBA does not accept responsibility to any person or body for any loss or damage, including personal injury, arising as a direct or indirect result of the installation and use of this product.



In the opinion of the British Board of Agrément, Sky Tunnel is fit for its intended use provided it is installed, used and maintained as set out in this Certificate. Certificate No 04/4141 is accordingly awarded to Sola Skylights UK Ltd.

On behalf of the British Board of Agrément

A handwritten signature in black ink, appearing to read 'P. Q. Newson'.

Chief Executive

Date of issue: 9th November 2004