Whitesales Rooflights

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CPD Article

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Testing and Certification for Glass Rooflights

Rooflights are a valuable source of natural light, with glass serving as a durable and hard-wearing material for the purpose. However, it is essential that rooflights are subject to stringent testing and compliant certification, to ensure that structures benefit from a safe roof surface.

Even more inaccessible roves require access and load bearing capabilities from time to time for routine maintenance and emergency repairs. As a result, rooflights need to maintain their ability to withstand load forces, and be manufactured, selected and fitted in such a way that they are not subject to degradation from the elements and accidental damage.

Key Learning outcomes

- Understand the factors which impact loadings
- Recognise permeability and breathability characteristics
- Gain knowledge of glass rooflight fire regulations
- Understand glazing performance requirements for glass rooflights
- Understand compliant security ratings for glass rooflights

1.0 Understanding how loadings are affected by the environment

Recognising the various loading capacities of glass rooflights is a key aspect of upholding safety. As a result, there are standards established to ensure that the product which is being installed is compliant and suitable for its proposed deployment.

The standard BS EN 12211:2016 (Windows and doors - resistance to wind load) assesses relative frontal deflection and damage resistance to wind loads. It supersedes the previous BS EN 12211:2000 standard, and is applicable to glass rooflights, and specifies the test method to determine the resistance to wind load for completely assembled windows, and pedestrian door sets of any materials, when submitted to positive or negative test pressures.

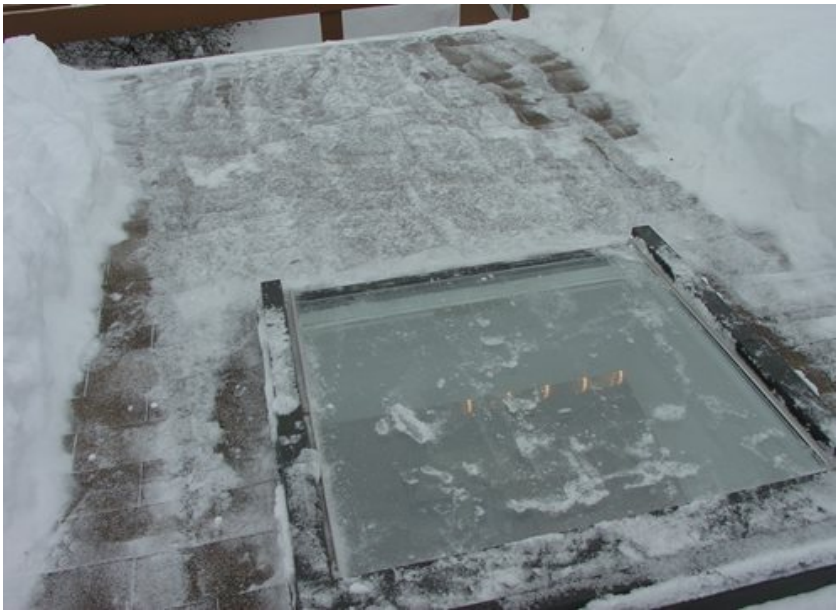
Load force can be impacted by several criteria. These include external factors such as wind pressure, snowfall, heavy rain or hail, all of which can affect the stability of the glass rooflight. Loading is also affected by geographical site locations, determined by the purpose of the rooflight – for example, a rooflight on a pitched will have significantly different loading requirements in comparison to a glass rooflight placed on a terrace which will be walked upon.

Imposed loads for walk on glass rooflights are defined by Uniform Distributed Load (UDL) and Concentrated Load. Typical standards are:

- Domestic applications: Uniformly distributed load (UDL) from 1.5kN/m2, and Concentrated load from 2.0kN
- Commercial applications: Uniformly distributed load (UDL) 4.0kN/m2, and Concentrated load 3.6kN
- Heavy duty commercial applications: Uniformly distributed load (UDL) 5.0kN/m2, and Concentrated load 4.5kN.

Loading capacity is also considered in relation with the weight of the rooflight itself, and the overall structure and suitability of the roof and upstand. As a general rule, this is calculated as 2.5kg per m2 per mm of glass plus the weight of the aluminium framework. Similarly, outthrust and span force are also important to consider when selecting the correct rooflight product. For example, when designing and constructing an upstand, it is critical to consider any outthrust forces which the rooflight may impose.

By definition, a pitched rooflight will always try to flatten out. Depending on the span of the rooflight, these forces can be considerable. If building in timber, care must be taken to ensure that the joints are lapped and not abutted, and corner bracing may be required. In some instances, a steel-formed upstand may provide the best solution.



Snow and ice provide additional loadings on rooflights and as different geographical ares have different loading values, careful consideration on design is required.

2.0 Recognising criteria for permeability and breathability in glass rooflights

Air permeability can be categorised as the physical property used, to measure the airtightness of the building fabric. It is defined as an air leakage rate per hour, per square metre of envelope area, at a test reference pressure differential across the building envelope, of 50 Pascal (50 N/m2). The design air permeability is the target value set at the design stage. BER Refers to Building Emission Rate and is compared to the TER, Target Emission Rate.

In April 2002, the UK government introduced legislation to enforce standards of building air tightness. This was intended to: lower running costs; verify the standards of materials, components and workmanship; prevent uncomfortable drafts and avoid condensation problems.

Air permeability and breathability qualities for glass rooflights are subject to specific regulations. The testing requirements to ensure regulatory compliance are set out in BS EN 1026: 2000 2 and BS EN 12207: 2000. Similarly, water permeability is regulated by the British Standards EN 1027: 2000 and BS EN 12208: 2000, and wind permeability/breathability in BS EN 12211: 2000 & BS EN 12210: 2000.

Regulations require that most buildings that are not dwellings must be tested for air tightness on completion of the building structure, and the worst case acceptable value (under Criterion 2) is 10m3/hr/m2 at 50 Pa. Attention to detail on the fixing of rooflights to the manufacturers recommendations, is critical to achieve a compliant Air Permeability test.

The National Association of Rooflight Manufacturers (NARM) provides comprehensive guidelines for assessing the permeability and breathability of glass rooflight products. They state that attention to the detail of the fixing process is critical. In particular, the correct type, size and positioning of sealants, and correct compression of sealants by use of the correct number, position, size and type of fasteners is vital. The consequences of failing the air pressure test means remedial work will need to be carried out, which can be expensive.

Well-designed rooflights play a key role in providing balance in a buildings breathability. The right balance of air permeability and weathertightness will enhance the emission rate.

3.0 Fire regulations for glass rooflights

Glass rooflights are subject to fire resistance regulations set out in Building Regulations Approved Document B (2006, amended 2007).

These can be met by achieving specific fire ratings to either British (BS476) or European (BS EN13501) test standards. Standards encompass internal fire spread and considers both the roof lining and walls of the structure. They detail surface spread of flame requirements to BS476 (Part 7) or to BS EN 13501 (Part 1). Section B4 covers external fire spread and applies to external coverings or roofs and walls; in general, these are fire resistance requirements to BS476 (Part 3) or to BS EN13501 (Part 5).

NARM summarises the regulations, as follows:

- The inner skin of a ceiling or wall or rooflight should normally be rated Class 1 (BS476 Part 7) or Class C-s3,d2 (BS EN 13501 Part 1) or achieve Tp(a)
- A concession allows the inner skin of a rooflight to be rated Class 3 (BS476 Part 7) Class D-s3,d2 (BS EN 13501 Part 1) or Tp(b) if the area of each rooflight is less than 5m2 , and there is a clear space of 3 metres (1.8 metres in some applications) in all directions between each rooflight
- There are no restrictions on use of rooflights with outer sheets rated at least AC (BS476 Part 3) or BROOF(t4) (BS EN 13501 Part 5)
- The only requirement for fire protection of wall outer sheets is where the building is within 1 metre of a boundary or is over 18 metres tall or is a building to which the public have access, when some areas will require sheets rated Class 0 or Class B-s3,d2 (BS EN 13501 Part 1)

Timed fire-ratings are covered under EN1364-2:199. This test summarises fire resistance in two values - integrity and insulation. The integrity reading highlights the time that the component can withstand and prevent fire and smoke from breaching the buildings compartmentation. This is denoted as ‘E’. insulation is the timed reading that accompanies the insulation test - It gives an indication of how long the component can withstand the heat generated from a fire . This is denoted as ‘I’. Therefore, a rooflight resistant to fire for 60 minutes will carry the value ‘EI60’.

Use of glazing over protected stairwells or within third-party walls is subject to additional regulation to ensure that the structure maintains a safe exit route in the event of fire. See supplement.

Rooflights are part of the building fabric and therefore they must match the fire resisttant capabilities of the building elements.

4.0 Glazing performance requirements

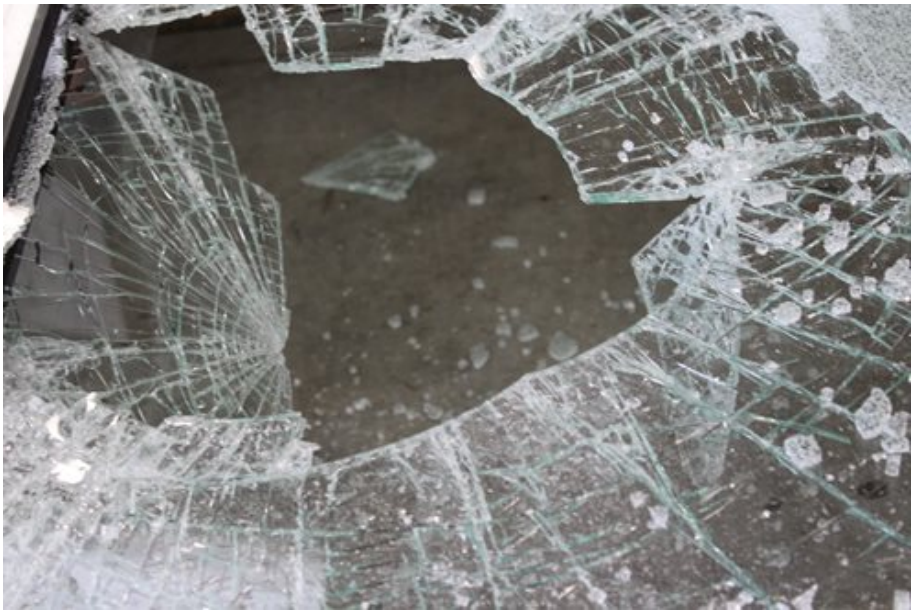
Rooflights with a non-fragile classification are assessed according to the roof loading capacity, as opposed to floor loadings; as a result, even non-fragile rooflight fixtures are not recommended to be walked upon. New rooflight installations should always be designed as non-fragile, and be installed using specified components and approved methodology, to maximise the longevity of the non-fragile classification.

CWCT testing for rooflights identifies a rating (Class 1, 2 or 3), according to performance under a standardised assessment. A specified weight is released in a controlled fall under gravity, at critical points, to monitor impact resistance. Class 1 is categorised as suitable to walk on for brief maintenance or cleaning. Class 2 is unsuitable for walking upon, but resistant to breakage in the event of surface impact. Class 3 is a ‘fragile’ classification, requiring additional safety considerations.

CWCT provides guidance for appropriate installation of rooflights. The TN66 Technical Note relates to glass rooflights which is not publicly accessible but may be accessed for maintenance purposes. TN67 outlines the required assessment process to ensure glass roofs are compliant with CWCT classifications. TN92 details the criteria required, for glass used in Class 2 roofs, to achieve a ‘deemed to satisfy’ rating.

Rooflights classified as ‘walk-on’ are subject to their own distinct loading levels, applicable depending upon their proposed application. CWCT Class 0 refers to rooflights with unrestricted access, which are designed to be walked upon. Loading levels are not calculated purely on the basis of capacity to withstand being walked upon, but also consider other factors which may cause additional pressure impacting load bearings, such as wind or snow loading. These additional factors are measured through test methods outlined within BS EN 12211 guidance.

Domestic applications for rooflights require a uniformly distributed load capacity of up to 1.5 kN/m2, and concentrated load capacity of up to 2.0 kN/m2. Commercial application requires load capacity of up to 4.0/3.6 kN/m2, and heavy-duty requires up to 5.0/4.5 kN/m2.



Building owners and designers must ensure that persons accessing the roof can do so in a safe way. Rooflights, as part of the roof, must meet impact resistant requirements.

5.0 Ensuring compliant security ratings for glass rooflights

Approved Document Q - Security in Dwellings (2015 Edition), is the supporting document to requirement Q1 of Schedule 1 to the Building Regulations 2010. It states that rooflights which are installed within 'easily accessible areas will need to ensure they specify a product that is compliant with security requirements. Most roof windows installed in plane, on a typical pitched roof in a two-storey building are unaffected by the guidelines. However, glass rooflights designed for flat roof applications are more likely to be affected due to their more accessible locations, often being found on single storey extensions.

More commonly known as 'Part Q', the document sets out the reasonable standards required for doors and windows to resist physical attack by a casual or opportunist burglar. They must be both sufficiently robust and fitted with appropriate hardware. Requirement Q1, relating to unauthorised access, states that reasonable provision must be made to resist unauthorised access to any dwelling and any part of a building from which access can be gained to a private residence within the building, for example communal areas or hallways.

To satisfy the requirements of Part Q, windows should be made to a design that has been shown by test to meet one of the following standards:

- PAS 24:2012
- STS 202 Issue 3:2011
- LPS 1175 Issue 7:2010 security rating 1
- LPS 2081 Issue 1:2015 security rating A.

Secured by Design (SBD)

Secured by Design was established in 1989, as the official UK Police security initiative. It aims to reduce crime by combining the principals of 'designing out crime' through physical security and layout across all realms of the built environment. The scheme also calls for the installation of security products that meet police approved standards.

SBD works with industry test houses to create and test high-level security standards in response to crime trends. Where a manufacturer has successfully tested its product and been certified by an accredited testing body to the specified standards, it can apply for SBD membership and licence to use the scheme's logo, making it easier for specifiers to identify products that are tested and approved.

In today's challenging environment, with increasing focus on security, rooflights in some situations e.g. where they are easily accessible, must meet police-approved standards, or similar.