BRITISH STANDARD

# Specification for windows and doorsets made from unplasticized polyvinyl chloride (PVC-U) extruded hollow profiles

ICS 91.060.50



British Standards

## Publishing and copyright information



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# Contents



**Summary of pages**

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# Foreword

## Publishing information

This British Standard is published by BSI and came into effect on 30 April 2007. It was prepared by Subcommittees B/538/1, *Windows*, and B/538/2, *Doors*, under the authority of Technical Committee B/538, *Doors, windows, shutters, hardware and curtain walling*. A list of organizations represented on these committees can be obtained on request to their secretary.

## Supersession

This British Standard supersedes BS 7412:2002, which will be withdrawn in December 2008.

## Relationship with other publications

The requirements for raw materials and properties of the finished profile for white PVC-U extruded hollow profiles are specified in BS EN 12608. The requirements for surface covered PVC-U extruded hollow profiles are specified in BS 7722.

This British Standard is related to the following other standards.

- BS EN 14351-1 is the harmonized European product standard for windows and external pedestrian doorsets without resistance to fire and smoke leakage characteristics. It gives a list of performance characteristics and classifications of performance, but does not give guidance on determining the appropriate classification for any specific application.
- BS 6375 (currently in two parts, with a third in preparation) is the national application document in the UK, giving performance requirements and guidance for the selection of appropriate classes of performance from BS EN 14351-1.
- The performance aspects in BS 6375 are referred to in BS 7412.

Guidance on the survey and installation of windows and doorsets is given in BS 8213-4.

## Information about this document

This is a full revision of the standard, and introduces the following principal changes:

- changes to take into account the publication of harmonized European product standard EN 14351 in three parts;
- information on how the requirements relate to the European Construction Products Directive.

## Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is “shall”.

*Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.*

## Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

**Compliance with a British Standard cannot confer immunity from legal obligations.**

Attention is drawn to the Building Regulations 2000 and subsequent amendments [1], the Building (Scotland) Regulations 2004 [2] and the Building Regulations (Northern Ireland) 2000 [3].

# 1 Scope

This British Standard specifies requirements for the design, fabrication and performance of windows and glazed doorsets made from PVC-U extruded hollow profiles.

This British Standard applies to windows and doorsets manufactured from PVC-U hollow profiles incorporating fusion welded corner joints.

It applies to windows and doors fabricated into frames in a factory, to be installed vertically (within 15°) into the external face of buildings, as single or multi-light units, in coupled assemblies when appropriate, of the following types:

a) windows:

   1) hinged: side-hung (open in or out), top-hung (open out), bottom-hung (open in), tilt and turn or turn before tilt;

   2) projecting: side-hung (open in or open out) and top-hung (open out or reversible);

   3) pivoted: horizontal and vertical (hung centrally or off-centre) including reversible;

   4) sliding: horizontal and vertical;

   5) side-hung: fully reversible;

   6) fixed light;

b) doors:

   1) single leaf single-swing doors with or without side lights and top panels;

   2) double leaf single-swing doors with or without side lights and top panels.

It is applicable to assemblies in which any frame member is not longer than 3 m. It does not apply to curtain walls that span across horizontal structural members of floors but is applicable to windows within a curtain walling system.

It is applicable to assemblies up to the point of installation.

*NOTE Guidance on the evaluation of conformity is given in Annex A. Guidance on durability and recycling is given in Annex B.*

# 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

### Standards publications

BS 4255-1, *Rubber used in preformed gaskets for weather exclusion from buildings – Part 1: Specification for non-cellular gaskets*

BS 6100-1 (BS ISO 6707-1), *Building and civil engineering – Vocabulary – Part 1: General terms*

BS 6100-1.3.5, *Glossary of building and civil engineering terms – Part 1: General and miscellaneous – Subsection 1.3: Parts of construction works – Subsection 1.3.5: Doors, windows and openings*

BS 6100-1.3.6, *Glossary of building and civil engineering terms – Part 1: General and miscellaneous – Subsection 1.3: Parts of construction works – Subsection 1.3.6: Jointing products, builders' hardware and accessories*

BS 6100-1.5.1, *Glossary of building and civil engineering terms – Part 1: General and miscellaneous – Subsection 1.5: Operations; associated plant and equipment – Subsection 1.5.1: Co-ordination of dimensions; tolerances and accuracy*

BS 6100-1.6, *Glossary of building and civil engineering terms – Part 1: General and miscellaneous – Subsection 1.6: Persons*

BS 6262 (all parts), *Glazing for buildings*

BS 6375 (both parts), *Performance of windows and doors*

BS 7722, *Surface covered PVC-U profiles for windows and doors – Specification*

BS 7950:1997, *Specification for enhanced security performance of windows for domestic applications*

BS 8000-7, *Workmanship on building sites – Part 7: Code of practice for glazing*

PAS 24-1:1999, *Enhanced security performance requirements for door assemblies – Part 1: Single and double leaf, hinged external door assemblies to dwellings*

BS EN 485-2, *Aluminium and aluminium alloys – Sheet, strip and plate – Part 2: Mechanical properties*

BS EN 514, *Unplasticized polyvinylchloride (PVC-U) profiles for the fabrication of windows and doors – Determination of the strength of welded corners and T-joints*

BS EN 515, *Aluminium and aluminium alloys – Wrought products – Temper designations*

BS EN 572 (all parts), *Glass in building – Basic soda lime silicate glass products*

BS EN 755-9, *Aluminium and aluminium alloys – Extruded rod/bar, tube and profiles – Part 9: Profiles, tolerances on dimensions and form*

BS EN 1027, *Windows and doors – Watertightness – Test method*

BS EN 1096 (all parts), *Glass in building – Coated glass*

BS EN 1279 (all parts), *Glass in building – Insulating glass units*

BS EN 1670:1998, *Building hardware – Corrosion resistance – Requirements and test methods*

BS EN 1863 (both parts), *Glass in building – Heat strengthened soda lime silicate glass*

BS EN 10088-2, *Stainless steels – Technical delivery conditions for sheet/plate and strip of corrosion resisting steels for general purposes*

BS EN 10327:2004, *Continuously hot-dip coated strip and sheet of low carbon steels for cold forming – Technical delivery conditions*

BS EN 12150 (both parts), *Glass in building – Thermally toughened soda lime silicate safety glass*

BS EN 12211, *Windows and doors – Resistance to wind load – Test method*

BS EN 12337 (both parts), *Glass in building – Chemically strengthened soda lime silicate glass*

BS EN 12608:2003, *Unplasticized polyvinylchloride (PVC-U) profiles for the fabrication of windows and doors – Classification, requirements and test methods*

BS EN 13024 (both parts), *Glass in building – Thermally toughened borosilicate safety glass*

BS EN 13141-1, *Ventilation for buildings – Performance testing of components/products for residential ventilation – Part 1: Externally and internally mounted air transfer devices*

BS EN 13142, *Ventilation for buildings – Components/products for residential ventilation – Required and optional performance characteristics*

BS EN 14178 (both parts), *Glass in building – Basic alkaline earth silicate glass products*

BS EN 14179 (both parts), *Glass in building – Heat-soaked thermally-toughened soda lime silicate safety glass*

BS EN 14321 (both parts), *Glass in building – Thermally toughened alkaline earth silicate safety glass*

BS EN 14449, *Glass in building – Laminated glass and laminated safety glass – Evaluation of conformity/product standard*

BS EN ISO 4042, *Fasteners – Electroplated coatings*

BS EN ISO 105-A01:1996, *Textiles – Tests for colour fastness – Part A01: Standard depths: matt*

## Other publications

BRITISH PLASTICS FEDERATION. *Code of practice for the reinforcement of high impact modified PVC-U windows and doors*. 323/1. London: British Plastics Federation, 1991.[1)]

BRITISH PLASTICS FEDERATION. *Materials for gaskets and weatherstrips for windows, doors, conservatories and curtain walling – Specification and performance requirements*. 345/2. London: British Plastics Federation, 2004.[1)]

BRITISH PLASTICS FEDERATION. *Infill panels for doors and windows*. 355/1. London: British Plastics Federation, 1996.[1)]

BRITISH PLASTICS FEDERATION. *Specification and guidelines for the selection and application of fasteners for the manufacture of plastics windows and doors*. 363/1. London: British Plastics Federation, 2001.[1)]

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[1)] British Plastics Federation, 6 Bath Place, Rivington Street, London EC2A 3JE. Telephone 020 7457 5000. www.bpf.co.uk.

# 3 Terms and definitions

For the purposes of this British Standard, the terms and definitions given in BS 6100-1, BS 6100-1.3.5, BS 6100-1.3.6, BS 6100-1.5.1 and BS 6100-1.6 and the following apply.

**3.1 casement**
framed opening window light that is hinged or pivoted

**3.2 coupled assembly**
two or more windows and/or doorsets mechanically joined to fill an opening

*NOTE This was previously known as a composite assembly.*

**3.3 cycle**
set of operations required to take a window or door from the closed and fully locked condition to the fully opened condition and back to the closed and fully locked position

**3.4 door frame**
part of a doorset surrounding the door leaf and to which the door leaf is hinged

**3.5 door leaf**
hinged, moving element within a doorset

**3.6 doorset**
complete unit, as installed, comprising door leaf, door frame, any associated side panels or top lights, and any operating hardware, locks and accessories

*NOTE This is also known as a door assembly.*

**3.7 finger operated**
operation of hardware by the use of fingers only without palm contact

*NOTE This might or might not include the use of a key.*

**3.8 fixing**
component that is used to secure separate parts of a window or doorset to each other, to secure an item of hardware to a window or door part, or to secure a completed window or doorset into the structure of a building

**3.9 glazing gasket**
plastic or synthetic flexible member used between the glazing and the frame and/or between the glazing and the glazing bead

**3.10 hand operated**
operation of hardware by full use of the hand including palm contact

*NOTE This might or might not include the use of a key.*

**3.11 hardware**
device attached to a structural member to facilitate opening, closing or making the product secure in the frame

**3.12 multi-light**
window incorporating two or more lights, opening and/or fixed, within one perimeter frame

**3.13 range**
group of assemblies with defined limits of size, type, configuration, hardware, glazing, construction and security features

**3.14 sash**
framed opening light that slides

**3.15 switch barrier**
device that prevents a tilt and turn window from engaging in the tilt mode and the turn mode at the same time

**3.16 ventilation device**
ventilator other than an opening light incorporated into a window

*NOTE 1 A permanent ventilation device provides continuous ventilation. A controlled device can be closed and may be adjusted to provide ventilation.*

*NOTE 2 A ventilation device is referred to as an "air transfer device" in BS EN 13142 and is frequently referred to as a "trickle ventilator" in the UK.*

**3.17 weatherseal**
resilient material designed to reduce air infiltration and water penetration

*NOTE This is sometimes referred to as weatherstrip.*

# 4 Handing

The handing shall be in accordance with the specification provided.

Where the manufacturer is specifying the handing, the specification shall conform to Annex C.

*NOTE Where the manufacturer is not specifying the handing, care should be taken to check the handing designation. See Annex C, Note to **C.1**.*

# 5 Components

## 5.1 PVC-U extruded hollow profiles

White PVC-U extruded hollow profiles used in plastics windows and doorsets shall conform to BS EN 12608.

Surface covered PVC-U extruded hollow profiles used in plastics windows and doorsets shall conform to BS 7722.

## 5.2 Glass

The type and quality of glass used in plastics windows and doorsets shall conform to the following standards as appropriate:

- BS EN 572 for basic soda lime silicate glass products;
- BS EN 1096 for coated glass;
- BS EN 1863 for heat strengthened soda lime silicate glass;
- BS EN 12150 for thermally toughened soda lime silicate safety glass;

- BS EN 12337 for chemically strengthened soda lime silicate glass;
- BS EN 13024 for thermally toughened borosilicate safety glass;
- BS EN 14178 for basic alkaline earth silicate glass products;
- BS EN 14179 for heat-soaked thermally toughened soda lime silicate safety glass;
- BS EN 14321 for thermally toughened alkaline earth silicate safety glass;
- BS EN 14449 for laminated glass and laminated safety glass.

Glass thickness and type shall be selected using the recommendations given in the relevant part of BS 6262.

Hermetically sealed flat double glazing units shall conform to BS EN 1279.

## 5.3 Reinforcement

The use of reinforcement in plastics windows and doorsets shall conform to the recommendations in British Plastics Federation publication 323/1.

*NOTE 1 Reinforcement should be non-hygroscopic and should have no adverse effect on the performance of the window or door.*

Where metal reinforcement is used it shall be manufactured from one of the following metals:

a) mild steel sheet, hot-dip zinc coated, conforming to BS EN 10327:2004, coating designation Z275. This type of reinforcement shall only be used in profiles or systems designed and sealed so that no exterior moisture can come into contact with the reinforcement;

b) mild steel sections which are subsequently given a corrosion-resistant coating in order to conform to the requirements in a). This type of reinforcement shall only be used in profiles or systems designed and sealed so that no exterior moisture can come into contact with the reinforcement;

c) austenitic stainless steel sheet or strip conforming to BS EN 10088-2;

*NOTE 2 This type of reinforcement can be used in any type of profile or system.*

d) extruded aluminium alloy conforming to BS EN 485-2, BS EN 515, or BS EN 755-9.

*NOTE 3 This type of reinforcement can be used in any type of profile or system.*

## 5.4 Glazing gaskets and weatherstrips

Glazing gaskets and weatherstrips shall conform to BS 4255-1 and BPF publication 345/2.

### 5.5 Hardware except for fixings

Materials for all hardware, except for fixings as defined in **3.8**, shall have at least the equivalent corrosion resistance of BS EN 1670:1998, grade (class) 3 when subjected to a neutral salt spray test. Tests shall be carried out on complete hardware items as supplied.

*NOTE 1 There is no direct correlation between a given number of hours salt spray testing and real-time natural environment exposure.*

*NOTE 2 In certain coastal or industrial environments austenitic stainless steel hardware, conforming to BS EN 10088-2, is particularly suitable.*

Threaded components shall be treated in accordance with BS EN ISO 4042.

### 5.6 Fixings

The performance of fixings shall conform to British Plastics Federation publication 363/1.

*NOTE In BPF publication 363/1, fixings are referred to as "fasteners". Similar guidance is also given in GGF data sheet 6.8 [4].*

### 5.7 Infill panels

Where infillings other than glazing are used they shall conform to British Plastics Federation publication 355/1.

## 6 Appearance and finish

The colour and/or appearance of profiles used in an assembled window or door shall be uniform and consistent when viewed by normal or corrected vision at a range of 1 m in 45° north sky light, viewing perpendicular to the surface in accordance with BS EN ISO 105-A01:1996, Clause **14**.

*NOTE 1 Instrumental methods of measurement may be used in accordance with BS 3900-D8, BS 3900-D9 and BS 3900-D10. For each measurement on white profiles, the change in colour $\Delta E^*$ should be not greater than 1.*

*NOTE 2 The perception of colour on installed windows and doorsets is affected by orientation, ambient light, length of time after installation, and other factors.*

## 7 Fabrication

### 7.1 Welds

When tested in accordance with Annex D, the joint shall not fracture and the weld shall withstand a stress of 20 MPa.

*NOTE Alternative methods of test may be used as long as equivalence with this test is demonstrated.*

## 7.2 Mechanical joints (mullion and transom joints)

When mechanical joints are tested in accordance with Annex E for thermal stress (**E.3**), torsion (**E.4**) and bending due to wind load (**E.5**), water shall not penetrate through the joint:

- into the reinforcing chambers other than those designed to allow water ingress;
- onto that part of the construction in contact with the window;
- to the inside of the building;
- into any undrained chambers (this can be determined by dismantling the specimen after testing).

When tested in accordance with **E.5**, under the static load the maximum misalignment measured at the extreme ends of the profile under load shall not exceed 2 mm from the neutral position (average of the two measurements).

When mechanical joints are tested in accordance with **E.6**, watertightness shall be retained and any movement or torsion effect on the mullion/transom shall not affect the performance of the window.

## 7.3 Ventilation devices

Ventilation devices shall not permit the penetration of moisture into any profile chambers that are not designed to have moisture in them.

*NOTE 1 Conformity to this requirement is determined by visual examination.*

*NOTE 2 Certain types of ventilation device permit moisture into the hardware cavity between opening light and frame and so could increase the chances of corrosion of the hardware.*

## 7.4 Hardware

Hardware shall be replaceable without removing the outer frame from the structure of the building.

*NOTE Conformity to this requirement is determined by visual examination.*

## 7.5 Drainage

In all windows and doorsets, drainage shall be provided to permit the escape of water from the platforms of the horizontal members beneath each sealed unit and on the frame members beneath opening lights. The route of the drainage shall be designed to prevent water running through the reinforcement chamber unless the reinforcement and fixings are of stainless steel or aluminium alloy in accordance with **5.3**, or of other materials that are known not to be adversely affected by moisture (e.g. not subject to corrosion, swelling, etc.).

### 7.6 Manufacturing tolerances

The overall height and width of an assembled frame shall not differ from the work size by more than ±3 mm when measured at (20 ± 5) °C, with a maximum difference of 3 mm at any point. For assemblies with outer frames having three or more joints per frame member, the deviation shall be not more than 4 mm when similarly measured.

Frame assemblies shall be such that they can be installed in a square opening with a maximum difference in the diagonal of 4 mm.

### 7.7 Gaskets and weatherseal

Gaskets and weatherseal shall be replaceable without removing the outer frame from the structure of the building.

## 8 Glazing

Glazing shall be fitted to windows and doorsets in accordance with the recommendations given in the relevant part of BS 6262. Windows and doorsets shall be designed to allow reglazing without removing the outer frame from the structure of the building and shall enable compliance with the recommendations given in BS 6262 and BS 8000-7.

## 9 Use, cleaning and maintenance

Guidance on the use, cleaning and maintenance of plastics windows and doorsets shall be provided by the manufacturer.

## 10 Security

### 10.1 Basic security

When a completed window or door is subjected to the following tests, it shall not be possible to gain entry:

a) completed window:

- manipulation test given in BS 7950:1997, **A.4**;
- glazing removal test given in BS 7950:1997, **A.5.1**, using only the tools specified in group A of BS 7950:1997, **A.3**;

b) completed door:

- manipulation test given in PAS 24-1:1999, **A.4**;
- infill removal test given in PAS 24-1:1999, **A.5.2**.

### 10.2 Enhanced security

When enhanced security is required, windows shall conform to BS 7950 and doorsets to PAS 24-1.

# 11 Safety in case of fire

## 11.1 Fire resistance

Where fire resistance forms part of the requirements, it shall be declared in accordance with the relevant clause of BS 6375.

## 11.2 Reaction to fire

Where reaction to fire forms part of the requirements, it shall be declared in accordance with the relevant clause of BS 6375.

# 12 Safety in use

*NOTE BS 8213-1 gives guidance on the safety in use and in cleaning of windows and doorsets.*

## 12.1 Impact resistance

Where impact resistance forms part of the requirements, it shall be declared in accordance with the relevant clause of BS 6375.

## 12.2 Safety devices

Any safety devices shall conform to the requirements in the relevant clause of BS 6375.

## 12.3 Panic exit devices

Any panic exit devices shall conform to the requirements in the relevant clause of BS 6375.

# 13 Weathertightness

Weathertightness shall be declared in accordance with BS 6375-1.

# 14 Operation and strength characteristics

Operation and strength characteristics shall be declared in accordance with BS 6375-2.

# 15 Hygiene, health and the environment

*NOTE 1 This clause is relevant to Essential Requirement 3 of the Construction Products Directive [5].*

*NOTE 2 There is a requirement in BS EN 14351-1 for the manufacturer to declare if there is a risk of any potentially dangerous substances being released from the window or door during normal intended use.*

The performance of any air transfer device mounted within the window shall be classified in accordance with BS EN 13142 when tested in accordance with BS EN 13141-1.

# 16 Acoustic performance

When specified, acoustic performance shall be declared in accordance with the relevant clause of BS 6375.

# 17 Energy conservation

The U value shall be declared in accordance with the relevant clause of BS 6375, and/or the Window Energy Rating as certified by British Fenestration Rating Council Ltd (BFRC).[2)]

# 18 Marking

Each window or door shall be identified with the following information:

a) the number and date of this British Standard, i.e. BS 7412:2007;[3)]

b) claimed performance classifications;

c) the name or trade mark of the manufacturer or other means of identifying the manufacturer; and

d) means of traceability.

The identification shall be affixed:

- to any suitable part of the product; or
- on an attached label; or
- on its packaging; or
- on the accompanying commercial documents; or
- on the manufacturer's website; or
- in the manufacturer's published technical specifications.

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2) 44–48 Borough High Street, London SE1 1XB. Telephone 020 7403 9200. Website http://www.bfrc.org.

3) Marking BS 7412:2007 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is therefore solely the responsibility of the person making the claim. Such a declaration is not to be confused with third party certification of conformity, which might also be desirable.

# Annex A (informative) Guidance on the evaluation of conformity

## A.1 Selection of samples for type approval

When considering a product range of windows for testing and approval with a view to selecting representative samples, the following aspects should be taken into account:

a) the size of the window:

1) largest area top-hung (TH) with the longest length;
2) largest area side-hung (SH) with the tallest height;
3) maximum area fixed light (F) for the weathertightness classification being considered;
4) maximum area casement multi-light with the longest continuous mullion/transom for the weathertightness classification being considered for welded or mechanical joints;
5) maximum area tilt and turn (TT) or turn before tilt (TBT);
6) maximum area tilt and turn (TT) or turn before tilt (TBT) multi-light with longest continuous mullion or transom for the weathertightness classification being considered;
7) largest area horizontal pivot (HP) with longest width;
8) largest area vertical pivot (VP) with tallest height;

*NOTE 1 If an offset pivot is available, this should be selected instead of a centre pivot.*

9) vertical pivots (VP) should be treated as side-hung (SH) windows unless they are 2/3 open out, 1/3 open in, in which case they should be treated as a centre pivot;
10) maximum area horizontal slider (HS) with the tallest height;
11) maximum area vertical slider (VS) with longest length;

b) windows fitted with or without reinforcement in both sash and outer frame and associated size limitations with respect to the weathertightness classification being considered;

c) internal/external beaded systems;

d) glazing – single/double glazed – consider window having the thinnest glass with maximum area for wind loading classification being considered (if applicable) and window having double glazed unit of maximum area for wind loading classification being considered;

e) single or multi-point locking and various other systems;

*NOTE 2 When considering single lights with multi-point locking systems, take the greatest value of opening perimeter divided by the total number of locking points.*

f) hinging systems/suppliers;

g) other supporting hardware used to support the weathertightness/ mechanical performance.

*NOTE 3 All of these details should be made available in the manufacturer's fabrication manual.*

### A.2 Testing schedule

Type tests in accordance with this British Standard should be carried out initially (i.e. at first assessment of the range) and at significant changes to the window construction.

## Annex B (informative) Durability and recycling

### B.1 General

The durability of PVC-U windows and doorsets is affected by the following factors:

- the specification of the framing material;
- the ambient atmosphere, i.e. coastal, industrial, etc.;
- the conditions of use/abuse, e.g. frequency of operation;
- the specification of the components used in the manufacture;
- the quality of manufacture and assembly;
- the quality of installation;
- maintenance and replacement of components.

Because of these variables, actual performance can vary under actual service conditions and any figures given for service life can only be general estimates. Any indications given bear no relationship to warranties given by the manufacturer.

A window or door is considered to have failed when it is no longer possible to repair or replace hardware or the physical integrity has been lost, e.g. broken weld.

### B.2 Components

#### B.2.1 PVC-U frames

PVC-U profiles manufactured in accordance with BS EN 12608 only require an occasional wipe down for appearance purposes. A gradual loss of gloss might occur over time which has no effect on the functional performance of the window. As PVC-U profiles have been successfully used for windows and doorsets for the last 40 years, PVC-U windows and doorsets manufactured in accordance with this British Standard are expected to last in excess of 40 years.

The Building Research Establishment *Green guide to specification* [6] uses a reference service life (RSL) of at least 35 years.

#### B.2.2 Sealed units

Sealed units manufactured in accordance with BS EN 1279 can last in excess of 20 years if they are correctly glazed into the frame. Sealed units can be replaced without removing the outer frame from the fabric of the building.

### B.2.3 Glazing gaskets and weatherseals

Glazing gaskets and weatherseals manufactured in accordance with BPF publication 345/2, when correctly applied, ensure the weathertightness of the window or door. Over time, the performance of glazing gaskets and weatherseals generally declines. Glazing gaskets and weatherseals generally need replacing after 10 to 20 years. They can be replaced without removing the outer frame from the fabric of the building. Whilst it might prove impossible or impractical to replace glazing gaskets and weatherseals with exact replicas, most gasket manufacturers carry a sufficiently wide range of gaskets to ensure that a near match can be achieved which enables the performance of the window to be maintained.

### B.2.4 Hardware and fixings

Hardware and fixings are available in many shapes, sizes and performance levels. Items of hardware can be hardware manufacturer-specific, system-specific and profile-specific. As many items of hardware require profiles to be routered, it might not be possible to replace hardware with items which require exactly the same routering, as this might require further work on site including routering or drilling new slots or holes and/or stopping up existing slots or holes to prevent moisture ingress into the profile. Consequently, choosing longer life hardware might be more desirable where replacement of the original hardware and fixings could be complex.

## B.3 Corrosion resistance of hardware

The requirement in this British Standard for corrosion resistance is 96 h corrosion resistance in a neutral salt spray test carried out in accordance with BS EN 1670:1998, grade (class) 3 on unused samples, tested in isolation. It should be recognized that this is a benchmark test and that there can be no correlation with real life conditions, where used hardware might be subjected to a corrosive environment. For example, coated steel hardware in an aggressive atmosphere combining coastal and industrial environments needs to be coated to a higher specification to achieve the same performance of hardware in a less aggressive environment. Specifying alternative materials such as austenitic stainless steel, or specifying higher levels of corrosion protection, is necessary in such environments if the hardware is not to be replaced frequently.

Because of the wide range of specifications of hardware and the variations of environments to which they are exposed, it is not possible to give any meaningful indication of working life with respect to corrosion resistance as this can vary from a few months for poorly protected hardware in an aggressive environment to many decades for higher specifications in less aggressive environments. In particularly aggressive environments, higher levels of corrosion resistance might be necessary to achieve maximum hardware life.

## B.4 Installation

Poor installation can hinder the performance of a window and is the most common cause of inadequate performance. BS 8213-4 gives guidance on the survey and installation of windows and doorsets in domestic dwellings. For additional information on the installation of PVC-U windows in new buildings see BPF publication 356/2 [7].

## B.5 Waste recycling

PVC-U profiles from windows and doorsets conforming to this British Standard can be recycled at the end of their life, for example into the core of a co-extrusion as specified in BS EN 12608. For more information visit www.recovinyl.com.

Glass from windows can be recycled.

Gaskets and weatherseals made from natural and synthetic vulcanized rubbers can be recycled into granules and fine powders for different applications in the rubber and other industries. Thermoplastic materials can be recycled into other applications such as sports and leisure equipment, e.g. gym mats.

The metallic components of windows and doorsets are recyclable.

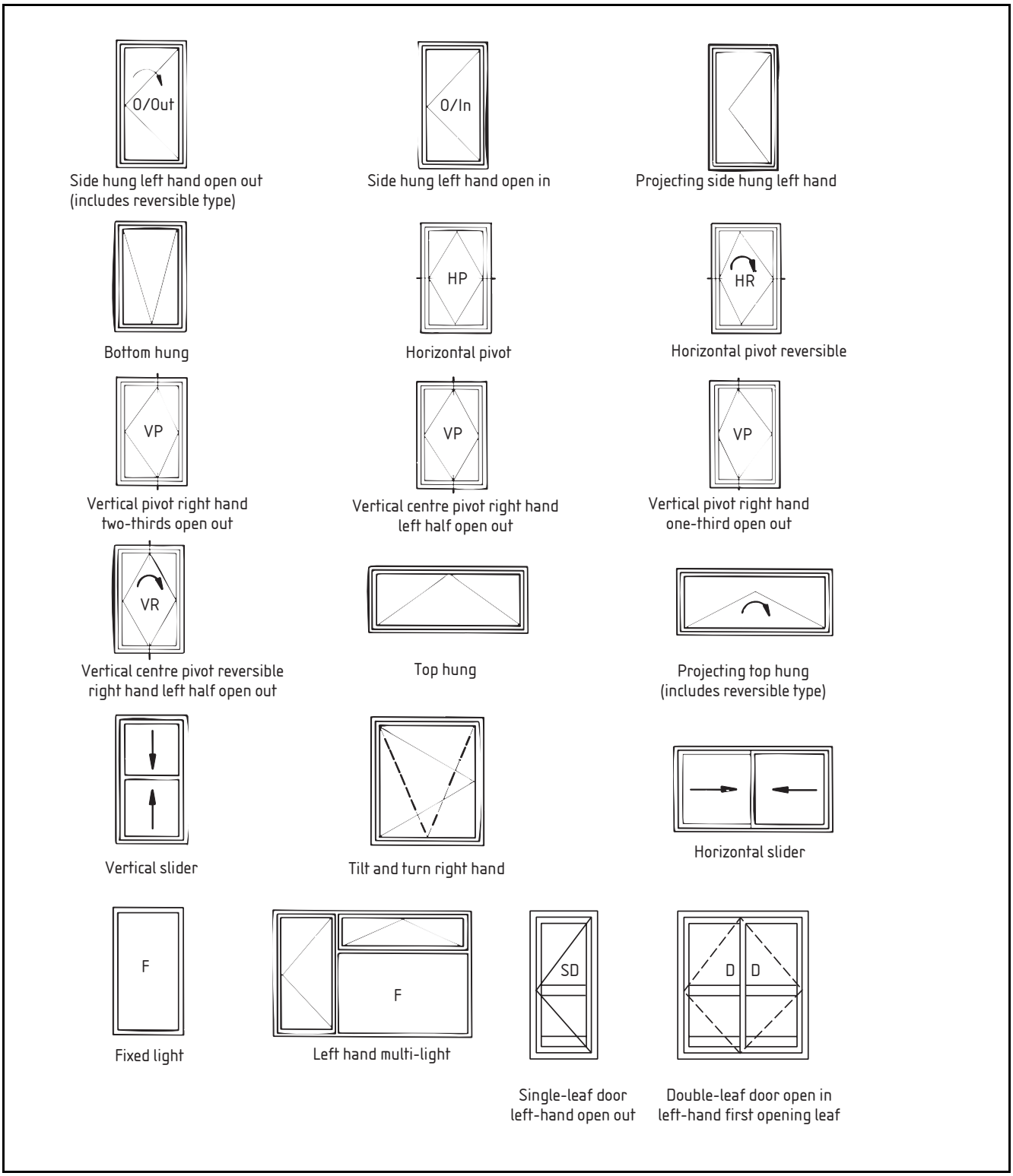
# Annex C (normative) Specification for handing

## C.1 View

When specifying handing, the window or door shall be viewed from the outside.

*NOTE Drawing conventions for window and door types are illustrated in Figure C.1. These do not conform to the conventions of BS EN 12519:2004, Annex A, which will be adopted at a future date.*

Figure C.1 **Drawing conventions for window and door types**



### C.2 Side-hung windows and doorsets

The handing of side-hung windows and external pedestrian doorsets shall be described by the hinge position when viewed from outside.

*NOTE 1 For instance, a door viewed from the outside with the hinges on the left, is a left-hand door.*

*NOTE 2 Care should be taken to avoid confusion with door handing specified in accordance with BS EN 12519, which is determined by hinge position but viewed from the opening face which might be outside or inside.*

### C.3 Vertically pivoted windows

For windows pivoted vertically off-centre, the handing shall be described by the pivot position in relation to the portion opening out. The proportion opening outwards shall be stated.

### C.4 Multi-lights

The handing of a multi-light shall be clearly described when viewed from outside.

*NOTE A drawing or diagram can be useful.*

## Annex D (normative) Weld test

### D.1 Principle

A welded corner is tested to determine whether it will withstand a minimum stress.

### D.2 Apparatus

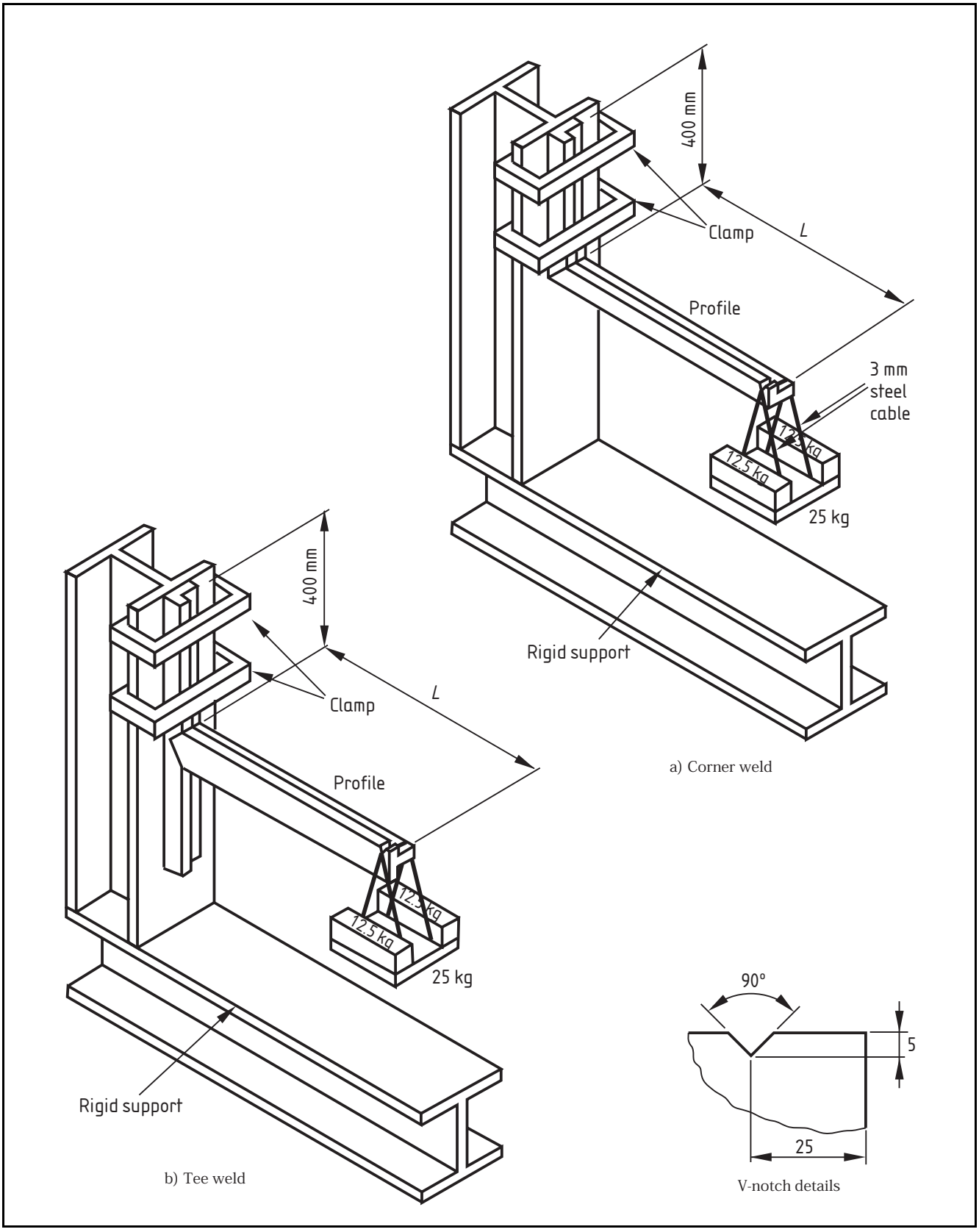
**D.2.1** *Weld test apparatus*, comprising a means of applying the load (see Figure D.1).

### D.3 Procedure

Cut sections of profile and weld into either a "T" shape or "L" shape as appropriate, or cut welded joints from a frame. Remove the weld sprue and finish the joint in the manner used by the manufacturer, i.e. grooving, knifing, polishing, etc.

Prepare the notch at a distance $L$ (as determined by the system supplier for each profile) to achieve a minimum 20 MPa stress as defined in BS EN 514. Place the welded joint in the apparatus (see Figure D.1). Apply a load of 25 kg, with a tolerance of ±1%, carefully and without shock. Leave the load applied for (60 ± 2) s. The load shall remain clear of the ground at all times. Remove the load and visually examine the welds for signs of fracture.

Figure D.1 **Apparatus for weld test**



# Annex E (normative) Mechanical joint tests (mullion and transom joints)

## E.1 Principle

Mechanical joints are subjected to cyclic mechanical loadings and their performance assessed by watertightness.

## E.2 Test specimen

The test specimen shall consist of one window comprising an outer frame, a mechanically jointed mullion/transom and two equally sized projected hung casements of overall size 1 200 mm × 1 200 mm.

The window shall be complete with all its operating and locking mechanisms. The window type shall be in accordance with Figure E.1.

The casements shall be glazed with glass of a type and thickness conforming to the relevant part of BS 6262.

Two inspection apertures approximately 8 mm × 30 mm shall be milled onto the interior face of the window into the reinforcement chamber in the region of the joints (see Figure E.1). Where the integrity of the joint would be affected by the inspection apertures, the apertures shall be milled 50 mm below the joints.

The apertures shall be temporarily sealed off (e.g. using PVC tape) to prevent ingress of water during transport and storage of the test specimen prior to testing.

Holes or slots for drainage shall be provided in accordance with the drainage requirements of the window system being tested but oriented as shown in Figure E.2.

*NOTE If it is considered that the use of one window in two orientations would be detrimental to a particular window system, two separate samples may be used.*

The specimen shall be mounted in a nominal 50 mm × 100 mm planed all round softwood sub-frame.

Figure E.1 **Window type and inspection apertures**

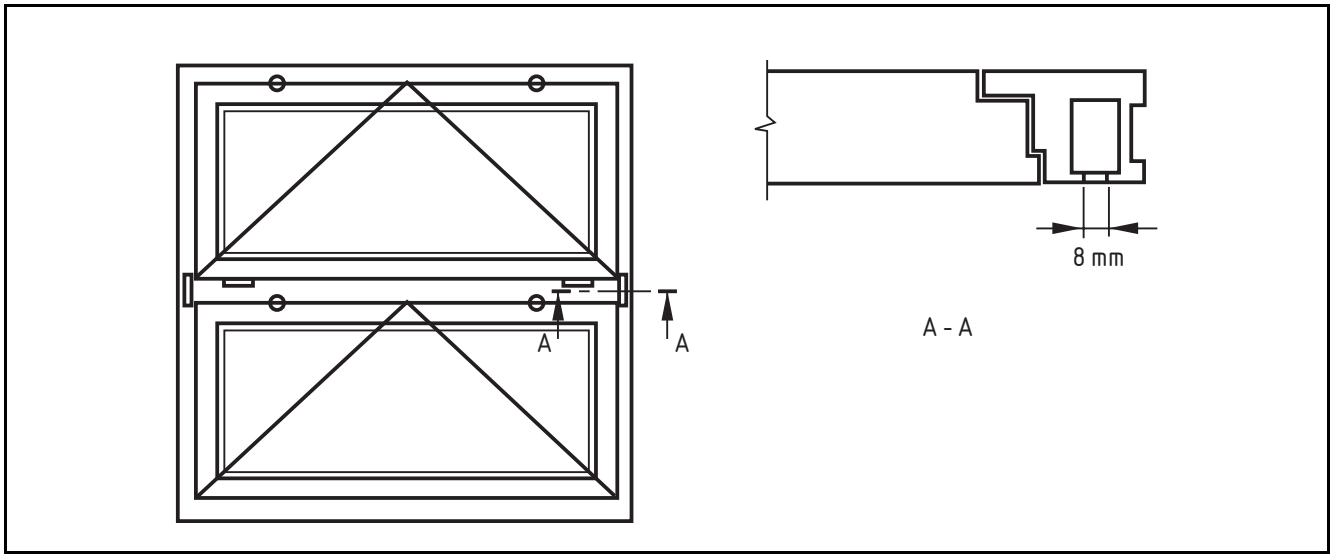
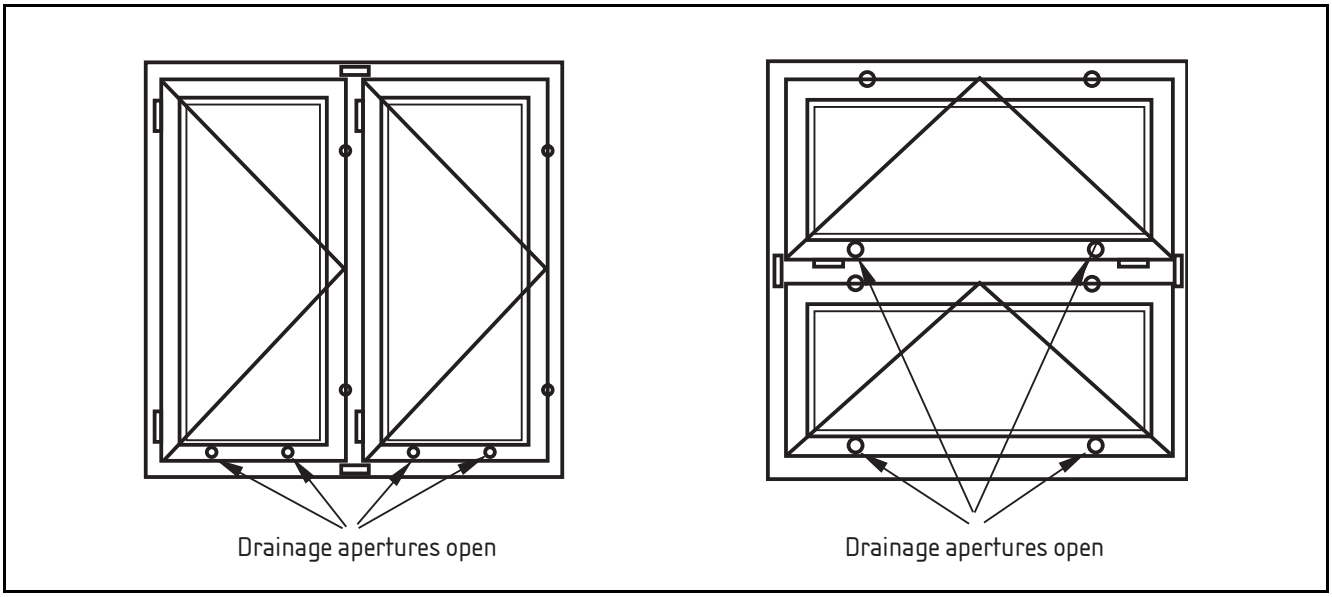


Figure E.2 **Test pieces for the watertightness test**




## E.3 Thermal stress

### E.3.1 Apparatus

**E.3.1.1** *Hotbox*, capable of maintaining the specified temperature ±2 °C and large enough to take a window sample.

### E.3.2 Procedure

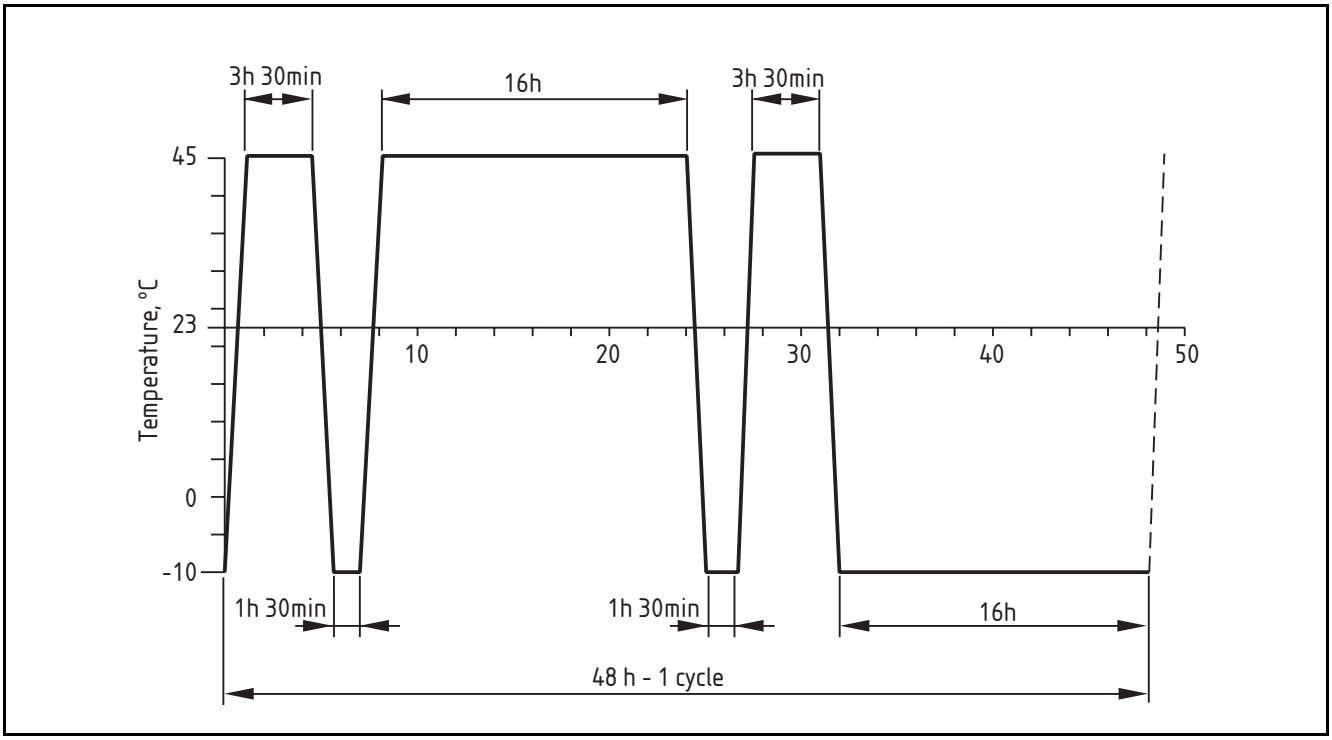
Subject the test specimen to hot (45 ± 2 °C) and cold (–10 ± 2 °C) cycles, including temperature stabilization cycles.

Each complete cycle shall have a duration of two days.

Carry out a total of four cycles, with intervening rest periods, over a period of 10 days in the following sequence (see Figure E.3):

- two complete cycles = 2 × 2 days;
- maintain at ambient temperature for 2 days;
- two further complete cycles = 2 × 2 days.

Figure E.3 **Thermal stress test**




## E.4 Torsion

### E.4.1 Apparatus

**E.4.1.1** *Two rigid U-shaped sections*, to suit the profile depth and width (60 ± 10) mm suitably extended to provide a lever.

### E.4.2 Procedure

Using the levers, apply a load simultaneously to both ends of the relevant profile (see Figure E.4). Apply 20 loading cycles, with an alternating torque of ± 10 N·m. Maintain each torque for 1 min (see Figure E.5).

Apply a static loading torque of 10 N·m simultaneously at each end of the profile as shown in Figure E.4 in each direction in turn. Measure and record the maximum misalignment.

Figure E.4 **Arrangement for torsion test**

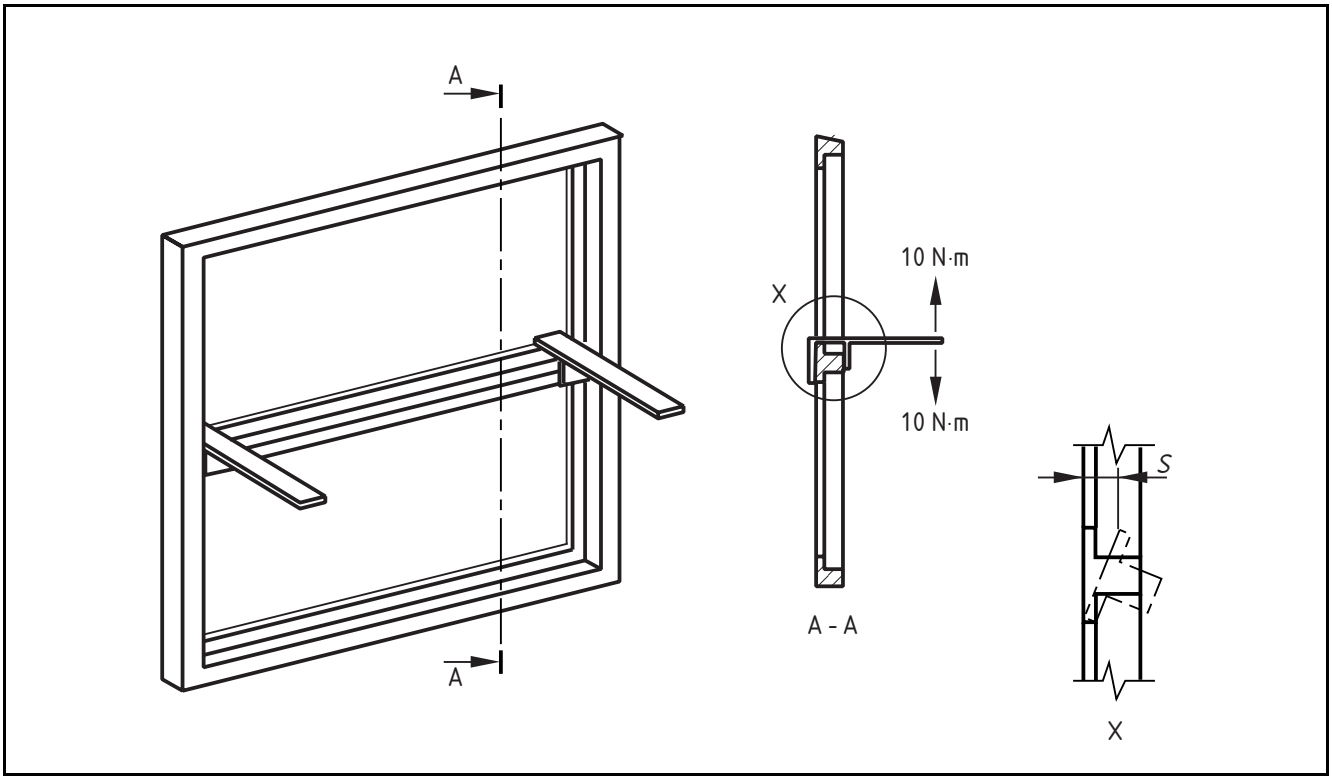
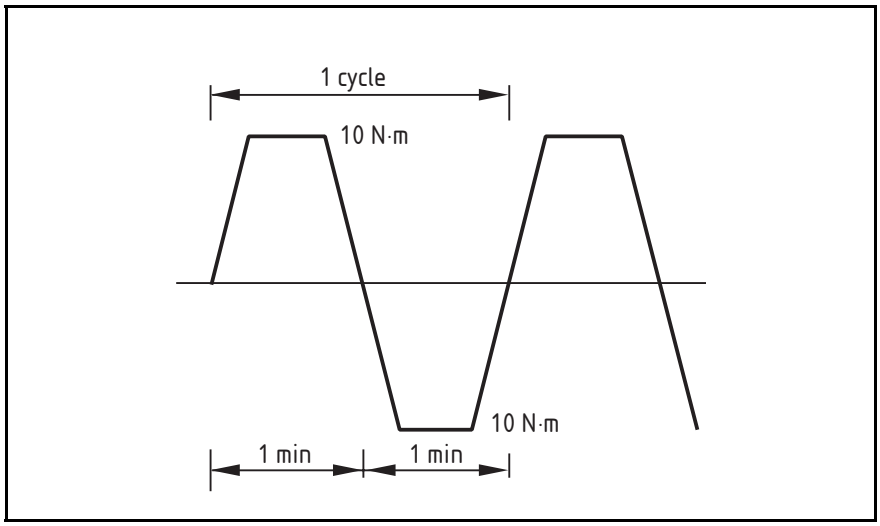



Figure E.5 **Torsion test loading cycle**




## E.5 Bending due to wind load

Carry out the test for bending due to wind load in accordance with BS EN 12211 using successive, sudden increases in pressure. Apply 1 000 cycles, each to a pressure of 1 000 Pa.

## E.6 Watertightness

Carry out two tests in accordance with BS EN 1027, preferred spray method number 2, up to a value of 600 Pa.

Using the same sample mounted in different orientations or separate samples (see Note to **E.2**) as shown in Figure E.2, with the relevant drainage aperture open, test the sealing system as applied to a mullion and a transform in accordance with Figure E.2.

Drainage apertures in the profiles which are not relevant to the orientation being tested shall be fully blocked off.

# Bibliography

## Standards publications

For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 3900-D8 (ISO 7724-1), *Methods of test for paints – Optical tests on paint films – Part D8: Determination of colour and colour difference: principles*

BS 3900-D9 (ISO 7724-2), *Methods of test for paints – Optical tests on paint films – Part D9: Determination of colour and colour difference: measurement*

BS 3900-D10 (ISO 6504-3), *Methods of test for paints – Optical tests on paint films – Part D10: Determination of contrast ratio (opacity) of light-coloured paints at a fixed spreading rate*

BS 8213-1, *Windows, doors and rooflights – Part 1: Design for safety in use and during cleaning of windows, including door-height windows and roof windows – Code of practice*

BS 8213-4, *Windows, doors and rooflights – Part 4: Code of practice for the installation of replacement windows and doorsets in dwellings*

BS EN 12519:2004, *Windows and pedestrian doors – Terminology*

BS EN 14351-1, *Windows and pedestrian doorsets – Product standard, performance characteristics – Part 1: Windows and external pedestrian doorsets without resistance to fire and smoke leakage characteristics but including external fire performance for roof windows*

## Other publications

[1] GREAT BRITAIN. Building Regulations 2000 and subsequent amendments. London: The Stationery Office.

[2] GREAT BRITAIN. Building (Scotland) Regulations 2004. Edinburgh: The Stationery Office.

[3] GREAT BRITAIN. Building Regulations (Northern Ireland) 2000. Belfast: The Stationery Office.

[4] GLASS AND GLAZING FEDERATION. *Guidelines for the selection, installation and maintenance of screws and fasteners for the window and door industry*. GGF data sheet 6.8. London: Glass and Glazing Federation, 2004.[4)]

[5] EUROPEAN COMMUNITIES. 89/106/EEC. Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of the Member States relating to construction products. Luxembourg: Office for Official Publications of the European Communities, 1988.

4) 44–48 Borough High Street, London SE1 1XB. Telephone 0845 257 7953. Website http://www.ggf.org.uk.

[6] ANDERSON, Jane, SHIERS, David E., and SINCLAIR, Mike. *The green guide to specification*. Third edition. Oxford: Blackwell Publishing, 2002. ISBN 0 632 05961 3.[5)]

[7] BRITISH PLASTICS FEDERATION. *Code of practice for the installation of PVC-U windows and doorsets in new domestic dwellings*. 356/2. London: British Plastics Federation, 1997.[5)]

[5)] Available from the Building Research Establishment, Garston, Watford WD25 9XX. Telephone 01923 664000. Website http://www.bre.co.uk/.

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