

Scope

This section deals with components of wood, metal and plastics, and with composite items combining these materials, usually fabricated off site, fixed into openings to give light or ventilation or to see through. Devices offering solar shading (e.g. brises soleil, awnings) are also included.

Accessories and associated items are included as follows:

- Architraves, trim, etc. where part of the component.
- Ironmongery where supplied with the component.
- Finishes where part of the component as delivered.
- Glazing where supplied with the component.
- Mechanical operating equipment where supplied with the component.
- Sealants.

This section does not include:

- Architraves, trim etc. not supplied as part of a component – see section P20.
- Ironmongery supplied separately from a component – see section P21.

Contents

General guidance

| | | |
|---|----------------------------|---|
| 1 | The performance of windows | |
| 2 | Adhesives for joinery | 4 |
| 3 | Quality assurance | |
| 4 | Contractual arrangements | |

Specification clauses

| | |
|---|--|
| 5 | |
|---|--|

General

| | | |
|------------------|-------------------------|--|
| 110 [^] | Evidence of performance | |
| 120 [^] | Site dimensions | |
| 140 | Control samples | |

Products

| | | |
|------------------|--|----|
| 210 [^] | Proprietary wood windows | |
| 250 [^] | Wood windows to BS 644-1 (1) | 6 |
| 260 | Wood windows to BS 644-1 (2) | |
| 310 [^] | Proprietary steel windows | 7 |
| 315 [^] | Steel windows to BS 6510 | |
| 330 [^] | Proprietary aluminium windows | 8 |
| 335 [^] | Aluminium windows to BS 4873 | |
| 350 [^] | Proprietary PVC-U windows | 9 |
| 360 [^] | PVC-U windows to BS 7412 | |
| 380 [^] | Agrément certified PVC-U windows | |
| 390 [^] | Proprietary windows of other materials | 10 |
| 400 [^] | Proprietary composite windows | |
| 410 | Composite windows specified by performance | |
| 420 [^] | Wood subframes | 11 |
| 440 [^] | PVC-U subframes | |
| 460 [^] | Rooflights | |
| 480 [^] | Roof windows | 12 |
| 490 [^] | Roof ventilators | |
| 510 [^] | Purpose designed glazed wood screens | 13 |
| 550 [^] | Purpose designed glazed metal screens | 14 |
| 560 [^] | Proprietary glazed screen system | |
| 580 [^] | Secondary glazing systems | 15 |
| 605 [^] | Proprietary wood louvres | |
| 610 [^] | Purpose designed wood louvres | |
| 650 [^] | Metal louvres | 16 |

| | | |
|------------------|----------------------|----|
| 670 [^] | Brise soleil | |
| 680 [^] | Solar shading system | 17 |

Execution

| | | |
|------------------|---|----|
| 710 [^] | Protection of components | |
| 730 [^] | Priming/ Sealing | |
| 740 [^] | Corrosion protection | |
| 750 [^] | Building in | 18 |
| 755 [^] | PVC-U window installation | |
| 756 [^] | PVC-U replacement window installation | |
| 760 [^] | Replacement window installation | |
| 765 [^] | Window installation generally | |
| 770 | Damp proof courses in prepared openings | |
| 780 [^] | Fixing of wood frames | |
| 781 [^] | Fixing of steel frames | |
| 782 [^] | Fixing of aluminium frames | |
| 783 [^] | Fixing of PVC-U frames | |
| 784 [^] | Fixing of composite frames | 19 |
| 790 [^] | Fire resisting frames | |
| 800 [^] | Backfilling of steel frame sections | |
| 810 [^] | Sealant joints | |
| 820 [^] | Ironmongery | |

Reference documents

For a list of documents cited in NBS, refer to the Reference documents listing on the subscriber website.

For a list of documents cited in this section, refer to All reference documents for a work section on the subscriber website.

To check the currency of documents cited in this section, refer to the list of New and amended reference documents on the subscriber website.

Publishers of documents cited in this section include:

- British Standards Institution (BSI)
- British Board of Agrément (BBA)
- British Plastics Federation (BPF)
- British Wood Preserving and Damp-proofing Association (BWPDA)
- Building Research Establishment (BRE)
- Centre for Window and Cladding Technology (CWCT)
- Construction Industry Research and Information Association (CIRIA)
- Council for Aluminium in Building (CAB) incorporating Aluminium Window Association (AWA)
- Steel Window Association (SWA)
- Timber Research and Development Association (TRADA)

General guidance

1 The performance of windows

1.1 Methods of assessment

- Most aspects of window performance are covered by British Standards, the principal references being: BS 6375-1 covering weathertightness.
 - BS 6375-2 covering operation and strength.
- These standards apply to all types of window, including those with unframed opening lights (e.g. adjustable glass louvres) and opening lights within vertical patent glazing or curtain wall systems, but excludes patent glazing and curtain walls that span across horizontal structural members of floors.

Other standards give requirements or guidance for aspects such as security and sound insulation – see later.

Alternatively, window performance may be assessed by reference to the BBA windows directive (MOAT 1), which gives requirements for safety, habitability (air and watertightness, thermal conditions, sound insulation, appearance, lighting and operation) and durability. The windows directive is used, in conjunction with BBA MOAT 17, to assess the performance of PVC-U windows for the purposes of Agrément certification.

Windows are classified in terms of:

- Air permeability (classes A1–A3).
- Watertightness (classes E1–E4).
- Pressure or suction resistance (classes V1–V3).

The performance characteristics are similar to those given in BS 6375-1, and the Agrément certificate for a particular product gives both the MOAT 1 gradings and the corresponding test pressure classes to BS 6375-1. The Agrément Certificate is awarded to a range of windows rather than to the window system (the profiles, etc. from which the windows are made), and it cannot be assumed that because a certificate is offered for one type of window it will apply to another type offered by the same manufacturer.

In the not too distant future, British Standards for window performance will be superseded by harmonized European Standards. These have already been published, and manufacturers are beginning to test their products in accordance with them. BS 6375-1 has been revised to take account of the European Standards.

1.2 Weathertightness to BS 6375-1

BS 6375-1 defines weathertightness as performance in respect of air permeability, watertightness and wind resistance. The standard classifies windows for weathertightness in terms of exposure categories related to design wind load. Five exposure categories are designated, with their associated requirements for air permeability, watertightness and resistance to wind loading, as given below (table 1).

The European test standard for air permeability is BS EN 1026.

Table 1 Exposure categories as defined in BS 6375-1

Part 1

| Exposure category/ Design wind load (Pa) | Air permeability | | Watertightness | |
|---|------------------|----------------------------|----------------|----------------------------|
| | Class | Maximum test pressure (Pa) | Class | Maximum test pressure (Pa) |
| 800 | 2 | 300 | 3A | 100 |
| 1200 | 2 | 300 | 3A | 100 |
| 1600 | 2 | 300 | 5A | 200 |
| 2000 | 2 | 300 | 5A | 200 |
| 2000 + Pa | 2 | 300 | 7A | 300 |

Part 2

| Exposure category/ Design wind load (Pa) | Resistance to wind | | | |
|---|--------------------|---------|--------------|--------------|
| | Class | P1 (Pa) | P2 (Pa) | P3 (Pa) |
| 800 | 2 | 800 | 400 | 1200 |
| 1200 | 3 | 1200 | 600 | 1800 |
| 1600 | 4 | 1600 | 800 | 2400 |
| 2000 | 5 | 2000 | 1000 | 3000 |
| 2000 + Pa | E | (xxxx) | (xxxx) x 0.5 | (xxxx) x 1.5 |

Note: Specimens tested with wind load above Class 5 are classified Class E xxxx – where xxxx is the actual test pressure, P1 (e.g. When P1 = 2350 Pa, this is classified as Class E 2350).

Whether specifying windows by prescription or by performance, the designer must first determine the local design wind load. The appropriate exposure category can then be selected. For example, if the design wind load is calculated as 1550 Pa, then the exposure category is 1600 (i.e. the next

highest value above the design wind load). Where the calculated design wind load is just over one of the exposure category pressures, e.g. 1350 Pa, then stating the actual pressure may achieve economies in mullion/ transom sections and/ or glass thickness. If the calculated design wind load is greater than 2000 Pa then the calculated value should be stated in the specification.

For the purpose of classification, BS 6375-1 recommends two methods of determining the design wind loading for low rise buildings: the abbreviated method detailed in the annex to the standard, and the more accurate and less conservative method covered in BS 6399-2. The use limitations for the abbreviated method are defined as:

- The overall height of the building must not exceed 15 metres.
- The method assumes a combined pressure coefficient (C_p) of 1.15, which takes into account the worst case that normally occurs. Higher coefficients might be experienced at points adjacent to the corners of the building.

BS 6375-1 requires the more detailed method given in BS 6399-2 to be used for non low rise buildings.

BS 6399-2 gives alternative methods for calculating wind loads:

- Standard method: Uses a simplified procedure to obtain a standard effective wind speed which, combined with standard pressure coefficients, can be used to determine wind loads for rectangular buildings.
- Directional method: Effective wind speeds and pressure coefficients are derived, allowing calculation of wind load for each wind direction.

The standard method gives a conservative result, which will be adequate in the majority of cases. However, on large projects, the greater detail afforded by the directional method may allow economies in design to be made.

Many window manufacturers now indicate the performance of their standard range products in terms of exposure categories. However it is still possible to find windows classed as high or moderate performance, or as suitable for use in severely exposed, moderately exposed or sheltered situations.

When specifying windows by proprietary reference, there is no need to specify the exposure category (unless the manufacturer offers a choice). However, the designer should check that the selected windows have been tested in accordance with BS EN 1026, BS EN 1027 and BS EN 12211 and have been given an exposure classification to BS 6375-1 suitable for the climatic conditions to which the windows will be exposed.

When specifying windows by performance, only the exposure category need be given in the specification. The window fabricator must then ensure that the finished components satisfy the associated requirements for air permeability, watertightness and wind resistance by testing prototypes to BS EN 1026, BS EN 1027 and BS EN 12211.

1.3 Operation and strength characteristics

BS 6375-2 specifies performance requirements for the operation and strength of windows in their glazed and fully finished condition including hardware. The standard has been partially replaced by BS EN 12046-1, which provides test methods to determine the minimum static force or torque required to release or lock the hardware (locks or handles) of a window, and to commence opening and complete closing a casement or sash. The standard indicates that BS 6375-2 is to be amended, but this has yet to be done.

The test levels established by BS 6375-2 are based on forces capable of being applied by the majority of people. Where windows are to be used by elderly, infirm or young people the standard recommends that special consideration be given to the type of window, its location and its hardware. Tests are specified for:

- Operation of fastener.
- Movement of sash.
- Resistance to excessive operating force (sliding windows only).
- Release of jammed sash.

- Release of jammed hinge (projecting windows fitted with variable geometry hinges only).
- Strength of restricted opening and location devices and maximum opening stops.
- Resistance to accidental loading.

1.4 Endurance

The ability of a window to withstand repeated operation (opening and closing) can be assessed using the methods given in various European standards. The standard giving performance requirements and a classification system, BS EN 12400, specifies three performance classes:

- Class 1 – light duty (5,000 test cycles).
- Class 2 – moderate duty (10,000 test cycles).
- Class 3 – heavy duty (20,000 test cycles).

Specimens tested must not suffer such damage or deformation – including loosening of hardware, closing devices of their connections, joints or weather sealing systems, intumescent seals or smoke seals – as would render the window unfit for its purpose.

Specifiers are advised to choose window designs in which the hinges, fasteners and seals are robust and/ or easily replaced. Manufacturers are continually modifying the design of their products to improve performance, and the replacement of, for example, a weatherseal after five or ten years may pose a problem if the profile has changed.

1.5 Safety and security

The main aspects of safety and security are covered by specific standards, as follows:

- Safety in use: BS 8213-1 gives recommendations on the design and construction of windows for safety in use, including positioning of operating controls.
- Intruder deterrence: BS 8220-1, -2 and -3 deal with ways of securing windows to deter intruders, and give guidance on the selection and fitting of locks and fastenings. Most window manufacturers offer security features, such as internal glazing beads, lockable fasteners, espagnolette (multi-point) locks, fitted as standard or as optional extras.

The CWCT standard 'Windows with enhanced resistance to intrusion' specifies tests for intrusion resistance. A single performance category is defined. Recommendations are given for design, glazing, selection, fabrication and installation.

Casement, top swing, vertical sliding and tilt/ turn windows for domestic applications can be assessed against BS 7950.

Successful testing to this standard is a performance criterion set by 'Secured by design', the UK Police initiative supporting the principles of 'designing out crime' by use of prevention and security standards for a range of applications. For more information on the scheme and a list of approved products and suppliers see 'Secured by design' website.

- Bullet resistance: A classification system and requirements for bullet resistance of windows, shutters and blinds are given in BS EN 1522. Seven classes, FB1–FB7, are included for increasing resistance to attack by hand gun and rifle. Class FB1 represents the lowest bullet resistance, and class FB7 the highest. A single class (FSG) is given for resistance to shotgun attack. Test results are qualified by the addition of a suffix, (S) or (NS), according to the presence or absence of splinters, e.g. FB3(S), FB4(NS).

The standard also gives the minimum class of bullet resistant glass (to BS EN 1063) to be used in the test. The glass classification is similar to that for the components, e.g. BR1 glass must be used in an FB1 window, BR2 glass in a FB2 window, and so on. FSG windows require SG2 glass.

- Explosion resistance: BS EN 13123-1 and -2 give a classification system and requirements for resistance of windows and shutters to high explosive detonation. Four classes, EPR1–EPR4, are given covering detonations in the order of 100–2500 kg TNT at distances from about 35–50 m. Again, the test results are qualified by the suffix (S) or (NS) depending on whether or not splinters originate from the protected face of the test specimen.

1.6 Thermal insulation/ condensation/ ventilation

Heat loss through the frame should be taken into account when calculating the U-value of a window. For uncomplicated profiles the effect of the frame can be assessed on a proportional area basis. BS EN ISO 10077-1 gives a simplified method of calculating thermal transmittance. The calculation does not include effects of solar radiation, heat transfer caused by air leakage, calculation of condensation or ventilation of air spaces in double and coupled windows.

BRE Digest 379 gives comparative U-values for a number of typical wood and metal windows. Wood and plastics have higher thermal resistances than aluminium and steel, which conduct heat easily and may create problems with cold bridging. Also, condensation may form on the window frame if the temperature of the surface falls below the dew point of the internal air. These problems can be moderated by the incorporation of a thermal break in the form of an insulating section that separates the inner and outer parts of the frame. Aluminium windows of this type are covered by BS 4873, which gives advice on acceptable materials and the robustness of thermal barriers – see Annex A. No specific requirement for thermal resistance is given.

Condensation forming on frames, or on the inner face of windows may cause damage if it is allowed to remain in contact with wood sills or subframes, or if it runs off onto curtains, carpets or wall decorations. Where severe condensation is anticipated, drainage channels should be provided.

Building Regulation requirements for limiting U-values of windows and rooflights and revised maximum U-values (area weighted average) for windows are now in force, and in order to meet the requirements, it will be necessary to install more sophisticated insulating glazing units, with larger cavities between panes, low emissivity glasses and, in some cases, inert gas cavity filling.

Double glazing reduces both the heat loss through a window and the amount of condensation forming on the glass, but this will result in the air having to retain an increased amount of water vapour which may condense elsewhere unless provision is made for its removal, e.g. by ventilation.

Building Regulations require the provision of both 'purge' (rapid) and 'background' (whole building and extract) ventilation to habitable/ occupiable rooms, kitchens, utility rooms, bathrooms and separate sanitary accommodation, in both domestic and nondomestic buildings, see:

- **E&W:** Approved Document F.
- **IRL** Technical Document F, Section 1.
- **NI** Technical Booklet K.
- **Scot** Technical Standard 3.14.

One way of meeting the requirement for purge ventilation to rooms other than kitchens is by providing one or more opening windows. In winter this will increase heat losses and is likely to cause discomfort: it also creates a security risk at any time, and locking devices that will hold the open light secure should be selected with care (see general guidance 1.5).

In order to satisfy the requirement for background ventilation, one alternative to installing mechanical ventilation is to provide trickle ventilators in or over window frames, and these are available to suit most types of window. 'Free area' values for trickle ventilators have been replaced with the more accurate 'equivalent area' values in the 2006 Approved Document F (E&W).

Passive stack ventilation is also considered within the Building Regulations for background ventilation, and can obviate the need for mechanical extraction.

For further guidance on the prevention and removal of condensation see BS 5250, clauses 8.7 and 10. See also BRE Information Paper IP 6/03 'Improving air quality in homes with supply air windows'.

1.7 Sound insulation

There is a conflict of interests between sound insulation and ventilation requirements, and it is usually only possible to provide one at the expense of the other, although often a compromise solution is acceptable.

The sound insulation value of a window increases with the mass of the glazing material, and further improvement is possible with double leaf construction. However, most of the sound insulation value may be lost due to air gaps around opening lights, and there is little to be gained by installing thicker glass or a second leaf if the windows are not sealed effectively. Normal weatherstripping may not be sufficient, and the use of additional compression seals should be considered.

The air space between panes of double windows should be a minimum of 100 mm, and preferably more (BRE Digest 377 recommends at least 200 mm for optimum sound insulation). Performance may be improved by using sound absorbent linings on the reveals between the panes, and by mounting the glass in flexible gaskets to dampen resonances between the panes. See also BS 8233, clause 8.4.7 and BRE Information Paper 6/94.

2 Adhesives for journey

BS 644 stipulates that adhesives used in the fabrication of wood windows must comply with the requirements for type D3 of BS EN 204 or with BS 1204:1993 'Specification for type MR phenolic and aminoplastic synthetic resin adhesives for wood'. This latter standard was withdrawn on publication of BS EN 12765 'Classification of thermosetting wood adhesives for non-structural applications'.

Synthetic resin adhesives complying with BS EN 301 (e.g. resorcinol formaldehyde or phenol/ resorcinol formaldehyde), although mainly used for structural purposes, can also be used. However, they are more expensive and difficult to handle, and the dark glue lines they produce may not be acceptable in windows that are to be clear finished.

In window construction, synthetic resin adhesives are being replaced by chemically cured PVAC adhesives, which are safer and more 'user friendly'. Many are able to satisfy the requirements for the class D4 durability rating of BS EN 204, which means that they are suitable for use externally, exposed to the weather, provided they are adequately protected by a surface coating.

The adhesive must be compatible with the proposed finish and with any preservative treatment used. Where specification of a proprietary adhesive is preferred, the manufacturer should be consulted about its properties and suitability.

3 Quality assurance

Many window manufacturers have quality management systems in operation and have, or are pursuing, product conformity recognition of their products.

Quality management schemes are assessed, usually to BS EN ISO 9001, by independent certification and inspection agencies who, in turn, are accredited by the National Accreditation of Certification Bodies (NACB). Certification of a system leads to the award of Registered Firm status or a Certificate of Approval. Products manufactured under a quality management system must be consistent in quality but may not conform in all respects to a recognised standard.

Product compliance with recognised standards, e.g. BS 4873 for aluminium windows or BS 7412 for PVC-U windows, is assessed by regular examination and testing. Certified products may, in some cases, be marked with the certification trade mark of the inspection agency, e.g. BSI's Kitemark, SGS Yarsley's Testguard or BM TRADA's Q-Mark.

British Board of Agrément Certificates cover product properties to which British Standards cannot be applied, and confirm the product's suitability for conditions of use, e.g. in accordance with relevant Building Regulations.

Windows are usually selected for their appearance, provided that their technical qualities are appropriate for the conditions of use. The latter can be reasonably assured if certified products are specified.

An accreditation scheme for wood windows is operated by the British Woodworking Federation (BWF). All aspects of window specification are covered, and products supplied by accredited firms are permanently labelled with the BWF Accreditation Mark.

Where the Contractor is permitted to submit alternative windows (e.g. public contracts), defining appearance and quality

can be a problem. The most direct method is to specify one or more products and include the statement 'or equivalent'. Alternatively, a quality assurance requirement can be specified, e.g. *Kitemark/ Testguard/ BM TRADA Q-Mark/ Agrément Certified*.

Windows specified by an open BS reference can have a product certification qualification added to the item in the relevant clause when the specifier has ascertained that accredited products are available.

4 Contractual arrangements

4.1 Subcontracting

The specifier may choose a subcontractor or influence the choice of subcontractor in several different ways. See Preliminaries section A30.

4.2 Requirements for submission of information

The specifier may require the Contractor or a subcontractor to submit drawings or other technical information. See Preliminaries section A31.

Guidance notes

120

Use this clause only where it is impractical to make proper allowance for tolerances in design, and where the construction programme is likely to allow sufficient time.

140

If prototypes are needed it is advisable to have them made up before going to tender. Any alterations to the design or construction can then be incorporated beforehand, thereby reducing the possibility of variations later in the contract.

Designated items: Insert, e.g. *Purpose made glazed screen, as clause 510.*

210

Use this clause to specify by proprietary reference. Use clause 250 or 260 to specify by performance, based on British Standards. The types of window, e.g. horizontal pivot, should be shown on drawings. **Species:** Ensure that a suitable preservative treatment is offered as standard for species of low natural durability – see BS 644, clause 5.1.2.

Finish as delivered: BS 644 advises that, where practicable, the full finishing system should be applied before delivery and installation. Where this is specified, extra care will be required during installation of finished components into prepared openings (building in is not recommended).

Where the windows are to be supplied primed for painting or sealed to receive a staining system, the priming/ sealing may be either:

- Included as part of the window manufacturer's standard specification – in this case insert, e.g. *Manufacturer's primer* and specify site painting accordingly in section M60, or
- Specified as part of the overall painting system in section M60 – give the relevant cross reference here, e.g. *Prepared and primed as section M60.*

Windows to receive a stain finish should have at least one coat of wood stain applied off site in addition to any basecoats specified.

Ensure that factory applied coatings offered as standard are of good quality. Paint primers, both solvent and water borne, should comply with BS 7956.

For further guidance see BRE Digest 422.

Glazing details: Use this item to state:

- Whether factory glazing is required and, if so, the type and thickness of glass (see general guidance to section L40, and BS 952-1. Hermetically sealed glazing units should comply with BS EN 1279.
- Bead fixing method – screw on or pinned.

Specify site glazing in section L40.

Ironmongery/ Accessories: BS 644, clause 5.4.1 specifies suitable materials and finishes for hardware and fixings. Many window ranges are supplied complete with all necessary hardware. Use this item to describe components supplied as standard and any variations or extras, e.g. different hinge type, locks, ventilators. Only include items to be supplied by the window manufacturer. Specify components to be supplied and fitted by others in section P21. Weatherstripping, where fitted as standard, need not be listed. →

Specification clauses

L10 WINDOWS/ ROOFLIGHTS/ SCREENS/ LOUVRES

To be read with Preliminaries/ General conditions.

GENERAL

110 EVIDENCE OF PERFORMANCE

- Certification: Provide independently certified evidence that all incorporated components comply with specified performance requirements.

120 SITE DIMENSIONS

- Procedure: Before starting work on designated items take site dimensions, record on shop drawings and use to ensure accurate fabrication.
- Designated items:

140 CONTROL SAMPLES

- Procedure:
 - Finalise component details.
 - Fabricate one of each of the following designated items as part of the quantity required for the project.
 - Obtain approval of appearance and quality before proceeding with manufacturer of the remaining quantity.
- Designated items:

PRODUCTS

210 WOOD WINDOWS

- Manufacturer:
 - Product reference:
- Species:
- Finish as delivered:
- Glazing details:
- Ironmongery/ Accessories:
- Fixing:

Fixing: See clause 780. Insert, e.g.

Screwed to timber framing.

Built in with cramps.

250, 260

Clauses 250 and 260 specify wood windows manufactured generally to BS 644. Use clause 250 for windows to receive an opaque finish and clause 260 for windows that are to be clear finished. To specify by proprietary reference, use clause 210. The types of window, e.g. sidehung outward opening, horizontal pivot, should be shown on drawings.

BS 644 is a performance specification for factory assembled windows (windows supplied in kit form for site assembly are not covered). Requirements are specified for materials, profile design, workmanship, glazing, construction, accuracy, security and safety, weathertightness (by reference to the performance categories of BS 6375), and operation and strength performance.

Recommendations for the storage, protection, installation and fixing of windows are given in Appendix D.

For guidance on the design of timber windows see TRADA publication 'High performance wood windows'.

Exposure category: See general guidance 1.2. Insert the actual design wind load if over 2000 Pa.

Timber:

– **Species:** Insert the name of the required species, selecting from BS EN 942, National Annex NA, table NA1 (softwood) or table NA2 (hardwood) as appropriate. Alternatively leave the choice to the manufacturer and insert *Softwood* or *Hardwood*.

Preservative treatment: See guidance in section Z12. Insert, e.g. *Organic solvent as section Z12 and BWPDA Commodity Specification C5, Desired service life 60 years.*

Include the relevant clauses from Z12 in the specification, where appropriate.

Finish as delivered: BS 644 advises that, where practicable, the full finishing system should be applied before delivery and installation. Where this is specified, extra care will be required during the installation of the finished components into prepared openings (building in is not recommended).

Where the windows are to be supplied primed for painting or sealed to receive a staining system, specify as part of the overall painting system in section M60 and give the relevant cross reference here, e.g. *Prepare and prime as section M60.*

Windows to receive a stain finish should have at least one coat of wood stain applied off site in addition to any basecoats specified. For further guidance see BRE Digest 422.

Glazing details: Insert information relevant to manufacturer, e.g.

Site putty glazing by others.

Site glazing by others. Include hardwood beads.

If factory glazing is required insert, e.g. *Factory glazing, 6 mm float glass with hardwood beads and two part rubberizing compound as clause L40/???*

Ironmongery/ Accessories: Requirements usually vary little from one window to another. The various items are best fixed by the window fabricator to ensure satisfactory operation and performance. Ironmongery and accessories include:

- Hanging devices such as hinges, sliding gear.
- Fastening devices such as catches, bolts, stays, locks, reversing catches, restrictors.
- Miscellaneous items such as window boards, fixing lugs, blinds, ventilators, insect screens, weatherstripping.

BS 644, clause 5.4.1 specifies suitable materials and finishes for hardware and fixings.

List the devices required, stating material and finish where relevant. Alternatively, where proprietary products are to be specified, insert *As section P21*, and include suitable clauses in that section to cover requirements.

Fixing: See clause 780. Insert, e.g. *Bolted to masonry reveal.*

250 WOOD WINDOWS

- Standard: To BS 644.
- Manufacturer: A firm currently registered under a third party quality assurance scheme.
- Exposure category to BS 6375-1/ Design wind load:
- Operation and strength characteristics: To BS 6375-2.
- Timber: Generally to BS EN 942.
 - Species:
 - Appearance class: J10 for glazing beads, drip mouldings and the like. J40 or better for all other members.
 - Moisture content on delivery: 12–19%.
- Preservative treatment:
- Finish as delivered:
- Glazing details:
- Ironmongery/ Accessories:
- Fixing:

260 WOOD WINDOWS

- Standard: To BS 644.
- Manufacturer: A firm currently registered under a third party quality assurance scheme.
- Exposure category to BS 6375-1/ Design wind load:
- Operation and strength characteristics: To BS 6375-2.
- Timber: Generally to BS EN 942.
 - Species:
 - Appearance class: J2 for glazing beads, drip mouldings and the like. J30 or better for all other members. Finger jointing and knots on arrises not permitted where exposed to view.
 - Moisture content on delivery: 12–19%.
- Preservative treatment:
- Finish as delivered:
- Glazing details:
- Ironmongery/ Accessories:
- Fixing:

310, 315

Use clause 310 to specify by proprietary reference. Use clause 315 to specify by performance. The types of window, e.g. side hung outward opening, horizontal pivot, should be shown on drawings.

Manufacturer (clause 310):

– **Product reference:** Where thermally improved frames are specified, ensure that manufacturer's reference makes this clear, otherwise insert requirements here, e.g. *W123 with thermal break*.

Standard (clause 315): BS 6510 specifies requirements for the design, fabrication and performance of steel framed windows factory made from hot rolled or cold formed profiles, as single or multi light units or coupled assemblies. It does not cover windows in which any frame member is longer than 3.0 m or kits despatched in bar form for assembly into frames on site.

– **Material:** BS 6510 allows the use of the following:

- Hot rolled carbon steel conforming to BS EN 10025, grade S235JR.
- Cold formed carbon steel conforming to BS EN 10025, grade S235JRG2C.
- Cold formed zinc coated steel strip conforming to BS EN 10142, grades DX51D, DX52D or DX53D. Note: BS 10142 'Continuously hot dip coated low carbon steels strip and sheet for cold forming. Technical delivery conditions' (withdrawn) has been superseded by BS EN 10327, but grade designations remain the same.

In recent years cold formed profiles have been introduced from European sources.

– **Window section:** The current version of BS 6510 does not refer to specific frame sections. However manufacturers and all members of the Steel Window Association (SWA) produce windows compliant with the requirements of the current standard, using sections listed in the previous (withdrawn) version. Refer to manufacturer and insert, e.g. *F, W20, W40*. For further information contact the Steel Window Association.

Exposure category (clause 315): See general guidance 1.2.

BS 6510 requires the completed window to be not less than exposure category 1200. Insert the actual design wind load if over 2000 Pa.

Finish as delivered: BS 6510 requires frames and ancillary profiles to be rust protected using one of the following methods (updated versions of standards cited in BS 6510 are given here):

- Hot dip galvanizing to BS EN ISO 1461 after fabrication.
- Hot dip galvanizing, coating mass 200 or 275 g/m², before cold forming.
- Hot melt zinc spraying (to BS EN ISO 2063).
- Stoved epoxy zinc priming suitable for moderate environments and over coated with a colour finish.

Windows may be specified with a factory applied powder coating. Window manufacturers usually offer a standard range of colours. Insert, e.g. *RAL 5015 Sky blue Powdakote*.

Where the specifier is able to choose nonstandard colours or alternative powder coating materials, these may be specified by reference to section Z31. Z31, general guidance 6, gives advice on how to amend and extend the clauses given here to include details of surface finish, film thickness, etc.

Alternatively, the windows may be painted on site, in which case insert *Galvanized to BS EN ISO 1461* and specify the painting system in section M60.

Glazing details: Specify site glazing in section L40. Even if the glazing is to be done on site it will still be necessary to state here information needed by the component manufacturer. Use this item when a choice is available or there are particular requirements, e.g.

- Special preparation of rebates.
- Provision of cleats.
- Beads fixed internally or externally.
- Bead fixing: clip on, screw on.
- Screw on beads: hollow or solid.
- Bead material: usually of the same material as the frame although aluminium beads can also be used.
- Provision for double glazing.

Check the availability of any options with the manufacturer before specifying. Insert *As supplied* if the glazing method is not a variable feature of a standard component.

Ironmongery/ Accessories (clause 310): Many window ranges are supplied complete with all necessary hardware. Use this item to

310 STEEL WINDOWS

- Manufacturer:
- Product reference:
- Finish as delivered:
- Glazing details:
- Ironmongery/ Accessories:
- Fixing:

315 STEEL WINDOWS

- Standard: To BS 6510.
- Material:
- Window section:
- Exposure category to BS 6375-1/ Design wind load:
- Operation and strength characteristics: To BS 6375-2.
- Finish as delivered:
- Glazing details:
- Ironmongery/ Accessories:
- Fixing:

describe components supplied as standard and any variations or extras. Only include items to be supplied by the window manufacturer. Components to be supplied and fitted by others should be specified in section P21.

Ironmongery/ Accessories (clause 315): The hardware specified in BS 6510 is the minimum that is required. Additional hardware may be needed to meet a particular requirement, e.g. security.

Windows may be supplied with sills and window boards. These are manufactured in four standard sizes to suit 57 mm and 109 mm set backs from both fairfaced and rendered brickwork.

List devices required, stating material and finish where relevant, e.g. Horizontal friction pivots, CP night latch, Airway type DC ventilator, lintel weatherbar, pressed steel sill and window board.

Alternatively, where proprietary products are to be specified, insert *As section P21*, and include suitable clauses in that section to cover requirements.

Fixing: See clause 781. Insert, e.g.

Built in.

Screwed to unrebated brick reveal.

330, 335

Use clause 330 to specify by proprietary reference. Use clause 335 to specify by performance. The types of window, e.g. side hung outward opening, horizontal pivot, should be shown on drawings.

BS 4873 specifies requirements for the design, construction and performance of aluminium alloy windows intended to be installed vertically, including materials and glazing. Replacement windows and thermally improved frames are included. The standard excludes:

- Windows with any frame member longer than 3 m.
- Fixed louvres.
- Secondary windows.
- Windows with frames designed for bullet resistant or antibandit glazing.

For design guidance and good practice advice on the assessment and selection of aluminium alloy windows, see Council for Aluminium in Building (CAB) publication 'Aluminium windows. A guide to specification and design'.

Manufacturer (clause 330):

– **Product reference:** Where thermally improved frames are specified, ensure that manufacturer's reference makes this clear, otherwise insert requirement here, e.g. *W456 with thermal break*.

Exposure category (clause 335): See general guidance 1.2. Insert the actual design wind pressure if over 2000 Pa.

Thermal improvement (clause 335): Frames can be thermally improved by the inclusion of an insulating barrier or cladding – see BS 4873, clause A.1.1. Insert specific requirements, or *Required* or *Not required*, as appropriate.

Finish as delivered: BS 4873 requires aluminium windows to be finished by:

- Anodizing to BS 3987: Insert, e.g. *Bronze anodized; Finish: Matt.*
- Liquid organic coating to BS 4842: Insert, e.g. *BS 04D44 Rust Red Organikote.*
- Powder coating to BS 6496: Insert, e.g. *RAL 6002 Grass green Polypowdakote.*

BS 3987 requires a minimum average anodic oxidation coating thickness of 25 micrometres. This should be suitable for all but the most highly polluted environments or severe industrial/ marine situation. A thicker coating can be specified, but excessively thick films can give unsatisfactory weathering performance. See also section Z11, general guidance 2.3.

Window manufacturers usually offer a standard range of colours for factory applied powder coatings. Where the specifier is able to choose nonstandard colours or alternative powder coating materials, these may be specified by reference to section Z31. Z31, general guidance 6, gives advice on how to amend and extend the clauses given here to include details of surface finish, film thickness, etc.

Glazing details: Specify site glazing in section L40. Even if the glazing is to be done on site it will still be necessary to state here information needed by the component manufacturer.

Use this item when a choice is available or there are particular requirements, e.g.

- Type of glass (preglazed windows and doors only).
- Special preparation of rebates.

330 ALUMINIUM WINDOWS

- Manufacturer:
- Product reference:
- Finish as delivered:
- Glazing details:
- Ironmongery/ Accessories:
- Fixing:

335 ALUMINIUM WINDOWS

- Standard: To BS 4873.
- Exposure category to BS 6375-1/ Design wind load:
- Thermal improvement:
- Finish as delivered:
- Glazing details:
- Ironmongery/ Accessories:
- Fixing:

- Provision of cleats.
- Beads fixed internally or externally.
- Bead fixing: Clip on, screw on.
- Screw on beads: Hollow or solid.
- Bead material: Usually of the same material as the frame.
- Provision for double glazing.

Check the availability of any options with the manufacturer before specifying. Insert *As supplied* if the glazing method is not a variable feature of a standard component.

Insert, e.g. Site double glazing by others. Provide internal beads.

If factory glazing is required insert, e.g. *Factory glazing, 6 mm float glass with internal beads and two-part rubberizing compound as clause L40/???*

Ironmongery/ Accessories (clause 330): Many window ranges are supplied complete with all necessary hardware. Use this item to describe components supplied as standard and any variations or extras. Only include items to be supplied by the window manufacturer. Components to be supplied and fixed by others should be specified in section P21.

Ironmongery/ Accessories (clause 335): BS 4873, Annex B lists optional features available, including, security and safety devices. BS 4873, clause 5 specifies suitable materials and finishes for both hardware and fixings. List the devices required, stating material and finish where relevant.

Alternatively, where proprietary products are to be specified, insert *As section P21*, and include suitable clauses in that section to cover requirements.

Fixing: See clause 782. Insert, e.g. *Screwed to masonry reveal*.

350, 360, 380

Three clauses are given for PVC-U windows, allowing specification by:

- Proprietary reference (clause 350).
- Performance, based on British Standards (clause 360).
- Performance, based on an Agrément Certificate, supported by British Standards (clause 380).

Alternative clauses are necessary because no one standard covers the whole range of materials or finishes currently used to fabricate PVC-U windows.

BS 7412 applies only to windows fabricated from extruded white profiles, and with frame members not exceeding 3.0 m. Windows manufactured to BS 7412 may, in some cases, be marked with the certification trade mark of a third party quality inspection agency, e.g. the BSI Kitemark – see general guidance 3.

PVC-U windows may also be made from self coloured profiles – either coloured throughout or with an external co-extruded layer, or from surface covered profiles, where special foils are applied to produce coloured and/ or textured (e.g. wood grain) effects. Windows made from these profiles are not covered by British Standards and should be specified either by proprietary reference or, where applicable, using clause 380.

The technique of painting PVC-U frames during manufacture has made a wider choice of colours available. However, the British Plastics Federation advises that painting should only be carried out by suitably qualified coating applicators approved by the PVC-U profile supplier, and it should be noted that such finishes may have a limited life expectancy. At present there is no British or Trade Standard for painted PVC-U windows and in this case, and in other similar situations where there are no relevant standards, it is obviously preferable to specify windows that have been certified by an independent authority, e.g. the British Board of Agrément.

For further guidance on the characteristics of PVC-U windows see BRE Digest 404.

Exposure category (clauses 360, 380): See general guidance 1.

Where windows are Agrément certified, the certificate gives the maximum size of window up to which a particular performance grading applies.

Reinforcement (clauses 360, 380): BS 7412 allows the use of the following materials in the defined conditions:

- Hot dip zinc coated carbon steel sheet. For use only in sealed profiles or systems where no moisture can come into contact with the reinforcement.
- Carbon steel sections with a corrosion resistant coating conforming to the same requirements for galvanized sheet

350 PVC-U WINDOWS

- Manufacturer:
- Product reference:
- Colour/ Texture:
- Glazing details:
- Ironmongery/ Accessories:
- Fixing:

360 PVC-U WINDOWS

- Standard: Manufactured to BS 7412 from white PVC-U extruded profiles.
- Manufacturer: A firm currently registered under a quality assurance scheme operated by a certification and inspection body accredited by the United Kingdom Accreditation Service (UKAS).
- Exposure category to BS 6375-1/ Design wind load:
- Reinforcement:
- Glazing details:
- Ironmongery/ Accessories:
- Fixing:

380 PVC-U WINDOWS

- Standard: Agrément certified.
- Colour/ Texture:
- Exposure category to BS 6375-1/ Design wind load:
- Reinforcement:
- Glazing details:
- Ironmongery/ Accessories:
- Fixing:

reinforcement. For use only in sealed profiles or systems where no moisture can come into contact with the reinforcement.

- Austenitic stainless steel sheet or strip. Can be used in any type of profile or system.
- Extruded aluminium alloy. This type of reinforcement can be used in any type of profile or system.

Glazing details: State whether single or double glazed and any particular requirements for the type/ thickness of glass if to be factory glazed. Specify site glazing in section L40.

Ironmongery/ Accessories (clause 350): Many window ranges are supplied complete with all necessary hardware. Use this item to describe components supplied as standard and any variations or extras. Only include items to be supplied by the window manufacturer. Components to be supplied and fixed by others should be specified in section P21.

Ironmongery/ Accessories (clauses 360, 380): List the items required, including locking, security and safety devices. State material and finish where relevant. It is essential that the manufacturer is notified at an early stage if ventilators are to be provided, so that they can be incorporated in the design of the window.

Where proprietary products are to be specified rather than giving generic descriptions, insert *As section P21* and include suitable clauses in that section to cover requirements.

Fixing: See clause 783. Insert, e.g.

Lug fixing.

Through frame fixing.

390

Use this clause, repeated as necessary, for proprietary windows manufactured from any other material, e.g. stainless steel or bronze.

For help on completing the clause items see guidance notes to clauses 210-350.

Clause heading: Insert, e.g. – *BRONZE*

400, 410

Use clause 400 to specify by proprietary reference. Use clause 410 to specify by performance. The types of window, e.g. side hung outward opening, horizontal pivot, should be shown on drawings.

Composite windows combine two or more materials to utilize the most beneficial properties of each, for example, the good thermal performance of wood and the long term durability of aluminium. In most cases wood is used for the inner frame and sash.

Alternatively, they may be made from PVC-U profiles. The exterior material may also be plastics, but more commonly the cladding or facing profiles are metal, e.g. aluminium, stainless steel, bronze, brass, copper, etc. In some systems the metal profile is used to form the complete casement section. Where this is done, a thermal break is usually incorporated to reduce cold bridging and the consequent risk of condensation on the inner surface of the casement.

Clause heading: Insert a brief description of the materials from which the windows will be made, e.g.

– *ALUMINIUM CLAD WOOD*

– *PLASTICS CLAD WOOD*

Manufacturer (clause 400):

– **Product reference:** Where thermally improved frames are specified, ensure that manufacturer's reference makes this clear, otherwise insert requirement here, e.g. *W789 with thermal break*.

Materials: For proprietary specifications insert requirements where a choice is available. Greater detail will be needed for performance specifications.

– **Exterior frame/ sash cladding:** Insert, e.g. *Extruded aluminium alloy profiles*.

Finish: Insert e.g. *RAL 7035 Silver grey Polypowdakote*.

– **Interior frame/ sash section:** Insert, e.g. *European Redwood*.

Ensure that a suitable preservative treatment is offered as standard for wood species of low natural durability.

Finish: Sections are usually factory finished with clear lacquer for a natural finish, or with decorative paints or stains. Where finishes other than those offered as standard are required the manufacturer should be consulted to ensure that they can apply the alternative materials using their existing production methods. Insert, e.g.

Factory finished, clear lacquer. →

390 PROPRIETARY WINDOWS

- Manufacturer:
- Product reference:
- Finish as delivered:
- Glazing details:
- Ironmongery/ Accessories:
- Fixing:

400 COMPOSITE WINDOWS

- Manufacturer:
- Product reference:
- Materials:
 - Exterior frame/ sash cladding:
 - Finish:
 - Interior frame/ sash section:
 - Finish:
- Glazing details:
- Ironmongery/ Accessories:
- Fixing:

410 COMPOSITE WINDOWS

- Manufacturer: A firm currently registered under a third party quality assurance scheme.
- Materials:
 - Exterior frame/ sash cladding:
 - Finish:
 - Interior frame/ sash section:
 - Finish:
- Thermal improvement:
- Exposure category to BS 6375-1/ Design wind load:
- Operation and strength characteristics: To BS 6375-2.
- Glazing details:
- Ironmongery/ Accessories:
- Fixing:

Factory finished stained, colour to approval.

Thermal improvement (clause 410): Insert specific requirements, or *Required* or *Not required*, as appropriate.

Exposure category (clause 410): See general guidance 1. Insert the actual design wind pressure if over 2000 Pa.

Glazing details: Composite windows are normally factory glazed. Use this item to state, e.g.

- Type and thickness of glass.
- Requirement for double/ triple glazing.
- Internal or external bead glazing.

The availability of any options should be checked with the manufacturer before specifying.

Site glazing, if required, should be specified in section L40.

Ironmongery/ Accessories (clause 400): Many window ranges are supplied complete with all necessary hardware. Use this item to describe components supplied as standard and any variations or extras. Only include items to be supplied by the window manufacturer. Components to be supplied and fixed by others should be specified in section P21.

Ironmongery/ Accessories (clause 410): Lists hardware required including locking, security and safety devices. State material and finish where relevant. Alternatively, where proprietary products are to be specified, insert *As section P21*, and include suitable clauses in that section to cover requirements.

Fixing: See clause 784. Insert e.g.

Screw fixing.

Lug fixing.

420

Use this clause for wood subframes to steel, aluminium, or plastics windows.

Timber:

– **Species:** Insert the name of the required species, selecting from BS EN 942, National Annex NA, table NA1 or NA2 as appropriate. Alternatively leave the choice to the manufacturer and insert, e.g.

Softwood as table NA1.

Hardwood as table NA2.

To approval.

– **Appearance class:** Select the class from BS EN 942. Class J40 (maximum knot size 40 mm) will generally be satisfactory for opaque finished frames and Class J30 (maximum knot size 30 mm) for clear finishing.

Assembly adhesive: See general guidance 2. Insert, e.g.

Thermosetting resin to BS EN 12765, class C4.

PVAC to BS EN 204, class D4.

Preservative treatment: See guidance in section Z12. Insert, e.g.

Organic Solvent as section Z12 and BWPDA Commodity Specification C5; Desired service life 60 years.

Include the relevant clauses from Z12 in the specification, where appropriate.

Finish as delivered: Insert, e.g. *Prepared and primed as section M60.*

Fixing: See clause 780. Insert, e.g. *Built in with cramps.*

440

PVC-U subframes are for use with metal and PVC-U windows.

460

Use this clause for glazed components to be installed in essentially flat or low pitched roofs for the primary purpose of providing natural lighting. Specify roof windows (glazed components installed in the plane of a pitched roof) using clause 480. Specify components providing natural ventilation and/ or smoke control in clause 490.

Type: Give a brief description of shape and function. Rooflights are basically square, rectangular or circular on plan, and dome, pyramid or flat in section. They can take the form of continuous barrel vaults, deadlights, lantern lights and monitors. Size and location may also be included if variants are simple – otherwise give dimensions on drawings.

Frame: Rooflights may be framed in aluminium, reinforced PVC-U, etc. Insert *None* if unframed units are specified. →

420 WOOD SUBFRAMES

- Timber: To BS EN 942.
 - Species:
 - Appearance class:
 - Moisture content on delivery: 12–19%.
- Assembly adhesive:
- Joinery workmanship: As section Z10.
- Preservative treatment:
- Finish as delivered:
- Fixing:

440 PVC-U SUBFRAMES

- Manufacturer:
 - Product reference:
- Fixing: Use lugs and ties supplied by subframe manufacturer.

460 ROOFLIGHTS

- Manufacturer:
 - Product reference:
- Type:
- Frame:
 - Finish:
 - Colour:
- Kerb:
- Glazing details:
- Other requirements:
- Fixing:

Kerb: If to be formed by the main contractor, insert, e.g. *Timber by main contractor*.

Proprietary kerbs may incorporate ventilators and/ or be insulated.

Glazing details: State material and whether single or double glazed. Rooflights are made from acrylic, polycarbonate, PVC-U (including wired), GRP and wired glass.

The size and disposition of rooflights made from thermoplastic materials are controlled under the Building Regulations. For guidance see:

- **E&W** Approved Document B, paragraphs 7.13, 15.6 and 15.7.
- **IRL** Technical Document B, paragraphs 2.3.3 and 4.3.5.
- **NI** Technical Booklet E, paragraphs 2.14 and 4.21
- **Scot** Technical Standard clause 2.5.6.

Other requirements: Use this item to specify features such as security bars and gutter systems for large rooflight assemblies.

Fixing: Give brief details of method of securing rooflight to kerb or other supporting structure, e.g. *Screw, sealer cap and washer*.

480

Use this clause for glazed components to be installed in the plane of a pitched roof. Specify rooflights (glazed components installed in flat or low pitched roofs) using clause 460. Specify components providing natural ventilation and/ or smoke control in clause 490.

The roof pitch will determine the type of window that can be used.

Where a roof window is provided for escape from a room above ground storey level, it should be positioned in accordance with the guidelines given in Building Regulations:

- **E&W** Approved Document B, paragraphs 2.11, 2.24 et seq, and diagram 6.
- **IRL** Technical Document B, paragraphs 1.5.6 and 1.5.7.6.
- **NI** Technical Booklet E, section 1, paragraphs 1.4, 1.22 and diagram 1.1.
- **Scot** Technical Standard clauses 2.9.4 and 2.9.30.

Glazing details: Use this item to state whether factory glazing is required and, if so, the type and thickness of glass, bead fixing method, etc. Specify site glazing in section L40.

To comply with Building Regulations, a roof window installed within 6 m of a boundary must achieve an AA, AB or AC designation when tested in accordance with BS 476-3:1958 – see:

- **E&W** Approved Document B, paragraphs 15.4, 15.5 and table 17.
- **NI** Technical Booklet E, paragraphs 4.19, 4.20 and table 4.7.

Note that BS 476-3 was revised in 1975 but, because of problems associated with the test methods given in that edition, it has not been accepted by the manufacturing industry in general. Testing is, therefore, still carried out in accordance with BS 476-3:1958.

However, Building Regulations for Ireland and Scotland make reference to BS 476-3:2004 – see:

- **IRL** Technical Document B, paragraphs 4.3.3, 4.3.4 and table 4.4.
- **Scot** Technical Standard clause 2.8.1 and Annex 2D.

The use of toughened, laminated or wired (Georgian) glass will give safety and security benefits, although wired glass may not be aesthetically acceptable for some applications.

Flashings: Insert details of roof tiling. Flashings to suit most commonly available tile profiles are usually available.

Accessories: Insert, e.g. *Cord remote control, pleated blind, internal lining and safety latch*.

Fixing: Give brief details of method of securing roof window to kerb or other supporting structure, e.g. *Galvanized steel brackets screwed to rafters and trimmers*.

490

Use this clause for ventilators providing natural ventilation and/ or smoke control. Specify powered ventilation units and passive stack ventilation terminals in the appropriate engineering services section.

Type: Insert *Glazed, Louvred, Flap* or *Sliding*.

Controls: Various control options are available, including linear actuator, pneumatic cylinder, electromagnetic latch and manual.

Materials: Insert, e.g.

Frame: Aluminium, Louvres: 9 mm clear, UV protected, twinwall polycarbonate.

Frame: Aluminium; Glazing: 28 mm insulating glazing unit.

– **Finish as delivered:** Insert, e.g. *Principal components polyester powder coated.*

Seals: Louvre type ventilators can be fitted with weatherseals to

480 ROOF WINDOWS

- Manufacturer:
- Product reference:
- Glazing details:
- Flashings: By window manufacturer to suit
- Accessories:
- Fixing:

490 ROOF VENTILATORS

- Manufacturer:
- Product reference:
- Type:
- Controls:
- Materials:
- Finish as delivered:
- Seals:
- Guards:
- Accessories/ Special features:
- Fixing:

reduce heat loss when closed. Insert *Required*, *Not required*, or *Not applicable*. Give details where a choice of seals is offered.

Guards: These can be factory fitted. Insert *Insect*, *Bird*, *Security*, *Burglar*, etc. or *Not required*.

Accessories/ Special features: Insert, e.g.

Aluminium covers to actuators.

Controllable side dampers.

Fixing: Give brief details of method of securing roof ventilator to kerb or other supporting structure, e.g.

Screw fixed to kerb.

Galvanized steel lugs.

510

Use this clause for purpose designed wood screens. Use clause 560 to specify proprietary screen systems.

Where the screen incorporates a door or doorset, include in the item for special features a cross reference to section L20 and specify requirements in that section.

Location: Insert, e.g. *Between general office and sales area.*

Timber:

– **Species:** Insert the name of the required species, selecting from BS EN 942, National Annex NA, table NA1 or NA2 as appropriate.

Alternatively, leave the choice to the manufacturer and insert, e.g. *Softwood as table NA1.*

Hardwood as table NA2.

To approval.

– **Appearance class:** Insert class (or classes) selected from BS EN 942. Small sections, e.g. glazing beads and door stops should be Class J2 or Class J10. Specification of these classes for larger sections may involve significant extra cost.

– **Moisture content on delivery:** BS EN 942 specifies:

- 13–19% for external joinery.
- 12–16% for unheated buildings.
- 9–13% for buildings with heating providing room temperatures in the range 12–21°C.
- 6–10% for buildings with heating providing room temperatures in excess of 21°C (joinery at this moisture content will only be available by special order or agreement, and appropriate protection and storage should be arranged to maintain its condition).

Panels: Insert details of opaque panels, e.g. *12 mm plywood, oak veneered both sides.*

Assembly adhesive: See general guidance 2. Insert, e.g.

Thermosetting resin to BS EN 12765, class C4.

PVAC to BS EN 204, Class D4.

Finish as delivered: Where the screens are to be supplied primed for painting or sealed to receive a staining system, specify as part of the overall painting system in section M60 and give the relevant cross reference here, e.g. *Prepare and seal as section M60.*

If the screens are to be installed into prepared openings and not built in as the work proceeds, consider having the full finishing system applied in the workshop. Extra care and protection is required during the installation of finished components.

Glazing details: Insert, e.g. *Hardwood beads fixed with brass cups and screws.* Specify glazing system in section L40.

Special features/ Other requirements: Insert, e.g.

Carved and pierced panels.

Scrolled uprights.

Glazed panelled door as section L20.

Fixing: See clause 780. Insert, e.g.

Screw fixing and pelleting.

Bolted to masonry reveal.

510 GLAZED WOOD SCREENS

- Location:
- Timber: Generally to BS EN 942.
 - Species:
 - Appearance class:
 - Moisture content on delivery:
- Panels:
- Assembly adhesive:
- Joinery workmanship: As section Z10.
- Finish as delivered:
- Glazing details:
- Special features/ Other requirements:
- Fixing:

550

Use this clause for purpose designed screens of steel, aluminium, bronze or copper alloy standard or proprietary sections. Repeat the clause as necessary for different types of screen. Use clause 560 to specify proprietary screen systems.

Where the screen incorporates a door or doorset, include in the item for special features a cross reference to section L20 and specify requirements in that section.

Location: Insert, e.g. *Between cafeteria and shop floor.*

Materials and workmanship:

– **Frame members:** Give a brief description of sections or a proprietary reference, e.g.

Rolled steel angles and hollow sections.

Alsec Masterframe – as shown on drawings.

Finish: Steel frame members may be:

- Painted, e.g. with red oxide primer.
- Galvanized to BS EN ISO 1461.
- Powder coated to BS EN 13438.

Aluminium frame members may be:

- Anodized to BS 3987.
- Liquid organic coated to BS 4842.
- Powder organic coated to BS 6496.

For further information about finishes see section Z11, general guidance. Specify site painting in section M60.

– **Panels:** Insert details of opaque panels, etc., e.g. *Aluboard.*

Jointing: Insert relevant details, e.g.

Welded.

Brazed.

Machine screws to backing plates.

Glazing details: Insert, e.g. *Clip on anodized aluminium beads.*

Specify glazing system in section L40.

Special features/ Other requirements: Insert, e.g.

Curved units and glazing at corners.

Frameless glass doors as section L20.

Fixing: See clause 782. Insert, e.g. *Screwed to masonry.*

560

Use this clause for proprietary screen systems. Use clause 510 for purpose designed wood screens. Use clause 550 for purpose designed metal screens.

The amount of detail required will depend on the range of options offered by the manufacturer. Insert *Not applicable* where appropriate.

Location: Insert, e.g.

Between sales area and general office.

Corridor walls adjacent atrium.

Screen height: The overall height may influence construction, particularly if the screen extends above a suspended ceiling to the soffit of a floor slab above. Insert, e.g. *Floor to ceiling (2700 mm).*

Fire resistance rating: Give requirements for fire resistance in terms of integrity and/ or insulation when tested to BS 476-22.

Insert, e.g.

To BS 476-22: 30/30 minutes integrity/ insulation.

To BS 476-22: 30 minutes integrity only.

Sound insulation rating: The airborne sound insulating effect of a screen is generally expressed as a weighted sound reduction index (Rw), which is a measure of the difference in sound levels either side of the screen. The higher the Rw figure, the better. Typically, using a screen with an Rw value of 40 dB will mean that loud conversation on one side of the screen will be heard but not distinguishable. A range of sound insulation levels may be offered. Insert, e.g. *Rw 40 dB.*

Materials: Insert requirements from manufacturer's available options.

Glazing details: The range of glass types offered within a particular range may be limited, and choice will be further constrained by any fire rating required.

Include here details of any manifestation markings required for large areas of glazing.

Incorporated features: Where the screen incorporates a doorset, give details as follows:

- Doorset provided as part of the system: Give precise requirements for door frame and door, including vision panels and ironmongery.
- Doorset provided by others or purpose made: Cross refer to

550 GLAZED METAL SCREENS

- Location:
- Materials and workmanship: As section Z11.
 - Frame members:
 - Finish:
 - Panels:
 - Finish:
- Jointing:
- Glazing details:
- Special features/ Other requirements:
- Fixing:

560 GLAZED SCREEN SYSTEM

- Location:
- Manufacturer:
 - Product reference:
- Screen height:
- Fire resistance rating of complete system:
- Sound insulation rating:
- Materials:
 - Frames:
 - Finish:
 - Panels:
 - Finish:
- Glazing details:
- Incorporated features:
- Accessories/ Other requirements:
- Fixing:

section L20 and specify requirements there, e.g. *Doorset as section L20*.

Note that incorporating components from a different source is likely to invalidate the fire certificate for the screen, and further testing or assessment of the combined assembly may be required.

Accessories/ Other requirements: Include here details of any ancillary items to be supplied by the screen manufacturer, e.g. blinds, skirtings, architraves and other trims.

Fixing: Insert, e.g. *Bolted to masonry reveal*.

580

Secondary glazing installation is normally a retrofit operation. A properly installed system can improve noise and thermal insulation, draught proofing and security.

Clause heading: Insert, e.g. *TO STREET ELEVATION WINDOWS*

Type: Typical configurations are horizontal sliding, vertical sliding, hinged casement, lift out and fixed.

Framing material: Insert, e.g.

Aluminium.

PVC-U.

– **Finish as delivered:** Insert, e.g.

Bronze anodized.

Polyester powder coated, colour: RAL 123.

Glazing details: Check availability of options with manufacturer.

Insert *As supplied* if the glazing method is not a variable feature of the system. Specify site glazing in section L40.

Ironmongery/ Accessories: Some systems are supplied complete with all necessary hardware. Use this item to describe components supplied as standard and any variations and/ or extras, e.g. acoustic linings, blinds, coupling mullions/ transoms, trickle ventilators.

Grounds/ Subframe: Insert manufacturer's recommendation or *Not required*.

Fixing: Insert, e.g. *Screwed to wood subframe*.

605

Use this clause for proprietary wood louvres incorporated as interior or exterior architectural features of the building. Specify internal and external air terminal devices for ventilation and air conditioning systems in the appropriate engineering services section. Use clause 610 for purpose designed architectural louvres.

Species: Select from the range offered by the manufacturer, or insert *Softwood* or *Hardwood*.

Fire resistance rating: Insert *Not applicable* where fire rated products are not required.

Number of louvre banks: Additional banks of louvres give increased exposure and weather resistance.

Louvre blade pitch and angle: Obtain details from manufacturer's literature.

Blanking panels: Obtain details from manufacturer's literature.

Areas where they are to be fitted should be shown on drawings.

Finish as delivered: See guidance to clause 610. Insert, e.g.

Undercoated.

Accessories/ Other requirements: Give details of items such as bird/ insect guards, access doors, special shapes.

Fixing: See clause 780. Insert, e.g. *Screwed and pelleted*.

610

Use this clause for purpose designed wood louvres incorporated as interior or exterior architectural features of the building. Specify internal and external air terminal devices for ventilation and air conditioning systems in the appropriate engineering services section. Use clause 605 for proprietary architectural products.

The disposition of the louvres (the blade pitch and angle, etc.) should be shown on detail drawings.

Timber:

– **Species:** Insert the name of the required species selecting from BS EN 942, National Annex NA, table NA1 or NA2 as appropriate. Alternatively leave the choice to the manufacturer and insert, e.g.

Softwood as table NA1.

Hardwood as table NA2.

To approval.

– **Appearance class:** Select from BS EN 942. Class J40 (maximum knot size 40 mm) will generally be satisfactory for opaque finished louvres and Class J30 (maximum knot size 30 mm) for clear

580 SECONDARY GLAZING SYSTEM

- Manufacturer:
- Product reference:
- Type:
- Framing material:
- Finished as delivered:
- Glazing details:
- Ironmongery/ Accessories:
- Grounds/ Subframe:
- Fixing:

605 WOOD LOUVRES

- Manufacturer:
- Product reference:
- Species:
- Fire resistance rating:
- Number of louvre banks:
- Louvre blade pitch and angle:
- Blanking panels:
- Finish as delivered:
- Accessories/ Other requirements:
- Fixing:

610 WOOD LOUVRES

- Timber: Generally to BS EN 942.
- Species:
- Appearance class:
- Moisture content on delivery:
- Blanking panels:
- Assembly adhesive:
- Preservative treatment:
- Finish as delivered:
- Joinery workmanship: As section Z10.
- Fixing:

finishing.

– **Moisture content on delivery:** BS EN 942 specifies:

- 13–19% for external joinery.
- 12–16% for unheated buildings.
- 9–13% for buildings with heating providing room temperatures in the range 12–21°C.
- 6–10% for buildings with heating providing room temperatures in excess of 21°C.

Blanking panels: Insert details of materials used to blank off louvres, e.g. *12 mm plywood, bonding quality to BS EN 314-2, Class 3*. For guidance on specifying board materials see section K11.

Assembly adhesive: See general guidance 2. Insert, e.g.

Thermosetting resin to BS EN 12765, class C4.

PVAC to BS EN 204, class D4.

Preservative treatment: See guidance in section Z12. Insert, e.g. *Organic solvent as section Z12 and BWPDA Commodity Specification C5; Desired service life 60 years.*

Finish as delivered: Where the louvres are to be supplied primed for painting or sealed to receive a staining system, specify as part of the overall painting system in section M60 and give the relevant cross reference here e.g. *Prepared and sealed as section M60.*

If the louvres are to be installed into prepared openings and not built in as the work proceeds, consider having the full finishing system applied off site. Extra care and protection is required during the installation of finished components.

Fixing: See clause 780. Insert, e.g. *Screwed and pelleted.*

650

Use this clause for proprietary metal louvres incorporated as interior or exterior architectural features of the building. Specify internal and external air terminal devices for ventilation and air conditioning systems in the appropriate engineering services section.

Material: Insert, e.g. *Stainless steel.*

– **Finish as delivered:** Manufacturers may offer options, e.g.

Primed for painting.

Organic powder coating to BS 6496 (on aluminium extrusions).

Specify site painting in section M60.

Fire resistance rating: Insert *Not applicable* where fire rated products are not required.

Number of louvre banks: Can be single, double or triple depending on exposure and weather resistance required.

Louvre blade pitch and angle: Obtain details from manufacturer's literature.

Blanking panels: These may be single skin or insulated. Areas where they are to be fitted should be shown on drawings.

Accessories/ Other requirements: Insert, e.g.

Access door.

Stainless steel bird mesh.

Fixing: See clause 781. Insert, e.g. *Bolted to structural steelwork.*

670

A 'brise soleil', or sunscreen, is a perforated screen or system of louvres strategically fixed to the external envelope of a building to provide shading to windows, thus reducing solar heat gain and glare. BRE Information Paper IP 17/03 gives data that can be used to quantify the effect of these devices for the purposes of satisfying Building Regulation requirements.

Loadbearing systems can be designed to provide access walkways for maintenance purposes. A fall arrest system is usually needed with these systems – include a cross reference here in the item for 'Special features/ Other requirements' and specify in section N25.

Materials/ Finish:

– **Louvre blades/ Side support arms:** These are generally fabricated in aluminium. A range of finishes is available, including mill finished, powder coated, anodized and PVF2 (polyvinylidene fluoride) coated.

– **Mounting brackets:** These are usually steel or aluminium. Where the brise soleil is fixed to a steel frame, the mounting brackets are best provided and attached by the steelwork contractor. Insert, e.g. *Galvanized steel by others.*

– **Support struts:** These spread the moment forces associated with the cantilevered screen over a larger area. They can be used in tension above the screen or in compression below it. They may not

650 METAL LOUVRES

- Manufacturer:
 - Product reference:
- Material:
 - Finish as delivered:
- Fire resistance rating:
- Number of louvre banks:
- Louvre blade pitch and angle:
- Blanking panels:
- Accessories/ Other requirements:
- Fixing:

670 BRISE SOLEIL

- Manufacturer:
 - Product reference:
- Materials/ Finish as delivered:
 - Louvre blades:
 - Side support arms:
 - Mounting brackets:
 - Support struts:
 - Fasteners:
- Accessories/ Special features:

be needed where the screen projection is short and a sufficiently strong mounting can be achieved. Note that some materials in certain section sizes must not be used in compression – seek manufacturers' advice. Insert, e.g.

10 mm polished stainless steel tension rods.

25 mm aluminium compression struts.

Not required.

– **Fasteners:** Care must be taken to avoid bimetallic corrosion.

Insert, e.g. *M8 stainless steel bolts.*

Accessories/ Special features: Insert, e.g.

Mitred and welded corner panels.

Fall arrest system as section N25.

680

Clause heading: Insert, e.g. *TO WINDOWS ON SOUTH AND WEST ELEVATIONS*

Type: Insert, e.g.

Exterior roller blind.

Folding arm awning.

External venetian blind.

Mode of operation: Insert, e.g.

Manual.

Motorized – radio controlled electric.

– **Power supply:** Give details, e.g. *Domestic mains voltage supply,* or insert *Not required.*

Operating mechanism: Insert details of cassette housing, guide rails, support arms, etc. as appropriate, including material and finish where a choice is available.

Shading device:

– **Material:** Insert, e.g:

Polyester fabric.

60 mm rolled edge aluminium slats.

Fixing: Give brief details, noting particular requirements, e.g. for accuracy of line and level for coupled units.

710

Factory finished windows are usually delivered to site with protective wrappings, tapes, etc. and these should be left on to protect the components during storage. Paper or cardboard wrappings, however, should be removed if there is a risk of them becoming damp or getting wet.

Anodized aluminium is susceptible to attack by alkaline building materials, e.g. cement, plaster and some cleaning materials. Strippable tapes, wax coatings or lacquers are used for protection. Where the windows are to be built in, protective tapes should be left in place until the adjacent building work is complete and then removed immediately, as sunlight, weathering and time may make them difficult to remove. Lacquer coatings should be left to weather away.

730

Specify priming and sealing in section M60. Paints in direct contact with aluminium should not contain copper or mercury fungicides, graphite or lead.

740

Copper alloys should not be in direct contact with iron, steel, zinc (including galvanizing) or aluminium.

Aluminium alloys should not be in direct contact with:

- Timber treated with copper, zinc or mercury based preservatives.
- Oak, sweet chestnut, Douglas fir and western red cedar, unless well seasoned.
- Iron and steel unless galvanized.
- Copper or copper alloys and rainwater which has run over them.
- Concrete, mortar or plasters, especially when embedded.
- Soil.
- Paints containing copper or mercury based fungicides, graphite or lead.
- Lead and stainless steel in heavily polluted atmospheres.

Anodizing will not protect the alloy when in contact with the above materials. Aluminium is not affected by contact with zinc or cadmium but contact will accelerate their rate of corrosion. For additional information about the protection of aluminium against corrosion see

680 SOLAR SHADING SYSTEM

- Manufacturer:
- Product reference:
- Type:
- Mode of operation:
- Power supply:
- Operating mechanism:
- Shading device:
- Material:
- Colour:
- Fixing:

EXECUTION

710 PROTECTION OF COMPONENTS

- General: Do not deliver to site components that cannot be installed immediately or placed in clean, dry floored and covered storage.
- Stored components: Stack vertical or near vertical on level bearers, separated with spacers to prevent damage by and to projecting ironmongery, beads, etc.

730 PRIMING/ SEALING

- Wood surfaces inaccessible after installation: Prime or seal as specified before fixing components.

740 CORROSION PROTECTION

- Surfaces to be protected:
- Protective coating: Two coats of bitumen solution to BS 6949 or an approved mastic impregnated tape.
- Timing of application: Before fixing components.

BS 8118-2, Section 4.

Insert, e.g. *Aluminium alloy components in contact with preservative treated timber.*

750

If the contractor is permitted to build in components ensure that the corresponding clause in section F30 (building in frames) is included in the specification, if appropriate.

Often a steel or aluminium window is fitted into a wood subframe to give a bolder sight line. The subframe may be used as a template, allowing the window to be installed at a later date.

755, 756

Use clause 755 for new domestic work. Use clause 756 for the installation of replacement PVC-U windows.

760

Use this clause for the installation, into existing structural openings in dwellings, of windows manufactured from metal, plastics or wood, supplied with or without surrounds. BS 8213-4 does not apply to secondary sashes, nor does it cover design, materials, finishes, quality or workmanship of the windows.

765

The recommended maximum perimeter gap for steel windows is 3 mm. A 10 mm gap is generally recommended for plastics windows. In all cases, joints exceeding 10 mm should be avoided.

770

Where components are not to be built in it is highly desirable that templates are used – see clause F30/840.

780–784

For guidance on site handling and fixing of windows see:

- BS 644, Appendix D (wood windows).
- SWA 'Specifier's guide to steel windows'.
- BPF code of practice for the installation of PVC-U windows in new dwellings.
- Joint trades publication 'Code of practice for the survey and installation of windows and external doorsets', developed by British Plastics Federation, British Woodworking Federation, Council for Aluminium in Building, and Steel Window Association.

For windows under 1200 mm wide, frame fixings are generally only required up the jambs. For wider openings it may be necessary to specify head and sill fixings.

Fasteners: Frames may be fixed using cramps, straps, screws or expanding bolts. Insert, e.g. *Stainless steel wood screws.*

25 x 3 x 150 mm galvanized carbon steel frame cramps.

10 mm XYZ Ltd phosphor bronze expanding bolts.

BS 6510 requires the lugs, screws, or other materials necessary for fixing steel windows to be supplied by the window manufacturer.

The location of fixings may also be shown on the drawings for clarification.

750 BUILDING IN

- General: Not permitted unless indicated on drawings.
 - Brace and protect components to prevent distortion and damage during construction of adjacent structure.

755 PVC-U WINDOW INSTALLATION

- Standard: In accordance with clause 783 and British Plastics Federation 'Code of practice for the installation of PVC-U windows and doorsets in new domestic dwellings'.

756 PVC-U REPLACEMENT WINDOW INSTALLATION

- Standard: In accordance with clause 783 and British Plastics Federation 'Code of practice for the survey and installation of replacement plastics windows and doorsets'.

760 REPLACEMENT WINDOW INSTALLATION

- Standard: To BS 8213-4.

765 WINDOW INSTALLATION GENERALLY

- Installation: Into prepared openings.
- Gap between frame edge and surrounding construction:
 - Minimum:
 - Maximum:
- Distortion: Install windows without twist or diagonal racking.

770 DAMP PROOF COURSES IN PREPARED OPENINGS

- Location: Ensure correct positioning in relation to window frames. Do not displace during fixing operations.

780 FIXING OF WOOD FRAMES

- Standard: As section Z20.
- Fasteners:
 - Spacing: When not predrilled or specified otherwise, position fasteners not more than 150 mm from ends of each jamb, adjacent to each hanging point of opening lights, and at maximum 450 mm centres.

781 FIXING OF STEEL FRAMES

- Standard: As section Z20.
- Fasteners:
 - Spacing: When not predrilled or specified otherwise, position fasteners not less than 50 mm and not more than 190 mm from ends of each jamb, adjacent to each hanging point of opening lights and at maximum 900 mm centres.

782 FIXING OF ALUMINIUM FRAMES

- Standard: As section Z20.
- Fasteners:
 - Spacing: When not predrilled or specified otherwise, position fasteners not more than 250 mm from ends of each jamb, adjacent to each hanging point of opening lights, and at maximum 600 mm centres.

783 FIXING OF PVC-U FRAMES

- Standard: As section Z20.
- Fasteners:
 - Spacing: When not predrilled or specified otherwise, position fasteners 150–250 mm from ends of each jamb, adjacent to each hanging point of opening lights, but no closer than 150 mm to a transom or mullion centre line, and at maximum 600 mm centres.

790

There is often a gap of up to 12 mm between the back of a frame and the reveal into which it is fitted. This gap may be covered with architraves which, if they are at least 15 mm thick and closely fitted on both sides of the frame, may give up to 30 minutes integrity in a fire. If the fit of the architraves cannot be guaranteed, some form of seal must be used to fill the gap. This may be plaster, tightly packed mineral wool, or an intumescent mastic or tape. If architraves are not to be fitted, then plaster or intumescent mastic should be used. Even with closely fitting architraves, sealing will be necessary to give 60 minutes integrity.

800

Use this clause for steel frames where the window opening is not rebated.

810

Oil based sealants are commonly specified and are usually adequate when of good quality. They are not suitable for use with PVC-U windows or wood windows finished with microporous paints.

Solvent based acrylic sealants are especially suitable for refurbishment work since they will adhere to surfaces that are difficult to clean. Water based acrylics may be used externally if early exposure to rain is avoided.

Where weather conditions are severe (e.g. on high rise buildings) high grade sealants such as polysulfides and silicones should be used.

BS 6213 and BRE Information Paper 25/81 give guidance on types of joint sealant, their selection and application. Guidance on specification of sealants is given in section Z22. See also CIRIA publication 'Sealant joints in the external envelope of buildings'.

Where the joint is deep in comparison to its width a backing strip should be used to fill the inner portion of the joint, leaving the correct joint depth to accommodate the sealant. The sealant should have a minimum depth of 6 mm. The locations of backing strips should be shown on drawings if they are not required for all joints.

Mastic sealants are not recommended for vertical joints between wood windows and the adjacent reveals, because there is a risk that any moisture penetrating behind the seal may be trapped at the back of the frame and absorbed into the wood.

An alternative method, recommended by TRADA, is to replace the sealant with a precompressed impregnated foam tape. The tape expands to fill the joint, forming a waterproof but vapour permeable seal. A minimum 5 mm gap is generally required for such tapes. They can be concealed using a cover bead if desired.

784 FIXING OF COMPOSITE FRAMES

- Standard: As section Z20.
- Fasteners:
 - Spacing: When not predrilled or specified otherwise, position fasteners not more than 150 mm from ends of each jamb, adjacent to each hanging point of opening lights, and at maximum 600 mm centres.

790 FIRE RESISTING FRAMES

- Gap between back of frame and reveal: Completely fill with

800 BACKFILLING OF STEEL FRAME SECTIONS

- Windows fixed direct into openings: After fixing, fill back of steel frame with waterproof cement fillet.

810 SEALANT JOINTS

- Sealant:
 - Manufacturer:
 - Product reference:
- Colour:
- Application: As section Z22 to prepared joints. Finish triangular fillets to a flat or slightly convex profile.

820 IRONMONGERY

- Fixing: Assemble and fix carefully and accurately using fasteners with matching finish supplied by ironmongery manufacturer. Do not damage ironmongery and adjacent surfaces.
- Checking/ Adjusting/ Lubricating: Carry out at completion and ensure correct functioning.