NHS National Services Scotland

Scottish Health Technical Memorandum 55

SHTM Building Component Series

Windows

Health Facilities Scotland
Property and Capital Planning

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Contents

Disclaimer

The contents of this document are provided by way of general guidance only at the time of its publication. Any party making any use thereof or placing any reliance thereon shall do so only upon exercise of that party's own judgement as to the adequacy of the contents in the particular circumstances of its use and application. No warranty is given as to the accuracy, relevance or completeness of the contents of this document and Health Facilities Scotland shall have no responsibility for any errors in or omissions therefrom, or any use made of, or reliance placed upon, any of the contents of this document.

1. Introduction

Background

1.1 This is one of a series of Scottish Health Technical Memoranda which provides specifications and design guidance on building components for health buildings which are not adequately covered by current British Standards.

A full Reference Section is provided at the end of this document, including Acts and Regulations, NHS Resources and British Standards.

1.2 The numbers and titles of the SHTMs in the series are:

- 54 User manual;
- 55 Windows;
- 56 Partitions;
- 57 Internal glazing;
- 58 Internal doorsets;
- 59 Ironmongery;
- 60 Ceilings;
- 62 Demountable storage system;
- 63 Fitted storage system;
- 64 Sanitary assemblies;
- 66 Cubicle curtain track;
- 67 Laboratory fitting out systems;
- 69 Protection.

Scope and status

1.3 This SHTM offers guidance on the technical design and output specifications of windows.

1.4 Its content does not diminish either the manufacturer's responsibility for fitness for purpose of products or the design team's responsibility for selection and application of products to meet project requirements. Design teams are also reminded of their obligations under the Construction, Design and Management (CDM) Regulations 1994 (as amended 2002) to ensure safe construction.

1.5 The term 'windows' as used in this SHTM includes matching doors, and doors forming an integral part of a window unit.

Application

1.6 Due to the wide-ranging considerations necessary to successful selection, specification, installation and use of windows, this SHTM should be made available to project teams, design teams and those responsible for construction, commissioning and maintenance of health buildings.

1.7 It is mainly concerned with new building work, but much of the information it contains is equally applicable to renewal of windows in existing buildings.

Relationship to other data

1.8 The main sources of data used in the preparation of this SHTM are listed in the References section.

1.9 This SHTM was prepared for publication in December 2006. After this date, readers should ensure that they use the latest or new edition of all building legislation, British Standards etc which may post-date the publication of this document.

1.10 First preference should be given to products and services from sources which have been registered under current BSI Quality Assurance procedures or other certification schemes. Suppliers offering products other than to British Standards should provide evidence to show that their products are at least equal to such Standards.

1.11 This guidance should be used in conjunction with sections of the National Building Specification (NBS) relevant to windows. NBS is a library of standard specification clauses covering most kinds of building work and comprising a wide range of clauses with accompanying guidance notes. All clauses are optional, and their combination into a job specification is left to the specifier. NBS has great flexibility and it can be adapted to suit the technical needs and preferences of different projects, organisations and specifiers. Specifications go out of date as a result of technical innovation or major review of a key BSI document. As NBS sections become affected by such major changes, they are re-issued to members of the subscription service. Users are advised to ensure that they refer to the current edition. Refer to the NBS website at http://www.thenbs.com

1.12 Any enquiries regarding the technical content of this SHTM should be e-mailed to enquiries@hfs.scot.nhs.uk

Terminology

1.13 In this SHTM the following terms apply. Others are defined in the sections in which they are used or in other documents listed in the References section:

- Basic space – a space bounded by reference planes assigned to receive a building component or assembly, including allowance for joints and tolerances;
- Co-ordinating size – the size given to a basic space;
- Work size – a size of a window frame or opening to which its actual size should conform within specified permissible deviations;
- These terms are illustrated in Figure 1.

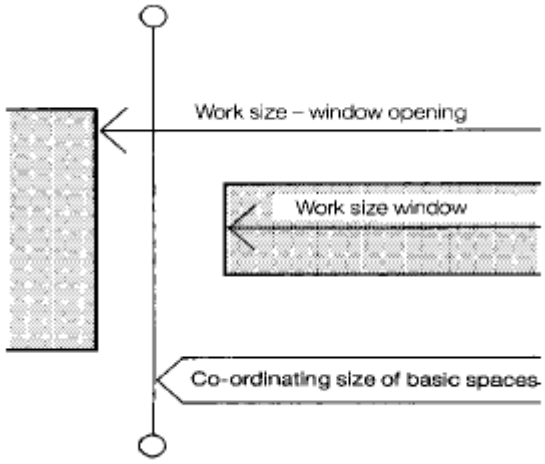


Figure 1

- Coupled window – (also known as a dual sash window) consists of two single-glazed frames joined by hinges or fasteners so that both open together in the same direction for ventilation and can be separated for cleaning;
- Double window – two separate single-glazed windows, one external and one internal, in the same wall opening, but capable of acting independently;
- Secondary window – a glazed unit added to an existing glazed window to improve the thermal and acoustic performance;
- Thermal barrier – a spacer of insulating material incorporated in a frame to separate the outer surface from the inner surface to improve its thermal performance.

2. Design guidance

Introduction

2.1 The design of a satisfactory environment has to balance various needs.

2.2 At an early stage the designer should prepare sketch plans showing positions, sizes and types of window. The architectural considerations and main design criteria with which they have to comply are:

- natural lighting;
- natural ventilation;
- view;
- weather-tightness;
- energy conservation;
- sound insulation;
- security;
- safety;
- fire spread.

Natural lighting

General considerations

2.3 The character and control of natural daylighting must be based on the needs of the occupants and the function of the space.

2.4 In addition to considering the position and size of the window in relation to the use of a space, the designer should consider the effect of obstruction to vision and restriction of daylight by framing members of the window and curtains or blinds. Tall narrow windows give greater penetration of light than wide windows of the same area. Splayed reveals give a gradation of light from outside to inside, improve the spread and quality of light, and reduce harsh contrasts which may be unpleasant to the eye.

Daylight

2.5 Daylight varies in quality and intensity according to location and weather conditions. Window shapes and positions can be evaluated by calculating the daylight factor using daylight protractors, reference tables and computer programs.

2.6 For further guidance see:

- BS 8206-2:1992 ‘Lighting for buildings. Code of practice for daylighting’;
- BRE digest 288: ‘Designing buildings for daylight’;
- CIBSE lighting guide: ‘Daylighting and window design’;
- Dalke et al (2004), ‘Lighting and colour for hospital design’.

Sunlight

2.7 Sunlight is beneficial provided that glare, dazzle and overheating are controlled. These undesirable effects can be countered by installing various devices located either:

- outside the window;
- between the glazing;
- within the glass; or;
- inside the window.

2.8 The methods or devices should be checked for:

- range of control;
- external view;
- reasonable levels of daylight;
- ease of operation;
- ease of maintenance;
- ease of cleaning;
- ease of replacement;
- effects of exposure;
- cost.

2.9 See BS 8206-2:1992.

Natural ventilation

2.10 Opening lights should be used to provide normal ventilation except where:

- the level of outside noise is unacceptable;
- safety or security features must be provided;
- unpleasant smells are generated either inside or outside the building;
- inflows of air are undesirable (such as in a laboratory).

2.11 Mechanical ventilation may be required in these circumstances.

2.12 Small openings or baffled grilles can provide minimum, or filter, ventilation successfully. These should be arranged at high level to avoid draughts, and designed so that the passage of air does not create noise which would be a nuisance to the building's users. Specifiers should take into account the room function when considering the latter performance aspect and select appropriate components.

2.13 Maximum or hot-weather ventilation can be provided by large openings, but patient safety and rigidity of large opening lights must be considered (see paragraphs 2.56–2.58).

2.14 Louvres or additional high-level opening lights may be considered when restricted openings cannot provide sufficient natural ventilation in hot weather.

2.15 The provision of opening lights should be discussed with the services engineer when mechanical ventilation is to be provided.

View

2.16 The ideal viewing zone will be determined by the eye level of occupants, depending upon whether they are standing up, sitting or lying down. The following factors will affect the ideal viewing zone:

- security and safety;
- outlook and privacy;
- under-sill requirements for mechanical services or furniture.

2.17 These factors will determine:

- size of the window;
- shape of the window;
- height of sill;
- height of transom;
- height of head.

2.18 The ideal viewing zone and ranges of eye levels for all types of occupants is shown in Figure 2 (all dimensions are in millimetres). Further information may be found in Health Building Notes.

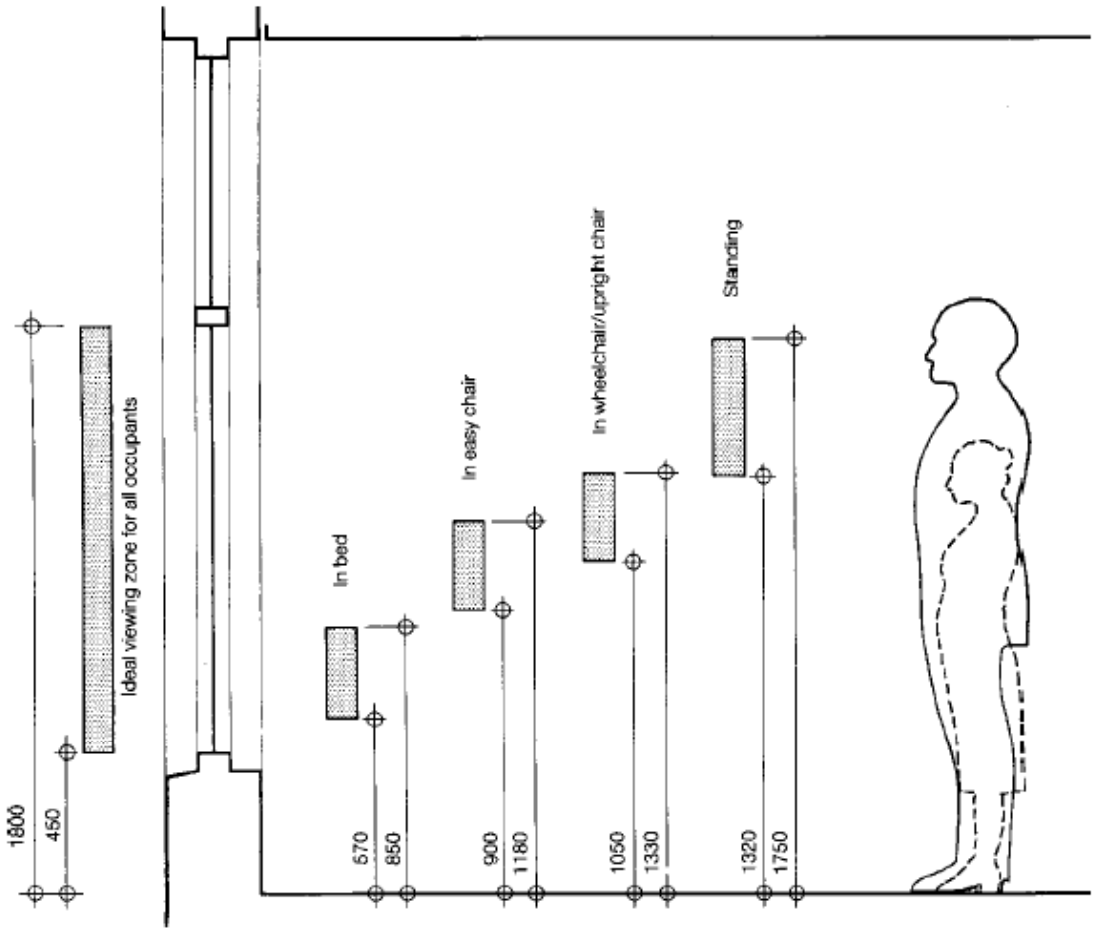


Figure 2

Weather tightness

General

2.19 The first step in assessing weather-tightness is to visit the site and note any special local environmental conditions.

2.20 Weather-tightness is defined as the performance of windows in respect of:

- air permeability;
- watertightness;
- wind resistance.

2.21 The classification of windows in terms of weather- tightness required may be determined by following the guidance in BS 6375-1 and the specifications given by the National Building Specification in order to:

- calculate the design wind pressure;
- select the exposure category and test pressure classes for air permeability, watertightness and wind resistance.

2.22 Methods of determining design wind pressures for buildings and windows are set out in:

- BS 6375-1:2004 'Performance of windows. Classification for weather tightness and guidance on selection and specification';
- BS 6399-2:1997 'Loading for buildings. Code of practice for wind loads';
- BS 6262:1982 'Code of practice for glazing for buildings'.

2.23 Building configuration, site topography and location are taken into account in the calculations for wind pressure.

2.24 The documents are intended for use in determining the loadings for complete buildings, windows or glass. However, sample calculations made to the documents show a general similarity of results.

2.25 Actual performance in use will depend on a number of factors including the location of the building, size and shape of the windows, the way the windows are installed in the building, the associated design detailing and the degree of maintenance (see also BS 8104:1992 'Code of practice for assessing exposure of walls to wind-driven rain').

2.26 Choosing the proper grade of window, installing it in a suitably sheltered position, with well-detailed protective damp-proof courses in head, jambs and sill, can avoid undesirable consequences. It may be necessary to choose a grade higher than the minimum indicated by exposure charts to obtain weather-resisting qualities throughout the life of the window, or to allow for special local conditions.

Air permeability

2.27 In determining an acceptable level of air permeability, account must be taken of:

- the function of the rooms;
- the need to minimise heat losses;
- whether air-conditioning is to be employed.

2.28 Achievement of an acceptable level within a given weather-tightness classification will depend on:

- type of window;
- construction;
- weather stripping;
- fittings.

2.29 The test methods called up by BS 6375-1:2004 to measure air permeability are specified in BS 5368-1: 1976, BS EN 42:1975.

Water tightness

2.30 The test methods called up by BS 6375-1:2004 to measure water tightness are specified in BS EN 1027:2000.

Wind resistance

2.31 The wind resistance performance of windows depends on:

- strength of frame and sashes;
- fixed or opening lights;
- location and type of fixings
- glazing;
- location and type of fittings.

2.32 The test methods called up by BS 6375-1:2004 to measure wind resistance are specified in BS EN 12211:2000 (see also BS 6399-2:1997 and National Building Specification guidelines).

Classification for weather-tightness

2.33 Classification by weather-tightness is based on test pressures for air permeability, water tightness and wind resistance as set out in BS 6375-1:2004. The appropriate test pressure can be arrived at by calculation of the design wind pressure and by reading off the corresponding test pressures for watertightness and air permeability.

2.34 However, the specifier should not assume that the values obtained will apply automatically in all circumstances. For example, where high energy conservation values are required, it may be appropriate to specify higher levels of test pressures for air permeability than that required for wind resistance, which relates to the strength of the window and its ability to resist wind pressures.

Replacement windows

2.35 When windows are replaced, it is common for the installers (who may not be particularly knowledgeable in matters of weathering) to position the new windows closer to the face of the wall, often relying on copious quantities of mastic pointing for weather resistance.

2.36 Replacement windows should comply fully with the recommendations in paragraphs 2.19–2.34.

Water shedding

2.37 Water shedding can be improved by following certain fundamental principles, for example:

- projecting mullions;
- transoms and sills (to break up wind and rain driven over windows);
- rips in heads and sills;
- water checks at sills and jambs;
- protection over opening lights (water can stream down surfaces above the light and be blown in);
- adequate slope to all horizontal surfaces;
- canopies over doors.

Weather stripping

2.38 All windows and external doors should include weather stripping around opening parts to improve the resistance to air permeability, elimination of water penetration and reduction of noise from outside, and to retain this performance for as long as possible throughout the life of the window. This should be capable of being replaced, removed or protected during decoration or cleaning of the frame.

Energy conservation

2.39 No external wall should have a U-value greater than that permitted by section 6 of the Building (Scotland) Regulations 2004. The window:wall ratio has an important bearing on the U-value of the wall as a whole. Double glazing will permit larger areas of glass and give better comfort near windows. Triple glazing and the use of special glasses may permit even larger areas of glass to be used and/or higher levels of insulation to be achieved.

2.40 Optimum thermal performance may favour small windows, and this could conflict with the need for natural lighting, ventilation and view.

2.41 The thermal performance of a window as a whole will be influenced by its frame material; for example, timber and plastic frames have a better thermal performance than metal frames (see paragraphs 3.5–3.32).

2.42 Weather stripping improves the thermal performance of opening lights by reducing air permeability.

Sound insulation

2.43 There is a need to identify locations where improved sound insulation is required.

2.44 Effective reduction of sound transmission through a window can only be achieved by a high standard of design, manufacture and installation.

2.45 Sound insulation is improved by:

- double windows with fixed lights;
- double windows with weather-stripped opening lights;
- sealing windows to eliminate air paths;
- methods of glazing;
- using thick glass;
- lining the reveals with sound-absorbent material.

2.46 An air space of 150 mm between differing thicknesses of glazing gives optimum reduction; sealed glass units will give a further limited improvement.

2.47 For further information see:

- BRE Digest 338: 'Insulation against external noise';
- BS 6262:1992 'Code of practice for glazing for buildings';
- BS 8233:1999 'Sound insulation and noise reduction for buildings. Code of practice';
- CP 153-3:1972 'Windows and rooflights. Sound insulation'.

Security

2.48 This following paragraphs are not intended to deal with windows for high-security situations, but in certain situations special security precautions will be required to prevent unauthorised entry or exit. These areas should be identified early in the design stage and will include spaces which house:

- drugs;
- valuable equipment;
- records;
- certain categories of patient;
- residential staff.

2.49 The provision of security devices should be decided by consultation between the project and design teams, who will need to consider their effect on the operation and performance of the windows together with access for fire-fighters and means of escape in case of fire.

2.50 Security devices include:

- bars, grilles and shutters;

- special glazing;
- alarms;
- special locks.

2.51 Consideration must be given to measures to counteract vandalism and, in major urban areas, acts of terrorism.

2.52 Handles and fasteners should be designed so that they cannot be easily released from the outside by the insertion of a thin blade or other simple tool. Lockable lever handles should be fitted with 20 mm long spurs.

2.53 No openable light should be openable or removable from the outside when it is fastened in the closed position, except by breaking part of the window.

2.54 Where specified, windows should be provided with:

- special locks, operated from the inside of the window with removable keys;
- adjustable fasteners as specified in Appendix A under 'Manoeuvrability and control', providing security against unauthorised entry;
- internal bead glazing systems providing maximum security.

2.55 Vertical and horizontal sliding windows should be constructed so that any movement occurring between the inner and outer sashes is capable of being taken up and locked by the operation of a fitch catch or other locking devices.

Safety

2.56 Project teams must decide on the needs for safety in health buildings. The restriction of opening lights will be required in many rooms or even throughout a building. A restricted opening of not more than 125 mm is recommended for use within reach of patients, particularly in areas for older people and people with learning disabilities or mental illness; a dimension of 100 mm is essential where windows are accessible to children.

2.57 Any requirements for the use of safety glazing should be considered early in the design stage and the recommendations of BS 6262:1992 complied with. Particular attention should be given to glazing below 800 mm from floor level on ground floors and 900 mm on upper floors. The use of safety glazing should be considered in spaces which are accessible to children or vulnerable patients and generally in exercise areas.

2.58 Section 4 of the Building (Scotland) Regulations sets down requirements for safety glazing.

Fire spread

2.59 Requirements for the location and size of windows are set by The Building (Scotland) Regulations 2004.

3 Specification guidance

Window types

3.1 Window types generally used in health buildings are listed below. They may be identified by the conventional abbreviations and graphical illustrations (viewed from outside) shown.

Fixed

- FL Fixed Lights

Casement

- SH Side Hung left hand, open out

- SH Side Hung right hand, open out

- TH Top Hung, open out

- BH Bottom Hung, open in

- TT Tilt and Turn

Pivot

- VP Vertical Pivot

- HP Horizontal Pivot

Moving axis

- PSH Projecting Side Hung

- PTH Projecting Top Hung

Sliding

- VS Vertical Slider

- HS Horizontal Slider

Louvred

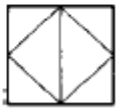
- L Louvred

Doors

- SD Single Door, glazed left hand

- LD Single Door, louvred right hand

- DD Pair of Doors, glazed



- GP Glazed Panel

3.2 The handing of side-hung windows and external doors is determined by the side on which the hinges occur viewed from the outside.

Fixed

- Fixed lights (FL).

Casement

- Side-hung left-hand, open out (SH);
- Side-hung right-hand, open out (SH);
- Top-hung, open out (TH);
- Bottom-hung, open in (BH);
- Tilt and turn (TT).

Pivot

- Vertical pivot (VP);
- Horizontal pivot (HP).

Moving axis

- Projecting side-hung (PSH);
- Projecting top-hung (PTH).

Sliding

- Vertical slider (VS);
- Horizontal slider (HS).

Louvred

- Louvred (L).

Doors

- Single door, glazed left-hand (SD);
- Single door, louvred right-hand (LD);
- Pair of doors, glazed (DD);
- Glazed panel (GP).

Testing and assessment

3.3 Manufacturers' product specifications and test data should be appraised to ensure that the sizes and types of window tested are applicable to those to be used on the project.

3.4 Some tests are for units of moderate size only, for example 1200 x 1200 mm. If a project requires larger units for which test data is not available, an authoritative assessment must be obtained from the manufacturer to cover the larger units (see Appendix A under 'Standards' for reference to methods of test).

Material and finishes

General

3.5 Steel and wood windows are commonly delivered to site for finishing by others, although factory-finished windows in both these materials are also available. Aluminium and plastic windows are factory-finished.

3.6 Special care should be exercised in the selection of finishes in industrial and marine atmospheres. When selecting surface finishes with a relatively low initial cost and short life, for example stains or paint finishes on wood, the periodic refurbishment that will be necessary should be assessed. Apart from the cost of this work and the problems of access, it will also cause considerable disruption and inconvenience to the building users.

3.7 Reference should also be made to BRE Digest No 377: 'Selecting windows by performance'.

Aluminium

3.8 Aluminium windows and finishes shall conform to BS 4873:2004.

3.9 Mill finish is not recommended as it will become unsightly and could ultimately incur significant maintenance costs.

3.10 Liquid organic coating to BS 4842:1984 should offer a maintenance-free life of about ten years. It is not recommended for marine and industrial environments.

3.11 Anodising to BS 3987:1991 should offer a maintenance-free life of 15 years or more in normal locations. It is not recommended for marine and industrial environments.

3.12 Powder organic coating to BS 6496:1984 is thicker than other finishes and has an expected maintenance- free life of up to 20 years. The thicker finish also affords improved protection against impact damage.

3.13 Ultimately all finishes will deteriorate and the frames will need further protection. At this time manufacturers' advice should be sought. Aluminium frames can act as a cold bridge and may result in condensation forming on the inner surfaces. Frames with a thermal barrier should be used.

Plastics

3.14 White PVC-U plastic windows shall conform to BS 7412:2002.

3.15 The lighter coloured materials have the advantage over the darker colours in that solar heat gain, expansion and contraction are less.

3.16 Cleaning may well be desirable at intervals in polluted atmospheres, but the frames should offer a maintenance-free life of up to 25 years. Frames made up of this material, in whole or in part, may minimise the risk of condensation resulting from cold bridging.

Steel

3.17 Steel windows shall conform to BS 6510:1984.

3.18 Galvanising provides good durability in mild and moderate environments, but normally requires painting for aesthetic reasons.

3.19 Factory-applied polyester coatings offer a maintenance-free life of up to 15 years.

3.20 Steel frames can act as a cold bridge and will generally result in condensation forming on the inner surfaces. Some provision should be made for condensation run-off in such windows or an alternative frame material considered.

Timber

3.21 Materials and workmanship shall comply with BS 1186-2:1988, BS 1186-3:1990 and BS EN 942:1996.

3.22 Timber frames provide good thermal insulation, minimising the risk of condensation.

Hardwood

3.23 Appearance and good functional performance are reasons for selecting hardwood windows. Resistance to decay is largely determined by the correct choice of species. However, with certain species preservative treatment is essential (see BRE Digest No 262: ‘Selection of windows by performance’).

Softwood: preservative treatment

3.24 Softwood windows should have preservative treatment applied by a licensed processor. The double vacuum process is suitable for all types of softwood. For further information see BS 5589:1989.

Paint finish

3.25 In addition to preservative treatment and factory priming, an undercoat and two finishing coats are recommended by BRE as offering a potential maintenance-free life of five years on external surfaces. Two undercoats and one finishing coat are recommended for internal surfaces.

3.26 Newer types of microporous paint or moisture vapour-permeable coatings are alternatives to the more traditional paint systems. They are easier to maintain due to improved weathering characteristics, but preservative treatment is still essential.

3.27 The following factors should be considered:

- oil-based or water-based type;
- priming paint of compatible formulation.

3.28 For further information, see:

- BS 6150:1991 ‘Code of practice for painting of buildings’;
- BRE Digest No. 422: ‘Painting exterior wood’;
- BRE Information Paper 4/94: ‘Water-borne coatings for exterior wood’.

Stain treatment

3.29 Stain treatment is an alternative to paint, offering a different appearance, but is less protective and less able to hide defects. It does not obviate the need for preservative treatment.

3.30 The use of stains could allow greater variations in moisture content to take place, with consequential variations in dimensional stability and splitting of the timber.

3.31 The following factors should be considered:

- the use of better-quality timber;
- the use of bead or gasket instead of putty glazing;
- more frequent but easier maintenance;
- the use of a low solid or high solid type of stain;
- the compatibility of bedding, pointing and glazing compounds.

3.32 Refer also to the Forestry Stewardship Council for guidance on sustainable sources (http://www.fsc.org/en/).

Bedding and pointing of frames

3.33 Frames should be bedded either in a sub-frame or directly into the window opening. The expected movement at these junctions must be considered. Window frames, sub-frames and surrounds of dissimilar materials having differing coefficients of expansion will require bedding compounds with an inherent elasticity.

3.34 Bedding compounds are not suitable for pointing. Apart from having insufficient flexibility and waterproofing characteristics, they may deteriorate on exposure to the elements. Traditionally, oleo-resinous sealants (oil-based mastics) were used as pointing material, but such relatively labour-intensive and hard materials have largely been superseded by gun-applied sealants.

3.35 Sealants vary in quality and in performance from the cheaper oleo-resinous and butyl rubber-based compounds to the expensive one- or two-pack polysulphide sealants. The maintenance-free life of these sealants varies from five years to approximately 20 years respectively.

3.36 Sealants are expensive, and joint widths should be kept as small as practicable. If excessive joint depths are anticipated, a backing material such as bitumenised foamed polyurethane sealing strip is often used in pre-compressed form and inserted in the joint before pointing.

3.37 The avoidance of premature failure of the joint will depend upon:

- good joint design;
- careful selection of sealant;
- preparation of joint surfaces;
- correct application of sealant.

3.38 Undue reliance should not be placed on sealants, as they are not an adequate substitute for good constructional details.

Glazing

3.39 Steel and wood windows are generally supplied for glazing by others. Aluminium and plastic windows are generally factory-glazed.

3.40 The type of glass and glazing method will be determined by the design guidance as set out in section 2. Further guidance on the selection of glazing is given below.

Solar control

3.41 Tinted, solar-reflective or other specialised or coloured glass should only be used after the clinical effect has been considered (see paragraphs 2.7–2.9).

Privacy

3.42 As well as in sanitary accommodation, obscured glass is often required in spaces such as examination and consulting rooms. The degree of obscuration should be determined by the privacy needed from either side of the glass and the difference between internal and external lighting.

Glass thickness

3.43 Glass thickness should be determined by the design wind pressure it will have to withstand. It should be calculated in accordance with the recommendations in BS 6262:1982.

Energy conservation

3.44 In sealed glass units the optimum width of air space is 20 mm. Below 20 mm the insulation value progressively decreases until it approaches that of single glazing; above 20 mm the value remains practically constant (see paragraphs 2.39–2.42). See also BRE Digest 379: 'Double glazing for heat and sound insulation'.

Security and safety

3.45 The need for special glazing can be met by one of the following types:

- laminated;
- toughened;
- wired;
- plastics;
- wired plastics.

3.46 See paragraphs 2.48–2.58.

Fire spread

3.47 In certain locations there may be a need for the use of fire-resisting glazing. This may be met by wired or special fire-resisting glass (see paragraphs 2.48–2.55).

Glazing materials

3.48 The most common materials for glazing are oil- based putty, glazing compounds, glazing beads, glazing clips and pre-formed gaskets.

3.49 Wood beads should always be back-primed to prevent absorption of binder from the glazing compound and excessive changes in moisture content.

Exposed arrises should be rounded to avoid early paint failures. Special attention should be given to the detailing of the bottom bead to ensure water shedding.

3.50 Highly flexible and weather-resistant sealants should be used when glazing to metal and plastic frames and to wood frames treated with preservative stains (see BS 6262:1982).

Fittings

3.51 Windows and external doors should be complete with the appropriate fittings, which should be assessed for ease of operation, security, safety and mechanical wear.

3.52 The choice of material and finish will be determined by the window material selected and the range of fittings offered by the window manufacturer. Typical sets of fittings for window types are as follows.

- Casements:
  (i) hinges;
  (ii) fasteners;
  (iii) stays;
  (iv) handles;
  (v) restrictors.

- Pivot windows:
  (i) adjustable friction pivots;
  (ii) bolts to give multi-point fixing;
  (iii) safety catches;
  (iv) handles;
  (v) restrictors.

- Sliding windows:
  (i) fittings to operate the sliding sashes;
  (ii) catches;
  (iii) locking devices;
  (iv) restrictors;
  (v) position keeps.

- Projecting windows:

  (i) pivots sliding in grooves;

  (ii) safety catches;

  (iii) locking devices;

  (iv) handles;

  (v) safety stays to restrict the opening.

3.53 Restrictors should be types that can only be disengaged by means of a special tool or key. Socket- head securing screws may be suitable. (See Appendix B. See also BS 6375-2:1987 and NHS Estates Hazard Notice HN (2003) 03.)

3.54 Additional fittings include:

- night ventilation devices consisting of fasteners or catches to hinged and pivoted opening lights to provide a minimal opening;
- blackout devices consisting of roller blinds of light proof material housed in light-tight frames fitted in the window openings.

Operating height

3.55 The maximum height for operating most opening devices when the user can stand close to the wall is about 1600 mm. In other situations it may be necessary to use some form of remote operating device such as cords or mechanical winding mechanisms. The use of poles should be avoided. Stays and similar devices on high-level windows in deep reveals may be difficult to operate; a sloping sill often alleviates the problem.

3.56 Where vertical sliding windows are to be used, consideration could be given to the use of a full-width low-level bar attached to the upper sash. This will enable the sash to be opened without resorting to the use of poles or mechanical devices.

Maintenance and replacement

3.57 The form and type, material, finish, accessories and accessibility of windows should be considered in respect of the maintenance, cleaning, repair and replacement of the whole or part of the component. All fittings and finishes should be selected to facilitate maintenance and cleaning.

3.58 An operation and maintenance manual should be compiled by the project architect and should be handed to the maintenance staff immediately following the practical completion of the contract.

3.59 The manual should include the following:

- identification of manufacturer;

- window specification;
- method of replacement of glass;
- size and thickness of glass;
- type and pattern of glass;
- fittings, including safety devices;
- gaskets, bedding and pointing materials;
- finishes;
- instructions on cleaning and maintenance.

Site-painted timber windows

3.60 When programming the first repainting of timber windows, the following should be borne in mind:

- that the windows will have been painted some time before the practical completion of the building;
- the anticipated maintenance-free life of the initial paint system.

3.61 For further information see:

- CP 153-2:1970: 'Windows and rooflights. Durability and maintenance';
- BRE Information Paper IP 4/94: 'Water-borne coatings for exterior wood'.

Hygiene and cleaning

3.62 Control and Prevention of Healthcare Associated Infection (HAI) is a priority issue for NHSScotland – both in respect of the safety and well being of patients and staff and also the resources consumed by potentially unavoidable infections.

Healthcare Associated Infection (HAI) is a complex issue involving the many different elements of patient care and provision. Due to its multi-factorial nature there is a need to develop a holistic approach to combating the spread of infection within the built environment.

It is imperative that those involved in the design and planning, construction and refurbishment and on-going maintenance of the healthcare facility have a sound knowledge of prevention and control of infection in the built environment.

Scottish Health Facilities Note (SHFN) 30 and HAI-SCRIBE aim to provide information on the prevention and control of infection, and on the prevention of cross-infection and cross contamination in healthcare facilities, to those responsible for the planning, design and maintenance of such facilities.

Cleaning is an essential part of the multi-disciplinary approach in improving patient, staff and public safety. Safe clinical care is supported through ensuring high standards of hygiene and related measures to tackle HAI in the healthcare environment.

Cleaning regimes including frequency of cleaning should be addressed in line with current national guidance together with any additional Local Management requirements.

Relevant provisions of current guidance, standards and Codes of Practice for cleaning of healthcare premises and including the latest technical requirements are embodied in the following documents:

- SHFN 30: 'Infection Control in the built environment: Design and Planning';
- HAI-Scribe (Healthcare Associated Infection System for Controlling Risk in the Built Environment);
- The NHSScotland National Cleaning Services Specification;
- NHS Quality Improvement, Scotland – Healthcare Associated Infection (HAI) Cleaning Services Standards;
- The NHSScotland Code of Practice for the Local Management of Hygiene and Healthcare Associated Infection;
- Clinical Standards Board for Scotland Healthcare Associated Infection (HAI) Infection Control Standards.

3.63 The method of cleaning should follow the guidance given in the above specifications.

3.64 See also BS 8213-1:1991 'Windows, doors and rooflights. Code of practice for safety in use and during cleaning of windows and doors (including guidance on cleaning materials and methods)'.

Appendix A: Performance requirements

Standards

Windows must comply with the current editions of all relevant British Standards, Codes of Practice and statutory requirements with regard to their performance, constituent materials, method of assembly and use.

The possession of satisfactory test evidence covering the components must not relieve a supplier of his normal legal liabilities to supply goods which are fit for their intended purpose.

Description

The requirements apply to windows and matching doors forming an integral part of a window unit, manufactured as non-loadbearing single or composite units, coupled horizontally or vertically. The units must include as appropriate:

- frame;
- sub-frame;
- fixed lights;
- opening lights;
- solid infill panels;
- glazing and glazing components;
- sill;
- fittings;
- all accessories necessary to complete and install the window units to ensure their normal operation.

Strength and safety of moving parts

The moving parts of the windows and doorsets offered must have sufficient strength and robustness to withstand incidental static and dynamic loads occurring during use. Strength and robustness of the windows will be assessed by selected mechanical tests, appropriate to different types of window operation. After each test the window must function normally, and any damage and deformation must be within the prescribed limits. The overall evaluation will be based on the test results and experience from use.

All tests must be in accordance with BS 6375-2:1987, followed by repeat air and water penetration tests, the results of which should be within 10% of the original tests but should not downgrade the window to a lower category.

In addition to BS 6375-2:1987, where untried mechanisms, fittings, weather strips etc are used, or where the specifier may be in doubt as to the mechanical performance of the assembly, the manufacturer may be required to submit a window to an endurance test of not less than 20,000 complete opening and closing cycles.

It must not be possible for any opening light to become accidentally disengaged from the outer frame.

The following safety fittings must be provided where specified:

- Reversing catches: these must be provided to hold pivoted or projected windows firmly when reversed for cleaning or other maintenance;
- Restrictor devices: these must check the opening of an opening light of whatever type, at an aperture of not more than 100 mm. To permit the window to be opened more widely, the catch must be capable of being unfastened. The catch must re-engage automatically when the window is closed;
- Remote controls: these must be provided for opening lights when specified and in positions as indicated on project drawings.

Manoeuvrability and control

The windows must be designed for manual control and the forces required for their operation must not exceed those stated in BS 6375-2:1987.

All windows must comply with the appropriate recommendations in BS 8213-1:1991, or must provide equivalent standards of safety for occupants and operatives.

It is desirable that all high-level opening lights are operated at a point of not more than 1575 mm above finished floor level.

Fasteners to hinged and pivoted opening lights must enable a light to be held at an opening of approximately 20 mm for night ventilation.

Windows depending on friction devices to control the degree of opening must be capable of holding the window open at a pressure of 50 Pa. Where these devices are unable to achieve this with the window opened to the extremity of the restriction device, the manufacturer must provide an auxiliary hold-open device.

The space between the back face of operating handles and the window frame must not be less than 30 mm.

In the case of turn and tilt windows, the operating handle must be designed to function in such a way that the locking position for the bottom-hung mode occurs before that for the side-hung mode. Preference will be given to a locking

system which prevents the use of the side-hung mode except by means of key operation.

Thermal insulation

Windows of the following types may be required and must satisfy the following conditions:

- Double windows must be tested for airtightness, watertightness and wind resistance in accordance with BS 5368-1:1994, BS EN 1027:2000 and BS EN 12211:2000, and must satisfy the requirements of BS 6375 Parts 1 and 2;
- Coupled windows must be tested as single window for airtightness, watertightness and wind resistance in accordance with BS 5368-1:1994, BS EN 1027:2000 and BS EN 12211:2000, and must satisfy the requirements of BS 6375 parts 1 and 2. Those parts of the window which can be opened to permit cleaning of the inner faces must be subject to the appropriate tests of BS 6375-2:1987;
- Secondary windows must be tested as single windows for airtightness and wind resistance to BS 5368-1:1994 and BS EN 12211:2000.

Suppliers of aluminium ‘thermal break’ windows will be required to supply evidence of the thermal properties of the frames.

Durability and reliability

Windows must have a minimum life of 25 years. The manufacturer must state the expected life of the units.

Fittings and component parts must have a life expectancy of at least ten years under expected conditions of use, and should be easily removable and replaceable. The life expectancy must be stated.

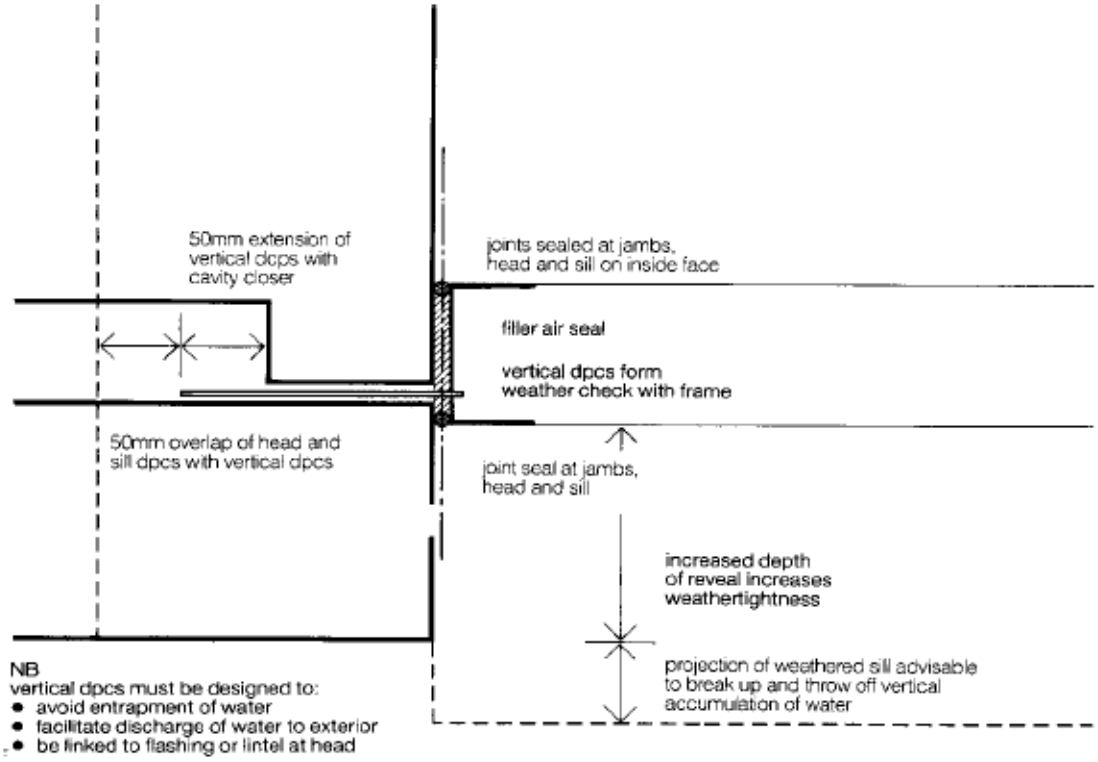
Component parts must be listed, with names of suppliers, part reference numbers and current cost of replacement.

The windows will be operated by users at considerable frequency and with low incentive to exercise care. Robustness and simplicity of operation of the component is important.

The manufacturer is to state his recommendations for maintaining the windows, their fittings and finishes in a satisfactory condition, together with an indication of the likely frequency of such maintenance, assuming the windows are not subject to abuse.

In polluted and marine atmospheres, all factory-applied finishes, excluding those for wood windows, should have a minimum life of five years without cleaning.

Appendix B: Design considerations for opening windows with regard to restricted openings



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