HEALTH TECHNICAL MEMORANDUM 57

Building Component Series
Internal glazing

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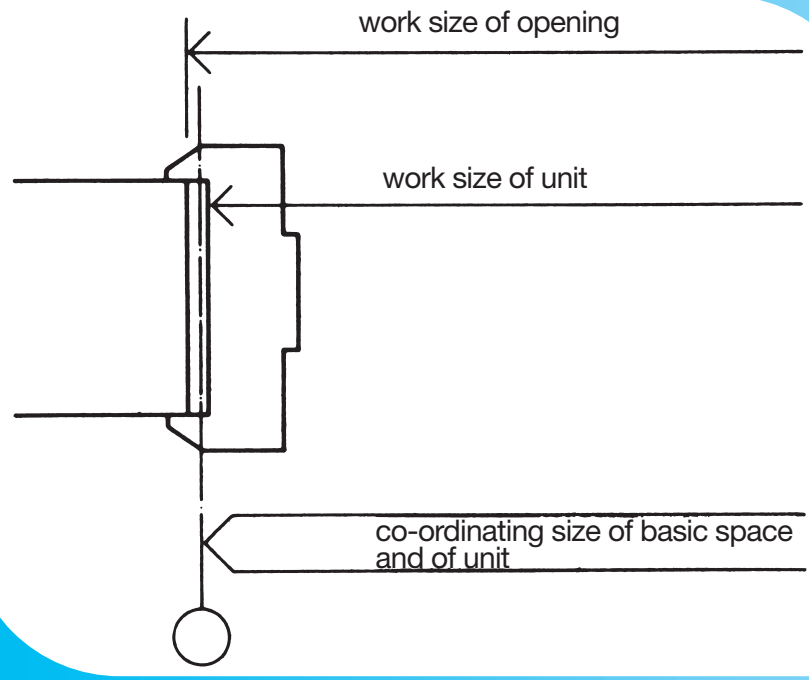

HTM 57
Internal glazing

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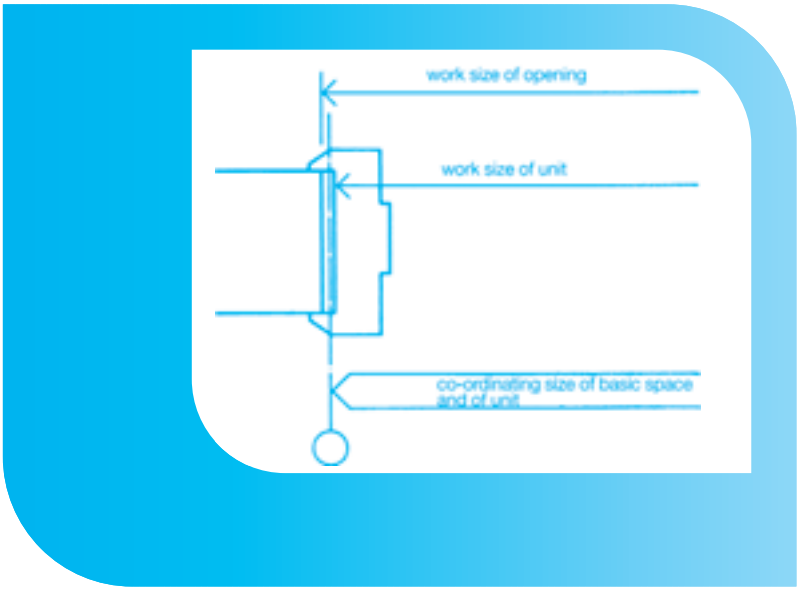

HTM 57
Internal glazing

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Contents

1 Introduction

BACKGROUND

1.1 This is one of a series of Health Technical Memoranda which provide specifications and design guidance on building components for health buildings.

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

54 User manual

55 Windows

56 Partitions

57 Internal glazing

58 Internal doorsets

59 Ironmongery

60 Ceilings

61 Flooring

62 Demountable storage system

63 Fitted storage system

64 Sanitary assemblies

66 Cubicle curtain track

67 Laboratory fitting out systems

68 Duct and panel assemblies

69 Protection

71 Materials management modular storage.

SCOPE AND STATUS

1.3 This HTM offers guidance on the technical design and output specifications of internal glazing suitable for health buildings including:

- glazed partitions;
- observation windows;
- borrowed lights;
- fanlights and side lights to doorsets.

1.4 Vision panels in door leaves and half-glazed door leaves are described in HTM 58 – 'Internal doorsets'; however, the guidance in paragraphs 2.5–2.23 and 2.35–2.70 of this HTM generally applies to these panels, as does the guidance in Approved Documents B, M and N of the Building Regulations.

1.5 Requirements for balustrades are given in Approved Document K of the Building Regulations. Paragraphs 2.5–2.23 and 2.35–2.69 of this HTM apply generally.

1.6 This guidance is not intended to cover the requirements for glazing to internal windows of atria, or similar constructions, internal roofs or canopies. These constructions can be extremely complex, with varying requirements for strength, safety, operation and fire resistance. Each case must be treated individually. Regulating authorities, technical experts and manufacturers should be approached early in the design process. It is not unusual for waivers or dispensations to the requirements of the Building Regulations to be required.

1.7 The content of this HTM 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 (CONDAM) Regulations 1994 (as amended 2000) to ensure safe construction.

1.8 This HTM is concerned mainly with new building work, but much of the information is equally applicable to replacement of internal glazing in existing buildings.

RELATIONSHIP TO OTHER DATA

1.9 The main sources of data used in the preparation of this HTM are listed in the References section.

1.10 This HTM was prepared for publication in January 2005. 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.

1.11 First preference should be given to products and services from sources which have been registered under 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.

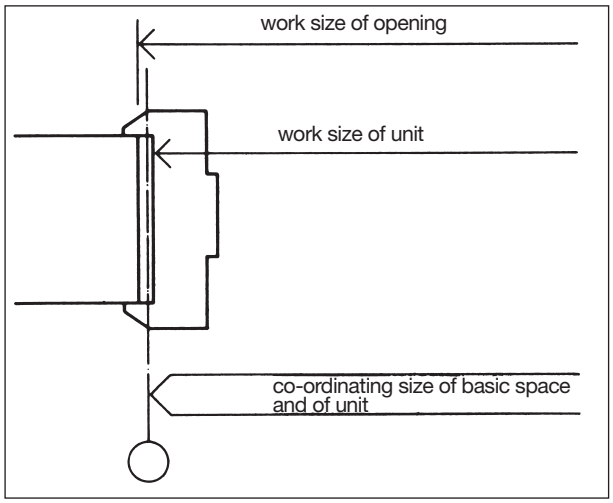
1.12 Any enquiries regarding the technical content of this HTM should be e-mailed to nhsestates@dh.gsi.gov.uk

TERMINOLOGY

1.13 In this HTM the following definitions apply:

- Internal glazing – the use of glazing in internal situations generally (for vision panels in door leaves and half-glazed and fully glazed door leaves, see HTM 58 – 'Internal doorsets').
- Width – the greater horizontal dimension.
- Height – any vertical dimension.
- Thickness – a dimension in any plane which is small compared to other dimensions, or the least overall horizontal dimension of a frame member.
- Basic space – a space bounded by reference planes assigned to receive a building component or assembly, including allowance for joints and tolerances.
- Coordinating size – the size given to a basic space.
- Work size – the size of the unit or opening to which its actual size should conform within specified permissible deviations. These terms are illustrated in Figure 1.

Figure 1



2 Design and specification guidance

GENERAL

2.1 Internal glazing will be required in health buildings to:

- relate and extend space visually while providing a barrier to physical movement, sound and airborne infection;
- facilitate observation and supervision of patients;
- provide borrowed light.

2.2 User requirements should be assessed to determine the type and extent of internal glazing necessary for these purposes and should include consideration of:

- sight lines for observation;
- resistance to impact damage and breakage, and fail-safe requirements when this occurs;
- fire precautions;
- sound insulation;
- X-ray resistance;
- security.

DESCRIPTION OF UNITS

2.3 The size, type and configuration of internal glazing units should be determined by user requirements, location and appearance. For example, glazing in a compartment wall adjoining a hospital street can be floor-to-ceiling, but special conditions apply for escape, handrails, privacy etc.

2.4 Internally glazed partitioned units may be specific to individual partition manufacturer systems.

GLAZING

2.5 All internal glazing should comply with the Building Regulations 2000 and BS 6262 ‘Code of practice for glazing of buildings’.

2.6 For safety reasons, glazed units which are below 2100 mm from the finished floor level (FFL) and which are not designated as fire-resisting should be glazed with safety glass.

2.7 In fire-resisting situations generally, glazing should be in fire-resisting glass. Where below 2100 mm, this should also provide a level of safety performance. In fire-resisting situations in protected shafts, escape routes etc, glazing should be in fire-resisting glass which possesses safety performance and which may also need to provide insulation against heat/radiation.

2.8 All glazing above 2100 mm, whether designated fire-resisting or not, should be glazed with 6 mm Georgian wired or other fire-resisting glass to reduce the risk of breakage from raised temperatures in a fire.

2.9 Approved Documents B, M and N of the Building Regulations set out criteria for fire-resistance, means of escape, visibility and safety for glazing. These requirements can result in complex criteria for the specification of glass.

2.10 Safety glasses are not necessarily fire-resisting. Fire-resisting glasses are not necessarily safety glass or capable of giving insulation. Glass capable of meeting several of these requirements is available, but is expensive.

2.11 Non-fire-resisting safety glass should be toughened or laminated and comply with the appropriate levels required by the Building Regulations 2000 and those set out in BS 6206 ‘Specification for impact performance requirements for flat safety glass and safety plastics for use in buildings’.

2.12 Where fire-resisting glass is required, panes of Georgian safety wired glass should be used, except where “small panes” of ordinary wired glass are permitted. In other cases the glass may also be required to possess insulating properties.

2.13 Security glazing may be required to prevent unlawful entry and resist vandalism, and may also be used in secure areas such as mental health accommodation. To meet these requirements, laminated glass or plastics glazing should be specified.

2.14 Plastics glazing materials may be used in security or vandal-resistance situations. These should not be specified where fire-resistance is required.

2.15 HTM 69 – ‘Protection’ gives advice on reducing the incidence and degree of damage.

2.16 Where sound insulation is required, two panes of glass (with a suitable air space between) or a single pane of thick glass should be used. Glass must be sealed to prevent the passage of sound.

Glass types

Annealed flat glass

2.17 Annealed glass is "ordinary" glass which "has been subjected to controlled cooling to reduce the presence of residual stresses in the glass; thus allowing easy cutting". It includes float glass, cast glass and wired glass.

2.18 When tested to BS 6206:1981, 6 mm annealed (soda lime) flat glass and ordinary wired glass do not achieve a classification.

2.19 Wired glass is available as cast, polished and safety types. Wired safety glass has a stronger wire interlayer and achieves Class C when tested to BS 6206:1981.

Processed flat glass

2.20 This includes toughened (tempered) glass and laminated glass.

2.21 Toughened (tempered) glass is either fire-resisting toughened glass (this is a modified type, edge treated), or borosilicate glass (this is fire-resisting). It is toughened by reheating after cutting to size and is approximately five times stronger than a similar thickness of annealed glass. When broken, it breaks into small fragments which are less likely to cause injury. It achieves Class A when tested to BS 6206:1981.

2.22 Laminated glass comprises two layers of glass with a layer of polyvinyl butyral or cast-in-place resin between. Safety, security, solar control and wired safety glasses are available, plus insulating or intumescent-interlayer glazing.

2.23 If the glass is broken, the fragments are held together by the plastics core. This glass can be cut to size from stock material. Classifications of A, B and C can be achieved according to type and thickness of laminated glass.

Glass blocks

2.24 Glass blocks are frequently used as an alternative to clear glazing. They are available in several thicknesses as hollow blocks and as solid blocks. Glass blocks can be a substitute for windows (where ventilation is not required) or as a partition or divider screen. Coloured blockwork is also available and often used in small areas as feature panels.

FINISHES

2.25 A wide range of finishes is available including paint, stain, clear finish and PVC. Where paint finish is specified the units will normally be supplied from the factory with priming coat only, the remaining coats being applied on-site. Stain and clear finishes are normally applied in the factory.

2.26 Finishes should be selected with full consideration of capital costs and subsequent maintenance costs.

2.27 Clear-coated finishes may be difficult to maintain, particularly in respect of scratching and minor impact damage where the coating has been penetrated.

2.28 Painted finishes are easier to maintain by filling scratches and minor impact damage and repainting.

Resistance to marking

2.29 When tested in accordance with BS 3962:1980 Parts 5 & 6, BS EN 12720:1997, BS EN 12721:1997 and BS EN 12722:1997, the surface treatment of factory-finished units should have a resistance rating of less than 3.

Cleaning and disinfection

2.30 A new "model cleaning contract" for hospitals has been developed. This has three key aspects:

- National Standards of Cleanliness (introduces measures for HCAI cleaning and disinfection);
- NHS Cleaning Manual (sets out best practice methods for cleaning);
- cleaning frequencies (these should be determined to address the element of risk identified in accordance with the National Standards of Cleanliness and taking into account any further advice and guidance in the model cleaning contract and the NHS Cleaning Manual).

2.31 All units, including those with site-applied finishes, should be capable of withstanding the cleaning regimes specified in the above specifications.

OBSERVATION

2.32 In areas where patients need to be observed, the glass should be clear and should be sized and positioned to suit the needs of both staff and patients. Remember that users may be adults or children, both of whom may be ambulant or in wheelchairs, or standing, sitting or lying.

2.33 Where through-vision is required for wheelchair users, the minimum zone of visibility should be between 500 mm and 1500 mm from the finished floor level.

2.34 Curtains should be considered where there is a conflict of interest between staff for supervision and patients' expectations of privacy.

SAFETY, STRENGTH AND SECURITY

2.35 Glazing in buildings can be a potential danger, and care should be exercised in its selection and location.

2.36 Areas of greatest risk include glazing at low level and glazing in doors and sidelights. These are referred to as "critical locations" in Approved Document N of the Building Regulations.

2.37 The following precautions should be taken:

- use safety glass generally (this has been used for almost all non-fire-resisting glazing in hospitals for several years);
- ensure that glass can be seen;
- ensure that glass is protected from accidental damage from users and mobile equipment by positioning framing or barriers of sufficient size and strength where there is the risk of impact.

2.38 In mental health accommodation, glazing must be capable of withstanding deliberate attack by patients. Broken glass can be used for self-harm and as a weapon to attack other patients and staff. The use of appropriate specifications of laminated or toughened glass and applied films to the surface of glass should be considered. Polycarbonate sheeting is an alternative product which will flex but will resist breakage. However, it has limited scratch resistance.

2.39 Thick annealed glass (8–15 mm thick) is referred to in Approved Document N, section 1.4 under "Robustness", as a material which "gains strength through thickness". This is not recommended for use in health buildings, because if fractured by hard body impacts, such as those that might occur from hospital tugs and trollies, the glass breaks into dangerous, sharp and pointed pieces.

2.40 Suitable framing systems with appropriately sized members, glazing systems with intumescent seals, beads etc and appropriate glass sizes must be used with all glass types.

2.41 Long runs of glazed units may require additional strengthening of the mullions or studs to ensure structural performance in normal use and under-fire situations.

2.42 Glazed units constructed of metal or plastics should be validated by test evidence of fire and structural performance from the manufacturers of the units.

2.43 Glass panels to improve visibility can reduce the risk of collisions, for example at doorways, in door leaves and/or in sidelights, and enable smoke or flames to be observed.

2.44 Zones of visibility of 900 mm to 1500 mm above finished floor level are specified in Approved Document M.

Forces acting on glazing

2.45 Impact forces and pressures acting on glazing are not normally specified, as it is recognised that glass has a lower resistance to these forces than the constructions into which it is fitted.

2.46 Glazing can be easily designed to resist soft/heavy body impact forces, but glass is less resistant to impacts from point loads such as those that occur when glass is struck by sharp corners on unprotected hospital tugs, trollies or other wheeled equipment.

2.47 If possible, impacts on glazing should be avoided by the design of the framing etc or provision of barriers.

2.48 However, partitions and doors are required to resist impact forces and pressures, and these forces inevitably relate to any glazing in them.

Implications of the Building Regulations

2.49 The requirements of Approved Document N are satisfied by the recommendations in this HTM and comprise the use of:

- safety glass, for non-fire-resisting situations; or
- 6 mm Georgian wired glass for fire-resisting situations where "small panes" are permitted;
- 6 mm Georgian wired safety glass for fire-resisting situations where panes are from 250 mm to 900 mm wide;
- other safety/fire-resisting/insulating glass.

Critical locations

2.50 Critical locations in terms of safety are:

- between finished floor level and 800 mm above that level in internal (and external) walls and partitions;
- between finished floor level and 1500 mm above that level in a door or in a side panel, close to either edge of the door.

Reducing the risks

2.51 Glazing in critical locations should either:

- break safely, if it breaks;
- be in small panes; or
- be permanently protected.

Safe breakage

2.52 Safe breakage is defined in BS 6206:1981 and is based on the impact test which requires the result of the impact to be limited to creating:

- a small clear opening only, with a limit to the size of the detached particles; or
- disintegration, with small detached particles; or
- breakage resulting in separate pieces that are not sharp or pointed.

2.53 In terms of safe breakage, a glazing material suitable for installation in a critical location should satisfy the test requirements of Class C of BS 6206:1981 or, if it is installed in a door or in a door side panel and has a width exceeding 900 mm, the test requirement of Class B of the same standard.

Glazing in small panes

2.54 In the context of Approved Document N, a small pane may be an isolated pane or one of a number of panes contained within glazing bars.

2.55 Small panes should have a maximum width of 250 mm and an area not exceeding 0.5 m^2, each measured between glazing beads or similar fixings. Annealed glass in a small pane should not be less than 6 mm nominal in thickness.

FIRE PRECAUTIONS

2.56 The Building Regulations and Department of Health guidance (see 'Firecode: Part 1 – functional standards') require that walls to compartments and subcompartments, protected shafts and escape routes be fire-resisting, and that such walls should satisfy the test requirements of BS 476:1987 Parts 20 and 22 for integrity and insulation for the designated periods.

2.57 Glazed units in corridors and protected shafts, in the limited situations permitted by the Building Regulations, and glazed panels in fire-resisting doors (see HTM 58 – 'Internal doorsets') are required to possess integrity only.

2.58 In some situations, glass panels, particularly in the lower half of partitions or doors, may also be required to possess insulation characteristics, as defined in BS 476:1987, or may not be appropriate.

2.59 Most types of glass do not achieve any significant rating for thermal insulation or resistance to radiation. These types of glass will not, therefore, reduce the risk of problems such as potential radiation hazards, the creation of an unbreathable atmosphere, or an outbreak of a fire in the space on the side of the glazing away from the source of the fire. These problems can be eased by the positioning and reduction in size of areas of glazing or by the use of special glasses which reduce radiation and provide insulation.

Specification

2.60 Where any glazed panels are to be glazed with special glass such as insulating, intumescent, modified toughened or borosilicate glass, the details should be discussed with the glass manufacturers, as modified edge details may be required.

2.61 Internal glazing should be designed and constructed to resist the passage of smoke wherever possible, but always where glazed units are adjacent to or in the same run of partition as smoke-resisting doorsets. This requires that the gaps between frames and adjacent construction and between glazing beads and the glass be made airtight by the use of suitable sealing materials.

2.62 Proprietary systems of glazing and special glasses should be validated by appropriate test data.

Fire-resisting glazing materials

2.63 The most widely used glass for fire-resisting panels in screens, borrowed lights, and doors and sidelights is 6 mm Georgian wired glass. It can provide up to 90 minutes' fire resistance in suitable sizes, framing and glazing systems.

2.64 Generally, where glass panels are not more than 900 mm wide, 6 mm Georgian wired safety glass, which gives both fire resistance and Class C impact performance to BS 6206:1981, should be used. It is available at a slight additional cost. For "small panes", 6 mm "ordinary" Georgian wired glass may be used.

2.65 Other special fire-resistant glazing materials are available providing:

- resistance to fire and resistance to impact of BS 6206:1981 Class B; or
- resistance to fire and insulation/protection from radiation; or
- resistance to fire, insulation and impact. These characteristics may be required for glazed screens to escape routes etc.

2.66 These special materials include: special types of laminated glass, modified toughened glass and borosilicate glass. They are much more expensive than 6 mm wired glass, and usually require special framing and glazing systems.

2.67 Specialist guidance on their performance and installation should be obtained from the glass manufacturers or from the Fire-resistant Glass and Glazed Systems Association (FRGGSA).

2.68 Plastics glazing materials may be used in security or to deter vandalism; however, these should not be specified where fire resistance is required.

Implications of the Building Regulations

2.69 The requirements of Approved Document B are satisfied by the recommendations in this HTM to use:

- 6 mm Georgian wired glass in "small panes";
- 6 mm Georgian safety wired glass in panels wider than 250 mm but narrower than 900 mm, requiring a BS 6206:1981 Class C rating;
- laminated or special fire-resisting toughened glass in panels larger than 900 mm wide, requiring a BS 6202:1981 Class B rating;
- insulated fire-resisting and safety glass below 1.1 m to protected shafts and escape routes in single stairway buildings and other situations required by Approved Document B.

SOUND INSULATION

2.70 The sound insulation performance of a partition will be reduced where the partition is penetrated by a glazed opening, and the need for internal glazing should be balanced against such a reduction.

2.71 Double glazing or thicker glass should be used where sound insulation is an important consideration.

2.72 Sound leakage should be avoided by sealing glass into the frame and by filling gaps between frame and partition with sound-absorbent material.

2.73 To achieve optimum sound reduction, the air space in double glazing should be a minimum of 100 mm and should be lined with sound-absorbent material.

2.74 Guidance on levels of sound insulation that can be achieved with partitions is given in HTM 56 – 'Partitions' and HTM 2045 – 'Acoustics'.

HYGROTHERMAL PERFORMANCE

2.75 The hygrothermal conditions in which units are installed can materially affect their appearance and performance.

2.76 Normal conditions likely to be met in health buildings are:

- 25% to 65% relative humidity over a temperature range of 10°C to 25°C.

2.77 In areas of high humidity, such as laundries and shower rooms, the conditions would be:

- 25% to 100% relative humidity over a temperature range of 10°C to 30°C.

2.78 Internal glazing units should be able to withstand these conditions without loss of appearance or performance.

X-RAY RESISTANCE

2.79 Internal glazing should not be provided in the enclosing walls to X-ray diagnostic or treatment rooms (see HBN 6 – 'Facilities for diagnostic imaging and interventional radiology').

2.80 Where there is a need for protective glazed screens within the room, for observation by staff, they should comply with the requirements of the local Radiological Protection Adviser and may be obtained from specialist manufacturers.

2.81 Doors to X-ray rooms may have vision panels (see HTM 58 – 'Internal doorsets').

MAINTENANCE MANUAL

2.82 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.

2.83 Internal glazing units should be cleaned and disinfected at regular intervals in accordance with the specifications outlined in paragraphs 2.30–2.31.

2.84 Broken or damaged glass should be replaced without delay, particularly in the case of fire-resisting units where the performance of the unit must be maintained at all times (see paragraphs 2.5–2.23 for method of glazing). Intumescent strips in fire-resisting glazing should be inspected regularly and replaced if damaged.

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TRADE ASSOCIATIONS

Fire Resistant Glass and Glazed Systems Association (FRGGSA). 20 Park Street, Princes Risborough, Bucks HP27 9AH. Tel: 01844 275500; Fax: 01844 274002.

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