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Glass and Glazing Federation

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A Guide to Good Practice

Installation of replacement windows and doors



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SECTION 1:

Introduction

This Good Practice Guide has been developed by the GGF Window and Door Group - Technical Committee. Its intention is to assist those involved with the survey, installation and maintenance of replacement windows and doorsets for dwellings within England and Wales.

This guide will also be of benefit to those responsible for ensuring that the fenestration complies with the Building Regulations.

The guide reflects the changes made in the British Standard BS 8213-4: 2016 and gives an added dimension to all areas of home improvement by including good practice notes.

Whilst not as yet part of the requirement for replacement windows and doors, Approved Document Q has been added to the list within the Building Regulations Annex. This was included as it is recognised that new build installations match the requirements for replacement in many ways.

With the ever increasing changes to the requirements within the four countries of the United Kingdom it will become necessary to separate the guidance accordingly.

In time there will be a separate guidance for Scotland with the requirements for Wales and Northern Ireland being added to the England guide as Appendices.



SECTION 1:

Principles

1.1 General requirements

The following matters need to be considered:

- The need to provide a weatherproof and thermally efficient solution.
- The need to provide natural light and ventilation.
- Design for safety in use.
- Means of escape in case of fire.
- Security against unauthorised entry.
- Design for safety when cleaning.
- Maintenance.
- Robust and workmanlike installation.

Note: The type of occupancy, and the age range of both occupants and visitors to the building should also be considered. BS 8213-1:2004 advises that a risk assessment be conducted by the designer (in the case of domestic replacement windows this is the person or organisation taking the order from the client), taking account of the relative priority needs established in each situation. If a significant change of use of the building occurs, the risks should be reassessed.

1.2 Construction products regulation – CPR

The performance characteristics of external windows and doorsets are covered by European Standard EN 14351. The Standard identifies performance characteristics that are applicable to windows and doors and it identifies the test methods that should be used to establish these characteristics. However, it does not actually specify the level of performance that is required for the characteristics, because this varies according to the climate or local building regulations.

This has been adopted as a British Standard, BS EN 14351. This standard will be covered by the Construction Products Regulation regarding CE marking of products.

1.3 CE marking

Any construction product placed on the market and manufactured in accordance with an harmonised European Norm (hEN) must be CE marked. The Declaration of Performance (DoP) must include as a minimum:

- U Value.
- Toxic substances.

- Load bearing capacity of safety devices (if fitted).

The company making these claims must have an adequate Factory Production Control (FPC) system in place.

1.4 Performance of windows and doors

Weathertightness - BS 6375 Part 1

Explains how to calculate the appropriate design wind load for a particular location and then how to use that wind load to specify the appropriate weather resistance class for the proposed windows or doors. It specifies the exposure categories and classifications that can be achieved and the test methods that should be used to determine these results. Aspects covered include air permeability, watertightness and wind resistance, including safety of the product under extreme loading conditions.

The Standard gives an abbreviated method for calculating wind loads for low rise applications within the British Isles. This is a conservative way of assessing wind loads. If a more accurate calculation of wind load is required, or if the product use falls outside the scope of this document, then reference should be made to the building designer or to BS EN1991-1-4. A structural engineer or other competent person should always complete calculations.

Operation and strength characteristics - BS6375 Part 2

Specifies the performance requirements for the operation and strength of windows and doors. Test procedures and recommended performance levels are listed for the maximum forces that can be allowed to operate hinges and handles to open sashes, and for resistance to vertical loads, resistance to static torsion, racking, load bearing capacity of safety devices, resistance to soft and heavy body impact, resistance to hard body impact and resistance to repeated opening and closing.

Additional performance characteristics - BS 6375 Part 3

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Covers the performance requirements for all the other characteristics identified in BS EN 14351 which are not dealt with in BS 6375 Parts 1 or 2. It covers items such as reaction to fire, acoustic performance, bullet resistance, explosion resistance and burglar resistance. For each of the characteristics, comment is made on an appropriate level of performance and the test methods to be used are specified. However, it should be noted that it is not necessary for windows and doors to always comply with all of the characteristics, but if a certain characteristic needs to be specified then it should be in accordance with BS 6375 Part 3.

Note: It is recommended that all specifiers and manufacturers be familiar with all parts of BS 6375.

1.5 Security considerations

Regulations

There is currently no requirement within the England and Wales Building Regulations regarding the level of security provided by replacement windows and doors. However, there may be a local requirement for enhanced security windows through imposed conditions.

There may also be additional requirements based on the Secured by Design specification of the National Police Chiefs Council (NPCC) Crime Prevention Initiatives.

Meeting the general requirement for enhanced security, Secured by Design or complying with Approved Document Q are all achieved by compliance with PAS 24

Note: AD Q applies to new dwellings only!

PAS 24 incorporates a test of the handle and cylinder (for doors) and resistance to mechanical forces. It contains the loading requirements for doors and windows and the cylinder specific requirements. The loading requirements of EN 1627 – 1630 are also permissible.

1.6 Safety considerations

There are two main aspects concerning safety of

Good Practice Note - The GGF recommends that vulnerable windows and doors should be manufactured to enhanced security standards that meet the requirements of PAS 24. The vulnerability of windows and doors should be determined by a site risk assessment carried out by a competent person. Generally, windows and doors at ground floor or basement level and those on first floor that are easily accessible (via flat roofs, balconies etc.) are considered to be vulnerable.

replacement windows. These are:

1. The appropriate use of safety glazing in critical locations

Safety glazing should be installed in critical locations. Reference should be made to the following:

- Approved Document K4 of the Building Regulations (England) for guidance and indications of critical locations.
- Approved Document N1 of the Building Regulations England and Wales (now only applies to Wales) for guidance and indications of critical locations.

Note: Further details concerning the Building Regulation requirements can be found in Section 5 of this guide.

2. Safety in use and during cleaning

Advice on safety in use and during cleaning is given in BS 8213 Part 1. This standard recommends a risk assessment approach to window design. It states that windows should be easy to operate, open safely without being a hazard to passers by, and minimise the risk of falling through. It explains that safe use depends on window location, window type, safety fittings, guarding, and window construction and installation. Risks in use and during cleaning are given for all types of window.

BS 8213 also gives advice on the requirement for, and use of restrictors. It states that safety

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restrictors should be fitted to accessible opening lights where children or adults are at risk of falling out. An accessible opening light is defined as an opening light, any part of which is 1500mm or less above floor level.

Any safety restrictor should limit the initial movement so that a clear opening of no more than 100mm is achieved and that release is only achievable by manipulation.

Restrictors should meet the requirements of BS 6375-2. EN 14351-1 clause 4.8 'load bearing capacity of safety devices' specifies testing in accordance with EN 14609 or EN 948 at a load of 350 N.

1.7 Planning considerations

Before replacing windows consideration should be given to any possible planning issues that may arise. The flow chart (Figure 1) below outlines the thought process. However, if doubts remain, advice from local building control should always be sought.

Note: Any alterations from a flat window to a bay or bow window, may require planning approval and should be referred to the Local Planning Office.

Good Practice Note - If it is deemed necessary to fit safety restrictors to fire escape windows, then the positioning of the device should be such that while achieving the above requirements, the occupant does not have to spend time searching for the mechanism in the case of a fire and that the release can be achieved without prior instruction and cannot be confused with other operations.

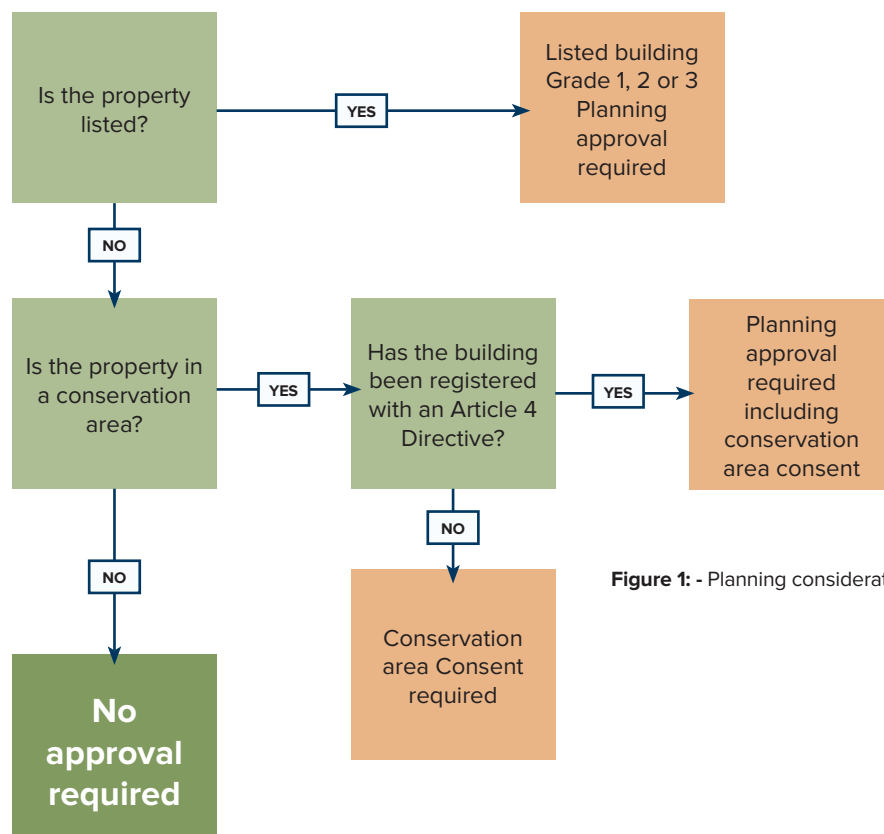


Figure 1: - Planning considerations

SECTION 2:

Surveying

2.1 General

Good surveying is the basis of ensuring a quality installation. Surveyors must demonstrate their competence by displaying a valid Minimum Technical Competence (MTC) card upon demand or, have been certified to NVQ level 3.

The MTC card must show that they have passed the MTC surveyor test which shows the surveyor to have knowledge of both installation techniques, and in the requirements of surveying for the fenestration product.

For future reference with respect to Building Regulation compliance, it is advisable to record (ideally with the aid of a photograph) the style of the window or door being replaced along with the size of any opening lights and the position of any mullions and transoms. Ideally, this would be witnessed by the householder and countersigned.

The surveyor should carry out a risk assessment for both the installation process and the suitability of the window design. Information on the safety of windows in use and during cleaning is given in BS 8213-1. The requirements of Health and Safety regulations should also be considered. When sub-contracting, the surveyor, as part of the installation risk assessment, should ensure that the main contractor will provide a safe working environment including safe access. When a load-bearing situation is suspected or confirmed then reference should be made to the manufacturer's instructions and guidance provided within Approved Document A: Structure.

2.2 Building regulations

The Building Regulations exist to ensure the health and safety of people in and around all types of buildings. They also provide for energy conservation, access to and use of buildings.

Where windows and doorsets are to be replaced (but not where they are to be repaired only, as repair work does not fall within the definition of building work) the replacement work must comply with Schedule 1 of the Building Regulations.

For detailed Building Regulation information refer to

Annex B of this guide.

2.3 Suitability of aperture

The surveyor should check for any apparent defects and other considerations around the structural opening. If any defects or special requirements are identified, then the customer should be notified, and agreement reached as to who is responsible for rectifying any defects prior to the new windows or doorsets being installed.

Note: For large replacement contracts, it may be advisable to remove one window to check the condition of the reveals and existing DPC, in so far as this is possible.

2.4 Services in the aperture

The presence of any electrical or specialist items such as television aerials and telephone wires in the aperture should be noted. Wherever possible such services should be routed around, and not through, the outer frame of the window or door. When this is not possible, a solution should be agreed with the customer, which does not compromise the performance of the product. The presence of any curtain tracks in the aperture should be noted. This is particularly important for inward opening windows and where net curtains are present. These could cause problems either during installation, or interfere with the function of the window and doorset after the installation. Action to prevent any problems should be agreed with the customer prior to the installation.

2.5 Design for weather performance

The surveyor should determine the design wind load for the application, and then specify windows and doors that are suitable for that exposure. BS 6375-1 gives guidance on the selection and specification of windows and doors for weather performance.

Note: Reference to the manufacturer should be made in case of doubt.

2.6 Structural support

The necessity for an adequate means of support is dependent on the design of the structure. However, even if no such support is evident, the installation company is responsible for assessing if one should be installed. This is due to potential damage to the building's structural integrity. If this additional work is

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required, the customer can be given the option to have it fitted by the installation company or independently.

The installation company cannot avoid the issue on the grounds that because there is no means of support over the existing window, there is no requirement to fit one over the new. It is strongly recommended that the need is thoroughly investigated before work commences.

Every effort should be made at the time of survey, to determine if an adequate means of support is either fitted or required. There will be instances where windows being renewed are replacements (which did not have the necessary means of support fitted) of the original load bearing timber frames. The construction material of the original windows should be established if possible as this may help in determining the requirement.

If the surveyor cannot establish this either way, both the customer and installation team should be notified as to the possibility, or should seek the advice of a structural engineer.

In the worst case, the installation team may only recognise the need after the removal of the existing frame. It is entirely the company's responsibility to ensure the structure is not compromised and opening secured whilst immediately informing the customer with the option to either rectify the issue independently or through the employed company, explaining the likelihood of a delay either way. This scenario highlights the importance of competent surveying.

2.7 Aperture resizing

Where a consideration is made to adjust the size and shape of the opening, Local Authority Building Control (LABC) must first be consulted and an application made. Applications to the planning department may also be required.

2.8 Bow, oriel and dormer windows

If bow, oriel or dormer windows have applied loads, a structural assessment should be carried out by a

competent person. Care should be taken to ensure that adequate provision is made to support the weight of the replacement window.

Consideration should also be given to the insulation requirements of any protruding internal element e.g. extended window board.

2.9 Bay windows

Where bay windows are to be replaced, care should be taken to determine the loads present within the existing bay in order that adequate structural support is provided during the removal.

It is also important to specify the appropriate bay poles according to these loads which will ensure the structure is not compromised.

Further details can be found within this guide under Part A of the Building Regulations.

2.10 Roof windows

Health and safety requirements for working at height must be taken into consideration. Additionally an area of ground/floor directly below the window may need to be cordoned off for safety against materials or tools being dropped from roof level during the time the work is carried out.

The condition of the existing roofing material and roof structure should be assessed along with felting detail around the window frame upstand, insulation within the gap between the window frame and roof structure and vapour barrier. If remedial work or adjustment is required to any of these, - particularly to the roof structure - this should be brought to the attention of the customer. Alterations/adjustments to the roof structure may come under the aspects of the Building Regulations. It is advised that where possible, new felt, insulation and vapour barrier be provided if not already present. A new flashing set compatible with the roofing material will be required.

The type and size code for the roof window can be found either between the two individual panes of glass or on the data plate at the head of the sash

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depending on the age of the roof window. This should then be compared to the current product offering to determine which product is suitable to replace the existing window. The choice of product should reflect the necessity to comply with the relevant Building Regulations.

2.11 Coupled / combination frames

Where windows and / or doorsets are to be coupled, the surveyor should determine the method to be used taking into account wind and dead loads, visual appearance and position of the coupling.

2.12 Opening type and direction

The surveyor should confirm the handing with the customer and whether the window or door is to be inward or outward opening. On outward opening doors, it is recommended that a restriction or hold-open device is fitted, e.g. a doorstop, to help avoid damage caused by e.g. sudden wind gusts.

2.13 Doorsets

Part M of the Building Regulations does not require the installation of a door with better access than the existing. However, it is good practice to consider the requirements of the occupants and improve access into the dwelling if necessary e.g. by reducing the threshold height.

NOTE: Weathering should be considered when lowering the threshold.

The size and location of any letter plate should be confirmed with the customer.

NOTE: Reference may be made to BS EN 13724 which gives guidance on the apertures of private letter boxes and letter plates.

The requirement for additional hardware such as trickle vents, cat flaps, spy holes etc. should be clearly specified.

On doorsets with side panels, it may be necessary to stiffen the mullion to ensure rigidity when the door is closed against it.

2.14 Sill selection and drainage

The projection of the sill or alternate methods of drainage should be specified to ensure that drainage water is effectively shed from the window and does

not come into contact with parts of the fabric of the building that are not designed for that purpose.

2.15 Decorative glazing

The surveyor should specify or confirm the position, style and orientation of any glass pattern or decoration including leaded lights or Georgian bar inserts and the need for alignment.

2.16 Measurement

Three measurements of width and height should be taken and the rectangularity (squareness) of the aperture determined by taking diagonal measurements, see Figure 2. The smallest measurement of width and height is used for manufacturing sizes and the need for any sill should be determined. The size of the sill should be such that there is an adequate overhang of at least 25mm from the face of the building. The surveyor should determine how the sill is to be fitted taking into account features such as horns, and how any making good is to be carried out. The difference between internal and external reveal sizes should be determined and checks made to ensure that the operation of any opening light will not be impeded by plaster, render or tiles etc.

2.17 In-check reveal (reverse brick detail or rebate opening)

These are openings that are constructed so that the outer face dimension is smaller than the internal often found in areas of high exposure to severe weather conditions.

Good Practice Note - In the case of box sash windows, remove an internal architrave from the window to see exactly how deep the reverse brick detail really is, and to identify how much of the outer frame can be put behind the face brickwork. A hole should be drilled through the head of the existing box frame to ascertain the maximum height the window can be put behind the brick. This may differ from the allowance on the width.

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Other examples can be found in properties with box sash windows where the side boxes are hidden behind the face brickwork.

It is good practice to ensure that windows on a single elevation should ideally have a consistent amount of visible frame.

2.18 Manufacturing sizes

With some framing materials, due consideration should be taken when materials that have significant expansion/contraction under temperature fluctuations are to be used. Allowances should also be made with regard to the window or doorset and building aperture tolerances. Table 1 gives the deductions that are recommended for windows and external doorsets. When calculating height deductions, due allowances should be also made for the thickness of any sealant or mortar bed at the sill.

Care should be taken to ensure that the thickness of the internal plaster does not hide or obscure the frame, especially on internally beaded systems. A suitable add-on may therefore be required.

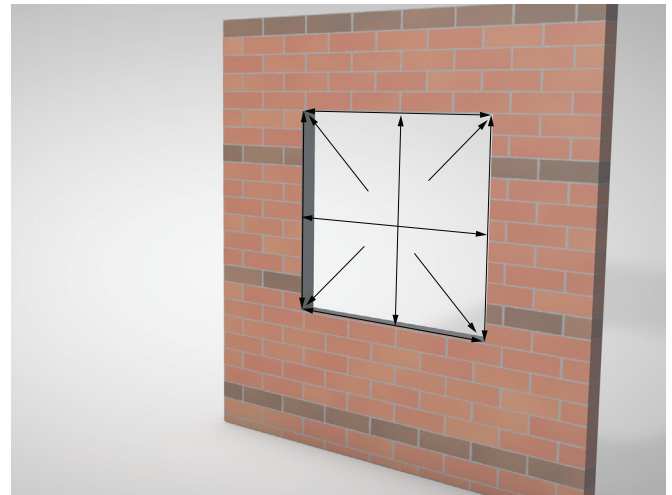


Figure 2: - Survey measurements

Table 1:

Material	Recommended deductions for width and height of structural opening			
	Up to 1.5m	From 1.5 m to 3.0m	From 3.0m to 4.5 ^{A)}	Over 4.5 ^{A)}
GRP	5	10	15	15
PVC-U white	10	10	15	20
PVC-U non-white	15	15	22	28
Timber	10	10	10	15
Steel	8	10	12	15
Aluminium	10	10	15	20

NOTE 1: These deductions are from the total width or height and are not "per side"

NOTE 2: The gap required for effective polyurethane foam fixing at the head is 10mm to 15mm

NOTE 3: When fitting aluminium or steel frames into existing timber sub-frames, deduct 4mm

A) Intermediate expansion joints might be needed when the width or height exceed 3m

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2.19 Asbestos

The GGF produce a Code of Practice for the Safe Working with any Products Containing Asbestos.

A risk assessment should be carried out and the surveyor should work in accordance with this document. The assessment process can be found within the following flow chart.

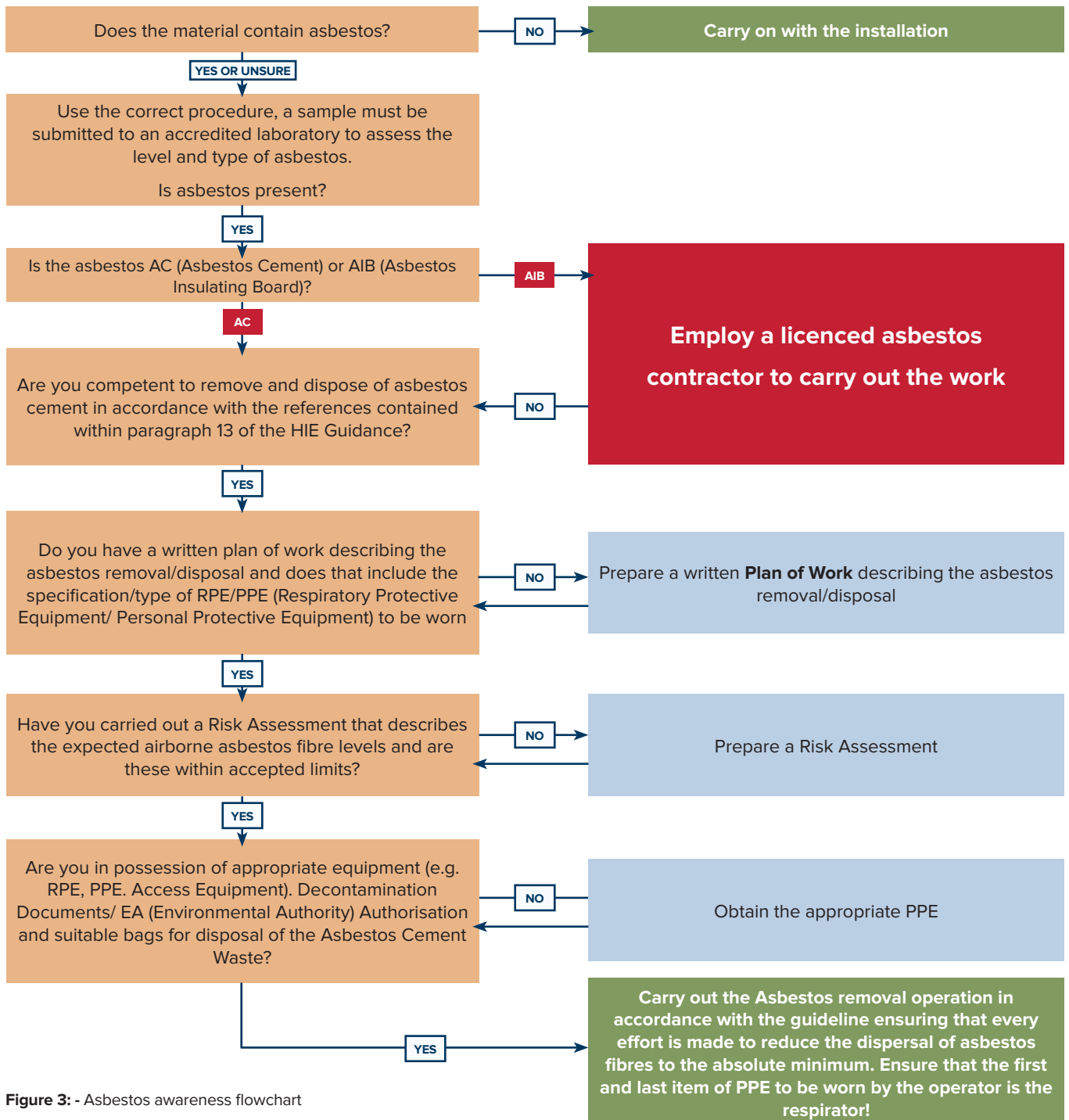


Figure 3: - Asbestos awareness flowchart

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2.20 Surveyor's check list

Table 2:

	Y/N
Is there any evidence of asbestos that may need to be removed or disturbed?	
Is the condition of the aperture satisfactory and without evidence of damp or cracks?	
Is the aperture square and even to within 5mm height and width and 10mm diagonals?	
Will any loads be carried by the building and not the window or doorset?	
Has the size and method of fixing any sill been determined?	
Will the proposed style function without being fouled by plaster, etc.?	
Will any trickle vents fitted function without being fouled by plaster, etc.?	
Will hinges function without being fouled by plaster, etc.?	
Are curtain tracks and nets clear of proposed design?	
Is the size and configuration within the manufacturer's limits?	
Will the exposure classification of the products be suitable for the location?	
Will the installation comply with Building Regulations?	
Is the method of drainage appropriate for the installation and product	
Has the customer confirmed the position and handing of opening lights?	
Has any additional hardware been specified?	
Is the access for installation safe?	
Has the fixing method been determined?	
Has the extent of making good been agreed with the customer?	

Good Practice Note - Make a photographic record of the existing installation in case of dispute, e.g. Building Regulation compliance.

SECTION 3:

Installation

3.1 General

Prior to the commencement of work the sizes, type and condition of all windows and doorsets should be checked to ensure they meet the survey specifications and sizes.

At the request of the installer, prior to the commencement of the work, the customer should be given adequate notice to remove any furniture, fixtures or fittings that may otherwise be damaged during the installation.

The installer is responsible for both internal and external protection of the property during the installation work.

Floor coverings should be protected and care afforded to decorations and furnishings.

Reasonable steps should be taken to minimise any damage to adjacent reveals.

Wherever possible, the installer should install and seal the new windows and doorsets on the same day that the existing windows or doorsets are removed, to maintain security and weather tightness of the building. If this is not possible, an alternative arrangement for security and weather tightness should be agreed in advance between installer and client.

The existing windows and doorsets should be removed with care to avoid unnecessary damage to the building structure and its finishings and without permitting any subsidence of the superstructure during or after the installation procedure.

Any electrical or specialist items, such as television aerials or telephone wires should be re-routed around the frame of the window. Where this is not feasible, then alternatives should be agreed with the customer.

Note: This may require the services of the appropriate service provider.

3.2 Window removal techniques

Before the removal of existing windows and doorsets is started, a risk assessment should be carried out.

Appropriate protective equipment should be worn at all times and any non-essential personnel should be excluded from the immediate area.

Safe removal of putty-glazed fixed lights is imperative. This should preferably be carried out by removing the putty, glazing sprigs, beads or fixing nails and removing the glazing intact. Alternatively, the glass should be carefully broken, so that the fragments are on the outside of the structure.

It is good practice to run a sharp knife between the inside face of the frame and the adjoining plaster, to minimise damage to the plaster when the frame is removed.

3.3 Timber framed windows and doors

Opening casements should be removed first, complete with their glass, by levering the screws from the frames, by unscrewing the hinges, or by cutting through the hinges.

After removal of the casements and fixed light glazing, any mullions and transoms should be cut through and removed from the outer frame of the window.

If the frame fixing nails or screws cannot be found and removed, it will be necessary to cut through the outer frame at an angle which will allow it to be carefully levered from the surrounding aperture - in the plane of the window - so as to cause the minimum of damage to the aperture.

There are often problems with windows under the roof eaves. There may be a brick course resting on the existing frame between the top of the frame and the soffit board. This course is often decorative and thus not load-bearing. It is recommended that the bricks be removed before the window. The soffit board is frequently nailed to the existing window frame. This joint should be carefully severed by locating and removing or cutting the nails. See page 12 for advice on the removal of soffits containing asbestos.

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3.4 Box-sash windows

Most box-sash windows pre-date cavity walls, and are built into the internal reveals of solid brickwork. The sashes can be removed fully glazed.

1. Remove the mitred beading from around the frame.
2. Carefully cut the sash cords to release and lower the weights.
3. Remove the bottom sash, take off the parting bead and then take out the top sash.
4. Cut the outer frame from the aperture, leaving the horns in the structure.
5. Remove the counterweight from the sash box.
6. Remove the sill, if this is not part of the outer frame

3.5 Metal framed windows

There are two distinct methods by which metal windows are fixed.

1. Screw-fixed through the frame into timber sub-frames or directly to the structure. Firstly remove all glazing from fixed lights, and separate and remove all opening lights from the frames. Then locate the screws holding the metal frame in place and remove them. Finally remove any timber sub-frame as described for timber windows.
2. Lug-fixed directly into the aperture. Firstly remove any opening lights with an angle grinder or hacksaw then cut through any transoms and mullions and remove them. Remove the lug screws by driving them through the frame using a suitable punch. Finally cut through each side of the frame with an angle grinder and lever away from the wall, taking care not to damage the fabric of the aperture.

3.6 PVC-U framed windows and doors

All of the glazing should be removed by removing the glazing beads. A knife may be required to free the glass where glazing tapes have been used.

Opening lights should be separated from the frame

and removed.

It is advisable to remove any trim profiles around the windows to allow easier access and to determine the presence of fixing brackets.

1. Through-frame fixings can usually be unscrewed to allow the frame to be removed from the aperture. Care should be taken to minimise damage to the fabric of the building.
2. Fixing brackets can be cut with an angle grinder or alternatively, it might be possible to remove the screws from the fixing brackets but this will inevitably cause more damage to the window or door surround.

3.7 Sills

Sometimes sills, heads and window boards, are 'horned' into the fabric of the aperture. This may conceal DPC's, and lead to difficulties in removal. Great care should be taken when cutting and levering these items to reduce damage to plaster, renders, and brickwork to a minimum. If the DPC is damaged, it must be repaired or replaced.

3.8 Wall cavities

Open cavities discovered between inner and outer skins of brick or blockwork should be closed with an insulating material. Care should be taken to maintain the integrity of the DPC and adequate purchase for fixing screws should be ensured, if necessary with extended fixing lugs.

3.9 Frame position

Replacement windows and doorsets should generally be positioned to minimise the amount of making good, taking into account the following points:-

1. They should be installed plumb and square within the aperture, without twist, racking or distortion of any member in accordance with the manufacturer's recommended tolerances, to operate correctly after installation and in accordance with the surveyor's instructions.
2. The new frame should bridge the DPC. Any damaged DPC should be repaired.

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3. The frame should be centralised within the aperture and set as far back in the reveal as is feasible for better weather performance.
4. The correct movement gap should be provided around the perimeter of the window or door.
5. The condition of the reveal should be considered and any surveyors notes adhered to.

Note - Examples of some commonly found reveal details are shown in Annex A

3.10 Flush reveal

Replacement windows and doorsets should be positioned to minimise the amount of making good, taking into account the following points:

1. The new frame should bridge the DPC. Any damaged DPC should be repaired.
2. Wherever possible to reduce the effects of thermal bridging, the replacement frame should be set in such a position that the rear face of the replacement frame is behind the rear face of the external skin by 25mm or more.
3. The frame should be set as far back in the reveal as is feasible for better weather performance. If a sill is included, the projection should be not less than 25mm from the face of the building to allow the shedding of water.
4. The correct movement gap should be provided.

3.11 Check reveal

When installing in a check reveal, the frame should be positioned taking into account the following points:

1. The frame should be positioned directly behind the external skin and positioned centrally with a minimum overlap of the frame behind the external skin of 12 mm on both sides. Where applicable, the frame should be positioned vertically with the head positioned behind the external skin at the head.
2. If a vertical DPC is installed in the check reveal, the frame should be positioned as far forward as possible with the vertical DPC between the rear of the external skin and the external face of the

frame.

3. When installing in a check reveal aperture and the check is being used to hide the width of the frame jambs (i.e. box sash windows) to provide more visually acceptable aesthetics, the frame should be positioned taking into account the following points:
 - The frame should be positioned behind the external skin and positioned such that the external visible dimensions of the frame jambs are equal.
 - The frame should be positioned where applicable behind the head check with the frame weight suitably supported.
 - Box sash windows are often installed in solid wall construction where a vertical DPC is not present. In these circumstances it can be beneficial to incorporate a suitable bead of sealant or impregnated foam tape between the external face of the frame and the external skin to provide additional protection against weather ingress.

Note 1: In some instances the reason for check reveal may be for both weathering and aesthetics.

Note 2: Recommendations for fixing distances are given in Section 3 Page 18.

Note 3: Annex A shows examples of the most commonly found reveal details.

Note 4: The external skin sill detail may incorporate shaped stone sills or plinth bricks to bring this effective external face closer to the frame and therefore reduce the depth of sill needed.

For all situations, as with flush reveal, the sill projection beyond the effective external face of the wall below the aperture should be not less than 25mm.

3.12 Installation packers

Frame installation packers should be used adjacent to fixing positions to:

1. Prevent outer frame distortion during installation and use.
2. Ensure that the frame remains centralised, level and square.
3. Allow for thermal movement of the frame.

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4. Assist in withstanding wind loadings.

Packers should normally be left in situ and concealed as part of the completed installation. However, in some instances they may be removed to facilitate perimeter detailing or for reasons of compatibility with the type of frame fixing used. In these cases, the objectives listed above should be satisfied and the fixings manufacturer's guidance followed.

Note 1: Due to the dynamic forces experienced when doors are opened and closed, it is good practice on doorsets to use additional packers adjacent to hinge and locking points to provide additional support and security.

Note 2: Some lugs need to be packed off the substrate to prevent distortion.

Frame installation packers should be resistant to compression, rot and corrosion.

Over-tightening of fixings can lead to distortion and should be avoided.

3.13 Methods of fixing

For correct window and door fixing, each frame member should be fixed to the structure or to an adjacent frame in order to resist all likely imposed loads which could cause the frame to deflect. These loads might be due to:

- Wind loads.
- Operating loads.
- Weight.
- Accidental impact.
- Attempted burglary.

Fixing methods are affected by:

- The presence or absence of a wall cavity.
- The nature and condition of any cavity.
- The relative position of the frame and cavity.
- The position of the plaster line and the need to minimise disturbance and damage to interior decorations.
- The design of the reveal.
- Any requirements for fire resistance (timber frame).

3.14 Fixings

There are two principal methods of fixing available, which may be used separately or in combination. These are through frame fixings and lug fixings. The manufacturer's instructions should always be followed.

If lug fixings are used they should be of a suitable material to resist corrosion and, if used externally, they should be secured to the wall using "one-way" or other suitable security screws.

Fixings should be sized to securely penetrate at least 40mm for windows and 50mm for doors into brick, block, concrete or masonry, or 25mm into timber framing unless equivalent demonstrable provision can be made by other means, for example by complying with an appropriate structural code. Connections to steelwork up to 2mm thick such as folded sheet lintels should be made with appropriate thread cutting screws. Connections to steelwork over 2mm thick should be into pre-tapped holes with machine screws of minimum 5mm diameter or alternatively with power-driven hardened self-drilling screws.

Other proprietary mechanical fixing methods should be assessed for suitability, preferably by obtaining an appropriate third party assessment.

Fixings should be at least as corrosion resistant as BS EN 1670:1998, Grade 3.

The presence of precast concrete or steel lintels can make it impracticable to achieve the recommended fixing distances using through-frame fixings or fixing lugs, or can pose severe difficulties in doing so. In these instances polyurethane (PU) foam may be used as a supplement to mechanical fixings but should not, under any circumstances, be used as the sole method of securing the entire frame into the reveal.

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3.15 Fixing distances

3.15.1 PVC-U windows and doors

Where possible, all four sides of the frame should be secured as follows:-

- Corner fixings should be between 150mm and 250mm from the external corner.
- No fixings should be less than 150mm from the centre line of a mullion or transom.
- Intermediate fixings should be at centres no greater than 600mm.
- There should be a minimum of two fixings on each jamb.

- Frame width up to 1200mm – no fixings
- Frame width 1201mm to 2400mm – one fixing
- Frame width 2401mm to 3600mm – 2 equally spaced fixings.

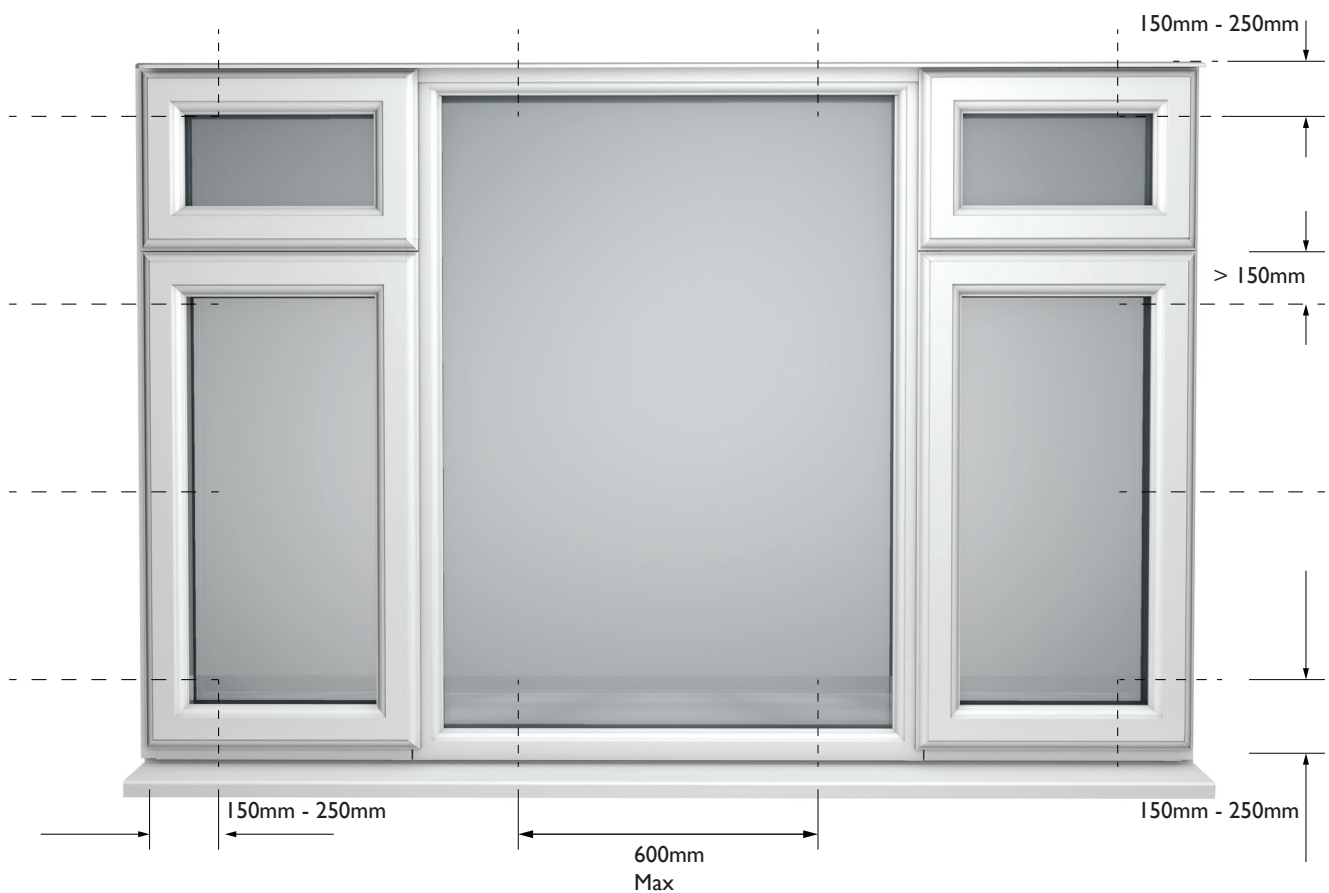


Figure 4: - PVC-U Window example

SECTION 3: Installation

3.15.2 Timber windows

Where possible, the sides of the frame should be secured as follows:-

- Corner jamb fixings should be between 150 mm and 250 mm from the external corner.
- Intermediate fixings should be at centres no greater than 600mm.
- There should be a minimum of two fixings on each jamb.
- On windows over 1800mm wide, central head and sill fixings should be provided.

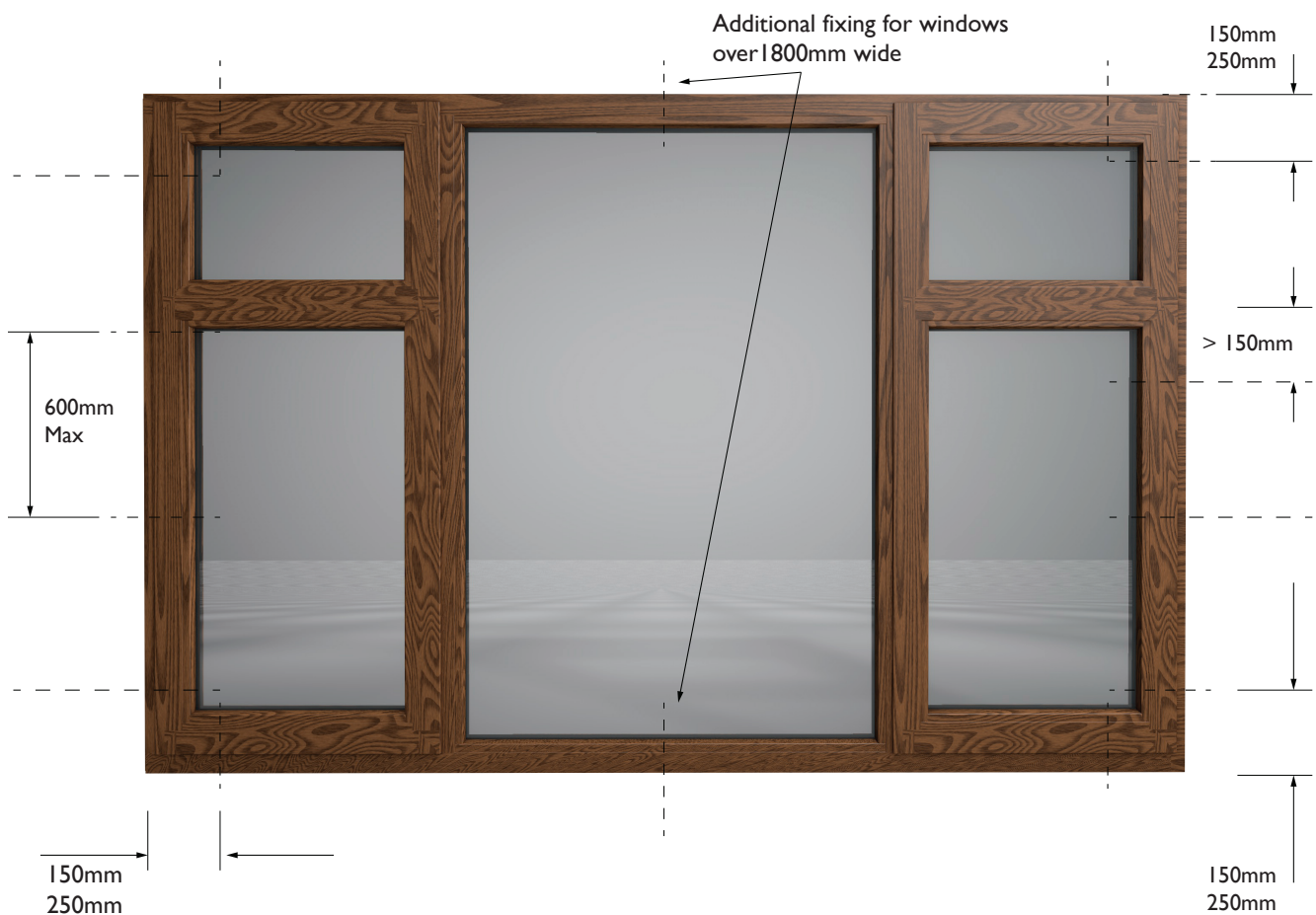


Figure 5: - Timber window example

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3.15.3 Aluminium windows

Where possible, all four sides of the frame should be secured as follows:

- Corner jamb fixings should be between 100mm and 150mm from the external corner.

- No fixings should be less than 100mm from the centre line of a mullion or transom

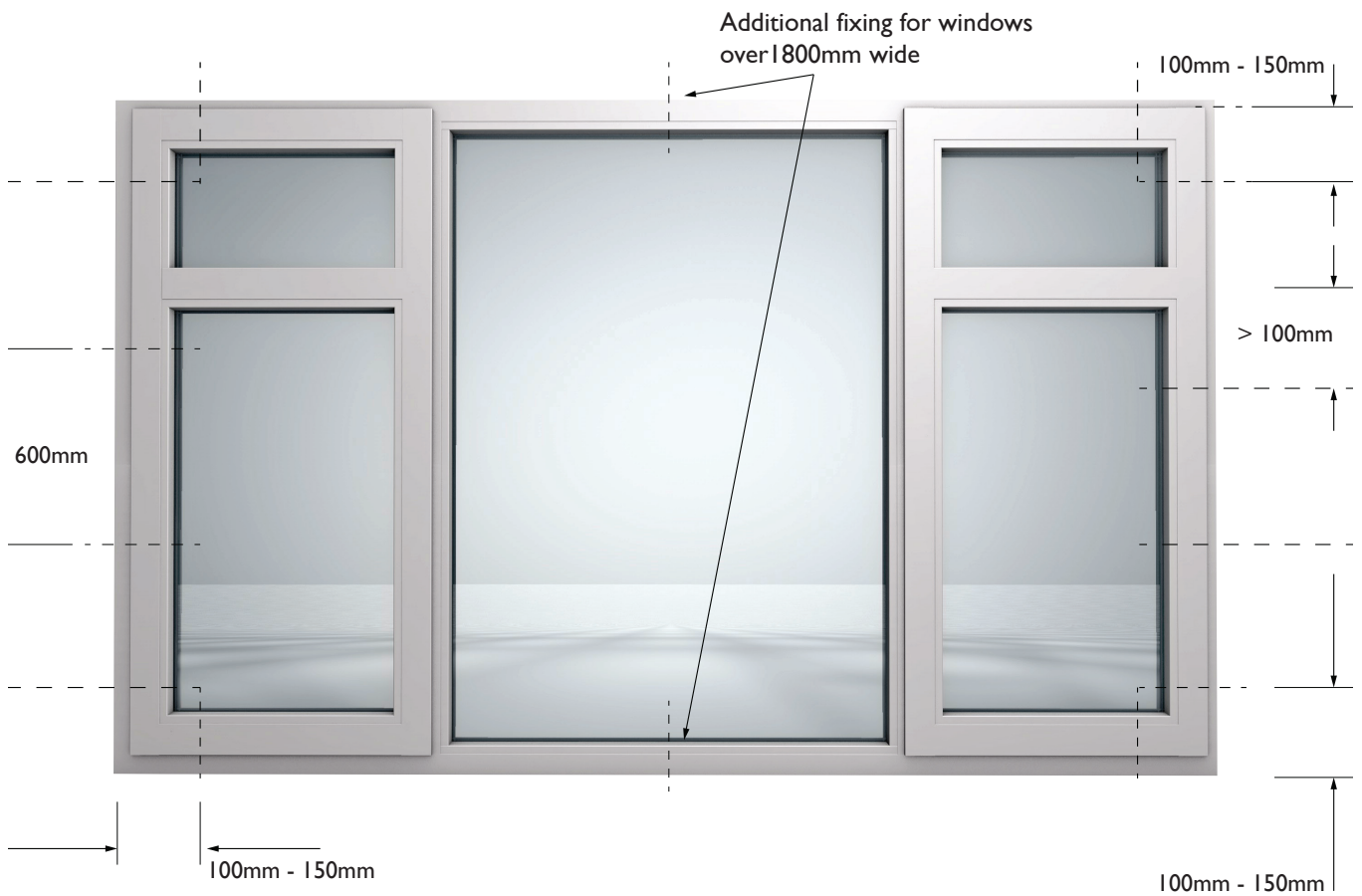


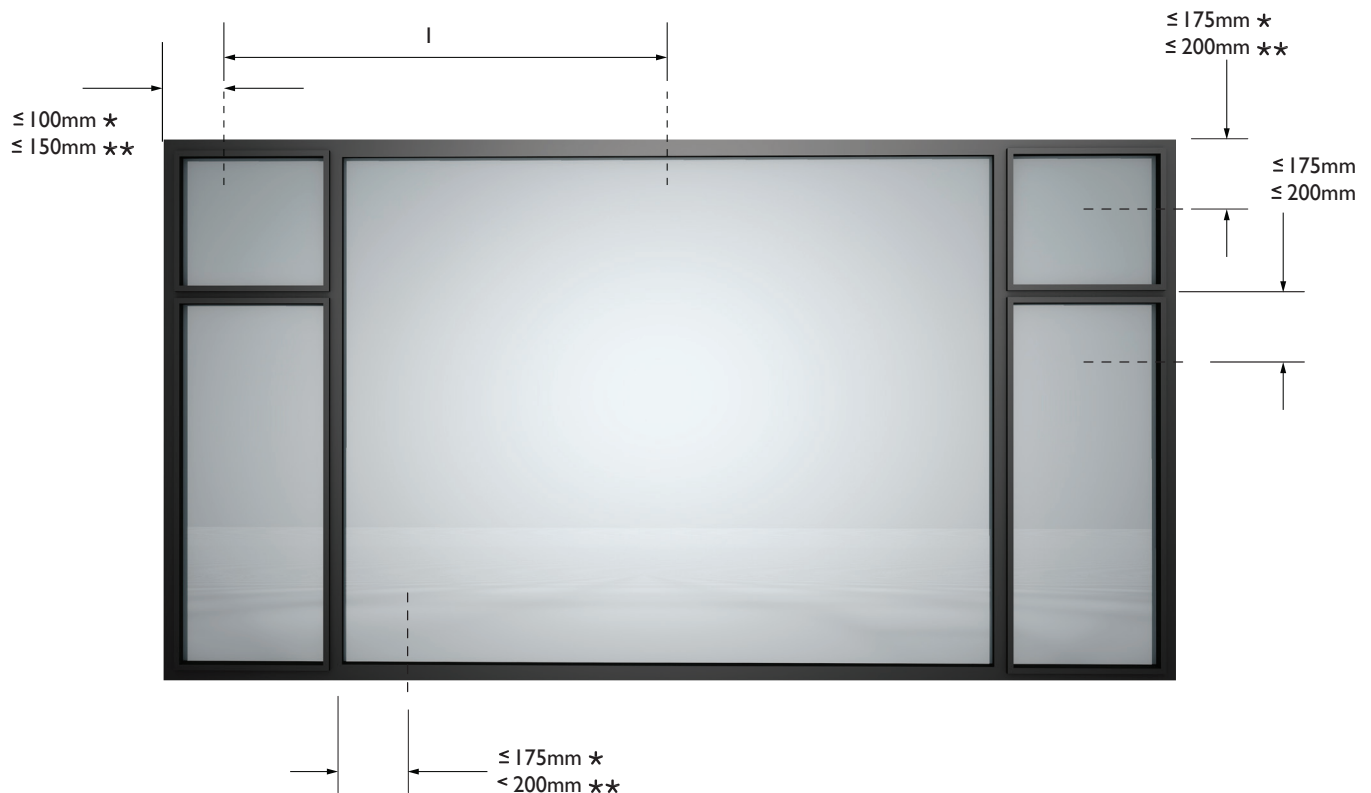
Figure 6: - Aluminium window example

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3.15.4 Steel windows

- Intermediate fixings should be at centres no greater than 600mm.
- There should be a minimum of two fixings on each jamb.
- On windows over 1800mm wide, central head and sill fixings should be provided.

The recommended maximum pitch of fixing positions for steel frames of hot rolled solid section is 175mm from corners, and then at 750mm intervals. For steel frames of cold formed hollow section it is 200mm from corners, and then at 900mm intervals. Note that not all holes pierced around the frame perimeter for fabrication and assembly purposes will necessarily require a fixing screw.



Key

1 Max. intermediate fixing distances (750mm for hot rolled; 900mm for cold rolled)

* Dimension for hot rolled sections

** Dimension for cold rolled sections

Figure 7: - Steel window example

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3.16 Roof windows

Remove sash from frame and install frame into existing aperture using new brackets provided. Provide/renew insulation and felt around frame. Install new flashing and replace roofing material. If internal lining is being replaced provide additional insulation and vapour barrier before fitting new lining.

3.17 Box sash windows

When replacing a box sash window into the original check reveal, the window should be fitted from the inside, with the outer frame hidden behind the brickwork.

Packing should be placed at the ends of the sill to transfer the weight of the replacement sash window into the structure without bowing the sill member. A bowed sill will result in the hardware not engaging.

It is essential that the window be fitted level, without twist and with parallel jambs. Jambs bowing outward will make the sash window draughty, and jambs bowing inwards will mean that the sashes will be excessively tight to slide, and will probably not tilt inwards for cleaning (if that option is present).

Bay Pole Positioning

Key

1. Head plate (timber)
2. Top end cap
3. Window profile
4. Bay pole (load bearing)
5. Bay pole jacking device
6. Sill
7. Bearing (spreader) plate
8. Reinforcement (solid)
9. Brickwork

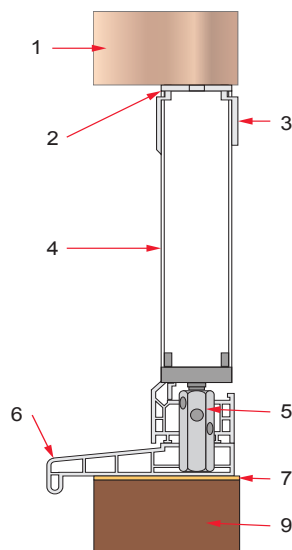


Figure 8: - Bay pole passes through sill

Expanding foam can be used as an aid to the mechanical fixings, but great care should be taken not to bow the outer frame jambs. If expanding foam is used then packing pieces should be placed between the frame and the sashes, or a brace put across the frame in order to prevent it bowing.

3.18 Bay poles

Where significant loads are being transferred (e.g. several storeys or just a roof) the bay poles are carried through the sill to the bearing plate. If unsure, a competent engineer should be consulted.

For lesser loads it might be possible to position bay poles directly on to reinforced sills. In this case:

1. The reinforcing system should be designed to perform this task, and
2. The system manufacturer's guidelines should be followed.

Note 1: To reduce thermal bridging, it is desirable for bay poles to have a similar thermal performance to the adjacent frames.

Note 2: Figure 8 and 9 shows a Bay Pole jacking system. A load bearing pole using shims is also acceptable.

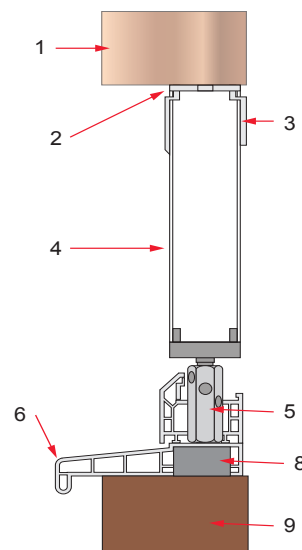


Figure 9: - Bay pole Positioned on reinforced sill

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3.19 Coupled assemblies

Note: Coupled assemblies are usually delivered to site as separate units, to ease handling and minimize damage.

When building up components into the required assembly, care should be taken to keep coupling joints equal, and frames both aligned and plumb. When coupling joints are also to be used as expansion joints, they should have seals, such as wet sealants, impregnated foam tapes or flexible polymer gaskets, placed within the joint during the assembly operation. It is not sufficient to rely solely on external pointing sealant.

Coupled assemblies should be fastened together in accordance with the system supplier's instructions. Particular attention should be paid to weather-proofing.

3.20 Glazing

All glazing should conform to the recommendations given in the relevant part of BS 6262 and in BS 8000-7. In addition, any glass or insulating glass unit (IGU) manufacturer's instructions should be followed.

All IGU's should conform with the requirements of BS EN 1279 – 5. They should be examined for damage prior to installation and defective units should not be used.

IGU's incorporating safety glass should be oriented with the safety glass on the appropriate side.

It is a legal requirement that the marking on the safety glass remains visible after installation.

IGU's with low emissivity coatings should be oriented in accordance with the manufacturer's instructions.

Many windows and doorsets are delivered ready-glazed. Alternatively they can be supplied with glass units and pre-formed glazing gaskets to be installed on site in accordance with the manufacturer's instructions.

Some systems, e.g. steel windows, require butyl-based, polyethylene, PVC or acrylic glazing tapes.

Other systems use non-setting compounds, gun-grade

solvent release sealants, one or two part curing sealants or two part rubberizing compounds.

In all cases the manufacturer's instructions should be followed. IGU's should be installed in accordance with BS 8000-7 requiring, where appropriate, the correct use of setting and location blocks, distance pieces, frame to glass and bead to glass gaskets, bead to frame air seals, corner sealing blocks, beads and bead end caps, and bedding and capping sealants.

3.21 Finishings

Finishings, such as trims, are generally used to neaten the interface between a window and the substrate. They should not be used to provide or enhance the weather tightness of the window or door or the perimeter joints. Good exterior quality materials should be used in accordance with the manufacturer's instructions, and colour matched where specified.

When using cellular extruded PVC-UE trims, they should conform to the current version of BS 7619.

3.22 Perimeter sealants

The purpose of perimeter sealants is to resist water penetration and prevent air leakage due to differential movement between the aperture and the window or doorset. Suitable sealants exhibit and retain flexibility and adhesion over the intended service life of the product and it is vital that the correct sealant is selected to suit the construction and frame materials involved.

The movement class for the sealant depends on the substrate material, the frame material and the dimensions of the joint between the frame and the opening.

Wet sealants, e.g. silicones, should be tested and classified in accordance with BS EN ISO 11600. Unless an unusual and specific known requirement determines otherwise, they should be of low modulus, with adequate adhesion, movement capability of at least 20%, and neutral curing. The movement and modulus characteristics should be identified on their packaging as class 20LM or 25LM.

Note 1: A guide to the use of BS EN ISO 11600 [10] is given on The British

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Adhesives and Sealants Association website at www.basaonline.co.uk 4.

If a situation arises where the anticipated movement exceeds the performance criteria of a class 25 sealant, then the sealant manufacturer should be contacted for specific advice on sealant selection.

Note 2: If in doubt, sealant manufacturers can be consulted on sealant adhesion to specific substrates and materials and on whether primers are required. They can also propose sealant/primer systems, which minimize the potential for staining. A comprehensive list of UK sealant manufacturers can be found at www.basaonline.co.uk.

Impregnated foam tapes can also be used for sealing, and should remain permanently flexible and accommodate joint movement of at least the same as a wet sealant as classified above.

Note 3: The use of impregnated foam tapes or gun-applied polyurethane (PU) foam might enhance the thermal performance of the installation due to the location within the perimeter joint, although application of gun-applied PU foam might be impractical if the perimeter joint is below 5mm wide. For joints below 10mm, it is advisable to use a special tapered nozzle on the gun to facilitate adequate application depth.

Note 4: Impregnated foam tapes conforming to DIN 18542:2009 with an exposure category of BG1 are suitable.

Note 5: Such products do not rely on chemical adhesion to the contact surfaces, being held under compression within the joint, and do not therefore require primers.

3.23 Sealing

A thermally insulating filling material should be applied into the perimeter gap around the frame, e.g. PU foam or impregnated foam tapes.

The presence of old oil-based mastics and bituminous DPCs can adversely affect the behaviour or appearance of otherwise correctly specified and applied wet sealants, through the migration of hydrocarbons to the surface of the new sealants. Consequent photo-oxidation of the migrant products can affect sealant performance and produce discolouration. This risk should be avoided by removal of unwanted mastic and by keeping sealant away from DPCs.

Perimeter joints should be continuously sealed on both the outside and the inside with a sealant appropriate to:

- a. The frame surface.
- b. The substrate material.

- c. Joint size and configuration.
- d. Anticipated joint movement.
- e. Anticipated exposure to weather.

When using impregnated foam tapes, over-capping with a wet sealant is generally not required. The manufacturer's instructions should be followed.

Note 1: Annex A gives examples of joint construction.

In situations where sealants rely upon atmospheric moisture to initiate curing, deep filling should be avoided.

The sealant should be applied against a firm backing so that it is forced against the sides of the joint during application. To avoid failure in service, the sealant should not adhere to the backing because this would restrict the lateral movement of the joint.

Note 2: For gaps greater than 6 mm these recommendations can be achieved through the use of a closed-cell over-sized polyethylene (PE) foam backer rod.

When applying sealant into a parallel joint, a width to depth ratio of between 1:1 and 2:1 should be observed. When applying a fillet joint, a minimum 6mm contact to non-porous and 10mm to porous substrates should be achieved.

For steel and aluminium framed windows and doorsets, an insulating fill should be inserted or injected wherever practicable around their full perimeter behind the external seal between frame and structural opening (see Annex A).

An adequate seal should be provided between any sill and frame, and a barrier should be created at the ends of the sill.

Note 3 This is to stop water bypassing the perimeter seal and entering the building or cavity. This seal/barrier can be made using appropriate sealants or proprietary end caps/sill sections designed for the purpose.

3.24 Finishing off and making good (external)

Debris or contaminants should be removed and any drainage paths cleared.

Any materials such as trims or sealant should not be applied on top of loose material.

Protective tapes should be removed as soon as

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practicable, as ageing of tapes can cause difficulties in removal. Refer to the manufacturer's guidance.

Sand and cement should not be used to fill the gap between the outer frame and the substrate except for backfill for steel windows, usually limited to windows in stone surrounds or interior fair-faced brick and concrete.

Where the replacement product has a smaller front to back dimension than the original, there might be a mastic and/or paint line visible on the substrate which should be removed as much as practicable or covered with a trim.

The method of, and responsibility for, repair to any render should be as agreed with the purchaser.

3.25 Finishing off and making good (internal) Trims

Typical materials used are PVC-U, timber, mdf and composite.

Internal reveals should be made good as agreed, ready for the purchaser to redecorate if necessary.

The type and style of the internal trims will be determined at the time of survey.

Consideration should be given when sealing trims to wallpapered surfaces. Prior to applying the acrylic sealant, a knife or similar tool should be used to score the edge to allow removal of the paper without disturbing the trim.

It is important that an acrylic sealant is used between the architrave or trims and any material which requires decoration as this can be over-painted, e.g. window boards or plaster.

When sealing between PVC-U trims and frames, either low modulus silicone or a specialist solvent based sealant is recommended. Acrylic sealants such as decorators caulk or similar, are not suitable for this application.

3.26 Final inspection

After installation a final inspection should be carried out, preferably accompanied by the purchaser, to

ensure that the installation is fully in accordance with the surveyor's and manufacturer's instructions and that the products operate correctly. An example of a final checklist is given on the next page.

The purchaser should be made aware of the method of operation, locking and unlocking and fire egress. Written operating and maintenance instructions should be provided. Ideally, all occupants of a household, other than small children, should carry out the operation of the windows and doorsets, particularly the operation of safety restrictors and their release for egress, in order to identify any difficulties any occupant might have and to agree remedies. Where it is not possible to pass the instructions directly to the occupant, then it is the responsibility of the purchaser to ensure that the instructions are passed on.

Information on the ordering of spare keys should be provided.

In addition, it is good practice to have the purchaser or purchaser's designated representative sign off the installation after the inspection has been passed.

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Table 3:

Final Inspection Check List		Y/N
Visual appearance	Is the frame installed plumb and square?	
	Is the beading fitted correctly and evenly?	
	Are exposed faces, including beads, free from damage?	
	Is the frame clean with all protective tape removed?	
	Has any damage to aperture been correctly made good?	
	Have all trims been fitted correctly?	
	Has all site debris been removed?	
Glazing	Is all glazing as specified within the contract?	
	Do the sealed units meet current visual quality standards?	
	Are obscure and coated glassed oriented properly?	
	Are sealed unit spacer bars covered by frame and beads?	
	Is the glazing held properly by beads/gaskets, etc.?	
	Is safety glass used where necessary?	
Operation	Do all openers open, close and lock as intended?	
	Are seals on frames without gaps?	
	Are cams free from binding against strikers?	
	Is all operating gear lubricated as necessary?	
	Is all hardware attached with correct numbers of fixings?	
Sight lines	Are all sight lines visually correct?	
	Are adjacent opening lights aligned as appropriate?	
	Are all decorative features, e.g. leading, correctly aligned?	
Sealing	Are all joints smooth and correctly formed?	
	Is the sealant continuous around the frame?	
	Is the frame face free from excess sealant?	
Drainage	Are all drainage channels free from obstruction?	
Miscellaneous	Are all sill end caps fitted if required?	

SECTION 4:

Maintenance

Good quality replacement windows and doors will give many years of trouble free service, however a few simple items of regular maintenance will prolong the life of many of the components.

4.1 Glass

Cleaning of glass can be carried out using a solution of detergent in warm water. This method is particularly suitable for more heavily soiled surfaces, such as the external face of the glass.

Alternatively, less heavily soiled glass surfaces can be cleaned using a soft cloth and proprietary glass cleaner, in accordance with the manufacturer's instructions.

Laminated, toughened, leaded or low-E glass, and units containing Georgian bars, can all be cleaned in a similar manner.

The glass used in double glazed units can be easily scratched especially by jewellery and metallic scrapers. It is therefore recommended that hand jewellery is removed prior to cleaning and the use of such scrapers be avoided. Care is required when cleaning leaded lights as excessive pressure can dislodge the lead from the glass surface.

Care should be taken not to damage the seals between the frame and the glass.

Note: Externally exposed lead will oxidise - this is a natural phenomenon and does not indicate a fault with the material.

4.2 Scratched glass

The surface of glass can become damaged in a variety of ways.

Scratches, graffiti, pollution and other contaminants are the more common causes which can impair the visual quality of the glazing.

There is a widely held belief that replacement is the only option for damaged glass. This in fact is not always the case.

In common with repairs that are carried out to other building surfaces, on site glass repair can be cost effective, time efficient and sustainable.

The process of repair involves the removal of a minimal amount of the glass surface in order to rectify

the defect, without impairing the visual quality.

In some cases the severity of the surface damage may make repair impractical, this would normally be advised during the initial survey. In exceptional circumstances an unacceptable level of distortion may only become evident during or after treatment. In these instances replacement would be advised.

Details can be found within GGF Data Sheet 5.15.1

4.3 PVC-U frames

Frames should be washed using a solution of detergent in warm water. This may be conveniently carried out less frequently but at the same time that the glass is cleaned externally. Non-abrasive proprietary cleaners, suitable for PVC-U, can be used in accordance with the manufacturer's instructions.

In the event of unusual or stubborn marks and stains, advice should be sought from the window supplier.

Solvents, thinners, solvent-based cleaners and abrasive cleaners should not be used.

4.4 Aluminium frames

Frames should be washed down with a solution of detergent in warm water at least once a year. In areas where airborne contaminants are more concentrated than usual e.g., near the sea, around swimming pools, in places where industrial air pollution is a known hazard etc. - the products will benefit from more regular attention.

Scratches or chips may be touched in by brush using colour matched paint - The manufacturer may be able to supply small bottles of paint to match the stock colours it uses.

4.5 Timber frames

Advances with painting and coating systems have led to many timber window products not requiring re-coating for many years. Frames should be washed using a solution of detergent in warm water.

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Maintenance

4.6 Steel frames

Steel windows, properly maintained can be expected to last the life of the building. Simple measures, such as having the metal frame surfaces washed down at the same time as the glass is cleaned, and undertaking an annual inspection of working parts, gaskets, weather seals and joint sealants, will do much to ensure their trouble-free performance.

4.7 Roof windows

Maintenance should be carried out as recommended by the manufacturer. However, timber windows with varnish, lacquer or paint finish should be cleaned as required with ordinary household cleaners.

Periodic maintenance to the surface finish will be required depending on the internal environment and the manufacturer's recommendations for this should be followed.

Timber windows with a polyurethane lacquer finish or PVC-U windows should be cleaned periodically with household cleaner.

Fittings should be checked regularly and lubricated if necessary.

Externally, the gutters around window should be checked annually to ensure they are free of blockages.

4.8 Sealants

The sealant between a frame and the building can be cleaned in a similar manner to the frame, taking care not to break the seal to the frame or substrate.

4.9 Gaskets & seals

Gaskets and seals will give many years of performance. However, if they are damaged or reach the end of their useful life, some are designed to be replaceable.

4.10 Hardware & fittings

It is recommended that manufacturers' instructions are followed. Oil or light grease should be applied to mechanisms and keeps at least once a year.

A thin film of light oil on friction stays and mechanisms will enhance their corrosion resistance.

Residential door hinges with plastic bushes require no lubrication. The low-friction bushes could be damaged by the application of mineral oil over the long term.

Vertical slider spring balances are pre-lubricated and should require no maintenance.

When using spring balances, care must be taken to avoid any lubricant being applied or transferred to the spring balance chambers in the frame. Any such lubricant will impede the effectiveness of the pivot shoe locking system, causing the sash to move around when tilted inwards for cleaning.

Caution is required when using solvent based aerosol lubricants as these may cause damage to the frame material. If in doubt, further advice should be sought from the frame supplier.

Brass metal rapidly tarnishes when exposed to the atmosphere and requires regular polishing. To avoid this, solid brass furniture is usually supplied coated with a protective lacquer to keep it bright. However, if the lacquer becomes scratched or worn away then the underlying brass will naturally tarnish. Advice on removing and re-applying lacquer to brass furniture should be sought from the supplier.

SECTION 5:

Bibliography and Descriptions

In all cases, the latest version of a Standard should be used.

BS EN 948	<i>Hinged or pivoted doors. Determination of the resistance to static torsion.</i>
BS EN 1627	<i>Windows, doors, shutters. Burglar resistance. Requirements and classification.</i>
BS EN 1628	<i>Windows, doors, shutters. Burglar resistance. Test method for the determination of resistance under static loading.</i>
BS EN 1629	<i>Windows, doors, shutters. Burglar resistance. Test method for determination of resistance under dynamic loading</i>
BS EN 1630	<i>Windows, doors, shutters. Burglar resistance. Test method for the determination of resistance to manual burglary attempts.</i>
BS EN 1670	<i>Building hardware. Corrosion resistance. Requirements and test methods.</i>
BS EN 1991-1-4	<i>Eurocode 1: Actions on structures - Part 1-4: General actions - Wind actions.</i>
BS EN ISO 7389	<i>Building construction -- Jointing products -- Determination of elastic recovery of sealants.</i>
BS EN ISO 7390	<i>Building construction -- Jointing products -- Determination of resistance to flow of sealants.</i>
BS EN 12150 -1	<i>Glass in Building - Thermally toughened soda lime silicate safety glass - Pt 1 Definition and description.</i>
BS EN 14351-1	<i>Product standard, performance characteristics - Part 1: windows and external pedestrian doorsets without resistance to fire and smoke leakage characteristics but including fire performance for roof windows.</i>
BS EN 14449	<i>Glass in building. Laminated glass and laminated safety glass. Evaluation of conformity/ product standard.</i>
BS EN 14609	<i>Windows. Determination of the resistance to static torsion.</i>
BS 644	<i>Timber windows. Factory assembled windows of various types. Specification.</i>
BS 6093	<i>Design of joints and jointing in building construction. Guide.</i>
BS 6206	<i>Specification for impact performance requirements for flat safety glass and safety plastics for use in buildings.</i>
BS 6262 -1	<i>Glazing for buildings. General methodology for the selection of glazing.</i>
BS 6262 - 2	<i>Glazing for buildings. Code of practice for energy, light and sound.</i>
BS 6262 - 3	<i>Glazing for buildings. Code of practice for fire, security and wind loading</i>
BS 6262 - 4	<i>Glazing for buildings. Code of practice for safety related to human impact.</i>
BS 6262 - 6	<i>Glazing for buildings. Code of practice for special applications.</i>
BS 6262 - 7	<i>Glazing for buildings. Code of practice for provision of information.</i>
BS 6375 - 1	<i>Performance of Windows & Doors. Classification for water tightness and guidance on selection and specification.</i>

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Bibliography and Descriptions

BS 6375 - 2	<i>Performance of windows. Specification for operation and strength characteristics.</i>
BS 6375 - 3	<i>Performance of windows. Specialist Characteristics.</i>
BS 6510	<i>Steel framed windows and glazed doors.</i>
BS 7412	<i>Plastic windows made from unplasticized polyvinyl chloride (PVC-U) extruded hollow profiles - Specification.</i>
BS 7950	<i>Specification for enhanced security performance of casement and tilt and turn windows for domestic applications.</i>
BS 8213 - 1	<i>Windows doors and rooflights. Design for safety in use and during cleaning of windows, including door-height windows and roof windows. Code of practice.</i>
BS 8213 - 4	<i>Windows, doors and rooflights. Code of practice for the installation of replacement windows and doorsets in dwellings.</i>
BS EN 1279 - 5 + A2	<i>Glass in building. Insulating glass units. Evaluation of conformity.</i>
BS EN 15752-1	<i>Glass in building. Adhesive backed polymeric film. Definitions and requirements.</i>
BS EN 15755 - 1	<i>Glass in building. Adhesive backed polymeric filmed glass. Definitions and requirements.</i>
BS EN ISO 8339	<i>Building construction -- Sealants - Determination of tensile properties (Extension to break).</i>
BS EN ISO 9046	<i>Building construction -- Jointing products -- Determination of adhesion/cohesion properties of sealants at constant temperature.</i>
BS EN ISO 9047	<i>Building construction -- Jointing products -- Determination of adhesion/cohesion properties of sealants at variable temperatures.</i>
BS EN ISO 10563	<i>Building construction -- Sealants -- Determination of change in mass and volume.</i>
BS EN ISO 10590	<i>Building construction -- Sealants --- Determination of tensile properties of sealants at maintained extension after immersion in water.</i>
PAS 24	<i>Enhanced security performance requirements for doorsets and windows in the UK. Doorsets and windows intended to offer a level of security suitable for dwellings and other buildings exposed to comparable risk.</i>

SECTION 5:

Bibliography and Descriptions

Building Regulation Approved Documents:

Annex B England and Wales

Approved Document A	<i>Structure.</i>
Approved Document B	<i>Volume 1: Dwelling houses.</i>
Approved Document C	<i>Site preparation and resistance to contaminants and moisture.</i>
Approved Document E	<i>Resistance to the passage of sound.</i>
Approved Document F	<i>Ventilation.</i>
Approved Document J	<i>Combustion appliances and fuel storage systems.</i>
Approved Document L1B	<i>Conservation of fuel and power.</i>
Approved document M	<i>Access to and Use of Buildings.</i>

Annex C England Only

Approved Document K	<i>Protection from Falling, Collision and Impact.</i>
Approved document Q	<i>Security.</i>
Regulation 7	<i>Materials and Workmanship.</i>

Annex D Wales only

Approved Document K	<i>Protection from Falling, Collision and Impact.</i>
Approved document N	<i>Safety Against Impact.</i>

ANNEX A:

Examples of Replacement Frame Positions and Joint Construction

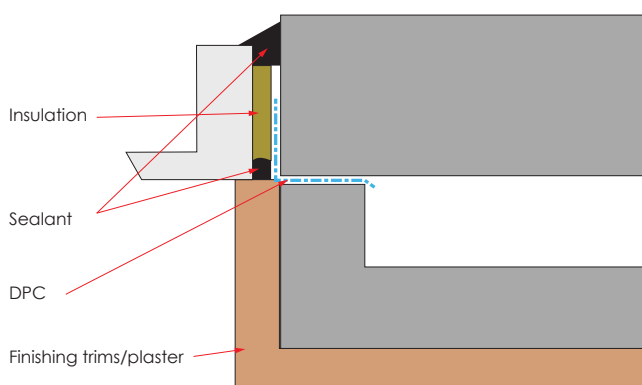
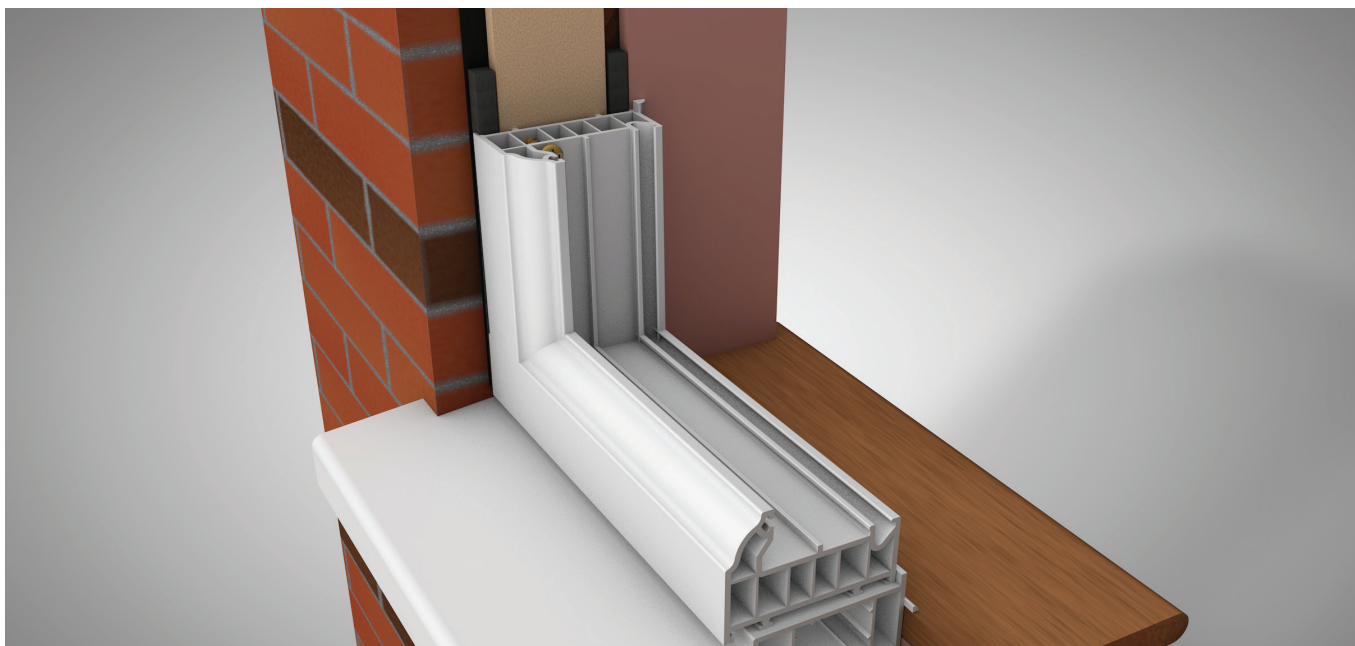
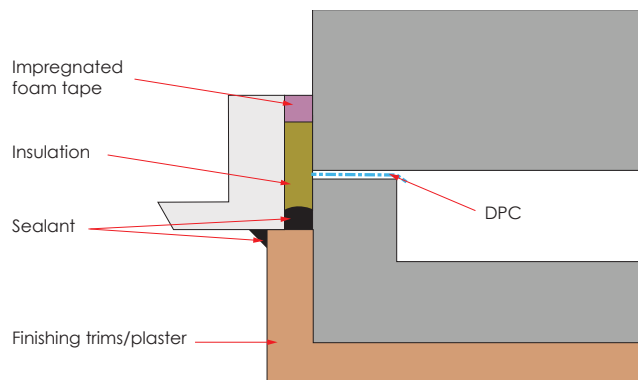


Figure 10: - Flush reveal with joint width less than 6mm and frame forward of DPC



Note: - Alternatively, the impregnated foam tape can be installed to the full depth of the joint to provide insulation.

Figure 11: - Flush reveal and frame bridging DPC - Alternative details using impregnated foam tapes

ANNEX A:

Examples of Replacement Frame Positions and Joint Construction

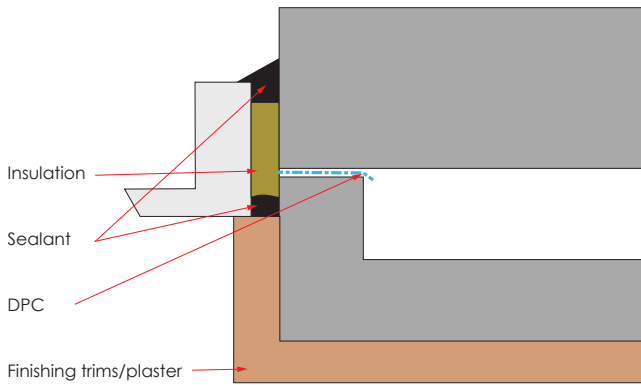


Figure 12: - Flush reveal with joint width less than 6mm and frame bridging DPC

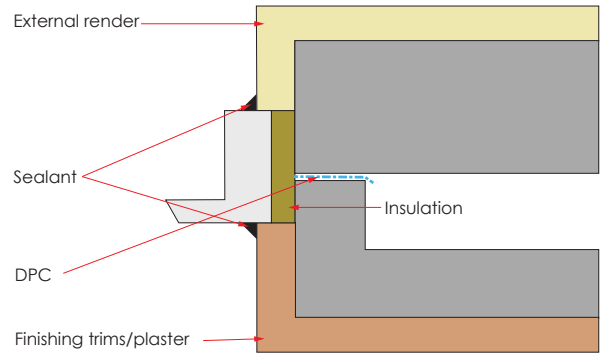


Figure 15: - Flush reveal with external render, for replacement windows/dorsets with frame shuffled into position

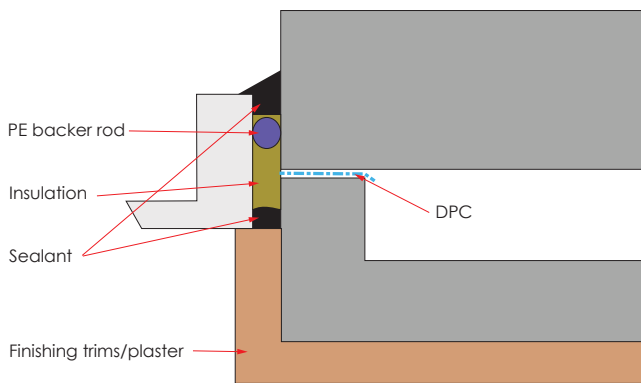


Figure 13: - Flush reveal with joint width from 6mm to 15mm and frame bridging DPC

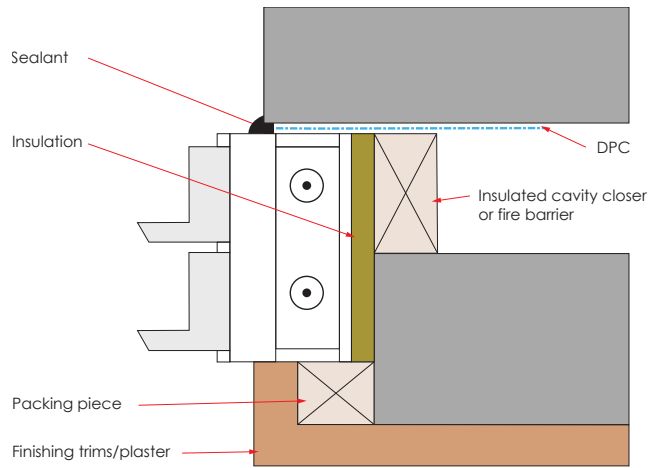


Figure 16: - Box sash (cords and weights) replacement into cavity wall with open cavity

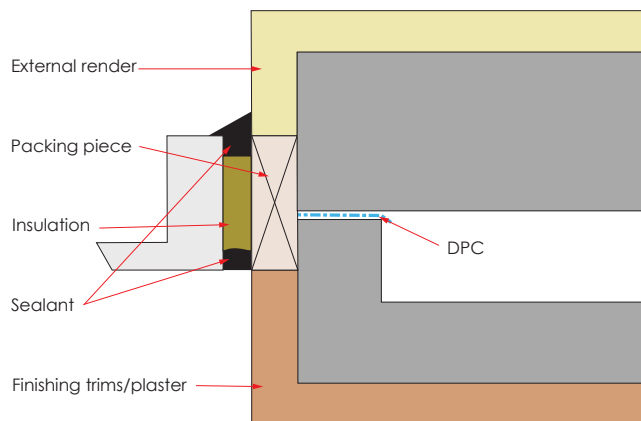


Figure 14: - Flush reveal with external render, for replacement frames

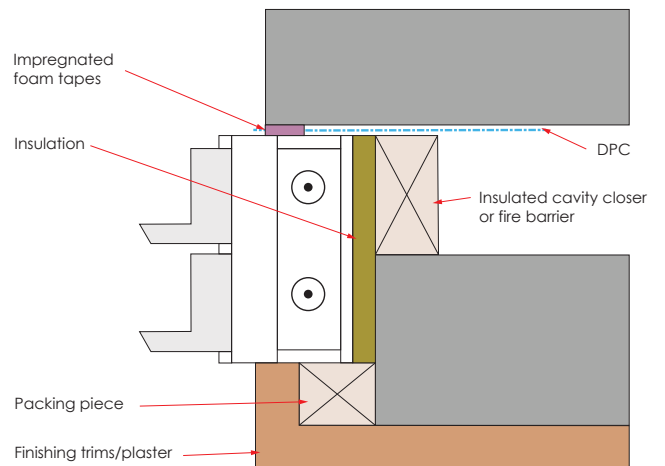


Figure 17: - Box sash replacement - Alternative details using impregnated foam tapes

ANNEX A:

Examples of Replacement Frame Positions and Joint Construction

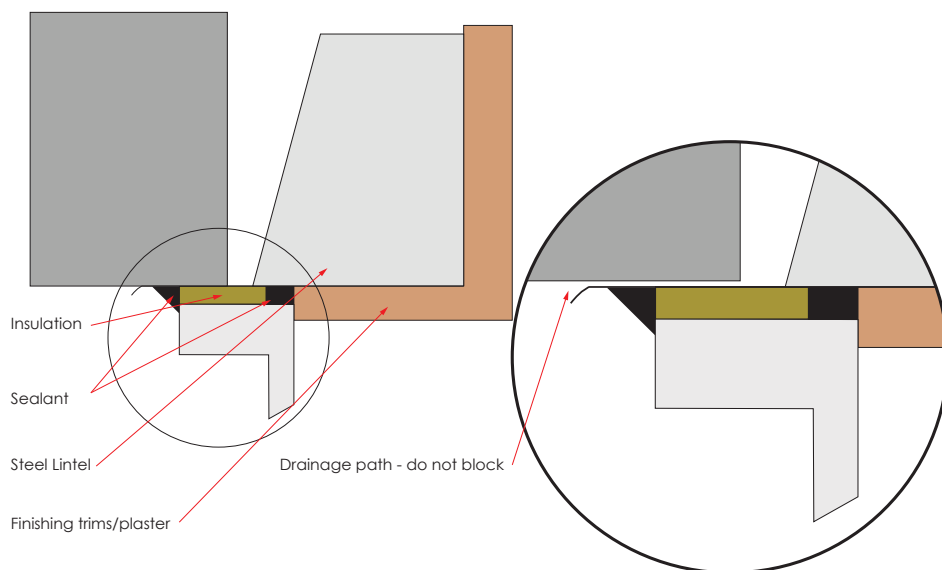
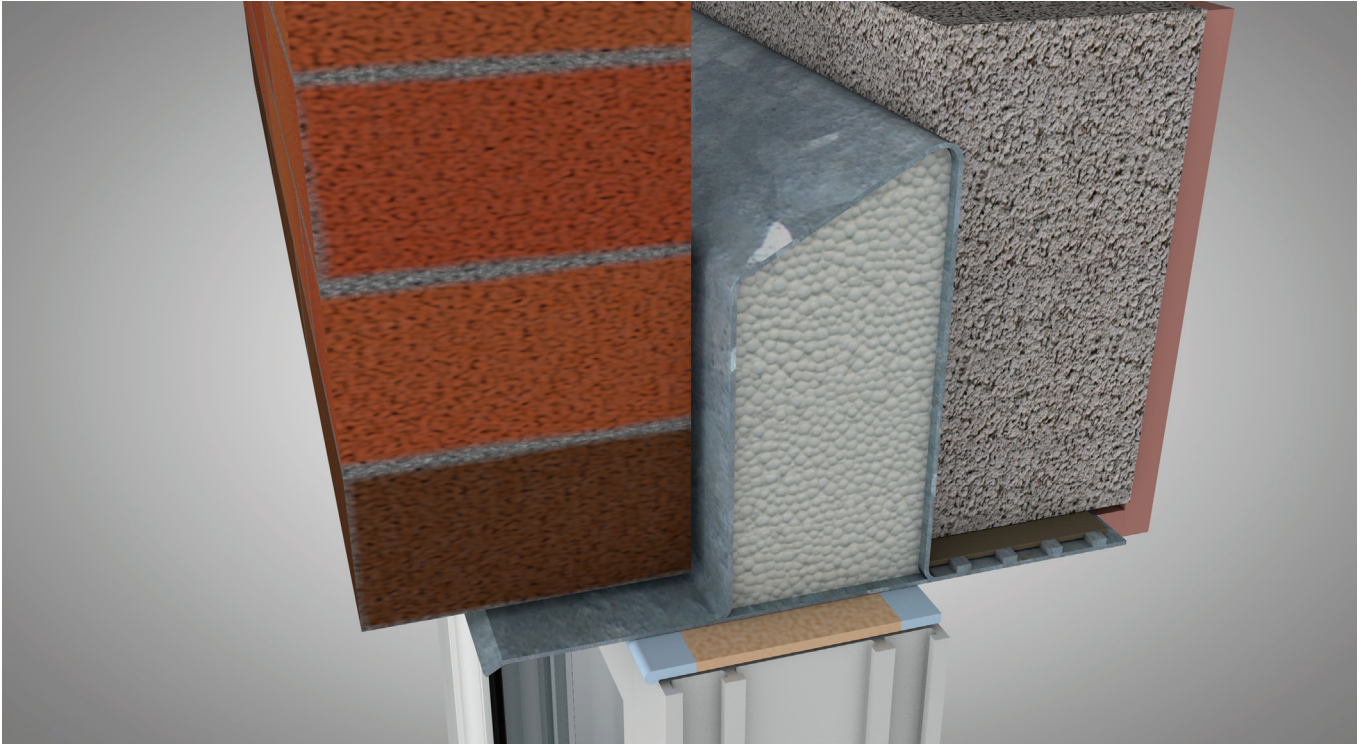


Figure 18: - Head arrangement

ANNEX B:

Building Regulations - England and Wales

Introduction

The Building Regulations exist to ensure the health and safety of people in and around all types of buildings. They also provide for energy conservation, access to and use of buildings.

To assist with understanding the Department of Communities and Local Government (DCLG) is the Government department with responsibility for Building Regulations, in England & Wales, produces an excellent guide written in clear English that will help in understanding why the system works in the way it does.

Hard copies of the guide are free from the DCLG or it can be downloaded free from their website at:

www.communities.gov.uk/publications/planningandbuilding/buildingregulationsexplanatory

There are many ways in which compliance with the Building Regulations can be achieved.

DCLG produces a series of guidelines that demonstrate some of the more straightforward ways to achieve compliance with the Regulations. These guidelines are referred to as Approved Documents.

Companies such as FENSA enables entities that install replacement windows and doors to self-certify compliance to the Building Regulations for England and Wales under the Competent Person Scheme.

The Building Regulation Approved Documents

Where windows and doors are to be replaced (but not where they are to be repaired only, as repair work does not fall within the definition of building work) the replacement work should comply with the requirements of Parts L and K of Schedule 1 in England and Parts L and N in Wales. In addition, after the work has been completed, the building should not have a lesser level of compliance with the other applicable parts of Schedule 1.

Summary: Replacement doors and windows should always comply fully with the requirements of:-



Approved Document L1B – Conservation of fuel and power in existing dwellings

Approved Document K4 (England) – Glazing – Protection against impact

Approved Document N1 (Wales) – Glazing – Protection against impact

However, for all other applicable parts of the Building Regulations the windows or doors should either comply fully with the requirements of the Approved Documents or, if the item being replaced does not already fully comply, the replacement item should NOT make the current situation worse.

The Building Regulations sections are divided as follows:

- Annex B - England and Wales.
- Annex C - England only.
- Annex D - Wales only.

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Building Regulations - England and Wales

Approved Document A – Structure

Requirement A1

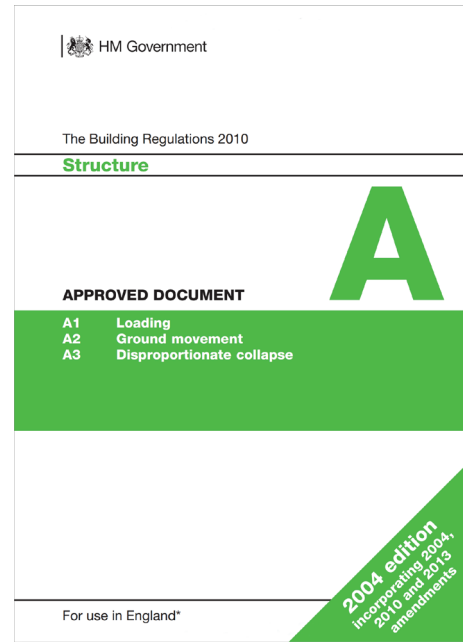
The building shall be constructed so that the combined dead, imposed and wind loads are sustained and transmitted by it to the ground -

1. Safely; and
2. Without causing such deflection or deformation of any part of the building, or such movement of the ground, as will impair the stability of any part of another building.

With regard to windows and doors, Approved Document A applies to bay windows and other windows that are load bearing, e.g. where lintels have not been used. When replacing windows and doors it is vital that the integrity of any existing structural support is not compromised.

The supplier of the framing material may be able to offer technical advice.

It is important to note that in situations where uncertainty



exists, e.g. when using new materials or construction methods, the services of a structural engineer or other competent person should be employed.

Good Practice Note - Adequate means of structural support

It is essential to maintain the integrity of the building.

The necessity for an adequate means of support is dependent on the design of the structure. Even when no such support is evident, the installation company is responsible for assessing if one should be installed. This ensures the structural integrity of the building is not compromised. If this additional work is required, the customer can be given the option to have it fitted by the installation company or independently.

The installation company cannot avoid the issue on the grounds that because there is no means of support over the existing window there is no requirement to fit one over the new window. It is strongly recommended that the need is thoroughly investigated before work commences.

A disclaimer issued by the customer is an unacceptable practice and is likely to incur a non-conformity when inspected.

Every effort should be made at the time of survey to determine if an adequate means of support is either fitted or required. There will be instances

where windows being renewed are replacements of the original load bearing timber frames but did not have the necessary means of support fitted. The construction material of the original windows should be established if possible as this may help in determining the requirement.

If the surveyor cannot establish this either way, both the customer and installation team should be notified as to the possibility or should seek the advice of a structural engineer.

In the worst case the installation team may only recognise the need after the removal of the existing frame. It is entirely the installing company's responsibility to inform the customer immediately, advising that an adequate means of support must be installed before the replacement window or door can be fitted. Clearly a situation to be avoided especially as this will incur additional time for the company and cost to the customer along with a variation to the original contract.

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Bow bay replacements

It is recommended that the structure of a bow bay replacement should be constructed in such a way as to provide adequate means of support to a flat roof setup. This will take into account any loads imposed by a heavy snow fall which could otherwise compromise the structure.

Ensure that exposed areas, e.g. sills, external canopies or roofs, are adequately insulated as this could incur a non-conformity against AD L when inspected.

Note 1: If a structural opening is to be made wider, Local Authority consent is required. This is outside the scope of FENSA registration and should be referred to Local Authority Building Control.

Note 2: If the existing structural apertures are found to be unsound prior to the replacement of any windows and/or doors, work should be carried out beforehand to ensure the stability of the building e.g. the soldier course above an existing window may require an adequate means of support.

If a means of support is required, a separate contract and costing can be raised or it can be incorporated within the window contract as a variation incurring additional cost. Although the financial outlay of any support is the responsibility of the customer, the cost of any retrospective remedial work required due to the omission of a required means of support would likely fall upon the installation company, e.g.

- Removal and safe storage of window to facilitate fitting of the means of support
- Making good any resultant damage to the fabric of the building
- Refitting of window

It should be noted that if, after the completion of an installation and the issuing of a CPS (Competent Person Scheme) certificate, it can be established that an adequate means of support was not fitted where needed, a retrospective non-conformity will be levied against the installation company even if weeks, months or years have elapsed. This may incur significant cost.

Removal of bay windows

In order to maintain the structural integrity when replacing a bay window, it is essential that temporary supports such as adjustable steel props are used. It is important to ensure that the walls, floors or beams that may be affected by the

window replacement are adequately supported prior to removing the windows.

Care should be taken to protect internal ceiling and floor finishes at support bearing points. The sequence of removal of the windows in a two storey bay should ensure that unnecessary damage to the lower bay construction does not occur and structural stability is not impaired. It is important that the structure is always adequately supported.

After supporting the bay structure, the windows should be removed carefully, ensuring that the minimum of damage is caused to reveals, plaster, finishes and trims.

It is recommended that structural mullions are removed one at a time, and that both the temporary supports and the pre-existing structure are closely monitored for any signs of settlement.

Depending upon the design of the structure at the head of the bay window, it may be necessary to leave the head of the frame in position providing there is no rot present.

If the condition of the aperture or the damp proof membrane (DPC) is not considered to be fit for purpose, or does not correspond with that described by the surveyor, the installer should refer back to the surveyor or the company for agreement to the proposed solution.

Installation of the replacement window assembly should not start until any defects in the structure have been rectified. The assembly of the bay window should follow the product designer's recommendations.

Care should be taken to ensure that no applied loads are carried by the individual segments of the window. Bearing plates should be used on bay poles when loads are transferred from or to masonry or timber.

Where there is no danger of the bay pole damaging the fabric of the building with which it comes into contact, bearing plates are not necessarily required e.g. where the bay pole bears directly onto a steel joist.

Care should be taken to ensure that the loads are transferred correctly from and to the structure of the building and the bay pole assembly. This is achieved either by having the bay pole pass through the sill, or by using a sill which is reinforced strongly enough to transfer the applied loads.

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Where significant loads are being transferred (e.g. several storeys or just a roof) it is recommended that the bay poles are carried through the sill to the bearing plate. If unsure, consult a structural engineer.

For lesser loads it may be possible to position bay poles directly on to reinforced sills. In this case it is imperative that:

- a. The reinforcing system is designed to perform this task, and
- b. The system manufacturer's guidelines are followed.

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Approved Document B - Fire safety requirement B1

The building shall be designed and constructed so that there are appropriate provisions for the early warning of fire and appropriate means of escape in case of fire from the building to a place of safety outside the building capable of being safely and effectively used at all material times.

Approved Document B1 states:

Provision for escape from the ground storey

2.3 Except for kitchens all habitable rooms in the ground storey should either:

- c. open directly onto a hall leading to the entrance or other suitable exit; or
- d. be provided with a window (or door) which complies with paragraph 2.8

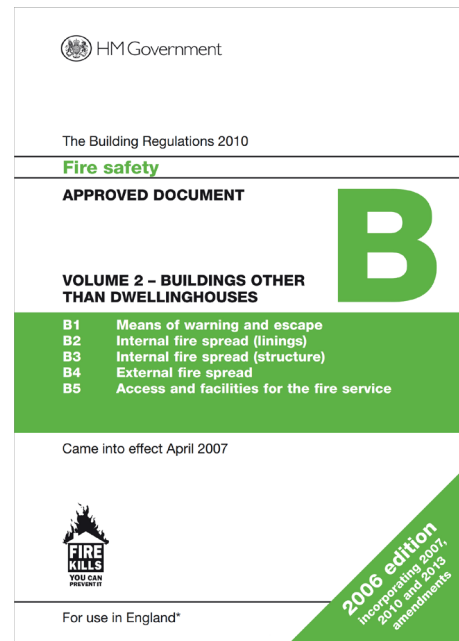
Provision for escape from upper floors not more than 4.5 metres above ground level

2.4 Except for kitchens, all habitable rooms in the upper storeys) of a dwellinghouse served by only one stair should be provided with:

- a. window (or external door) which complies with paragraph 2.8; or
- b. direct access to a protected stairway (as described in 2.6 (a) or (b))

2.6 The dwellinghouse may either have a protected stairway as described in (a) below, or the top floor can be separated and given its own alternative escape route as described in (b).

- a. The upper storeys (those above ground storey) should be served by a protected stairway (protected at all levels) which should either:
 - ii. extend to a final exit, see Diagram 2(a); or
 - iii. give access to at least two escape routes at ground level, each delivering to final exits and separated from each



other by fire-resisting construction and fire doors, see Diagram 2(b); or

- b. The top storey should be separated from the lower storeys by fire-resisting construction and be provided with an alternative escape route leading to its own final exit.

Emergency egress windows and external doors

2.8 Any window provided for emergency egress purposes and any external door provided for escape should comply with the following conditions.

- a. The window should have an unobstructed openable area that is at least 0.33m² and at least 450mm high and 450mm wide (the route through the window may be at an angle rather than straight through). The bottom of the openable area should be no more than 1100mm above the floor.
- b. The window or door should enable the person escaping to reach a place free from danger from fire. This is a matter for judgement in each case, but, in general, a courtyard or back garden from which there is no exit other than through other buildings

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would have to be at least as deep as the dwellinghouse is high to be acceptable.

Note 1: Approved Document K Protection from falling, collision and impact specifies a minimum guarding height of 800mm, except in the case of a window in a roof where the bottom of the opening may be 600mm above the floor.

Note 2: Locks (with or without removable keys) and stays may be fitted to egress windows, subject to the stay being fitted with a release catch, which may be child resistant.

Note 3: Windows should be designed such that they will remain in the open position without needing to be held in position by the person during their escape.

Note: Diagrams 2(a) and 2(b) are references to the Approved Document and not this guidance.

Work on existing houses

2.19 Where windows are to be replaced (but not where they are to be repaired only, as repair work to windows does not fall within the definition of building work) the replacement work should comply with the requirements of Parts L and K of Schedule 1. In addition, the building should not have a lesser level of compliance, after the work has been completed, with other applicable parts of Schedule 1.

For the purposes of Part B1, where a window is located such that, in a new dwelling house, an escape window would be necessary and the window is of sufficient size that it could be used for the purposes of escape then:

- a. the replacement window opening should be sized to provide at least the same potential for escape as the window it replaces; or
- b. where the original window is larger than necessary for the purposes of escape, the window opening could be reduced down to the minimum specified in paragraph 2.8.

Summary:

Refer to Figure 19 to determine if a fire egress window is required.

A fire escape window is required on the ground floor in any habitable room that does not open onto a hall leading directly to an exit door e.g. an inner room or a final exit door,

A fire escape window is required on upper floors not more than 4.5m above ground level in every habitable

room (unless the room has direct access to a “protected stairway”). This is usually the case for the upstairs of a conventional two-storey dwelling.

A habitable room does not include a kitchen or a bathroom.

Upper floors more than 4.5m above ground level should be accessed by a “protected stairway” or an alternative escape route and therefore fire escape windows are not required.

There is no requirement to have more than one escape window in a room.

A fire escape window should have an unobstructed openable area that is at least 0.33m^2 and at least 450mm high or 450mm wide. If one of the dimensions is at the 450mm minimum then the other dimension will need to be at least 734mm to achieve 0.33m^2 . The route through the window may be at an angle rather than straight through.

The bottom of the openable area should be no more than 1100mm above the floor.

If the outgoing window meets the minimum openable area size of 0.33m^2 and 450mm dimension, then the replacement should meet these minimum requirements. However, if the outgoing openable area exceeds the minimum requirements, there is no obligation for the new window to meet this larger size, as long as it meets the minimum requirement of 0.33m^2 and 450mm. Similarly, if the openable area complies by being less than 1100mm above floor level then the replacement should also comply by being less than 1100mm, but there is no obligation for it to be any lower than 1100mm above floor level even if the outgoing window is lower.

If the outgoing window does not meet the minimum openable area requirements, then the replacement window does not have to meet them, but the area, minimum dimension and height above floor level should not be made worse than the outgoing window.

Use the graph as a guide to ensure the correct openable area is achieved.

Sizes that intersect above the blue line will comply.

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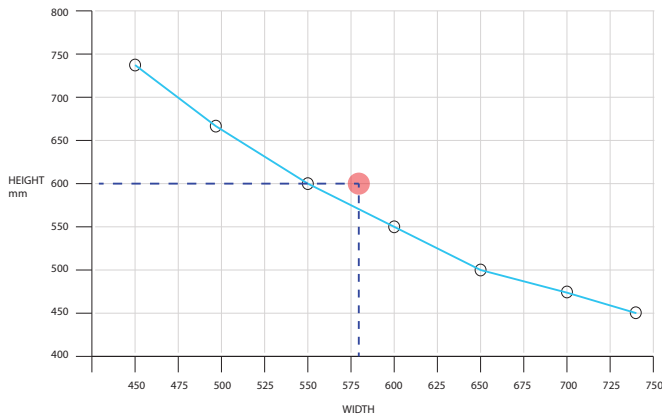


Figure 19: - This graphic shows an example of a compliant opening.

Approved document B3 states:

Internal fire spread (structure)

B3. (1) The building shall be designed and constructed so that, in the event of fire, its stability will be maintained for a reasonable period.

A wall common to two or more buildings shall be designed and constructed so that it adequately resists the spread of fire between those buildings. For the purposes of this sub-paragraph a house in a terrace and a semi-detached house are each to be treated as a separate building.

Where reasonably necessary to inhibit the spread of fire within the building, measures shall be taken, to an extent appropriate to the size and intended use of the building, comprising either or both of the following:

- Sub-division of the building with fire-resisting construction.
- Installation of suitable automatic fire suppression systems.

(4) The building shall be designed and constructed so that the unseen spread of fire and smoke within concealed spaces in its structure and fabric is inhibited.

Good Practice Note -

Replacement window hardware - In all windows identified as egress windows, suitable hardware should be installed to maximise the egress opportunity e.g. egress hinges and non key locking handles.

Smoke Detectors - Although it is not the responsibility of the replacement window company, every opportunity should be taken to advise the householder to have adequate working smoke detectors throughout the property to give early warning of fire.

Reducing Compliance - Although it is permissible to reduce compliance to the minimum required by Approved Document B, it is recommended that maximum escape opportunity is retained wherever possible, for example by retaining multiple escape windows in a room, particularly if they are on different elevations.

Non Compliance - If a replacement egress window cannot meet the minimum size requirements as defined within paragraph 2.8 of Approved Document B1 and also the proposed replacement can only provide a smaller egress size than the existing, refer to Local Authority Building Control who may grant dispensation. (this needs to be formally received prior to installation).

Stone Sills - If a box sash window is being replaced by a top hung sash as a means of complying with AD B and a protruding stone sill is being retained, the clear openable area must include the sill in this case and not be measured from the sash frame.

Particular care must be taken when replacing windows and doors within a timber framed building.

In most cases there will be a fire break between the window frame and cavity within the timber structure. If there is no fire break present one must be in place before the replacement window or door is fitted

This fire break must be installed without exception in order to maintain the fire suppression properties as laid down in the Approved Document B3 (4).

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Fire Egress Flow Chart

For ground and upper floors not more than 4.5 metres above ground level.

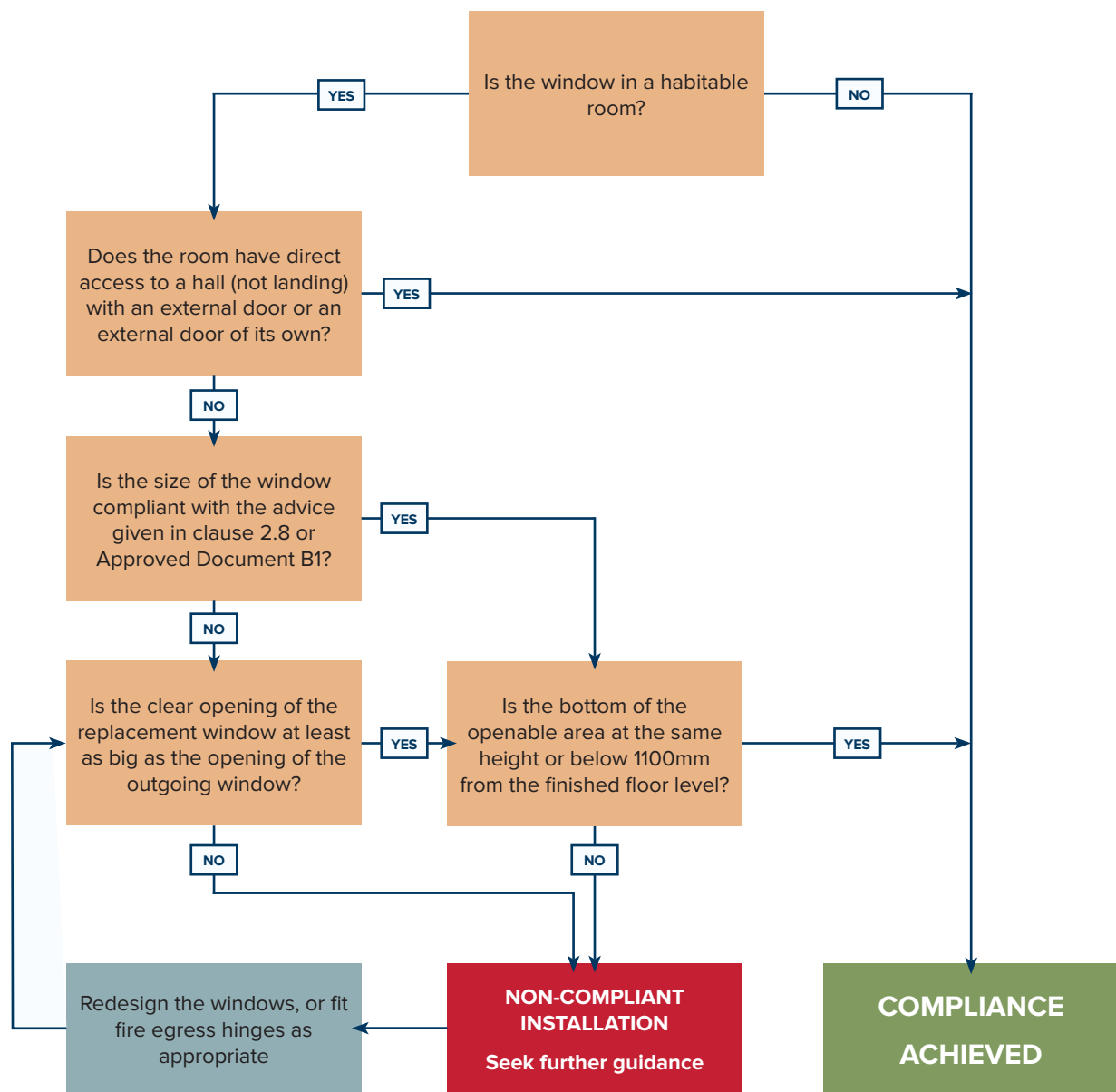


Figure 20: - Fire Egress Flow Chart

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Approved Document C – Site preparation and resistance to contaminants and moisture

Requirement C2

Resistance to moisture

The floors, walls and roofs of the building shall adequately protect the building and people who use the building from harmful effects caused by:

- a. Ground moisture.
- b. Precipitation.
- c. Interstitial and surface condensation.
- d. Spillage of water from or associated with sanitary fittings or fixed appliances.

Approved Document C states:

Joint between doors and windows

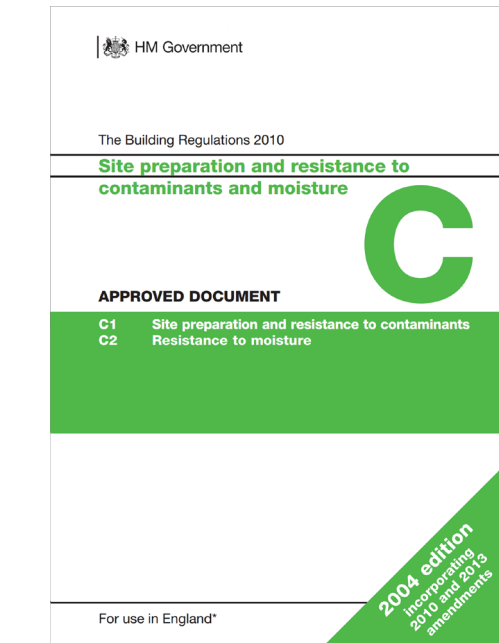
5.29 The joint between walls and door and window frames should:

- f. resist the penetration of precipitation to the inside of the building; and
- g. not be damaged by precipitation and not permit precipitation to reach any part of the building which would be damaged by it

5.30 Damp-proof courses should be provided to direct moisture to the outside:

- a. where downward flow of moisture would be interrupted at an obstruction e.g. at a lintel
- b. where sill elements, including joints, do not form a complete barrier to the transfer of precipitation, e.g. under openings, windows and doors
- c. where reveals, including joints do not form a complete barrier to the transfer of rain and snow, e.g. at openings, windows and doors

5.31 In some cases the width of the cavity due to thermal insulation and the 50mm clearance for drainage may be such that the window frame is not wide enough to completely cover the cavity closer. The reveal may need to be lined with plasterboard, dry lining, a



support system or a thermal backing board. Direct plastering of the reveal should only be used with a backing of expanded metal lathe or similar.

5.32 In areas of the country in driving rain exposure zone 4 checked rebates should be used in all window and door reveals. The frame should be set back behind the outer leaf of masonry, which should overlap it as shown in (Diagram 13). Alternatively an insulated finned cavity closer may be used.

Door Thresholds

5.33 Where an accessible threshold is provided to allow unimpeded access, as specified in Part M, Access to and use of buildings, it will meet the requirements if:

- a. the external landing is laid to a fall between 1 in 40 and 1 in 60 in a single direction away from the doorway
- b. the sill leading up to the door threshold has a maximum slope of 15°

Note: Diagrams 13 and 14 refer to the Approved Document and are not shown in this guide.

Summary:

When existing windows are removed from a cavity wall, the vertical DPC or cavity closer should be

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inspected to ensure it is complete and un-damaged.

When existing windows are removed from a cavity wall, the horizontal cavity, DPC or cavity closer at the base of the window should be inspected to ensure moisture will not penetrate from the external skin of the wall to the inner skin of the wall.

Note: Remedial works to ensure compliance in both these situations should be completed prior to the installation of each window.

When existing windows are removed from a wall built with a checked rebate, the vertical DPC or cavity closer should be inspected to ensure it is complete and undamaged. Remedial works to ensure compliance should be completed prior to the installation of window. Windows should be re-fitted with a check rebate to ensure compliance with Approved Document C.

Windows should be installed on a bed of sealant across the sill and beads of sealant applied vertically to the DPC or cavity closer and horizontally across the head of the window to form a seal between the rear of the window and the wall. Insulation of suitable backing materials such as closed cell foam roll should be used in the gap between the window and wall. This will ensure the external sealant adheres to the frame and wall when applied.

Suitable external sealant should be applied to cover and form a water resistance joint between the frame and wall.

When the existing door is removed, confirm the type of sill detail fitted, this will either be a conventional sill or an accessible threshold sill.

If a conventional sill is fitted, the DPC and vertical DPC should be inspected for damage and if necessary repaired or replaced prior to the installation of the new door. Where a door with accessible threshold is removed, the original method of installation needs to be determined (e.g. directly onto a concrete sill with a DPC wrapped between the threshold and sill, on a timber sill fitted below finished floor level etc.) and the water tightness of the system confirmed.

If a conventional sill is being installed, the door should be fitted in a similar way as described above for

windows.

If an accessible (low) threshold is being installed into an opening that originally had an accessible threshold fitted, the door should be installed in the same manner as the original door was fitted with a DPC between the bottom of the threshold and the stone or timber sill with a sealant between the threshold and DPC.

If an accessible threshold is being installed where a conventional sill was originally fitted, some additional works may be necessary to correct the height of the sill below the door and to ensure surface water is directed away from the door to a suitable drainage channel or run-off.

Details of accessible threshold designs can be obtained from The Stationery Office – Accessible thresholds for new housing or BRE guidance IP17/01.

Doors should be sealed externally as described for windows above but care should be taken to ensure drainage holes in the external face of the threshold are not blocked.

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Approved Document F – Ventilation

Requirement F1

There shall be adequate means of ventilation provided for people in the building.

For new dwellings, a target of four air changes per hour is required to ensure suitable ventilation.

The installation of replacement windows should ideally achieve the requirements for new buildings however, if this is not possible the replacement windows should not make the existing capability worse.

There are two different types of ventilation that are required within a building.

1. Purge ventilation

Purge ventilation is required to remove high levels of pollutants and water vapour. It may also improve thermal comfort and reduce overheating during the summer.

Requirements for purge ventilation via windows.

For hinged or pivot windows that open 30 degrees or more, or for sliding sash windows, the area of the opening should be at least 1/20th of the floor area of the room.

For a hinged or pivot window that opens less than 30 degrees, the area of the opening should be at least 1/10th of the floor area of the room.

Note 1: For this purpose the opening area of a hinged or pivot window can be taken as the overall width x height of the opening sash.

Note 2: The opening areas for all windows in a room can be added together for the above purpose.

Note 3: It is good practice that any existing high level purge ventilation should be maintained. For example, when replacing a vertical sliding sash window, it is strongly recommended that two opening sashes (vertical slider or two top hung lights) or a tilt turn window are used. If a fixed top light is used, a suitably sized trickle ventilator should be installed.

2. Background ventilation

It is important that the dwelling can constantly breathe - good indoor air quality is important for health and also helps protect the fabric of the building from the harmful effects of condensation and mould etc. Background ventilation helps to



achieve this.

Requirements for background ventilation.

Where the outgoing window provided background ventilation, the replacement window should also provide background ventilation. It is acceptable for alternative high level ventilation to be provided, e.g. high level air brick. Typically, background ventilation is positioned at least 1.7 metres above finished floor level to avoid discomfort due to draughts.

Where trickle ventilators are used to provide background ventilation then the following performance is required:- habitable rooms 5000mm² equivalent area. Kitchens, bathrooms and other wet room areas require 2500mm² equivalent area.

If a trickle ventilator is fitted in the window that is being replaced, then a trickle ventilator should be fitted to the new window or an appropriately sized air brick fitted. (Two stage locking handles are not acceptable as an alternative to trickle ventilators.)

If trickle ventilators are not fitted, but two-stage locking handles are fitted in the windows being removed, then either:

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- a. trickle vents can be fitted as an alternative, or
- b. two-stage locking handles can be fitted or
- c. appropriate air-bricks can be fitted.

If no ventilation is provided in the windows being removed then a number of options are available to the consumer. Consideration should be given to the fitting of:

- a. trickle vents, or
- b. two-stage locking handles, or
- c. air bricks

The key point is that the building work, once completed, should not have a worse level of compliance than before commencement of the work. Therefore the customer can, in these circumstances, opt not to fit ventilators.

The provision of permanent ventilators for combustion appliances is a mandatory requirement as laid out in Approved Document J. Seek advice from a Gas Safe registered engineer to establish the level of required ventilation. See also Section J within this guidance.

Good Practice Note - When specifying replacement windows the current level of ventilation in each room should be assessed. If you consider that it is inadequate, advise the customer of the options available. Ensure that whichever method is chosen meets the necessary level of compliance.

Where the existing purge ventilation area is in excess of the requirements, although it is acceptable to reduce this to the minimum level required in the Approved Document, consideration should be given to retaining the existing level.

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Approved Document C – Combustion appliances and fuel storage systems

Air supply

J1. Combustion appliances shall be so installed that there is an adequate supply of air to them for combustion, to prevent overheating and for the efficient working of any flue.

Discharge of products of combustion

J2. Combustion appliances shall have adequate provision for the discharge of products of combustion to the outside air.

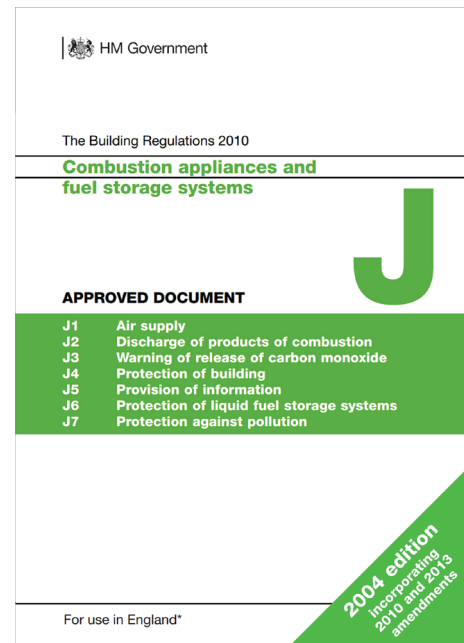
Note: J1 and J2 apply only to fixed combustion appliances (excluding incinerators)

Air supply for combustion appliances

- 1.2 Combustion appliances require ventilation to supply them with air for combustion. Ventilation is also required to ensure the proper operation of flues or, in the case of flueless appliances, to ensure that the products of combustion are safely dispersed to the outside air. Installation of room-sealed appliances or those with a directly connected ducted external air supply will minimise ventilation energy losses from the room and the risk of cold draughts. In some cases, combustion appliances may also require air for cooling control systems and/or to ensure that casings remain safe to touch (see Diagram 8). General guidance on where it may be necessary to install air vents for these purposes is given below.
- 1.3 Air vent sizes, which are dependent upon the type of fuel burned, are given in Sections 2, 3 and 4 and are for one combustion appliance only. The air supply provisions will usually need to be increased where a room contains more than one appliance (such as a kitchen containing an open-flued boiler and an open-flued cooker).

Permanently open ventilation of rooms

- 1.4 A room containing an open-flued appliance may need permanently open air vents. An open-flued appliance should receive a certain amount of air from outside ('combustion air' in Diagram 8) dependent upon its type and rating. Infiltration through the building fabric



may be sufficient but for certain appliance ratings and forms of construction, permanent openings are necessary (see Diagram 8).

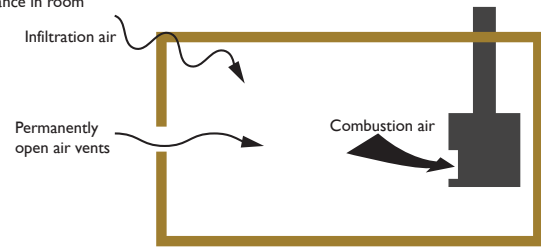
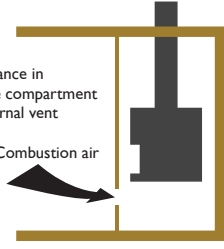
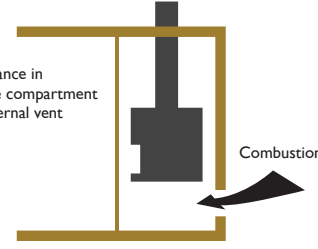
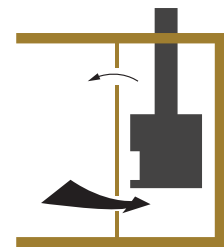
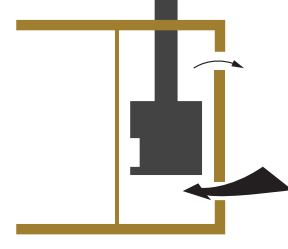
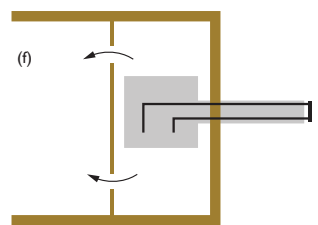
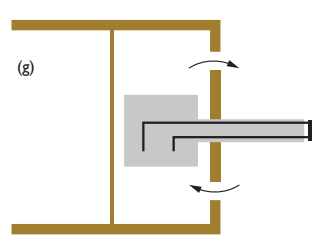
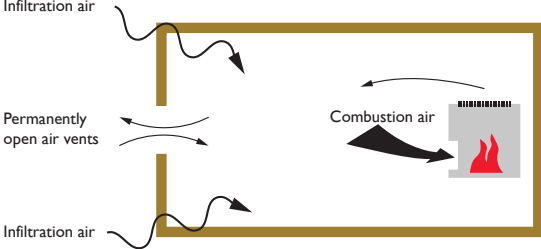
Approved Document J paragraphs 1.18 and 1.19 make provision for using ventilation which satisfies the requirements for part F and J and states:

- 1.18 Rooms or spaces intended to contain open-flued combustion appliances may need permanent ventilation to comply with Part J and adjustable ventilation to comply with Part F. Permanently open air vents for combustion appliances can be accepted in place of some or all of the adjustable background ventilation for health, dependent upon opening area and location. However, adjustable vents installed to meet the requirements of Part F cannot be used as substitutes for the ventilation openings needed to comply with Part J unless they are fixed permanently open.

ANNEX B:

Building Regulations - England and Wales

General air supply to a combustion appliance

OPEN FLUED		ROOM SEALED
<p>Air for combustion and operation of the flue</p>	<p>(a) Appliance in room</p>  <p>(b) Appliance in appliance compartment with internal vent</p>  <p>(c) Appliance in appliance compartment with external vent</p> 	<p>No provisions necessary</p>
<p>Where cooling air is needed</p>	<p>(d)</p>  <p>(e)</p> 	<p>(f)</p>  <p>(g)</p> 
FLUELESS		
<p>Air for combustion and to carry away its products</p>	<p>(h)</p> 	<p>Figure 21: - Air supply to a combustion appliance</p>

ANNEX B:

Building Regulations - England and Wales

1.19 Rooms or spaces intended to contain flueless appliances may need: permanent ventilation and purge ventilation (such as openable windows) to comply with Part J; and adjustable ventilation and rapid ventilation to comply with Part F. Permanent ventilation provisions to comply with Part J may be acceptable in place of adjustable ventilation provisions for Part F subject to the limitations described in Paragraph 1.18. Openable elements installed for the rapid ventilation of rooms and other provisions made for the rapid ventilation of kitchens, in order to comply with Part F, may be acceptable in place of openable elements for the rapid ventilation of rooms or spaces containing flueless appliances.

Limitation on requirements

In accordance with regulation 8 of the Building Regulations, the requirements in Parts A to D, F to K and N and P (except for paragraphs G2, H2 and J6) of Schedule 1 to the Building Regulations do not require anything to be done except for the purpose of securing reasonable standards of health and safety for persons in or about buildings (and any others who may be affected by buildings or matters connected with buildings). The replacement window should not make the ventilation requirements any worse for any combustion appliance which is using permanently open vents installed through the window. If a replacement window installer is not sure if a window vent is being used to ventilate a gas appliance, a "Gas Safe" registered gas fitter should be consulted Figure 9 to provide advice.

Particular care should be taken when installing replacement windows in rooms with a gas cooker, provision for a gas cooker or other flueless appliances such as water or space heaters.

In the case of a gas cooker (or provision for a gas cooker), the size of permanently open ventilation is dependent on the volume of the room. If the room is below 5m³, 10,000mm² equivalent free area of permanent ventilation is required, between 5m³ and 10m³, 5,000 mm² (no permanent opening required if the room has a door that opens directly to outside) and over 10m³, no permanently open vent needed.

Instantaneous water heaters require the same permanently open ventilation but the volume limits are under 10m³, between 10m³ and 20m³ and over 20m³ respectively.

Space heaters installed in areas not classed as internal space, i.e. a room which communicates with several other rooms or spaces, e.g. a hallway or landing, requires permanently open ventilation of 10,000mm² plus 5,500mm² per kW input (net) in excess of 2.7kW (net).

Space heaters installed in an internal space, e.g. a lounge, requires permanently open ventilation of 10,000 mm² plus 2,750mm² per kW input (net) in excess of 5.4kW (net).

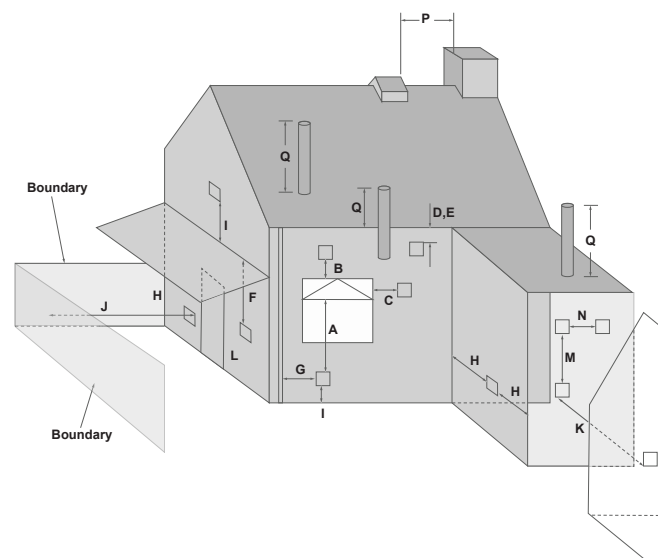


Figure 22: - Location of outlets from flues serving gas appliances

ANNEX B:

Building Regulations - England and Wales

Approved Document L - Conservation of fuel and power

Requirement L1B

1. Where a person intends to renovate a thermal element, such work shall be carried out as is necessary to ensure that the whole thermal element complies with the requirements of paragraph L1(a)(i) of schedule 1
2. Where a thermal element is replaced, the new thermal element shall comply with the requirements of paragraph L1(a)(i) of schedule 1

Windows

To comply with the 2010 edition of Approved Document L1B, replacement windows should comply with one of the following:

- a. Window Energy Rating minimum (WER) band C
- b. Whole window U-Value maximum 1.6 (W/m²·K)
- c. Centre pane U-Value maximum 1.2 (W/m²·K) (For exceptional circumstances only e.g. historic buildings or unique windows).

Doors

All replacement external doors should have a U-value not exceeding 1.8 (W/m²K)

Table 1 Section 4 Document L1B

Currently for registration of replacement doors through the competent persons scheme, only doors with greater than 50% glazing have to be registered.

British Fenestration Rating Council (BFRC) Window Energy Rating Scheme

The BFRC Window Energy Rating scheme determines the energy rating of a window i.e. demonstrates how energy efficient a particular window is. The scheme takes into account the overall window and not just the insulating glass unit; it measures the window U-value, the solar gain and the air loss to produce an accurate performance figure which grades the window into one of seven bands A++ to E. The Window Energy Rating scheme is recognised way of demonstrating



compliance similar to that displayed on all new household 'white goods' such as refrigerators, freezers, washing machines, electric ovens etc. that can be found in many retail outlets.

The more efficient the product, the less energy or heat escapes from the property therefore saving the homeowner money and reducing environmental impact. The highest rated products are labelled 'A++' with the least efficient rated 'E'.

Building Regulations ask for a Window Energy Rating Band 'C' or better. This is one of a number of alternative methods to demonstrate compliance.

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For additional information on how to gain a BFRC Window Energy Rating, or to see the various options for window installers and fabricators, go to the web site: www.bfrc.org

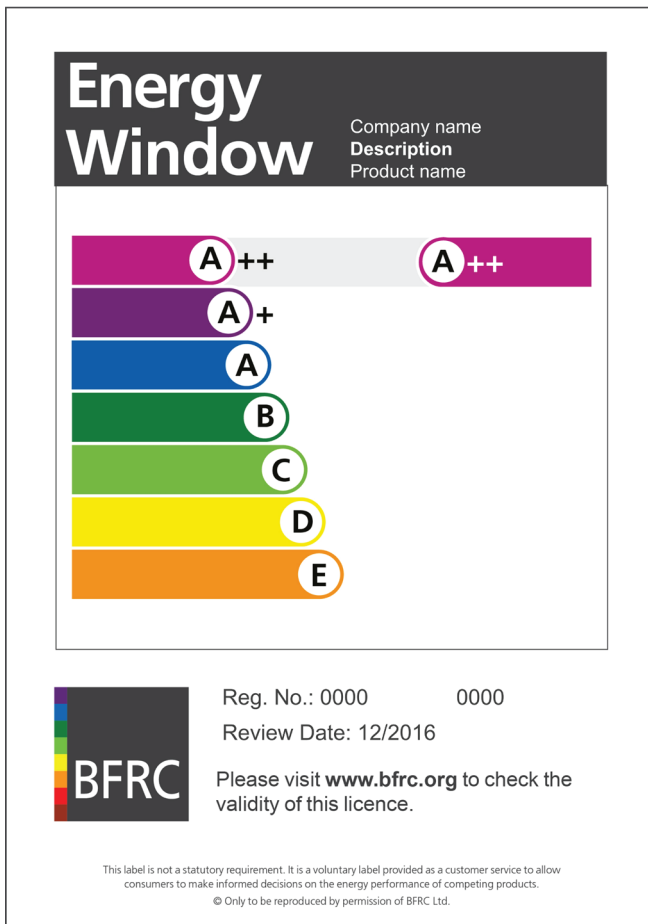


Figure 23: - Window Energy Rating

ANNEX B:

Building Regulations - England and Wales

Approved Document M - access to and use of buildings

Requirement M1

Reasonable provision shall be made for people to:

- a. Gain access to; and
- b. Use the building and its facilities.

The requirement of Part M is that you should not make the building less accessible than it was before the installation. The height of the sill for a door should not be made worse. In practice there is often a compromise between compliance (not make access worse) and performance (weatherproofing).

When the outgoing door is compliant with new build requirements the replacement shall also be compliant.

Where the door pre-dates the 2004 legal requirements, the installer should make compliance no worse and make every effort to minimise the hazard and comply with the following:

- a. Protected doorways, and doors in areas of low weather exposure, should be fitted with a threshold sill which gives a height of no greater than 35mm.
- b. Doors in areas of high exposure, and therefore prone to water ingress, should be fitted with a threshold height of no greater than 50mm.
- c. In some situations, due to design considerations, it may not be possible to install a low threshold sill of the requirements as stated above. In these situations, a gap of up to 35 mm measured from the underside of the door leaf to the finished floor level would normally be considered acceptable.

The principal entrance to a dwelling should ideally have a clear opening width of 775mm. When replacing the principal entrance door every practicable effort should be made to retain the maximum width. The clear opening width is taken from the edge of the frame on the latch side to the face of the door leaf when open at an angle of 90°.

All door installations should comply with the requirements of Approved Document C in relation to



resistance to moisture. If the original principal entrance door was fitted after 2004, it should already be fully compliant with the Building Regulations. If being replaced, only this door needs to meet the requirement specified within Approved Document M. Although other replacement doors within the property should not have a lesser level of compliance, they are not required to meet the requirements of Approved Document M.

Further guidance can be provided by the Stationery Office's publication "Accessible thresholds in new housing: Guidance for house builders and designers".

Good Practice Note - When surveying or specifying a window or door for a dwelling, the surveyor should make note of the person, or persons occupying or using the dwelling. Special consideration should be given to occupants with disabilities. It is not possible to provide a universal solution, so the installation should be suited to the occupants' requirements. These may include low height door thresholds, increased width door sets and suitable positioning and type of door furniture.

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Approved Document K: 2013

Protection from falling, collision and impact

Requirement K4: Protection against impact with glazing

Glazing, with which people are likely to come into contact whilst moving in or about the building, shall:

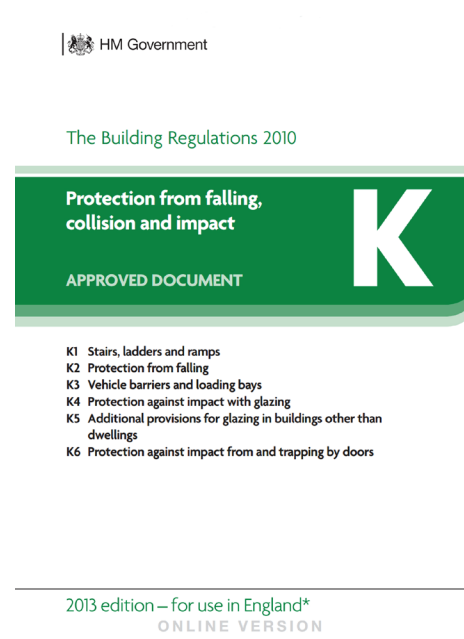
- if broken on impact, break in a way which is unlikely to cause injury or;
- resist impact without breaking or;
- be shielded or protected from impact

Performance

In the Secretary of State's view, you can meet requirement K4 if you adopt, in critical locations, one of the following approaches:

- Measures to limit the risk of cutting and piercing injuries by the use of glazing that is reasonably safe, such that, if breakage did occur, any particles would be relatively harmless.
- Use of glazing sufficiently robust to ensure that the risk of breakage is low.
- Steps are taken to limit the risk of contact with the glazing.

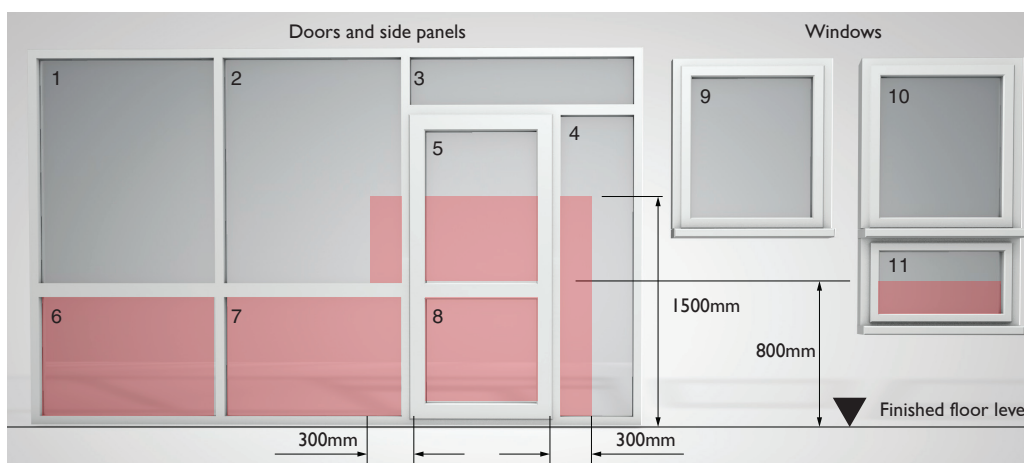
Impacts with glazing, particularly glazing in doors and door side panels, and at low level in walls and partitions, can result in cutting and piercing injuries. For doors and door side panels, the risk is greatest for



glazing between floor and shoulder level when near to door handles and push plates, especially when normal building movement causes doors to stick.

Hands, wrists and arms are particularly vulnerable. An initial impact at between waist and shoulder levels can be followed by a fall through the glazing, resulting in additional injury to the face and body.

In walls and partitions, away from doors, the risks relate predominantly to glazing at low level. At that level, children are especially vulnerable.



Glazing in critical locations

Any glazed area that is either all or part shaded, is in a critical location to which requirement K4 applies. This would apply to areas numbered: 2,4,5,6,7,8 and 11

Figure 24: - Glazing in critical locations

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Safe breakage

5.3 Safe breakage is defined in BS EN 12600 section 4 and BS 6206 clause 5.3. In an impact test, a breakage is safe if it creates one of the following.

- a. A small clear opening only, with detached particles no larger than the specified maximum size.
- b. Disintegration, with small detached particles.
- c. Broken glazing in separate pieces that are not sharp or pointed.

5.4 A glazing material would be suitable for a critical location if it complies with one of the following.

It satisfies the requirements of Class 3 of BS EN 12600 or Class C of BS 6206.

It is installed in a door or in a door side panel and has a pane width exceeding 900mm and it satisfies the requirements of Class 2 of BS EN 12600 or Class B of BS 6206.

Note: All glazing in buildings must comply with BS 6262-4 Glazing for Buildings – Part 4 Clause 7 Marking for safety glazing.

General

Installed safety glass and safety plastics in critical locations is to be indelibly marked in such a position so that the marking is visible after installation.

Safety glass

The installed safety glass should be clearly and indelibly marked with the following information:

- The name and trade mark of the manufacturer, merchant or installer
- The identifier of the product standard the safety glass conforms to; e.g.
BE EN 12150;
BS EN 14179;
BS EN 14449; and
- The classification according to BS EN 12600

A non-compliance will be recorded during an inspection if the mark is not both completely visible and clearly legible following installation.

Sliding sash replacement: If any part of the top sash falls below 800 mm from finished floor when opened

it must have safety glass installed.

The table below shows the relationship between safety glazing marking in accordance with Approved Document K (2013 Edition) and BS6262-4

Table 4:

Safety Glass Type	Installed glass - Marking in accordance with	
	BS 602:1981	BS 6062 - 4: 2005
Thermally toughened soda lime silicate safety glass	Glass Co. BS 6206 T, A	Glass Co. EN 12150 1(C)1, 2 or 3
Laminated safety glass	Glass Co. BS 6206 L, B	Glass Co. EN 14449 2 (B)2
Safety wired glass	Glass Co. BS 6206 W, C	Glass Co. EN 572-9 3 (B)3

Robustness

5.5 Some glazing materials such as annealed glass gain strength through thickness; others such as polycarbonates or glass blocks are inherently strong.

The maximum dimensions for annealed glass of different thicknesses for use in large areas forming fronts to shops, showrooms, offices, factories and public buildings with four edges supported are shown in Diagram 5.2 (see also paragraph 7.1).

Glazing in small panes

5.6 In the context of this approved document, a 'small pane' is an isolated pane or one of a number of panes held in glazing bars, traditional leaded lights or copper lights (see Diagram 5.3).

5.7 Small panes should be provided in accordance with all of the following.

- a. In a small annealed glass pane, use glass with a minimum 6mm nominal thickness except in the situation described in b.
- b. In traditional leaded or copper lights, when fire resistance is not important, you may use 4mm glass.

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The maximum area of a single pane is not to exceed 0.5m² and small panes of annealed glass should not be less than 6mm in thickness.

Polymeric backed safety film can be applied to certain glass types. The application of the film can provide the glass product with safety characteristics. BS EN 15752 part 1 contains the definitions and requirements for polymeric film and BS EN 15755 part 1 gives the definitions and requirements for polymeric filmed glass.

Good Practice Note - The critical locations set out above for the positioning of safety glazing are minimum requirements. In certain circumstances and in consultation with the customer, it would be advantageous to supply and install safety glazing material in other situations which the surveyor considers hazardous following his risk assessment. Consideration should be given to the type of safety glazing material used. In certain environments the containment of broken safety glass is crucial.

Although not necessarily a permanent fixture, a bunk bed positioned next to a window could also be a significant risk. In such circumstance, if the window is fixed, it must also act as a barrier.

For further information on the use of safety glazing in critical locations, please refer to the GGF publication 'The Right Glazing in the Right Place'.

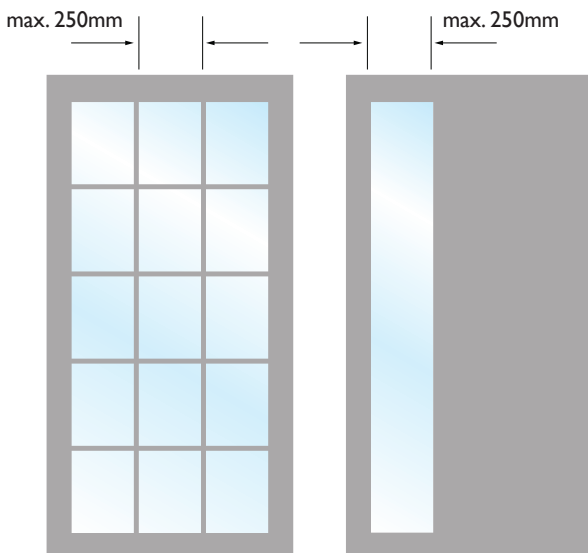


Figure 25: - Dimensions and areas of small panes

Permanent screen protection

5.8 If glazing in a critical location is protected by a permanent screen then the glazing itself does not need to comply with requirement K4.

The permanent screen should comply with all of the following.

- Prevent a sphere of 75mm from coming into contact with the glazing.
- Be robust.
- If it protects glazing installed to help prevent people from falling, be difficult to climb (e.g. no horizontal rails).

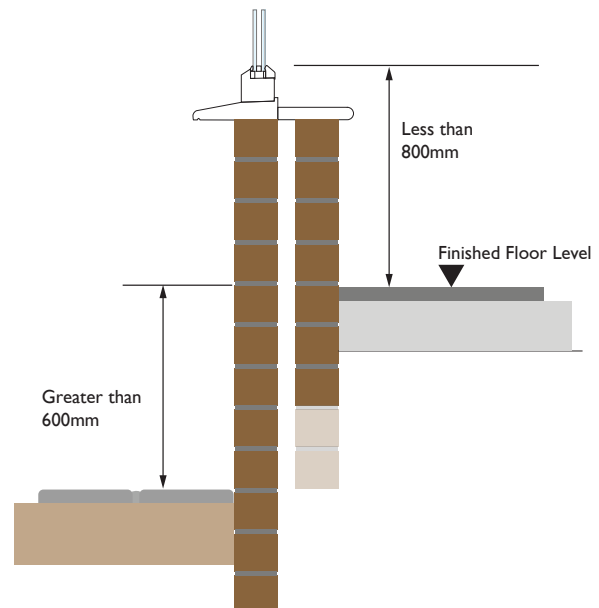


Figure 26: - Permanent screen protection

Good Practice Note - Figure 26 shows a situation where a fixed window will need to have safety glazing material in accordance with requirement K4 and act as a barrier in line with requirement K2 of AD K. An explanation of requirement K2 is given under the heading Glass in all buildings on page 62.

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Approved Document Q - Security

Requirement Q1

Reasonable provision must be made to resist unauthorised access to:

- a. any dwelling; and
- b. any part of a building from which access can be gained to a flat within the building

Requirement Q1 applies only in relation to new dwellings.

Section 1: Doors

General

- 1.1 All doorsets (including garage doorsets and communal entrance doorsets) that provide access into a dwelling or into a building containing a dwelling should be secure doorsets in accordance with paragraphs 1.2 to 1.4.

Note: If a garage has no interconnecting doorset allowing access into the dwelling, garage doors need not be secure doorsets. Where access to the dwelling can be gained via an interconnecting doorset from the garage, then either the garage doorset (pedestrian and vehicular) or the interconnecting doorset should be a secure doorset.

Design of secure doorsets

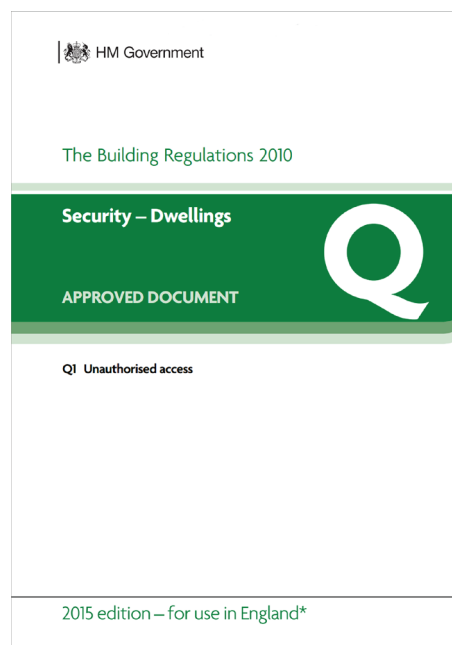
- 1.2 Secure doorsets should be either:
 - a. manufactured to a design that has been shown by test to meet the security requirements of British Standards publication PAS 24:2012, or
 - b. designed and manufactured in accordance with Appendix B.

Note: Doorsets satisfying other standards that provide similar or better performance are also acceptable. These standards include:

- STS 201 Issue 5:2013
- LPS 1175 Issue 7:2010 security rating 2
- STS 202 Issue 3:2011 burglary rating 2
- LPS 2081 Issue 1:2015 security rating B.

Further advice is available in Secured by Design's New Homes 2014.

- 1.3 Letter plates, where provided, should:



- a. have a maximum aperture of 260mm x 40mm, and
- b. be located and/or designed to hinder anyone attempting to remove keys with sticks and/or insert their hand, for example by incorporating a flap or other features to restrict.

Note: Letter plates meeting the requirements of the Door and Hardware Federation's (DHF) technical specification TS 008:2012 have been shown to protect against the attacks mentioned above.

- 1.4 The main doors for entering a dwelling (usually the front door) should have a door viewer unless other means exist to see callers, such as clear glass within the door or a window next to the doorset. The same doorset should also have a door chain or door limiter.

Note: In some situations a door chain or limiter is not appropriate, for example where a warden may need emergency access to residents in sheltered housing. Alternative caller-identification measures, such as electronic audio-visual door entry systems, can be used to identify visitors.

Installation and fixing of secure doorsets

- 1.5 Frames should be mechanically fixed to the structure of the building in accordance with the manufacturer's installation instructions.
- 1.6 Lightweight framed walls should incorporate a resilient layer to reduce the risk of anyone breaking through the wall and accessing the locking system.

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- 1.7 The resilient layer should be timber sheathing at least 9mm thick, expanded metal or a similar resilient material. The resilient layer should be to the full height of the door and 600mm either side of the doorset.

Section 2: Windows

General

- 2.1 Ground floor, basement and other easily accessible windows (including easily accessible rooflights) should be secure windows in accordance with paragraphs 2.2 and 2.3.

Design of secure windows

- 2.2 Windows should be made to a design that has been shown by test to meet the security requirements of British Standards publication PAS 24:

Note; Windows satisfying other standards that provide similar or better performance are also acceptable. These standards include:

- STS 204 Issue 3:201
- LPS 1175 Issue 7:2010 security rating 1
- LPS 2081 Issue 1:2015 security rating A.

Further advice is available in Secured by Design's New Homes 2014.

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Materials and workmanship

Building work shall be carried out-

- a. with adequate and proper materials which:
 - i. are appropriate for the circumstances in which they are used,
 - ii. are adequately mixed or prepared, and
 - iii. are applied, used or fixed so as adequately to perform the functions for which they are designed; and
- b. in a workmanlike manner.

Section 1: Materials

- 1.1 Building work must meet the functional requirements of Schedule 1 to the Building Regulations.

Approved documents refer to materials covered by harmonised European product standards, British Standards and other technical specifications. However, there is no obligation to adopt any particular solution contained in an approved document in order to meet functional requirements; the references are not exclusive and other materials may be suitable in the particular circumstances.

Ways of establishing the fitness of materials

- 1.2 You can assess the suitability of a material for use for a specific purpose in a number of ways, as described in paragraphs 1.3 to 1.21.

CE marking under the Construction Products Regulation

- 1.3 Many materials are construction products that have CE marking under the Construction Products.

Regulation (305/2011/EU-CPR).

The Construction Products Regulation requires that construction products on the EU market covered by a harmonised European product standard should normally have CE marking. In addition, manufacturers of products not covered by a harmonised standard can choose to affix CE marking to their products by obtaining a European Technical Assessment.

NOTE: You can find a list of the harmonised product standards under



the Construction Products

Regulation on the NANDO information system website at <http://ec.europa.eu/enterprise/newapproach/nando/index.cfm?fuseaction=cpd.hs>.

- 1.4 CE marking includes the reference of the product standard and the levels or classes of performance being declared against some or all of the characteristics covered by the standard. The CE marking should be on the product, its label, the packaging or accompanying documents. The CE symbol by itself does not necessarily indicate that the material is suitable for the building work.
- 1.5 In addition to CE marking, the product will have a declaration of performance containing more detailed information on the product. This may be a paper or electronic document, or it may be on a website. It is essential to check that the declared performance is suitable for the building works.
- 1.6 In the absence of indications to the contrary, the building control body should assume that the information given in the CE marking and declaration of performance is accurate and reliable, and that the product meets the declared performance.
- 1.7 If the declared performance of a product is suitable for

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its intended use, the building control body should not prohibit or impede the use of the product.

CE marking under other EU directives and regulations.

- 1.8 Products may have CE marking under European legislation such as the Gas Appliances Directive or the Pressure Equipment Directive. Such CE marking shows that the product meets the essential requirements set out in the legislation - for example, minimum safety requirements - and can be placed on the EU market.
- 1.9 Some products have CE marking in accordance with both the Construction Products Regulation and other legislation. The CE marking shows that the product complies with the requirements in all relevant EU legislation.

British Standards

- 1.10 Nearly all British Standards for construction products are the British versions of harmonised European standards used for CE marking. The BSI numbering policy is to adopt the CEN numbering, prefaced with BS, e.g. BS EN 197-1:2000.
- 1.11 Some British Standards are the British version of non-harmonised European standards; these also adopt the CEN numbering, prefaced with BS. These do not contain an Annex ZA, so CE marking cannot be affixed to products made to these standards.
- 1.12 Some British Standards for products not covered by a European standard will continue to exist.
- 1.13 Where a construction product has been made and assessed in accordance with one or more British Standards referred to in 1.11 and 1.12, this may show whether the product is suitable for its intended use.

Other national and international technical specifications

- 1.14 An international technical specification, including those prepared by ISO, or a national technical specification of a country other than the UK, may be used to demonstrate that a product not covered by a harmonised European standard meets the performance requirements of the Building Regulations. Where necessary, the person who intends to carry out

the work should obtain translations of specifications and demonstrate how the material meets the requirements of regulation 7.

NOTE: The national technical specifications of EU member states (and non-EU countries that are full members of CEN) are being progressively replaced by harmonised European standards, as is the case with British Standards.

Independent certification schemes

- 1.15 There are many independent product certification schemes in the UK and elsewhere that may provide information on the performance of a product. Such schemes certify that a material complies with the requirements of a recognised document and indicates it is suitable for its intended purpose and use. These may be in addition to, but not conflict with, CE marking.

NOTE: Materials which are not certified by an independent scheme might still conform to a relevant standard.

- 1.16 Accreditation of a certification body by a national accreditation body belonging to the European co-operation for Accreditation (EA) provides a means of demonstrating that their certification scheme can be relied upon. In the UK, most independent certification bodies are accredited by the United Kingdom Accreditation Service (UKAS), which belongs to the EA. It is important to check the scope of the accreditation of a certification body, as accreditation might cover only part of the certification body's testing or certification business.

Tests and calculations

- 1.17 Where there is no relevant harmonised European standard, tests, calculations or other means may be used to demonstrate that the material can perform the function for which it is intended. UKAS or an equivalent national accreditation body belonging to the EA may accredit the testing laboratories; this accreditation provides a means of showing that tests can be relied on.

Past experience

- 1.18 Past experience, such as use in an existing building, may show that the material can perform the function for which it is intended.

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Sampling

- 1.19 Under regulation 46 of the Building Regulations, local authorities have the power to take samples as necessary to establish whether materials to be used in building work comply with the provisions of the regulations.
- 1.20 Regulation 46 does not apply to any work specified in an initial notice or to any work for which a final certificate has been given by an approved inspector and accepted by the local authority.
- 1.21 Regulation 8 of the Building (Approved Inspectors etc.) Regulations 2010 provides that an approved inspector, having given an initial notice which continues to be in force, may take samples of material as are reasonable to establish within the limits of professional skill and care that regulation 7 of the Building Regulations or any other applicable regulations are complied with.

Short-lived materials

- 1.22 Some materials, in the absence of special care, may be considered unsuitable because of their rapid deterioration in relation to the expected life of the building.
- 1.23 A short-lived material which is readily accessible for inspection, maintenance and replacement may meet the requirements of the regulations if the consequences of failure are not likely to be serious to the health or safety of people in and around the building.
- 1.24 If a short-lived material is not readily accessible for inspection, maintenance and replacement, and the consequences of failure are likely to be serious for health or safety, it is unlikely that the material will meet the requirements of the regulations.
- 1.25 As noted in paragraph 0.2, local authorities have the power to impose conditions on the use of short-lived materials.

Materials susceptible to changes in their properties

- 1.26 The properties of some materials can change in certain environmental conditions. These changes can affect the performance of the materials over time.

- 1.27 Materials that are susceptible to changes in their properties may be used in building work and will meet the requirements of the regulations if the residual properties, including the structural properties, meet both of the following conditions.
- Residual properties can be estimated at the time of their incorporation in the work.
 - Residual properties are shown to be adequate for the building to perform the function for which it is intended, for the expected life of the building.

Section 2: Workmanship

Ways of establishing the adequacy of workmanship

- 2.1 Examples of ways to establish the adequacy of workmanship are described in paragraphs 2.2 to 2.11

CE marking

- 2.2 If a material has CE marking, workmanship may be specified in the relevant European Technical Assessment or harmonised product standard.

Standards

- 2.3 Methods of carrying out different types of work are also given in British Standards or other appropriate technical specifications.

Note: The BS 8000 series of standards on workmanship on building sites combines guidance from other BSI codes and standards. The various parts of BS 8000 are listed in appendix B.

Independent certification schemes

- 2.4 Some independent certification schemes specify how workmanship will deliver a declared level of performance. The person carrying out the work should show that the workmanship will provide the appropriate level of protection and performance.
- 2.5 Schemes, including competent person self-certification schemes, that register installers of materials can provide a means of ensuring that work has been carried out by knowledgeable contractors to appropriate standards.

Management systems

- 2.6 The quality of workmanship is covered by a quality management scheme, such as one that complies with

ANNEX C:

Building Regulations - England

the relevant recommendations of BS EN ISO 9000 and related series of standards. There are a number of such UKAS-accredited schemes.

Past experience

- 2.7 Past experience, such as use in an existing building, may show that workmanship is appropriate for the function for which it is intended.

Tests

- 2.8 Tests can be used to show that workmanship is appropriate.
- 2.9 In the following three instances, the Building Regulations require those carrying out building work to have testing carried out to demonstrate compliance.
- a. Sound insulation as described in regulation 41.
 - b. Air flow rate of mechanical ventilation as described in regulation 42.
 - c. Pressure testing as described in regulation 43.
- 2.10 Under regulation 45 of the Building Regulations 2010, regulation 8 of the Building (Approved Inspectors etc.) Regulations 2010 and section 33 of the Building Act 1984, building control bodies have powers to make tests as they consider necessary to establish whether building work complies with the requirements of regulation 7.
- 2.11 Those carrying out building work may voluntarily include testing in the activities they carry out to demonstrate that the work complies with the requirements of the regulations.

ANNEX D:

Building Regulations - Wales

Approved Document K: - Protection from falling, collision and impact

Requirement K2. Protection from falling

- a. Any stairs, ramps, floors and balconies and any roof to which people have access, and
- b. any light well, basement area or similar sunken area connected to a building, shall be provided with barriers where it is necessary to protect people in or about the building from falling.

Approved document K2 states:

In the Secretary of State's view the requirements of K2 and K3 will be met if, in order to reduce the risk to the safety of people in and about the buildings:

- a. Pedestrian guarding is provided in dwellings which is capable of preventing people being injured by falling from a height of more than 600mm.

3.1 Siting: Guarding should be provided where it is reasonably necessary for safety to guard the edges of any part of a floor (including the edge below an opening window).

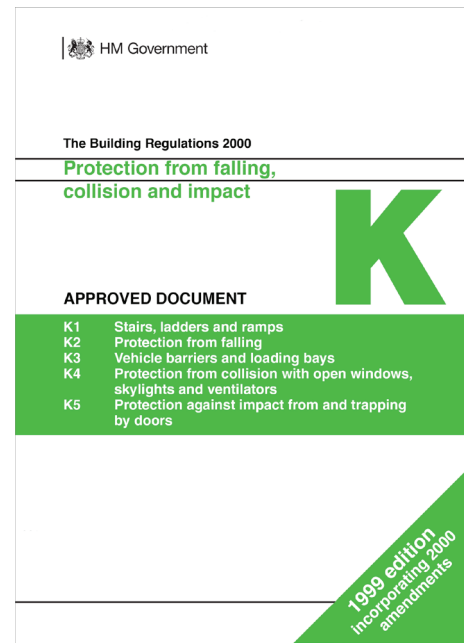
3.2 Design: Any wall, parapet, balustrade or similar obstruction may serve as guarding. Guarding should be at least the height shown in Diagram 11 of Approved Document K. Guarding should be capable of resisting at least the horizontal force given in BS EN 1991.

For further guidance on design of barriers and infill panels, reference should be made to BS 6180 Code of practice for protective barriers in and around buildings.

The Regulation applies to fixed glazing and opening lights less than 800mm above floor level, where the floor (or stairs or landing) adjacent to a window is more than 600mm above the outside ground level.

It usually means that low-level opening lights should have restricted openers and all low-level glazing should be sufficiently robust to resist likely impact.

Compliance can also be achieved by providing alternative guarding e.g. a guard rail or other fixed barrier, which should cover the zone 800mm above the floor.



For replacement windows and doors the obligation is to make compliance no worse. A replacement window with a qualifying low-level opening light should be fitted with a restrictor if the outgoing window was fitted with one. If a new qualifying low-level opening light is introduced into a replacement window then this should be restricted.

Any fixed glazing less than 800mm above floor level which acts as a barrier to prevent people falling out should be replaced with glazing which meets the impact resistance requirements of BS 6262-4 taking into account Approved Document K for containment.

Glass in all buildings

Part N of the Building Regulations seeks to ensure that where people are likely to come into contact with glass it is unlikely to cause injury or the glazing will resist impact or be shielded or protected from impact. However, glass is increasingly being used in locations that require it to act as guarding from falling. In these cases the glazing needs to comply with the requirement and guidance in Part K2 of the Building Regulations – Protection from falling.

Where balconies, landings and stairs within a dwelling require guarding, any glazing used as part or all of that guarding should comply with the requirements of

ANNEX D:

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Parts N and K2. As in all parts of the Regulations, the most onerous requirement takes precedent.

The Approved Document to Part K2 provides guidance on the height above finished floor level at which guarding should be provided and any glazing acting as guarding should be designed to resist the forces and impact as laid down in BS6399 and BS6180, even where the glass is in a critical location as defined in AD N.

Therefore, glazing that protects people from falling must meet these requirements **FIXED LOW LEVEL GLAZING** Where the design incorporates low level glazing, less than 800mm above internal finished floor level such as a window, that is fixed (not openable), glazing and the framing will need to function as guarding where the difference in floor levels exceeds 600mm.

The glass should be designed to resist the forces referred to in the British Standards above. Alternatively, suitable guarding, that resists the forces referred to and complies with Part K2 with respect to height and non-climb ability must be provided.

The Regulation applies to fixed glazing and opening lights less than 800mm above floor level, where the floor (or stairs or landing) adjacent to a window is more than 600mm above the outside ground level.

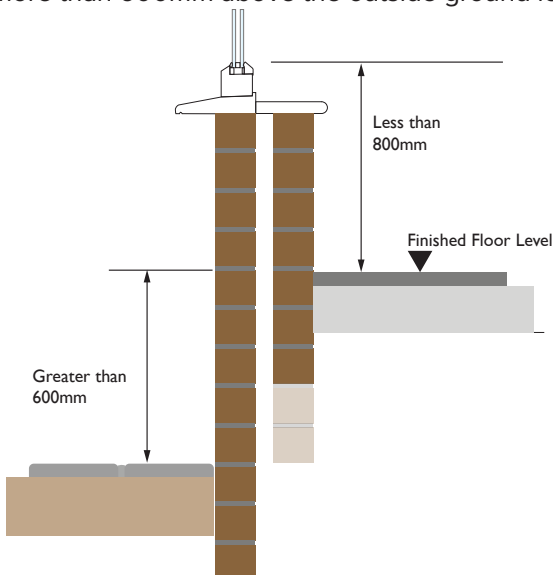


Figure 27: - Permanent screen protection

It usually means that low-level opening lights should have restricted openers and all low-level glazing should be sufficiently robust to resist likely impact.

Compliance can also be achieved by providing alternative guarding e.g. a guard rail or other fixed barrier, which should cover the zone 800mm above the floor.

For replacement windows and doors the obligation is to make compliance no worse. A replacement window with a qualifying low-level opening light should be fitted with a restrictor if the outgoing window was fitted with one. If a new qualifying low-level opening light is introduced into a replacement window then this should be restricted.

Any fixed glazing less than 800mm above floor level which acts as a barrier to prevent people falling out should be replaced with glazing which meets the impact resistance requirements of BS 6262-4 taking into account Approved Document K for containment.

Note: This version of Approved Document K now only applies to Wales. Reference should be made to Approved Document K 2013 Edition for guidance in England.

Note: Approved Document N England and Wales (only applies to Wales) still refers to BS 6206. However, although this standard has been withdrawn for glass it is still legally binding in relation to the marking of safety glass. Detail of the Safe Breakage element has been replaced by EN 12600 and the Marking of Safety Glass by BS 6262-4:

Good Practice Note - Figure 27 shows a situation where a fixed window will need to have safety glazing material in accordance with AD N and act as a barrier in line with requirement K2 of AD K.

ANNEX D:

Building Regulations - Wales

Approved Document N - Glazing - safety in relation to impact, opening and cleaning

Requirement N1.

Glazing, with which people are likely to come into contact whilst moving in or about the building, shall:

- a. If broken on impact, break in a way which is unlikely to cause injury or
- b. Resist impact without breaking
- c. Be shielded or protected from impact.

Safety in use

Where do safety-glazing materials need to be used?

Critical Safety Area Locations

Part of a door, wall or other part of a building likely to be subject to accidental human impact.

Those areas of internal and external walls, that are considered 'critical locations' in terms of safety are:

- Between the finished floor level and 1500mm above that level in doors, and side panels which are within 300mm of either edge of the door.
- Between the finished floor level and 800mm above that level in the case of windows not included in the point above.

Note 1: In bathroom areas where the window is situated adjacent to the bath/shower, the finished floor level is taken from the bottom of the bath or shower cubicle and not the floor level where the bath or shower has been installed.

Note 2: Similarly the drop on a stairway is measured from the height of the highest tread within the span of the window.

Note 3: Finished floor level would be taken from the top of any floor furnishings that may or may not be in place at the time of the survey. In some cases the ground level outside may vary from inside the property. The smaller of the two dimensions should be used to determine if the window is in a critical location.

It is important to note that any part of a glass area affected should meet the requirements in its entirety and not just in the relevant section.

Note 4: Bay Window seats and other such constructions or permanent fixtures which could be stood upon thereby effectively raising the finished floor level within the vicinity of a window

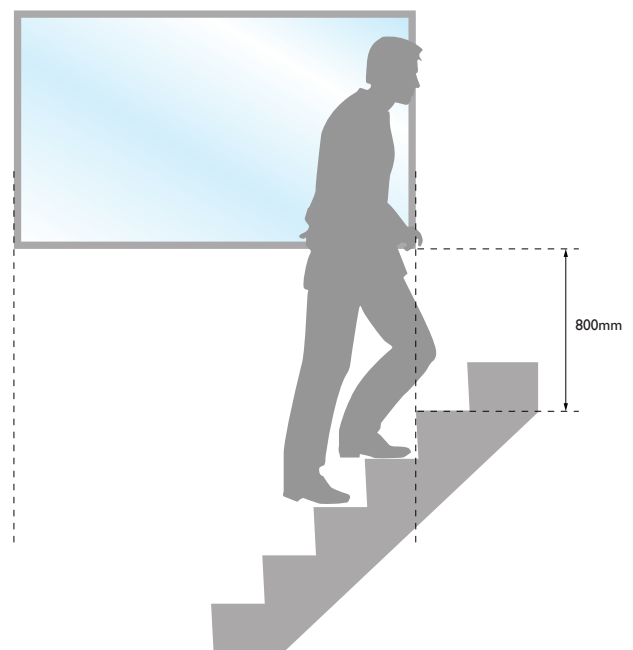
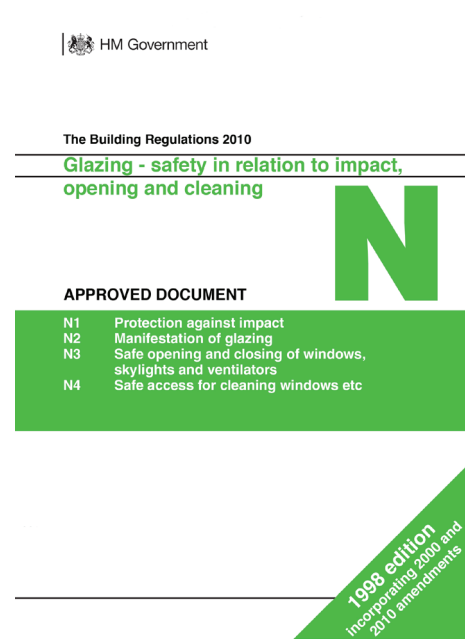


Figure 28: - Window on stairway

ANNEX D:

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Exception: Small Panes

Small panes that have a smaller dimension not exceeding 250mm and an area not exceeding 0.5m². Such glass should not be less than 6mm in thickness, except in the case of traditional leaded lights and copper lights, where 4mm can be used.

For further information regarding specifying glazing that will meet impact performance criteria, please refer to BS 6262 - 4 and/or Approved Document N of the Building Regulations.

Good Practice Note - The critical locations set out in Figure 29 for the positioning of safety glazing are minimum requirements. In certain circumstances and in consultation with the customer, it would be advantageous to supply and install safety glazing material in other situations which the surveyor considers hazardous following his risk assessment. Consideration should be given to the type of safety glazing material used. In certain environments the containment of broken safety glass is crucial.

Although not necessarily a permanent fixture, bunk beds positioned under windows could also cause significant risk.

Marking of safety glass

Safety glazing definition - according to BS 6262 - 4: 2005, Glazing for Buildings – Part 4: Code of practice for safety related to human impact

Installed safety glass in critical locations should be indelibly and legibly marked in such a position that the whole marking is visible after installation.

The glass should be marked with the following:

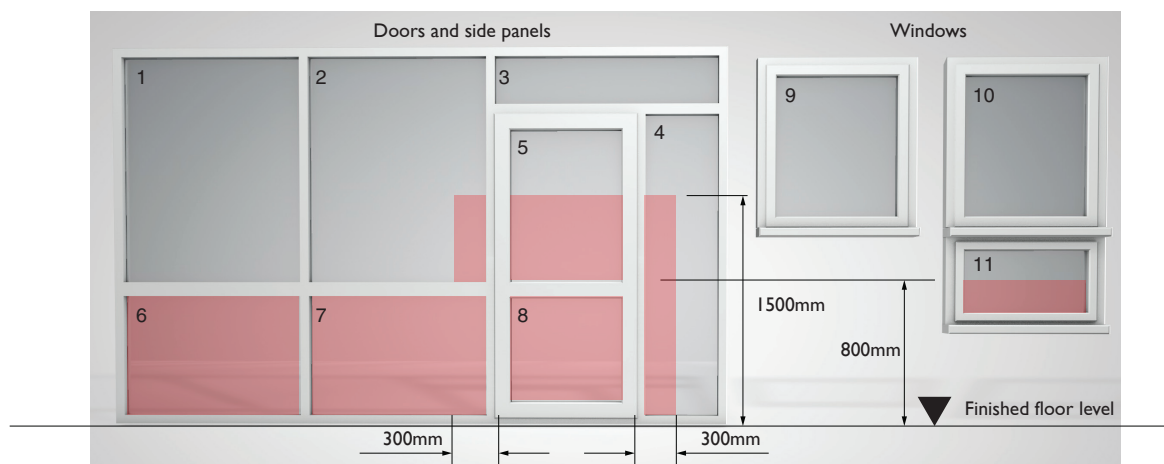
- The name and trademark of the manufacturer, merchant or installer;
- The identifier of the product standard that the safety glass conforms to; e.g. BS EN12150, BS EN 14449, etc;
- The classification according to BS EN 12600.

Table 5:

Safety Glass Type	Installed glass - Marking in accordance with	
	BS 602:1981	BS 6062 - 4: 2005
Thermally toughened soda lime silicate safety glass	Glass Co. BS 6206 T, A	Glass Co. EN 12150 1(C)1, 2 or 3
Laminated safety glass	Glass Co. BS 6206 L, B	Glass Co. EN 14449 2 (B)2
Safety wired glass	Glass Co. BS 6206 W, C	Glass Co. EN 572-9 3 (B)3

A non-compliance will be recorded during an inspection if the mark is not both completely visible and clearly legible.

Table 5 shows the relationship between safety glazing marking in accordance with Approved

**Figure 29:** - Glazing in critical locations

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Document N and BS6262-4.

Polymeric backed safety film can be applied to certain glass types. The application of the film can provide the installed glass with safety characteristics. BS EN 15752 part 1 contains the definitions and requirements for polymeric film and BS EN 15755 part 1 gives the definitions and requirements for polymeric filmed glass.

The marking requirements of BS 6262-4 stated that the second and third characters of the classification are not required to be marked on the product. However, the full classification shall be stated within any Construction Products Regulation (CPR) performance declaration.

Note: Approved Document N still refers to BS 6202: 1981. This standard has now been withdrawn. BS 6262-4 2005 should be referenced instead as this is referenced to the European glass product standards.

Good Practice Note - For further information on the use of safety glazing in critical locations, please refer to the GGF publication 'The Right Glazing in the Right Place'

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