

# FUNCTIONAL REQUIREMENTS

## 7.4 WINDOWS AND DOORS

### Workmanship

- i. All workmanship must be within the tolerances defined in Chapter 1 of this Manual.
- ii. All work is to be carried out by a technically competent person in a workmanlike manner.
- iii. Certification is required for any work completed by an approved installer.

### Materials

- i. All materials should be stored correctly in a manner that will not cause damage or deterioration of the product.
- ii. All materials, products and building systems shall be appropriate and suitable for their intended purpose.
- iii. The structure shall, unless specifically agreed otherwise with the Warranty provider, have a life of not less than 60 years. Individual components and assemblies, not integral to the structure, may have a lesser durability, but not in any circumstances less than 15 years.

### Design

- i. The design and specifications shall provide a clear indication of the design intent and demonstrate a satisfactory level of performance.
- ii. Structural elements outside the parameters of regional Approved Documents must be supported by structural calculations provided by a suitably qualified expert.
- iii. The materials, design and construction must meet the relevant Building Regulations, British Standards, Eurocodes and other statutory requirements.

### 7.4.1 Windows and doors

Timber used for external joinery should be a species classified as suitable in BS EN 942 and preservative treated; if not, use a moderately durable species or better (sapwood excluded). Guidance on selection is provided in TRADA Wood Information Sheets 3.10 and 4.16.

Workmanship should follow the recommendations of BS 1186: 2. Preservative-treated joinery cut or adjusted on-site should be brushed liberally with an appropriate and coloured preservative. Where the colour of the preservative will adversely affect the final appearance of the joinery, an appropriate clear preservative should be used.

Bay, oriel and dormer windows require particular care in detailing and fitting so that they are stable, weather tight and reasonably air tight.

Roof lights should be proprietary components, fixed within prepared openings in accordance with the manufacturer's instructions, and have effective weather sealing.

Non-timber components should comply with the following British Standards (as appropriate), and be installed and fixed in accordance with the manufacturer's recommendations:

- BS 4873 Aluminium windows
- BS 5286 Specification for aluminium framed sliding

### Glass doors

- BS EN 514 PVC-U windows
- BS 7412 PVC-U windows
- BS 6510 Steel windows and doors

PVC-U windows and doors should also be subject to independent third-party certification.

Windows should comply with the current Building Regulations taking into consideration:

- Means of escape in the event of a fire
- Thermal insulation
- Ventilation
- Safety

### 7.4.2 Thresholds and sills

Thresholds and sills should be at least 150mm above ground level. Where the top of a threshold is more than 225mm above ground level, the following steps are necessary:

- Where level (threshold) access is required, builders can follow the general guidance given in Figures 1, 2 and 3, ensuring a high level of supervision and workmanship, together with the correct specification of materials and consideration to design, location and exposure.
- Wherever possible, locate the entrance door away from the prevailing weather and provide a storm porch.

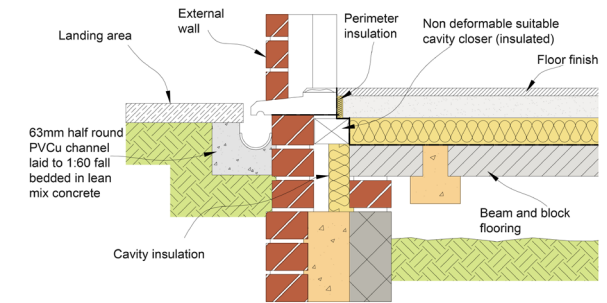


Figure 1: Typical level threshold suspended beam and block floor

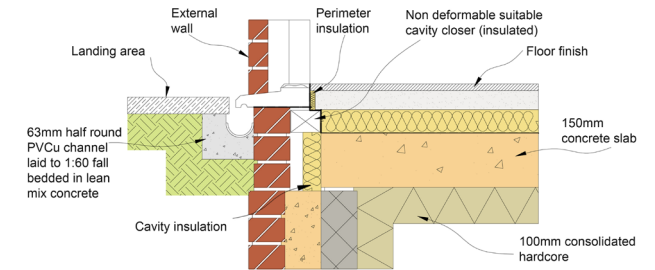
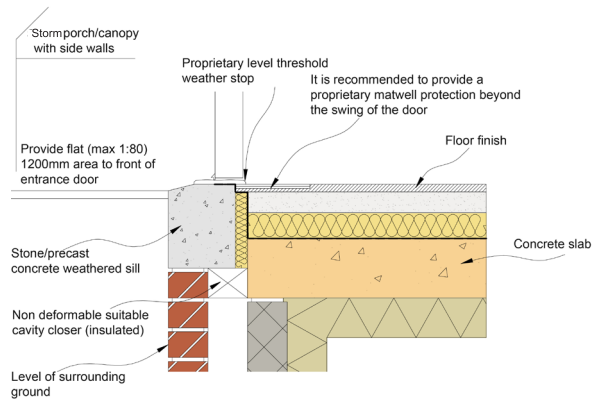


Figure 2: Typical level threshold suspended concrete slab



**Figure 3: Typical level threshold with canopy protection**

It is recommended that a matwell be constructed within the entrance hall to accommodate the swing of the door without fouling the carpet and/or the proprietary door seal to maintain the integrity of the seal.

External doors and opening lights to windows should be reasonably air tight by ensuring that effective draught seals are fitted.

External joinery should be designed and constructed in accordance with the requirements of the following British Standards:

- BS 4787: 1 Internal and external wood door sets, door leaves and frames
- BS 6262 Code of Practice for glazing for building
- BS 6375: 1 Performance of windows
- BS 644: 1 Wood windows
- BS 8213: 1 Windows, doors and roof lights

### 7.4.3 Security

External door leaves should be of a robust construction. Timber doors should be no less than 44mm thick (or equivalent strength for other materials). Flush doors should be of solid core construction. Door stiles to which locks are fitted should be of sufficient width so as not to create a weak point in the general robustness of the door (119mm minimum width is recommended for timber). Non-glazed panels should be sufficiently small to prevent access into the dwelling. Additional security may be provided within the design if required.

### 7.4.4 Protection from falling

For houses and flats, the guidance in Approved Document K2 specifies a minimum guard height of 800mm to window openings in the external wall. This would normally be achieved by forming window openings of at least 800mm above finished floor level. The wall beneath the opening is therefore considered to be the barrier to falling.

Where window openings are formed less than 900mm from the finished floor level, permanent guarding should be provided to the opening in accordance with the design requirements specified in the relevant Building Regulations.

Where window openings are formed less than 900mm from finished floor level and no permanent guarding is provided, with the glass required to act as the barrier and provide containment to persons falling against it, the glass shall be designed in accordance with the requirements of BS 6180.

The Designer shall determine the potential impact energy by establishing the perpendicular unhindered distance that could be travelled prior to impact.

In the absence of an assessment by a suitably qualified person, any glass that is required to provide containment will be designed to meet BS EN 12600 Class 1(C)1.

### 7.4.5 Control of condensation

Minimise the effects of condensation on glazing and frames by:

- Using insulated metal frames.
- Using details that prevent condensation running onto walls or floors.
- Housing window boards into frames to prevent condensation entering the joint.
- Providing thermal insulation to walls at lintels, sills and jambs. Guidance on this subject is provided in BRE's report Thermal insulation: Avoiding risks.

### 7.4.6 Security

Door frames should be securely fixed and the rebate formed preferably from a solid section. Where planted stops are used, they should be glued, screwed and pelleted. Door and window frames should be fixed to vertical reveals with corrosion-resistant fixings at a minimum of 600mm centres, with the end fixings being located within 150mm of the top and bottom of the frame.

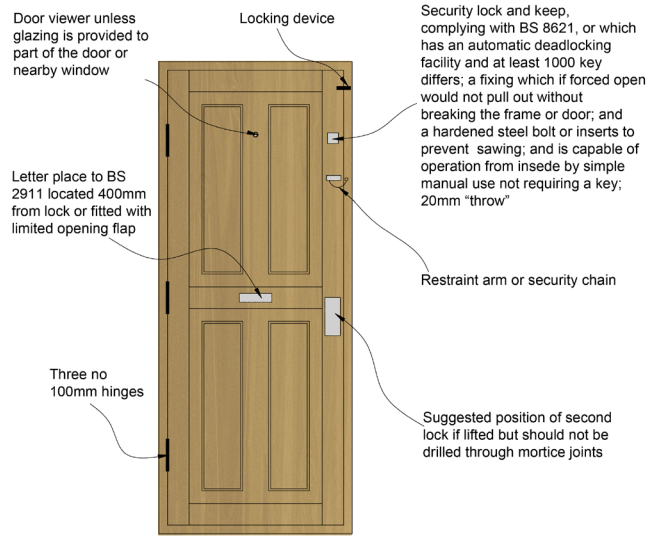


Figure 4: Security provisions to an entrance door

External doors should be hung on 3 no. 100mm hinges. A restraint arm or security chain should be provided to main entrance doors, which should also be provided with at least one security lock and key.

If a second lock is fitted, it is suggested that this is positioned 600mm away. A five-lever deadlock should be provided to other external doors, including patio doors. The lock should comply with BS 8621 (and BS EN 12209) or be of a similar performance standard. Locks to entrance doors of flats should not operate automatically and the deadlock mechanism on the dwelling side of the door should be non-key operated (this is a fire precaution requirement).

On the ground floor, with the exception of kitchens, all habitable rooms should either open directly onto a hall leading to the entrance or other suitable exit, or be provided with a suitable window or door.

External doors (except main entrance doors) and sliding patio doors should be provided with robust bolts at the top and bottom of the closing edge of the door, e.g. 100mm barrel bolts fixed with 30mm No. 8 screws (see Figure 4). Where espagnolette multi-locking points are provided, the bolts can be omitted.

Sliding doors should be designed so that they cannot be lifted out of the frame from the outside. Letter plates should comply with BS EN 13724 and either be located no closer than 400mm from the door lock or be fitted with a limited opening flap. Where fitted to a fire-resistant door, e.g. flats, the letter plate should not adversely affect the fire resistance of the door. Windows should be provided with a securing device that cannot be sprung by levering the casement or sash from the outside of the building when in a closed position. A key operated lock should also be provided to all ground floor windows and others that are readily accessible from the outside, either as part of the securing device or as a separate unit.

Roof lights should not be used on single storey or other accessible roofs unless they are specifically designed to provide a deterrent against forced entry and can be locked with a removable key. Externally located hinge pins should be non-demountable, e.g. welded or disturbed ends.

### 7.4.7 Means of escape

In terms of emergency egress windows in two storey dwellings, with the exception of kitchens, all habitable rooms in the upper storey served by one stairway shall be provided with a window:

- With an unobstructed opening area of at least 0.33m<sup>2</sup>.
- At least 450mm high x 450mm wide.
- With the bottom of the opening area not more than 1100mm above the floor.

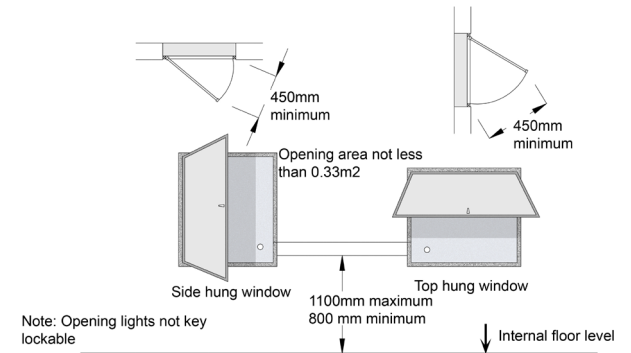


Figure 5: Emergency egress window provision

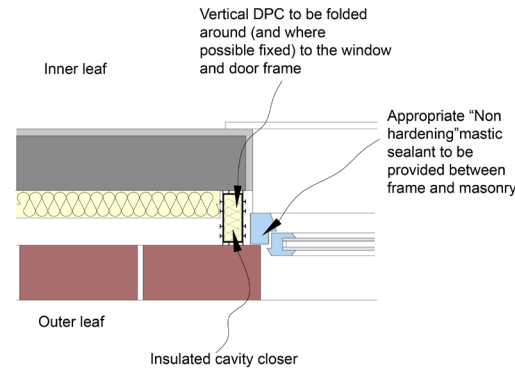
### 7.4.8 Installation of doors and windows

Window and door frames should be installed so that:

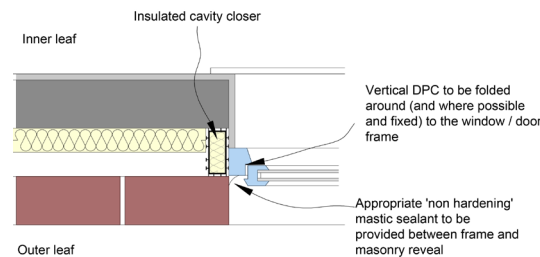
- They do not carry loads unless designed to do so.
- The face of the frame is set back at least 38mm from the masonry face; masonry on the external side of a vertical DPC should not be in contact with internal finishes.
- The window head is set back behind the edge of the cavity tray.
- The frame to wall junction is weather tight and reasonably air tight.
- In areas of very severe exposure, checked rebates should be provided.

The frame should be set back behind the outer leaf and should overlap it, as shown in Figure 6. Alternatively, an insulated finned cavity closer with third-party certification may be used.

- Distortion is minimised by not locating radiators or other heaters close to doors.
- The water drip to window and door sills projects beyond the wall or sub-sill by at least 10mm, and the sill edge by at least 25mm.



**Figure 6: Rebated window framed for areas of very severe exposure**



**Figure 7: Typical window reveal detail (normal exposure)**

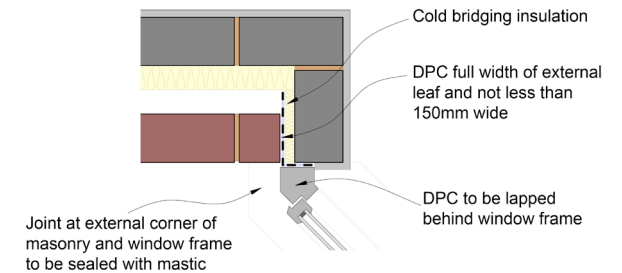
Proprietary materials with third-party certification should be used to close cavities at window and door openings. They should also be installed in accordance with the manufacturer's recommendations.

### 7.4.9 Fire doors

Any door between a dwelling and an attached or integral garage should be a half-hour fire-resisting door and frame.

### 7.4.10 Bay windows

The vertical DPC and cavity closer should be installed as shown in Figure 8.



**Figure 8: Typical bay window detail**

### 7.4.11 Workmanship

Window and door frames should be installed either by building in tightly as work proceeds or by fitting into pre-formed openings, suitably dimensioned to provide an accurate fit for the frame plus the perimeter weather tight joint.

Timber frame windows and doors can be installed so that they abut the masonry. Any gap provided should not exceed 10mm, and for gaps less than 5mm, the sealant must cover both the frame and the masonry by 6mm. For gaps greater than 5mm, a backing strip should be provided behind

the sealant. The sealant should have a minimum depth of 6mm.

PVC-U frame windows and doors should be installed with a gap of between 5mm and 10mm to allow for thermal expansion. For large framed units, such as patio doors, the gap can be up to 15mm.

Frames should be fixed in accordance with the manufacturer's recommendations or, if no instructions are given, with the following guidance:

- Fixings should be at 600mm maximum centres and within 150mm of corners of the frame.
- Frames should be fixed either by galvanised steel cramps or by non-corrodible screw fixings to the surrounding wall.

#### 7.4.12 Glazing

##### Critical locations

Glazing in doors and windows in areas known as 'critical locations' need to be given special consideration in order to prevent potential injury to people within or around the building.

These 'critical locations', as shown in Figure 9, are:

- In a door or, in a side panel adjacent to a door; where the glazing is within 300mm of the door and the glazing is situated between floor level and a height of 1500mm.
- In an internal or external wall or partition between floor level and a height of 800mm.

It is important that any glazing within these 'critical locations' should be either:

- Provided with permanent protection
- Small panes
- Robust
- Break safely

If permanent protection is provided, there is no requirement for the glazing itself to be of a special type. Permanent protection may take the form of railing or barriers and should:

- Be designed to be robust.
- Have a maximum opening or gap in any railing of 75mm or less.
- Be a minimum of 800mm high.
- Be non-climbable (especially where floor is acting as a balcony).

Small panes, either an isolated pane within glazing bars or copper or lead lights, should be restricted in size so that any breakage would be strictly limited.

Small panes should be:

- No more than 0.5m<sup>2</sup> in area
- No wider than 250mm

Where concealed glass is used, a minimum of 6mm thickness is recommended (4mm for copper or lead lights). Some materials are inherently strong, such as glass blocks or polycarbonates, whereas concealed glass will need to be of an increased thickness as the area of the panel increases to be considered 'safe'. As an alternative

to any of the above solutions, it is possible for the material to break 'safely' when tested to BS EN 12600, which would mean that:

- Only a small opening was created with a limited size of detached particles.
- The balance would create only small pieces that are not sharp or pointed.
- The pane disintegrates with only small detached particles.

Detailed guidance on this aspect of glazing can be found in Approved Document K: 2013 to the Building Regulations.

A glazing material would be suitable for a critical location if it meets the requirements of BS EN 12600 Class 3 or of BS 6206. Glass installed in a door or in a side panel to a door that exceeds 900mm wide must meet the requirements of BS EN 12600 Class 2 or BS 6206 Class B.

Glazing should be in accordance with BS 6262. Insulated glass units (IGU) should meet requirements of BS EN 1279 – Glass in building – insulating glass units, and should carry third-party accreditation. This includes windows in possession of a BBA certificate and timber windows.

- They should have dual seals; single seal units are not acceptable.
- Desiccant should be provided to every spacer bar.
- Any glazing on-site must have a drained and ventilated bottom bead.

## CHAPTER 7: Superstructure

- Any glazing with an area greater than 1m<sup>2</sup> must have a drained and ventilated bottom bead.
- Glazing with an area less than 1m<sup>2</sup> may be solid bedded.
- All spacer bars should be stamped with BS EN 1279.
- PVC-U frames and spacer bars should be stamped with BS 7412, 7413 and 7414.

Linseed oil glazing putty should not be used when the joinery is finished with vapour permeable paint or stain; glazing putty should also not be used with organic solvent-based stains. Putty should be neatly finished to receive a protective paint coat.

Putty is not suitable for double-glazed units. Workmanship should be in accordance with BS 8000: 7. To ensure the compatibility of the whole glazing system with a high level of workmanship and control, it is recommended that factory pre-glazed systems be installed in all external openings.

External glazing beads should be pinned at a maximum of 150mm centres (a maximum of 50mm from corners) or screwed at 200mm centres (maximum 50mm from corners).

The preferred method of installation for double-glazed units is either:

- Drained and ventilated frames, as recommended by the Glass and Glazing Federation (GGF). Where possible, this method should be adopted for external glazing.
- Solid bedding of units in 16mm–18mm deep frame rebates; 18mm rebates are recommended by the GGF to allow for tolerances. In all cases, sealants should not be sensitive to ultraviolet light. External glazing beads should be fixed at a maximum of 150mm centres, and the glazing bedded in non-setting putty. Louvre windows should not be used. Double-glazing should be fixed and bedded as recommended by the GGF.

### Control of condensation

Minimise the effects of condensation on glazing and frames by:

- Using insulated metal frames.
- Using details that prevent condensation running onto walls or floors.
- Housing window boards into frames to prevent condensation entering the joint.
- Providing thermal insulation to walls at lintels, sills and jambs.
- Using trickle ventilators, or similar, to provide background ventilation where required by the Building Regulations. Further guidance on this subject is provided in BRE report BR 262, Thermal insulation: Avoiding risks 2002.

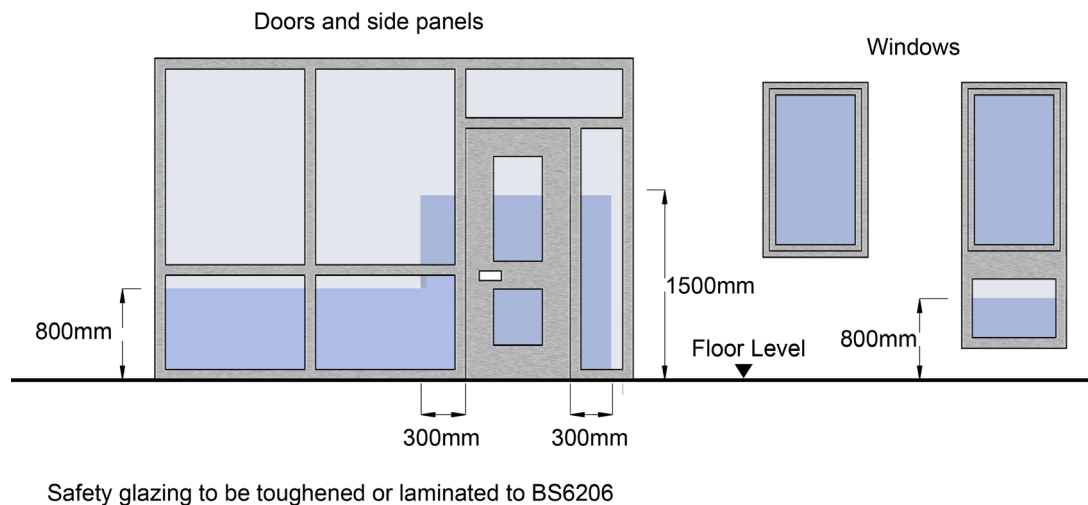


Figure 9: Glazing to critical locations

**Glazing**

Glass must meet the visual assessment criteria of CWCT Technical Note 35 (TN 35). The total number of faults permitted in a glass unit shall be the sum total of those permitted by the relevant BS EN Standard for each pane of glass incorporated into the unit concerned.

Faults include:

- Bubbles or blisters
- Bairlines or blobs
- Fine scratches not more than 25mm long
- Minute particles

When assessing the appearance of glass:

- The viewing distance used shall be the furthest stated in any of the BS EN Standards for the glass types incorporated in the glazed unit. In the event of doubt, the viewing distance shall be three metres.
- The viewing shall commence at the viewing distance, and shall not be preceded by viewing at a closer distance.
- The viewing shall be undertaken in normal daylight conditions without use of magnification.

The above does not apply within 6mm of the edge of the pane, where minor scratching is acceptable. Scratches on doors, windows and frames and factory finished door and window components should not have conspicuous abrasions or scratches when viewed from a distance of 0.5m.

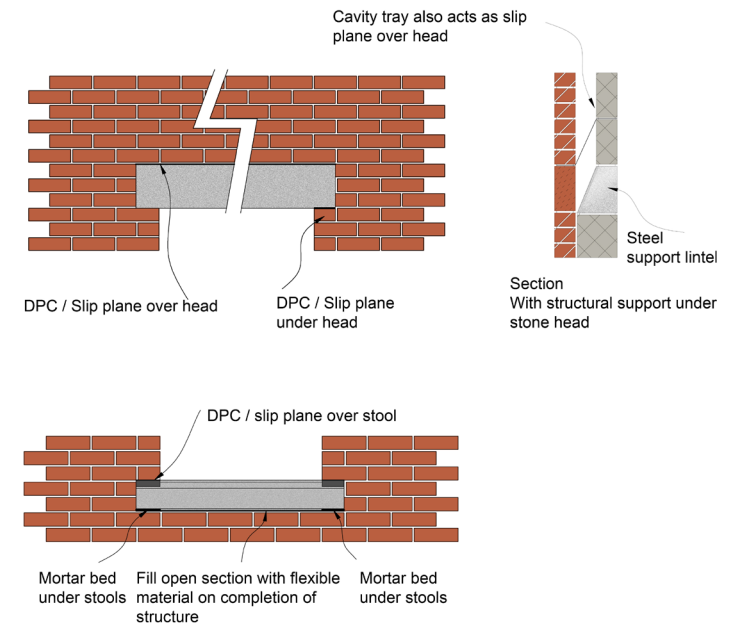
- Surface abrasions caused during the building-in process should be removed in accordance with the manufacturer’s instructions, which may include polishing out, re-spraying or painting.
- In rooms where there is no daylight, scratches should be viewed in artificial light from fixed wall or ceiling outlets, and not from portable equipment.

Where window openings are formed less than 900mm from finished floor level and no permanent guarding is provided, with the glass required to act as the barrier and provide containment to persons falling against it, the glass shall be designed in accordance with the requirements of BS 6180. The Designer shall determine the potential impact energy by establishing the perpendicular unhindered distance that could be travelled prior to impact.

In the absence of an assessment by a suitably qualified person, any glass required to provide containment must meet with BS EN 12600 Class 1(C)1 standard.

**7.4.13 Cast stone jambs and mullions**

Stainless steel dowels in the sides of the jambs should be bedded into adjacent mortar joints as the masonry is constructed.



**Figure 10: Stone heads and sills**



### Cast stone heads

A cavity tray must be provided above all heads, as this not only discharges water to the outside face of the masonry, but also acts as a slip plane. A slip plane will be required at the end of the cast stone head, as well as a soft joint between the top of the head and the steel support lintel.

### Cast stone window/door surrounds

Where cast stone butts up to other materials, allowance must be made to accommodate differential movement, e.g. where cast stone abuts clay brickwork, a slip surface between the two materials must be incorporated, or the cast stone should be flexibly jointed.

### Sills

The DPC should be overlapped by the vertical DPC at the jambs, and should be turned up at the back and ends for the full depth of the sill.

The mortar bed below sills should be trowelled smooth, allowed to set, cleaned off and then a DPC laid over. The open section below the sill should be sealed with a flexible material only on completion of the structure.

To control water penetration through joints in window surrounds, e.g. at junctions between jambs and mullions and sills, rectangular and T-shaped water bars should be provided.

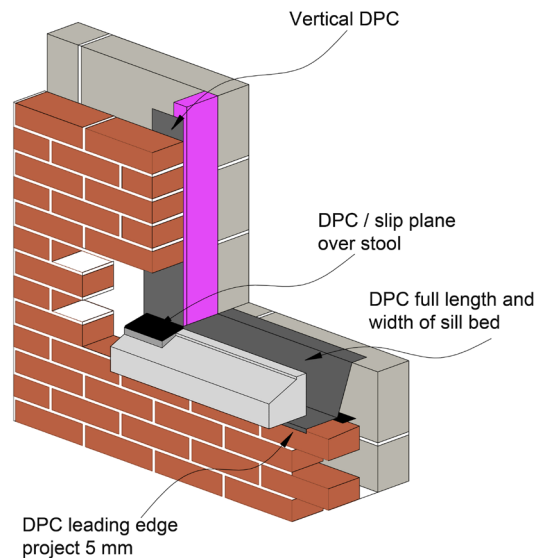


Figure 11: Stone sill with insulated cavity closer