



# TECHNICAL MANUAL

VERSION 10

# 8.

# Windows and Doors

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Functional Requirements

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## ADDITIONAL FUNCTIONAL REQUIREMENTS

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### **Workmanship**

Adequate Testing and certification is required for any curtain wall and rain screen construction systems.

### **Materials**

No additional requirements.

### **Design**

1. Windows, external doors and frames, and roof lights shall be designed and constructed so that they:
  - a. Meet the requirements of BS 6375-1 are durable and resistant to weather;
  - b. Have adequate thermal performance and air tightness;
  - c. Have sufficient strength to withstand operational and wind loads;
  - d. Offer reasonable resistance to unauthorized entry;
  - e. Can be operated readily and safely by the user.
2. Windows and roof lights shall be designed and constructed so that they offer, where necessary, adequate natural ventilation.
3. External doors and frames shall be designed and constructed so that they:
  - a. Resist to the spread of fire when situated between a dwelling and an attached or integral garage;
  - b. Permit convenient access for disabled people.

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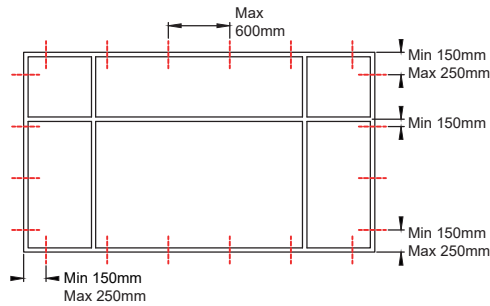
**Windows  
and Doors**

**8.1**

**uPVC**

### Fixing distances for uPVC windows and doorsets

Windows and doors should be installed in accordance with the manufacturers instructions.



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

Wherever practicable, the 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.
- There should be a minimum of two fixings on each jamb and sill, with intermediate fixings at centres no greater than 600mm.
- If the head is fixed with polyurethane foam, then the fixings at the head may be as follows:
  - a) Frame width up to 1200mm - no fixings;
  - b) Frame width 1201mm to 2400mm - one central fixing;
  - c) Frame width 2401mm to 3600mm - two equally spaced fixings.
- Frames should be fixed either by galvanised steel cramps or by non-corrodible screw fixings to the surrounding wall.

Note: These fixings do not apply to french doors, patio doors, or bi-fold doors. Manufacturers recommended fixing details should be followed.

### Windows and doors installation

Windows and door frames should be installed so that:

- They do not carry loads unless designed to do so.
- External doors and opening lights to windows should be reasonably air tight by ensuring that effective draught seals are fitted.
- The masonry on the external side of 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. In other areas of exposure, the frame should be set back at least 38mm and overlap the DPC.
- Distortions of doors should be minimized by not locating radiators or other heaters close to doors.
- The reveal should be protected throughout its width by a continuous DPC. The width of the DPC should be sufficient to overlap/be fixed to the frame and fully protect the reveal. Alternatively, an insulated finned cavity closer with third-party certification may be used.
- 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 manufacturers recommendations.

### 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.

UPVC 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.

Window and door frames should be installed in accordance with the manufacturers instructions.

### Windows and doors

uPVC windows and doors should be subject to independent third-party certification.

Workmanship should follow the recommendations of BS 8213-4.

The design and construction of factory assembled windows must meet BS 7412.

Non factory assembled units and 'bespoke' units are also expected to meet the same standard.

Factory made and bespoke doors and windows should be selected to withstand the design weather conditions and be classified and tested in accordance with the following weather performance standards:

- BS 6375-1 Weather tightness.
- Air permeability - BS EN 12207 - Classification & BS EN 1026 - Test method.
- Water resistance - BS EN 12208 - Classification & BS EN 1027 - Test method.
- Wind resistance - BS EN 12210 - Classification & BS EN 12211 - Test method.

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 EN 514:2018 Plastics. Poly(vinyl chloride) (PVC) based profiles. Determination of the strength of welded corners and T-joints.
- BS 7412:2007 Specification for windows and doorsets made from unplasticized polyvinyl chloride (PVC-U) extruded hollow profiles.

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

- BS 6262 Code of Practice for glazing for building.
- BS 6375: 1 Performance of windows.
- BS 7412 Specification for windows and doorsets made from unplasticized polyvinyl chloride (PVC-U) extruded hollow profiles.
- BS 8213 Windows, doors and roof lights.

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

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

### Draught Seals

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

### Fire doors

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

### Sealant around windows and doors

For gaps less than 5mm, the sealant must cover both the frame and masonry by 6mm.

For gaps greater than 5mm, a backing strip should be provided behind the sealant and the sealant should have a minimum depth of 6mm.

### Glazing

- Any glazing on-site must have a drained and ventilated bottom bead with a minimum gap of 5mm between the edge seal of the insulated glass unit and the bottom channel frames glazing rebate.
- The workmanship should be in accordance with BS 8000: 7.
- The window beads should suitably lap the windows and doors to prevent premature degradation of the glazing unit.

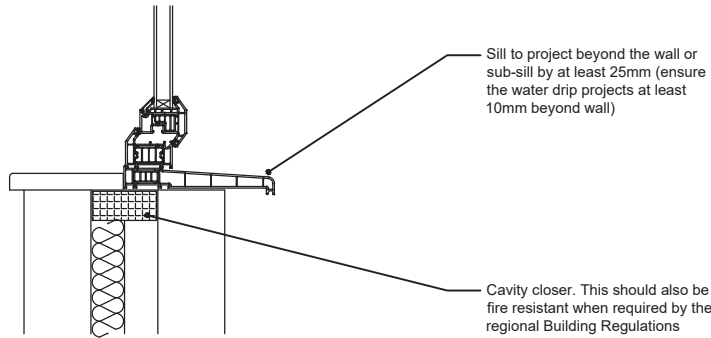
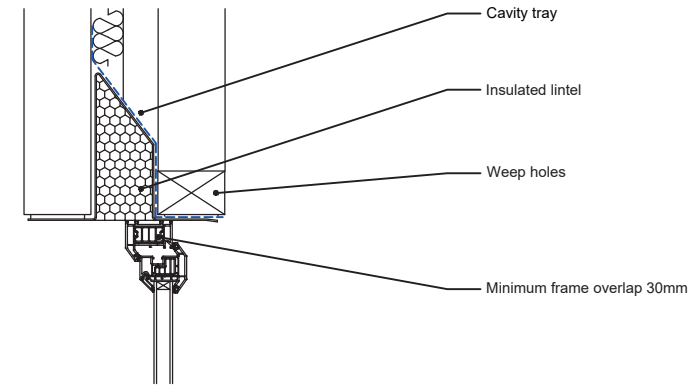
### Additional requirements in a coastal location

Where developments are within a coastal location additional Warranty requirements should be met.

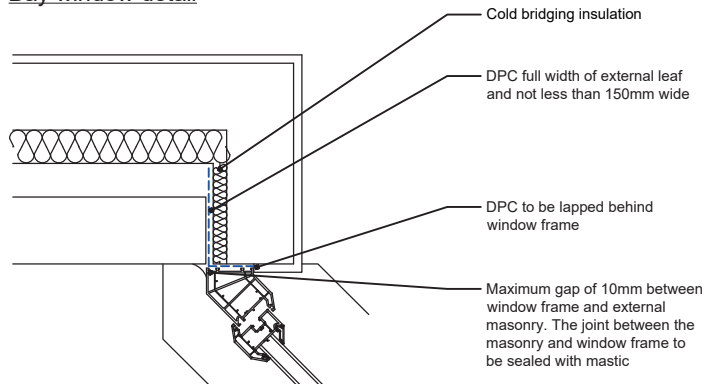
For the purpose of this Technical Manual we are considering sites within 5km inland from the shore line or sites located in 'tidal' estuarine areas where they are within 5km of the general shoreline.

Further information on Warranty requirements within a coastal location can be found in 'Appendix B - Coastal Locations'.

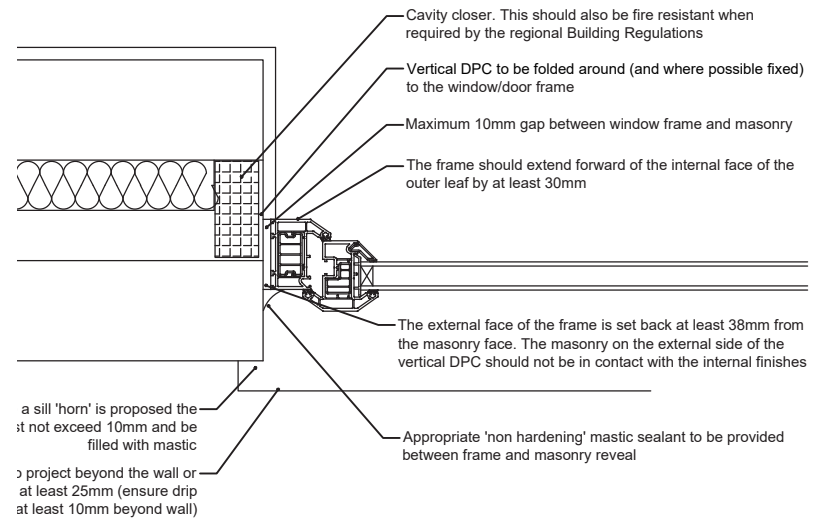
Typical vertical section through window



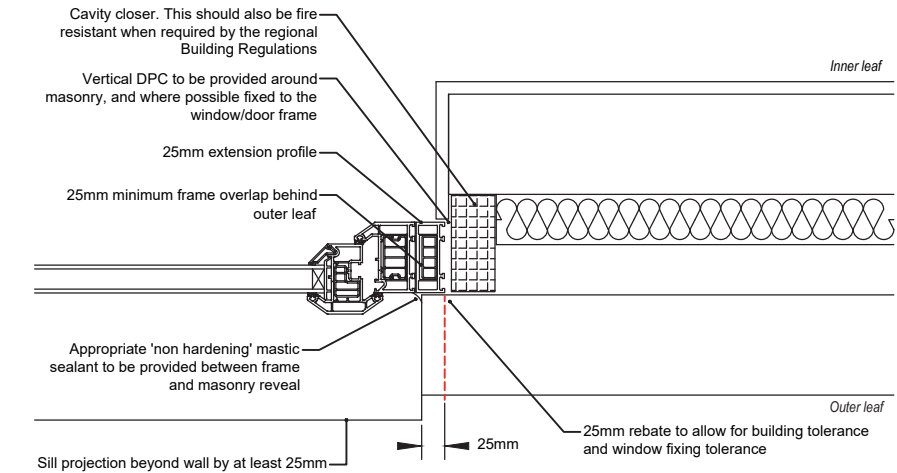
Bay window detail



Typical window reveal detail (normal exposure)



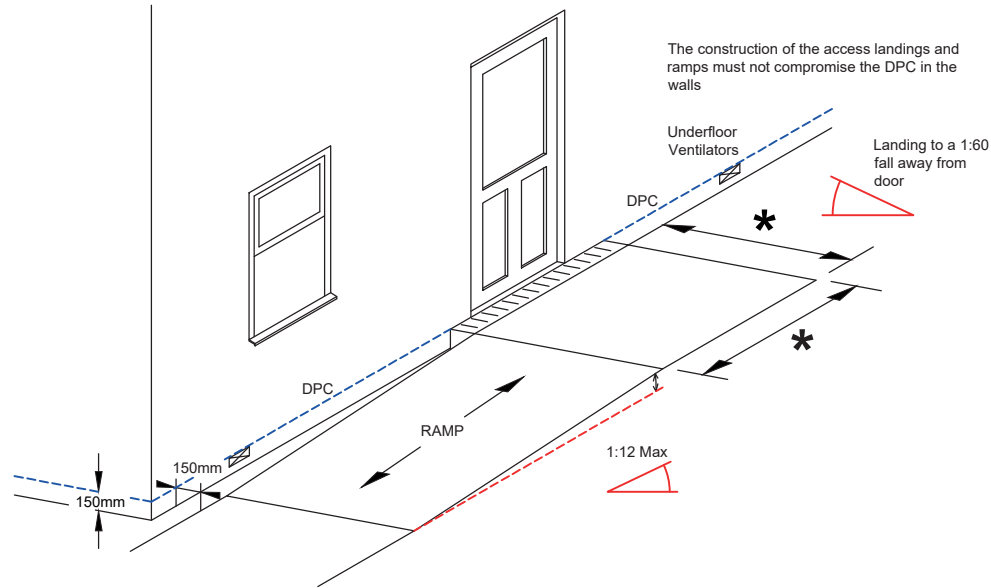
Checked rebate window frame detail for areas of severe exposure



When installing window/door frames in a checked rebate, allow for the frame to be deeper:

- To accommodate the 25mm rebate, and
- To allow for opening lights to open clear of the masonry/render.

Ramped/level threshold to principle entrance door



\* See Building Regulations for disabled ramp design and landing dimensions.

Ramps should not exceed 1:12 gradient. Where the outside ground levels slope towards the property, an effective gully system should be provided to prevent flooding, e.g. in front of garage doors.

Level threshold

Thresholds and sills should be at least 150mm above finished ground level. However, where a level (threshold) access is required, the general guidance in this section should be followed - ensuring a high level of supervision and workmanship together with the correct specification of materials and consideration to design, location, and exposure.

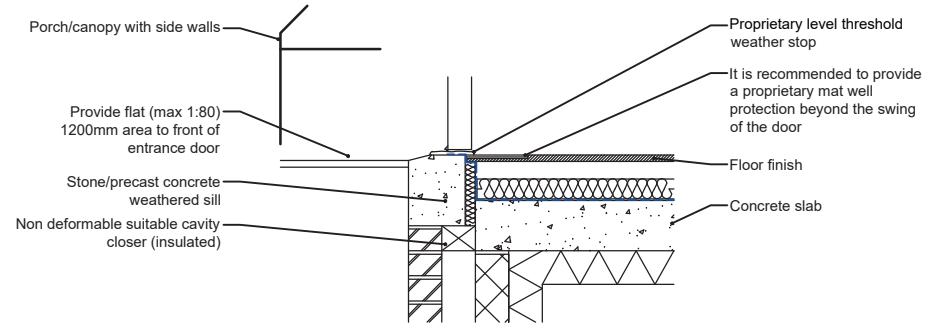
Wherever possible, locate the entrance door away from the prevailing weather and provide a storm porch. Where a drainage channel is provided, this must be connected to the storm drainage system to prevent flooding occurring and water ingress into the building.

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

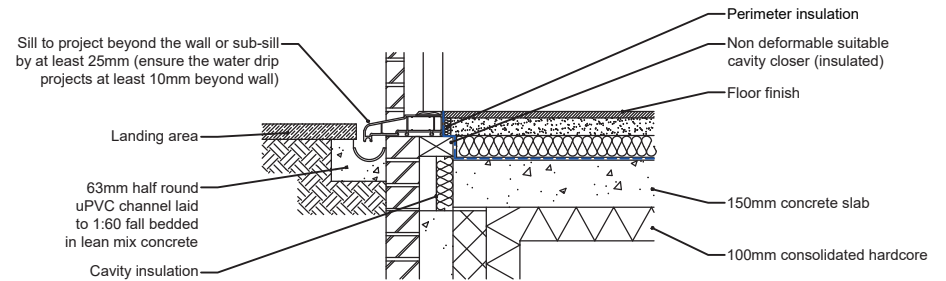
Level thresholds timber frame structure

At the level threshold open perpend should be provided in close proximity to the timbers on each side of the door opening one brick course below the lowest timber. The open perpend must provide adequate ventilation of the external wall cavity, and drainage to disperse water that may penetrate the cladding.

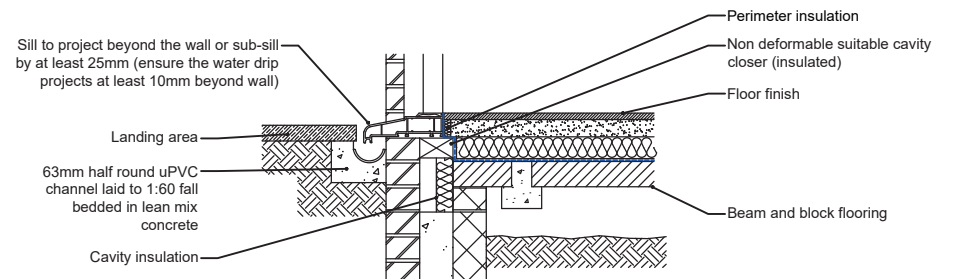
Typical level threshold where a porch/canopy is provided



Typical level threshold suspended concrete slab - without canopy protection



Typical level threshold suspended beam and block floor



**8.**

**Windows  
and Doors**

**8.2**

**Timber**



## 8.2.1 TIMBER: General requirements

### Windows and doors

Workmanship should follow the recommendations of BS 1186: 2. The design and construction of factory assembled windows must meet BS 644:2009.

Non factory assembled units and 'bespoke' units are also expected to meet the same standard.

Factory made and bespoke doors and windows should be selected to withstand the design weather conditions and be classified and tested in accordance with the following weather performance standards:

- BS 6375-1 Weather tightness.
- Air permeability - BS EN 12207 - Classification & BS EN 1026 - Test method.
- Water resistance - BS EN 12208 - Classification & BS EN 1027 - Test method.
- Wind resistance - BS EN 12210 - Classification & BS EN 12211 - Test method.

Bespoke/handmade window and door units must be designed and constructed to meet the same level of weather tightness as factory made tested units. Where these are proposed, there must be a detailed specification of the design, construction, and durability of the proposed units submitted to the Warranty provider before installation on site.

For bespoke/handmade windows; site testing for water penetration of the joints to windows and doors in accordance with the CWCT test methods is recommended to check the site workmanship of the building envelope as constructed. See CWCT Technical Note No. 41 for guidance on site hose testing.

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

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.

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

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

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

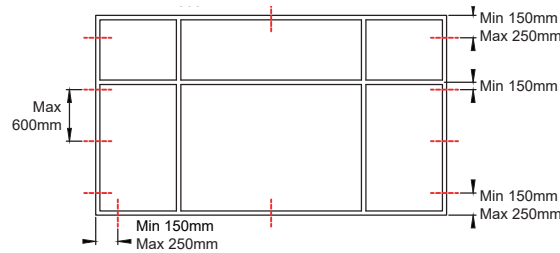
- BS 4787: 1 Internal and external wood door sets, door leaves and frames.
- BS 6262 Code of Practice for glazing for buildings.
- BS 6375: 1 Performance of windows.
- BS 644: 1 Wood windows.
- BS 8213: 1 Windows, doors and roof lights.

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 alloy windows and door sets.
- BS 6510 Steel windows and doors.

### Fixing distances for timber windows and doorsets

Windows and doors should be installed in accordance with manufacturers instructions.



Wherever practicable, the sides of the frame should be secured as follows:

- Corner jamb fixings should be between 150mm and 250mm 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 and doorsets over 1800mm wide, central head and sub-sill fixings should be provided.
- Frames should be fixed either by galvanized steel cramps or by non-corrodible screw fixings into the surrounding wall.

### Windows and doors installation

Windows and door frames should be installed so that:

- They do not carry loads unless designed to do so.
- The masonry on the external side of 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. In other areas of exposure, the frame should be set back at least 38mm and overlap the DPC.
- Distortions of doors should be minimized by not locating radiators or other heaters close to doors.
- The reveal should be protected throughout its width by a continuous DPC. The width of the DPC should be sufficient to overlap/be fixed to the frame and fully protect the reveal. Alternatively, an insulated finned cavity closer with third-party certification may be used.
- 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 manufacturers recommendations.

### Workmanship

- Timber frame windows and doors should be installed so that any gap provided between the masonry and the frame should not exceed 10mm.
- For gaps less than 5mm, the sealant must cover both the frame and masonry by 6mm.
- For gaps greater than 5mm, a backing strip should be provided behind the sealant and the sealant should have a minimum depth of 6mm.

### Draught Seals

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

### Decoration

Preservative-treated joinery cut or adjusted on-site should be brushed liberally with an appropriate and coloured preservative. The primer coat should be applied to all final exposed parts, including rebates prior to glazing installed or bottoms of doors.

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. Where a painted finish is proposed to the window/door frame and opening units; the primer coat should be applied to all final exposed parts, including rebates prior to glazing installed or bottoms of doors, or windows.

### The use of Oak in windows and door manufacture

For the purpose of this section there are three types of oak considered;

- Green Oak - recently felled Oak with a moisture content typically between 60%-80%.
- Air Dried (seasoned) Oak - naturally stored Oak with a natural seasoning process moisture content up to 30%
- Certified kiln dried oak - processed seasoned timber with a moisture content of 12% or less.

Green or air dried Oak is not acceptable for use when manufacturing windows and doors.

Certified kiln dried Oak with a certified moisture content of 12%, is acceptable for the manufacturing of windows and doors, subject to the external joinery meeting the relevant British Standards for manufacturing/testing, as outlined in this section.

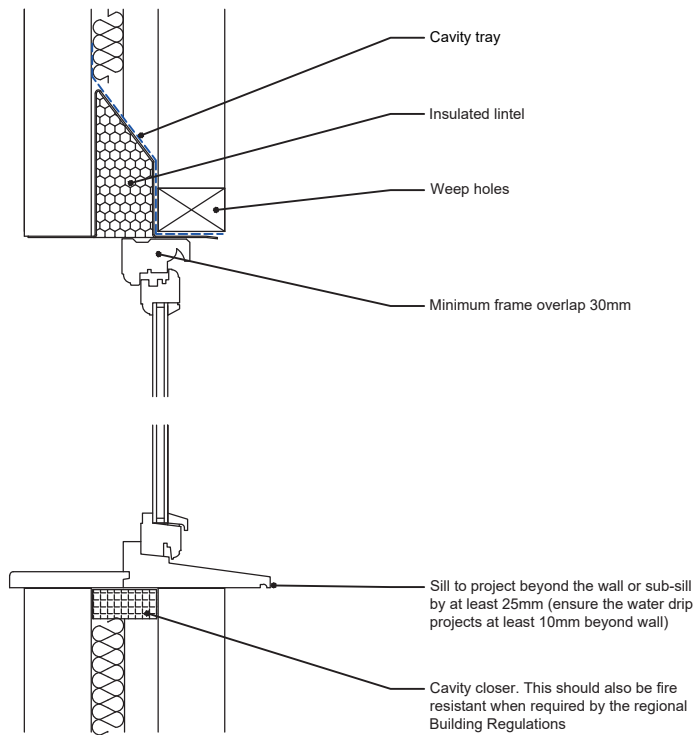
### Additional requirements in a coastal location

Where developments are within a coastal location additional Warranty requirements should be met.

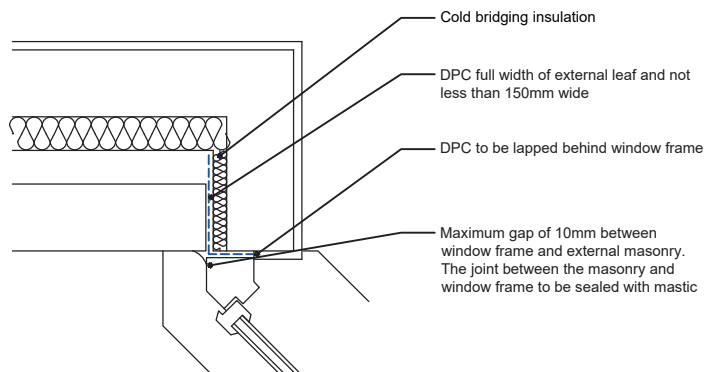
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Further information on Warranty requirements within a coastal location can be found in 'Appendix B - Coastal Locations'.

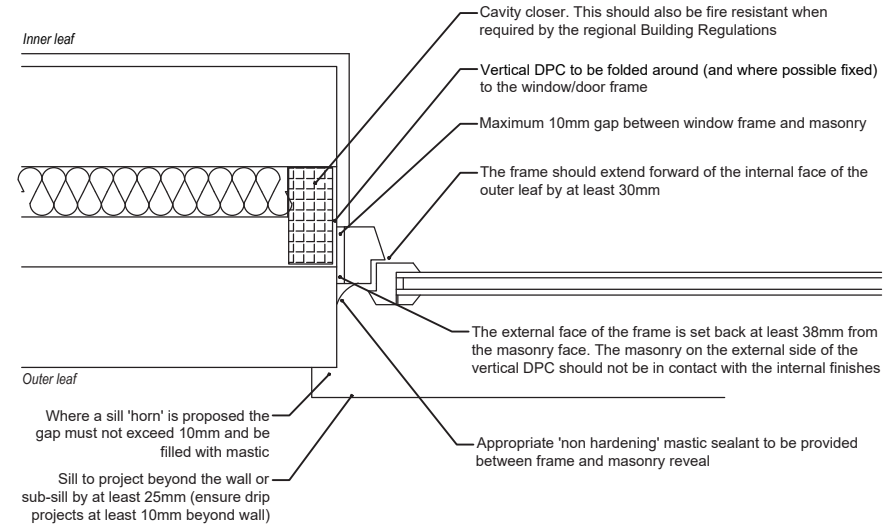
Typical vertical section through window



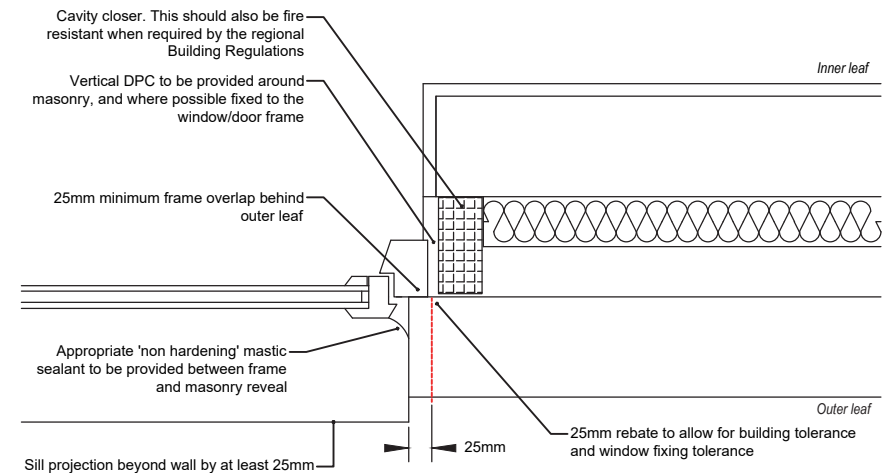
Bay window detail



Typical window reveal detail (normal exposure)

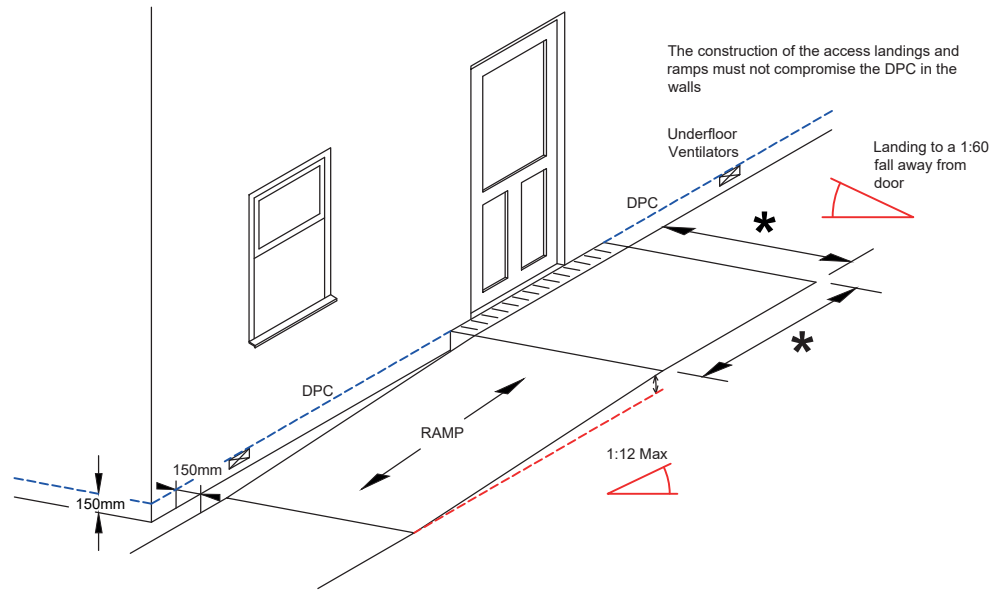


Checked rebate window frame detail for areas of severe exposure



When installing window/door frames in a checked rebate, allow for the frame to be deeper:

- To accommodate the 25mm rebate, and
- To allow for opening lights to open clear of the masonry/render.

Ramped/level threshold to principle entrance door

\* See Building Regulations for disabled ramp design and landing dimensions.

Ramps should not exceed 1:12 gradient. Where the outside ground levels slope towards the property, an effective gully system should be provided to prevent flooding, e.g. in front of garage doors.

Level threshold

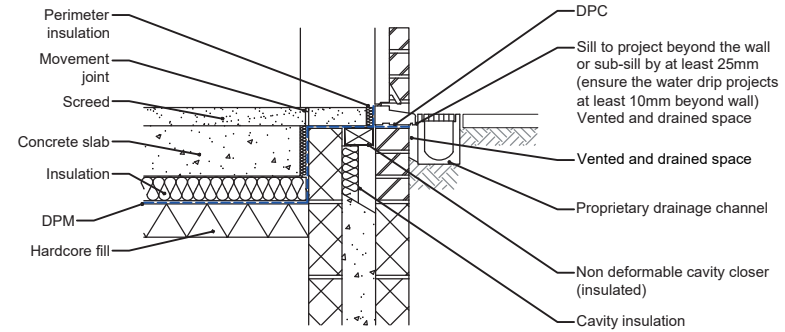
Thresholds and sills should be at least 150mm above finished ground level. However, where a level (threshold) access is required, the general guidance in this section should be followed - ensuring a high level of supervision and workmanship together with the correct specification of materials and consideration to design, location, and exposure.

Wherever possible, locate the entrance door away from the prevailing weather and provide a storm porch. Where a drainage channel is provided, this must be connected to the storm drainage system to prevent flooding occurring and water ingress into the building.

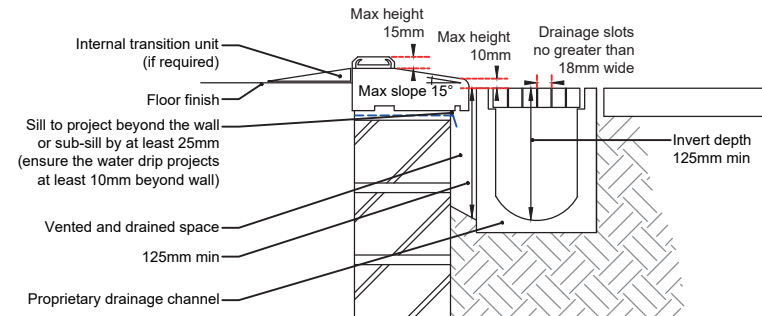
It is recommended that a mat well be constructed within the entrance hall to accommodate the swing of the door without fouling the carpet and/or the proprietary door seal.

Level thresholds timber frame structure

At the level threshold open perpend should be provided in close proximity to the timbers on each side of the door opening one brick course below the lowest timber. The open perpend must provide adequate ventilation of the external wall cavity, and drainage to disperse water that may penetrate the cladding.

Ground bearing slab construction, timber door sillTimber sill

Where timber sills are installed, to prevent deterioration of the timber due to the risk of moisture ingress, a drained and vented void must be provided immediately in front of the sill (at least 125mm invert).



# **8.**

## **Windows and Doors**

### **8.3**

## **General Requirements**

### Fire doors between a dwelling and attached / integral garage

A door (and frame) between a dwelling and an attached or integral garage should be:

- Half-hour fire resisting
- The fire door and frame must be installed as a combined tested fire door set and not made from either different untested components or components from different products which were not tested together.
- Proof of fire test performance to be available to demonstrate meeting the requirements of the Building Regulations.
- All gaps between the frame and the surrounding wall opening must be kept to a minimum as defined by the door supplier and appropriately made good to achieve the fire resistance of the wall.

Fire doors must be installed as a fire door set as tested and not made from different untested components. Proof of fire test performance to be available to demonstrate meeting the requirements of the Building Regulations. All gaps between the frame and the surrounding wall opening must be kept to a minimum and appropriately made good to achieve the fire resistance of the wall.

### Security

The design and specification of doors and windows which provide access into a dwelling or into a building containing a dwelling should take into account the requirements of current regional Building Regulations to ensure the system is classified and tested to the appropriate burglar resistance class.

In addition:

- The frames of secure doorsets and windows should be mechanically fixed to the building structure in accordance with the manufacturer's tested specifications.
- Where a doorset is installed in a lightweight framed wall, a resilient layer should be incorporated to reduce the risk of anyone breaking through the wall to access the locking systems. The resilient layer should be for the full height of the door and 600mm either side of the doorset, 9mm timber sheathing or expanded metal may be used.
- Any glazing which if broken in an attempt to gain access to the locking device on a door must be a minimum class of P1A in accordance with BS EN 356:2000.
- A means of caller identification should be provided at the main door to the dwelling to allow means of seeing callers. The same doorsets should also have a securely fixed door chain or door limiter fitted.
- The doors and windows should be manufactured to a design that has been shown by tests to meet the security requirements of PAS 24.

### Protection from falling

For houses and flats the guidance in Approved Document K2 (Building Regulations England and Wales) 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 the finished floor level. The wall beneath the opening is therefore considered to be the barrier to falling.

Where window openings are formed less than 800mm 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.

If window openings are formed less than 800mm from the finished floor level, and there is no permanent guarding provided, and the glass is required to act as the barrier and provide containment to persons falling against it; the glass needs to 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 which is required to provide containment must meet with BS EN 12600 Class 1(C)1.

### Control of condensation

Minimise the effects of condensation on glazing and frames by:

- 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.

### Critical locations

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

These 'critical locations', as shown below, 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 annealed 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 polycarbonate, whereas annealed 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.

A glazing material would be suitable for a critical location if it meets the requirements of BS 6262 - 4 Table 1 when tested in accordance with BS EN 12600. Glass installed in a door or in a side panel to a door that exceeds 900mm wide must meet the relevant requirements of BS EN 12600 and BS 6262 - 4.

### Appearance of glazing

Glass must meet the visual assessment criteria of the Glass and Glazing Federation and 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.

Acceptable Faults include:

- Inclusions, bubbles, spots and stains.
- Residues within the insulated glass unit cavity.
- Fine scratches not more than 25mm long.
- Minute particles.

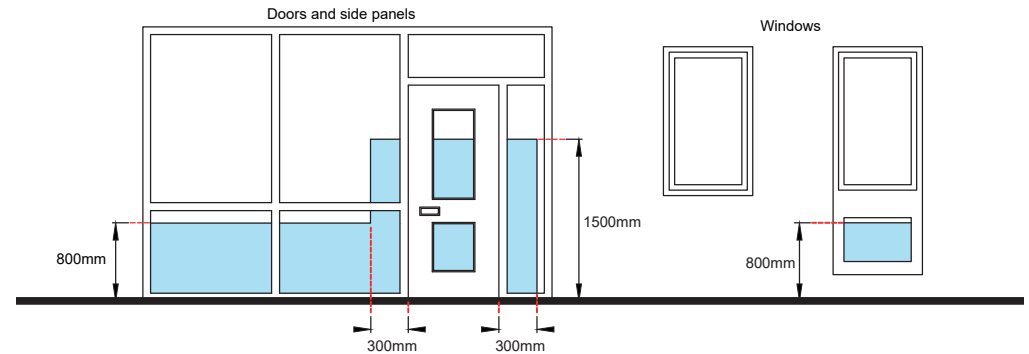
When assessing the appearance of glass:

- 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 50mm 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 diffused light from fixed wall or ceiling outlets and not from portable equipment.

### Glazing to critical locations



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, be CE marked and carry third-party accreditation. This includes windows in possession of a BBA certificate and timber windows.

- They should have continuous dual seals; single seal units are not acceptable.
- Desiccant should be provided to spacer bars.
- Any glazing on-site must have a drained and ventilated bottom bead with a minimum gap of 5mm between the edge seal of the insulated glass unit and the bottom channel of the frames glazing rebate.
- Any glazing with an area greater than 1m<sup>2</sup> must have a drained and ventilated bottom bead with a minimum gap of 5mm between the edge seal of the insulated glass unit and the bottom channel of the frames glazing rebate.
- Glazing with an area less than 1m<sup>2</sup> may be solid bedded.
- UPVC 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, the putty should be neatly finished to receive a protective paint coat.

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

The window beads should suitably lap the windows and doors to prevent premature degradation of the glazing unit.

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 and double-glazing should be fixed and bedded as recommended by the GGF.

### Nickel sulphide inclusions in glazing

In buildings which exceed three storeys in height, 100% of toughened glazing should be formed and then heat soak tested in accordance with BS EN 14179-1. The glass must be permanently marked in accordance with BS EN 14179-1 and substantiated evidence of heat soak testing must be disclosed for all effected panes.

Alternatively where toughened glazing does not exceed 50kg in weight and where there is safe and easy access to remove and replace the glazing without the need for access scaffolding or fall arrest equipment, a methodology statement of how this will be undertaken should be provided.

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