



Steel Window Association

Fact Sheet 3

THE STEEL WINDOW ASSOCIATION, 42 HEATH STREET, TAMWORTH, STAFFORDSHIRE, B79 7JH

Guide to Installation of Steel Windows

INTRODUCTION

Steel windows are designed for fixing directly into structural openings of masonry, concrete, brick, block or steelwork. They can be inserted into subframes of metal, plastic or timber, particularly when bolder sightlines are desired, but this is not a requirement.

Glazing techniques can vary from metal casement putty fronting of single glass to drained and ventilated systems with beads for insulating glass units.

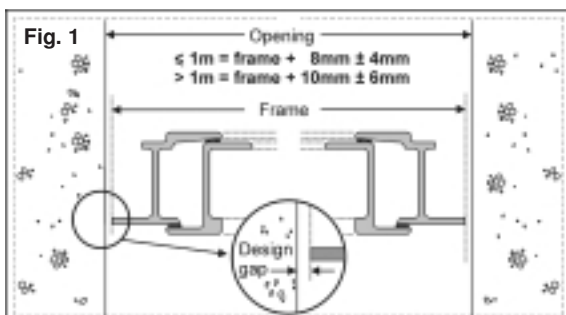
This guide offers advice applicable to frames of hot rolled steel - W40, W20, SMW - and of cold formed hollow profiles, either replacing windows in existing buildings or destined for new construction. Each manufacturer will have his own variations, and it is strongly recommended that manufacturers' specialist fixing and glazing services be employed for all but the most straightforward single light 'hole-in-wall' installations.

DETAILING THE PERIMETER JOINT

Steel windows can be connected to the structural opening either directly through the frame or offset with cranked lugs. They need a perimeter design gap to allow for thermal movement, fabrication size variance and aperture construction tolerance. Gaps may vary to rationalise frame sizes measured to fit existing similar but not identical openings.

Recommended opening sizes

Heights and widths up to 1m should be +8mm ±4mm greater than the window frame sizes. Over 1m they should be within +10mm ±6mm. Once the frame is centralised in its opening, perimeter design gaps will therefore be no less than 2mm and no greater than 8mm. See figure 1

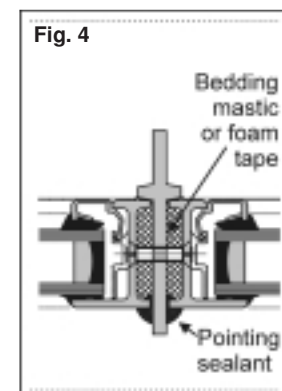
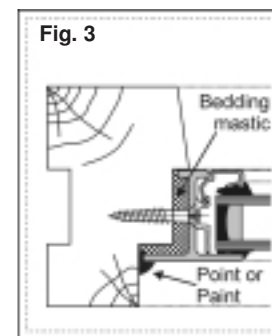
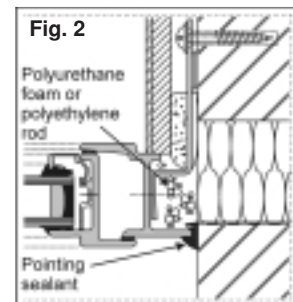


Sealing the joint

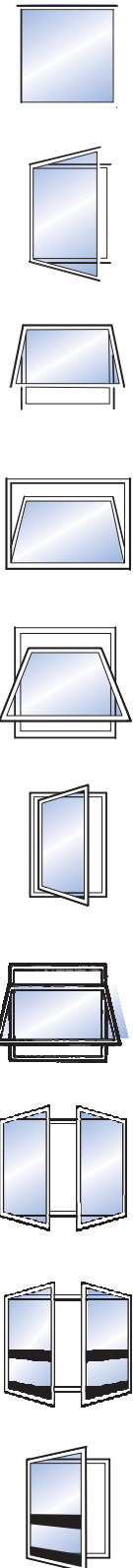
The external perimeter seal has to be appropriate to the metal frame surface, the structural opening material, joint size and configuration, anticipated joint movement and exposure to the weather. When greater than 3mm wide, it must be supported with a backing material. Flush brick or block reveals, flush soffits, and straight through joints at sills require a backfill of polyethylene rod, polyurethane foam, or in special cases waterproof cement mortar (by the general contractor), before any internal finishes are applied.

Waterproofing the perimeter joint is ensured by **both**

- external pointing **and**
- either perimeter backfilling, generally of flush straight through joints, see figure 2
- or bedding, against rebated structural openings or subframes, see figure 3



Coupling joints in many window systems must also have seals, such as polyethylene foam or expanding bituminised tapes, bedding mastic, or flexible polymer gaskets, placed within the profile cavity during the assembly operation. Without them, coupling screw holes can be a source of leaks. It is not enough to rely solely on an external pointing sealant. See figure 4



DETAILING THE PERIMETER JOINT - *continued*

Traditional vegetable oil based mastic sealants depend on a paint overcoat to maintain their service life. Non-setting butyl based compounds usually need capping with paint or a compatible pointing sealant to prevent oils weeping from the joint and to protect them from ultra-violet radiation.

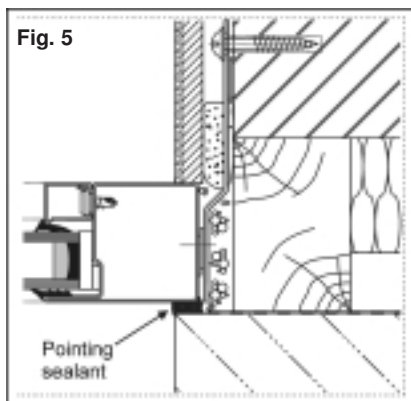
Modern polymer sealants are more resistant to weather and u/v exposure than bedding mastics: overpainting remains desirable with acrylics, is possible but not necessary with polysulphides, and is to be avoided with silicones. Some will need a primer before application to ensure adhesion and to prevent staining of timber or stonework surrounds. Specialist advice and application is recommended for large-scale contracts.

Size of joint

Small joints up to 3mm wide can be bridged with gun-applied sealant of triangular cross-section, but for joint widths greater than 3mm a backing material must support the external perimeter seal. Flush brick or block reveals, flush soffits, and straight through joints at sills require a backfill such as polyethylene rod or polyurethane foam before any internal finishes are applied.

Ensure that enough sealant depth is achieved in the joint gap - 6mm between impermeable surfaces such as painted metal, 10mm if porous such as brick, block or concrete - and adequate face contact is made with both frame and surround - at least 6mm. It is good practice to lay or tool the sealant to a convex face profile.

Joints from 5mm to 15mm wide are better recessed, with parallel sides, to accommodate a gun-applied sealant of rectangular cross-section, to a minimum depth of 10mm, whenever the frame profile allows, eg hollow box section, again always supported by a backing material. *See figure 5.*



Joints over 15mm require special consideration and may require add-on profiles at extra cost making a weathertight connection to window or door frame before application of perimeter sealant.

Useful references are BS 6093 "Code of practice for design of joints and jointing in building construction" and BS 6213 "Selection of construction sealants".

FIXING INTO PREPARED STRUCTURAL OPENINGS

Windows can be neither weatherproof nor properly operational if the openings are not constructed plumb, square and true. Openings in existing buildings, after removal of old windows, may need their reveals repaired or faced-up with cement mortar to provide a sufficiently straight and flat joint surface. Recessed mortar joints in new fair-faced brickwork will need to be tooled flush where they abut the window frames.

Fixing positions

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 200mm from corners, 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.

Jambs

When fixing into structural openings of double skin cavity construction, the position of the window relative to the cavity and its damp proof membrane (DPM) is of prime importance. When inner and outer skin reveals are flush, the window must be set with the **back** of its front flange - usually an extended leg - aligned with the **inner** face of the **outer** skin.

See figure 2.

When inner and outer skin reveals are constructed with a check or internal rebate, the window must be set with its **front** face behind the **inner** face of the **outer** skin. *See figure 5.*

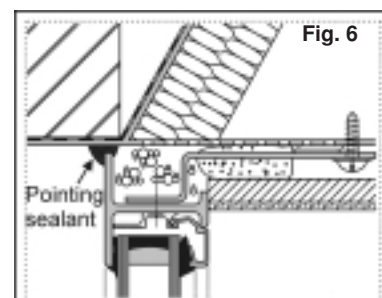
The vertical DPM must tuck into the frame behind this front flange and project well back into the cavity to ensure a proper weathering seal. A vapour barrier can be accommodated if required.

Through frame direct screw fixing may be possible into timber, steelwork and solid masonry. Existing double skin construction will often have returns to close the cavity. Extended cranked lugs, attached to the frame by nut and machine screw, are strapped back to the inner skin, plugged and woodscrewed, with shims as appropriate to avoid any twisting of the frame.

These extended lugs will subsequently be concealed by internal finishes, eg plaster, drylining, timber or plastic trim. Where a fair faced internal finish is desired, the most common solution is a cover trim to hide the fixings, but alternatively bricks or blocks can be left in sand at fixing positions, and adjustable angled lugs subsequently set in mortar.

Heads

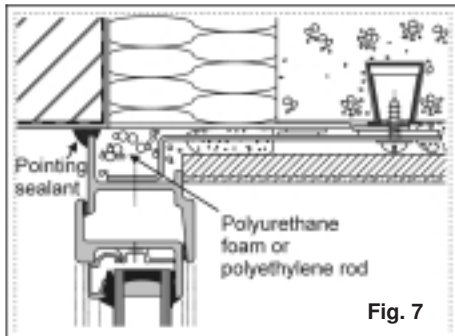
Lintel alignment at head must correspond with DPM position at jambs. No load shall be applied to the head of any window.



FIXING INTO PREPARED STRUCTURAL OPENINGS - *continued*

Adequate provision must be made in the joint design for head fixings. Lintels need to be selected with a suitable screw-holding surface for through frame or lug fixing. Steel lintels will need to be drilled at fixing hole centres for metal cutting screws. *See figure 6.*

Drilling and plugging of stone or concrete lintels can be speeded with pre-positioned cast-in dovetailed plugs, best full length as a continuous steel, timber or plastic rail at fixing positions agreed in advance with the window maker. *See figure 7.*



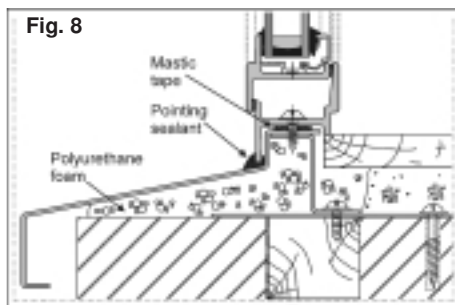
Sills

Subsills below the window may be of wood, plastic, brick, tile, stone, slate, or steel. As window heights may not always coincide with brick courses, the window must be positioned first at head to fit under the lintel, the brickwork under the sill being adjusted to suit.

Position any subsill rebate upstand so that a front extended flange on the window sits over it and is well bedded against both upstand and platform on mastic sealant, tooled and pointed in.

Wood subsills not already primed may need a sealer to protect them from mastic oil bleed.

Steel subsills with appropriate lugs, welded or bolted on, designed to span the cavity and be fixed to the inner leaf, can be provided by the window manufacturer. They should be fully bedded on mortar or back filled. *See figure 8.*



Composite Assemblies

Composite assemblies are usually delivered to site as separate window units, to ease handling and minimise damage. Build them up in the openings. Take care to keep coupling joints equal, and frames both aligned and plumb. Ensure that perimeter fixings are made close to coupling bar ends. Coupling joints must have seals, such as bedding mastic, expanding bituminised tapes, or flexible polymer gaskets, placed **within** the profile cavity during the assembly operation. It is not sufficient to rely solely on external pointing sealant. *See figure 4.*

Fixing into subframes

Using wood, plastic or metal subframes during new construction allows finished window frames to be inserted later, after many wet trades have finished on site, minimising risks of damage before completion. Frames are set on preformed mastic tapes or in mastic bedding compound spread continuously along rebate upstand and platform to fill the void between window and subframe. They are then cramped back and secured with substantial rustproofed screws. Surplus mastic is cut off and neatly tooled in. *See figure 3*

SPECIFICATION OF FIXING MATERIALS

Fixing lugs (at least 2mm thick) shall be of rustproof steel: cut from continuously hot dip galvanised sheet of Z2-G275M or N quality in compliance with BS EN 10142:2000; or hot dip galvanised to BS EN ISO 1461:1999; or of austenitic stainless steel to BS EN 10088-2:1995 grades 1.43xx (formerly 304) or 1.44xx (formerly 306).

Fixing screws (minimum shank diameter 5mm or No10) shall be of rustproof steel: zinc plated to BS EN 12329:2000 minimum thickness ZN10; or of austenitic stainless steel to BS EN ISO 3506:1998 grade A2 (304) or grade A4 (316).

Screws shall be sized to penetrate at least 25mm into timber, or 40mm into plugged holes in brick, block, or masonry. Connections to steelwork up to 2mm thick such as folded sheet lintels should be made with appropriate thread cutting screws, to steelwork over 2mm thick into pre-tapped holes with machine screws of minimum 5mm diameter, alternatively with power-driven hardened self-drilling screws.

BUILDING REGULATIONS

Replacement windows and doors

Building regulations now apply to replacement windows in existing buildings, whose owners are required to make reasonable provision for the conservation of fuel and power by limiting heat loss through the fabric of the building. They must demonstrate conformity

- either by submission to Local Authority Building Control
- or, for dwellings only, by employing an installer registered with FENSA, the Fenestration Self Assessment Scheme set up with government blessing by the Glass and Glazing Federation at 44 Borough High Street, London SE1 1BS.

BUILDING REGULATIONS - *continued*

A registered installer will need to have regard to many of the Approved Documents for England & Wales:

Building Regulations affecting installation of windows and doors

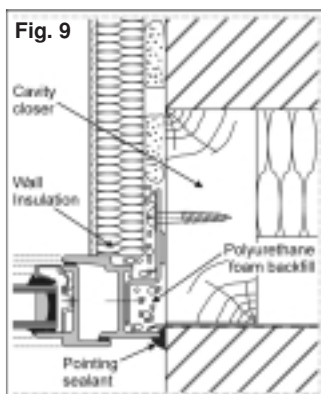
- A Structure - especially bay windows which may carry loads
- B Fire - means of escape
- E Sound - reduction of excessive noise
- F Ventilation - for health purposes in habitable rooms
- J Combustion appliances - the need to maintain an air flow to them
- L Energy - conservation of fuel and power
- M Access - for the disabled
- N Safety glazing

His duty will be fulfilled when he ensures that the building fabric is upgraded with respect to Parts L energy and N safety without worsening the building's compliance with any of the other requirements listed.

New build

For new construction, the specifier will seek conformity with current versions of all the above, and take note of *"Limiting thermal bridging and air leakage: Robust construction details for dwellings and similar buildings"* TSO 2001, invoked in Approved Document Part L1. This requires the building fabric to be constructed so that there are no significant thermal bridges or gaps in the insulation layers within the various elements of the fabric, at the joints between elements, and at the edges of elements such as those around window and door openings.

Consequently wall cavities, typically 75 to 100mm wide, need to be bridged by a treated softwood or proprietary closer, overlapped at least 30mm by the window frame. The frame should have sealant applied to both front and back. Wall insulation and finishes must return to the frame, which may impose alternative trickle ventilation solutions to the usual slotted head, and entail special consideration of vent opening clearance, hardware operation, and accessibility of glazing beads. *See figure 9.*

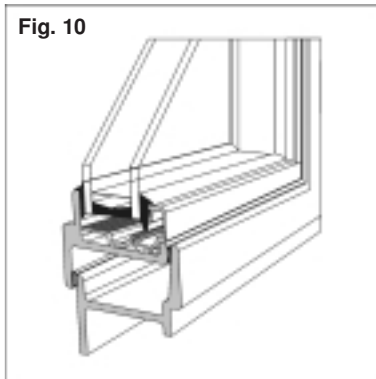


Properly fixed and glazed, modern steel windows will give a lifetime of satisfactory performance.

GLAZING

Steel windows and doors are designed for glazing on site. For ease of handling, assembly and installation on site, they are rarely delivered ready glazed by the frame manufacturer. W20, W40 and cold formed hollow section product ranges can be manufactured for glazing from outside or inside. SMW types of F7, EB14 or EB24 profiles are glazed only from outside. Putty fronted single glazing can still be offered for special heritage applications, but glazing with beads is recommended whenever frames are to be factory finished with a polyester colour coating, and beads are essential to protect most double glass units.

Drained and ventilated cavities around the edges of double insulating glass units are the preferred solution to enhance their durability. Refer to SWA Fact Sheet 6 for instructions on glazing W40, which adopts this technique. *See figure 10.*



All glazing should be installed in accordance with BS 8000-7:1990 "Workmanship on building sites - Code of practice for glazing". *This standard draws on BS 6262:1982 "Code of practice for glazing for buildings". Note that part 4 of this latter standard BS 6262-4:1994 "Glazing for buildings. Safety related to human impact" gives requirements for safety glazing superseded by Building Regulation Approved Document N.*

Within this framework standard, solid bedding methods remain acceptable, provided care is taken to ensure a continuous seal with no voids between the edge of the insulating glass unit and the glazing rebate platform. Each manufacturer will have his own preferred method. Some may require butyl based or polyethylene glazing tapes, which will need capping with silicone sealant. Others will use non-setting compounds, gun grade solvent release type sealants, one- or two-part curing sealants or two-part rubberizing compounds.

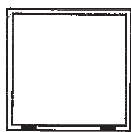
Manufacturers' instructions and guidance in BS 8000-7 need to be strictly followed for placement of insulating glass units, setting and location blocks (*See figure 11*), distance pieces, frame-to-glass and bead-to-glass gaskets, bead to frame airseals, corner sealing blocks, beads and bead end caps, bedding and capping sealants. Customers are usually best advised to employ manufacturers' specialist glazing services.

The following notes serve as a general indication of procedures for solid bedding in non-setting compound of insulated glazing units applicable to factory painted frames of hot rolled W20 or cold formed hollow section, and of putty fronted single glazing into SMW frames to be subsequently painted on site.

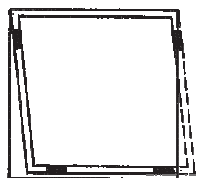
GLAZING - continued

Fig. 11

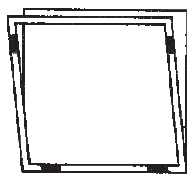
BS 8000: Part 7: Glazing
Recommended position of
Setting and Location blocks



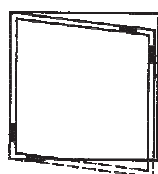
Fixed light



Top hung
or projected top
hung



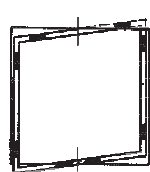
Bottom hung



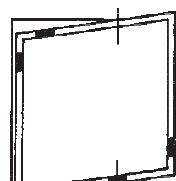
Side hung, door,
or projected side
hung



Horizontally pivoted
(central pivot)

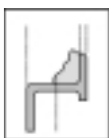


Vertically pivoted
(central pivot)

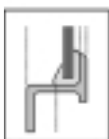


Vertically pivoted
(off centre pivot)

Single glazing putty fronted SMW F7



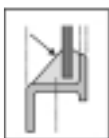
Ensure rebates are clean, dry and free of dust. Apply a continuous fillet of putty along the upstand and in the angle of the glazing rebates.



Offer the glass into the frame and press the perimeter to squeeze the putty out so that it forms an unbroken bed between the glass and the upstand about 3mm thick and between the glass edge and the glazing platform.



Apply the spring glazing clips: use at least two to each edge of a pane more than 600mm long. On small panes under 300mm high or wide a total of two clips per pane will suffice.



Apply facing putty, striking off with the putty knife to form a slope from the front edge of the glazing platform to a line about 1mm below the line of the glazing upstand on the inside of the glass.

Fig. 12

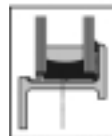
Footnotes

- 1 Metal window putty requires painting to ensure durability and performance. This should be done between two and four weeks after application. On factory finished windows this makes large scale putty glazing uneconomical and glazing beads are strongly recommended.
- 2 Special white glazing compounds which do not require painting are available for use with factory colour coated steel windows; these are sometimes slow to harden, may pick up dust, and discolour over time.

Double glazing with clip in beads SMW EB24



Ensure rebates are clean, dry and free of dust. Apply 1.5mm x 9mm tape to all rebate upstands and then remove paper protection. Apply rounded toe bead of low modulus silicone between rebate platform and tape. Sit glazing blocks on top of bead carriers at bottom of pane.



Ensure opening windows are secured in fully closed position and are located equally within their outer frame. Offer in 24mm sealed unit and push back firmly on tape. Fit location blocks where necessary to perimeter of units.



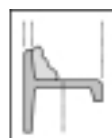
Insert putty knife into groove and ease open channel. Fill void between rebate platform and unit with low modulus silicone.



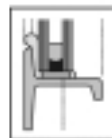
Offer in beads tilted at slight angle. True up beads. Insert spacer blocks between glass and bead adjacent to bead carriers. Completely fill void between glass and bead using low modulus silicone. Apply low modulus silicone fillet to cap off internally between frame and glass. Externally cap between bead and glass.

Fig. 13

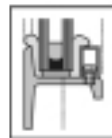
Double glazing with snap on beads W20 or cold formed hollow section



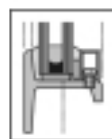
Ensure rebates are clean, dry and free of dust. Manufacturers prepare frames with holes for bead studs, which are either screwed or driven in. Apply a continuous fillet of glazing compound along the upstand and in the angle of the glazing rebate.



Position setting blocks as figure 11. Offer the glass into the frame and press the perimeter to squeeze the compound out so that it forms an unbroken bed between the glass and the upstand about 3mm thick and between the glass edge and the glazing platform.



Apply the bead studs in accordance with the window manufacturer's instructions.



Clip the beads over the studs and tap firmly into place. Corner clips may optionally be provided for use with square beads. These should be fitted squarely in each corner.

Fig. 14

Apply distance pieces between glass and bead. Strike off surplus glazing compound outside and inside to leave a smooth and flush line. Ensure that there are no gaps between glass and frame or beads.

Footnotes

- 1 Bead profiles may be square or sloping. The manufacturer may provide instructions about the sequence of applying widths and heights.
- 2 Frames are corner welded and glazing beads are cut to length; in each case to close tolerances within manufacturing limitations. Consequently gaps at the ends of beads may vary slightly. Corner clips may sometimes be provided for use with square beads to cover the gap between beads at the corner. Sloping beads can obviate their use.
- 3 Non-setting glazing compound does not have to be painted, although there is no harm by it.

The Steel Window Association represents the great majority of UK steel window manufacturers, ranging in size from the smallest of craft-based companies that specialise in replacement and repair work, particularly on windows for Heritage buildings, through to large, multi-site companies that manufacture and install windows in literally every type of building. There is not a single steel window project of any description, anywhere in the UK, that one of the SWA members cannot handle.

All windows produced by SWA members in hot rolled steel sections to BS 6510 are protected by the hot dip galvanizing process in accordance with BS EN ISO 1461. Cold formed steel section windows are also available and all steel section windows can be supplied with a decorative finish available in a range of colours. This process, in which polyester powder is electrostatically applied then heat fused under factory controlled conditions to BS 6497, gives a high quality, attractive and durable finish with a life expectancy of at least 15 years.

The Steel Window Association supports its member companies with a wide ranging service relating to product development, market research and promotion and the SWA helps ensure that each member operates to the highest industry standards. Every contract undertaken has the personal attention of senior management and SWA member companies operate established and flexible services in window design, manufacture, installation and repair and refurbishment.

Every effort has been made to ensure that the information in this fact sheet is correct at the time of going to print. However, the technical information and services referred to in it are subject to revision from time to time and may be added to or withdrawn. Please contact the SWA with any queries.

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