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SPECIFICATION FOR STEEL WINDOWS FOR INDUSTRIAL BUILDINGS

(First Revision)

(Incorporating Amendment Nos. 1 & 2)

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Price Group 5

Indian Standard

SPECIFICATION FOR STEEL WINDOWS FOR INDUSTRIAL BUILDINGS

(First Revision)

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(*Continued on page* 2)

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Indian Standard

SPECIFICATION FOR STEEL WINDOWS FOR INDUSTRIAL BUILDINGS

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 20 February 1978, after the draft finalized by the Doors, Windows and Shutters Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 Indian Standards Institution has already issued IS : 1038-1975* which covers steel doors, windows and ventilators for use in domestic buildings, such as residences, offices and schools. The range of sizes included in IS : 1038-1975*, however, does not meet all the needs of industrial buildings, like factories and warehouses, where larger single units are generally required to be used. Although, it is possible to couple two or more units in the domestic range to form larger units, yet the increased weight and cost and the resulting type of openings make it necessary to evolve a separate range to cover specifically the requirements of windows for industrial buildings. This standard has been prepared with this object in view and, as in the case of IS : 1038-1975*, the sizes of units have been derived on the basis of a 10-cm module and tolerances have been specified in accordance with IS : 1233-1969†.

0.3 This standard was first published in 1959. In this revision reference to rolled steel sections used for fabrication of doors, windows and ventilators has been omitted and separately included in IS : 7452-1974‡. With regard to the clearance on all the four sides for the purpose of fitting the doors windows or ventilators into modular openings, in view of the difficulties experienced with the adoption of specified clearance the provisions have been modified to 10 mm alround. Accordingly, the manufacturing sizes of these components have been suitably modified. Consequential changes have also been incorporated in the sizes of glass panes.

*Specification for steel doors, windows and ventilators (*second revision*).

†Recommendations for modular co-ordination of dimensions in the building industry (*first revision*).

‡Specification for hot rolled steel sections for doors, windows and ventilators.

0.3.1 Another important modification incorporated in this revision relates to the process of welding permitted for corner joints. In this context, provisions have been made to permit any method of welding provided the joints conform to certain requirements as given in this standard.

0.4 In the formulation of this standard due weightage has been given to international coordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country.

0.5 This edition 2.2 incorporates Amendment No. 1 (July 1983) and Amendment No. 2 (March 1986). Side bar indicates modification of the text as the result of incorporation of the amendments.

0.6 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard deals with steel windows suitable for use in industrial buildings and designed to suit openings based on a module of 10 cm.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Sash — A complete industrial window unit, whether of the fixed or opening type.

2.2 Composite Window — A window comprising of two or more sashes joined together with one or more coupling members.

2.3 Ventilator — The opening part of a sash. It consists of an inner frame and an outer frame.

2.4 Centre-Hung Ventilator — A ventilator horizontally pivoted at the centre of each side, with the top half opening inwards and the bottom half opening outwards.

2.5 Bottom-Hung Ventilator — A ventilator hinged at the bottom, and opening inwards.

2.6 Top-Hung Ventilator — A ventilator hinged at the top, and opening outwards.

*Rules for rounding off numerical values (*revised*).

3. HANDING

3.1 Handing and direction of closing of sashes shall be designated in accordance with IS : 4043-1969*.

4. DESIGNATION

4.1 In designating the different sizes and types of industrial windows, the following notation shall be adopted:

IN × Width of window expressed in number of modules × Type of window × Height of window expressed in number of modules

The letters IN indicate an industrial window; and the type of window is indicated by the following letter symbols:

F = Fixed sash,

C = Centre-hung sash,

B = Bottom-hung sash, and

T = Top-hung sash,

Examples:

1) IN 10 C 15 indicates 'Industrial window for opening 10 module wide (100 cm) by 15 module high (150 cm)' with centre-hung ventilator.

2) IN 16 F 10 indicates 'Industrial window for opening 16 module wide (160 cm) by 10 module high (100 cm)' with fixed glass panes.

4.2 Composite Windows — For composite windows, the notations illustrated below shall be adopted:

a) IN 10 C 10/IN 10 C 10/IN 10 C 10: This indicates three industrial windows of type IN 10 C 10, placed next to one another and coupled.

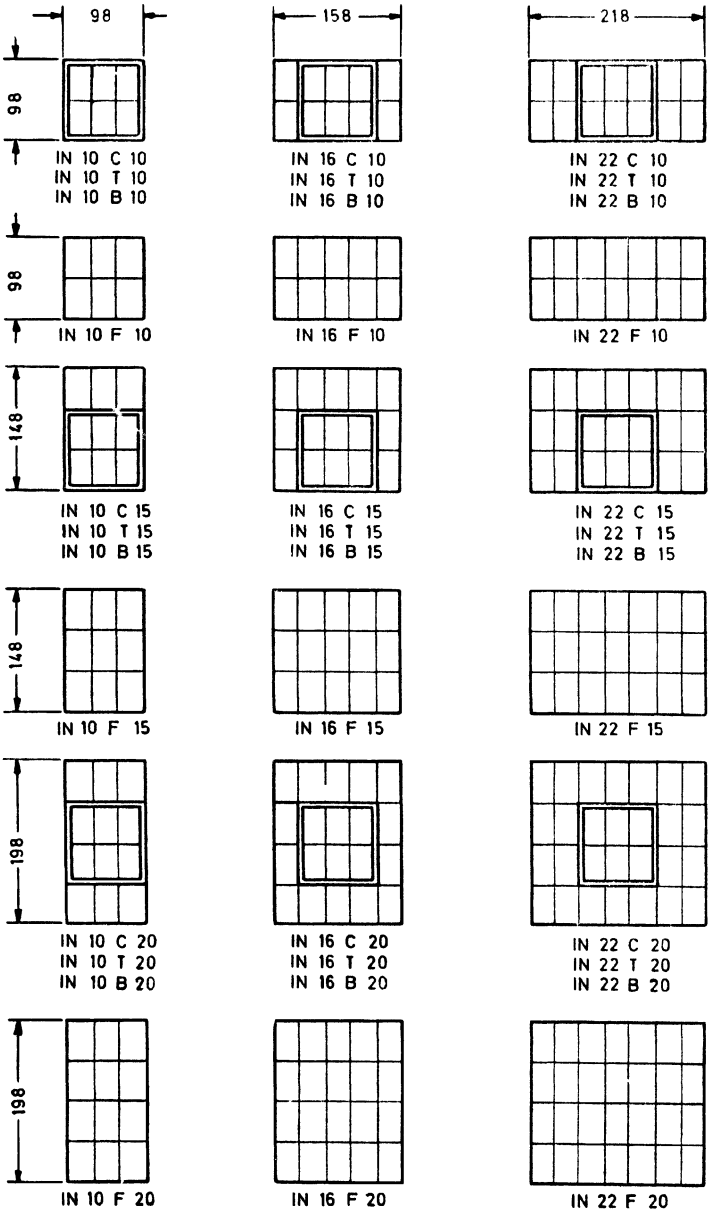
b) $\frac{\text{IN 10 C 10/IN 10 C 10}}{\text{IN 10 C 15/IN 10 C 15}}$: This indicates the combination of four windows, two of the type IN 10 C 10 on top and two of the type IN 10 C 15 at the bottom, all the four of them coupled both horizontally and vertically.

5. STANDARD SIZES AND TOLERANCES

5.1 Sizes

5.1.1 The type and sizes of industrial sashes shall be as given in Fig. 1.

*Recommendations for symbolic designation of direction of closing and faces of doors, windows and shutters.



All dimensions in centimetres.

FIG. 1 INDUSTRIAL SASHES

5.1.2 The dimensions shown in Fig. 1 are overall heights and widths to the outside of frames of steel sashes. These sizes are derived after allowing 10 mm clearance on all the four sides for the purpose of fitting the sashes into modular openings.

5.1.3 The ventilators shall be of one size and designed to fit into the outer frame of IN 10 C 10 and with 1.2 mm clearance.

5.2 Tolerances — The manufacturing tolerances of the industrial windows shall be such that the overall dimensions as shown in Fig. 1 shall not vary by more than 3 mm.

6. MATERIAL

6.1 Rolled steel sections for the fabrication of industrial sashes shall conform to IS : 7452-1974*. Steel used in the manufacture of these sections shall conform to IS : 1977-1969†.

6.2 Cord-eyes, pulleys, brackets and catch plates for spring catches may be of malleable iron or mild steel.

6.3 Pivots and spring catches shall be of non-ferrous metal. Coupling members for forming composite windows shall be fabricated either from mild steel sheets or mild steel flats conforming to IS : 226-1975‡ or shall be of extruded aluminium alloy section (*see* Fig. 2). The thickness of the sheet/flat shall be 3.15 mm.

6.4 Glass panes shall conform to IS : 2835-1977 Specification for flat transport sheet glass (*second revision*) or IS : 5437-1969 Specification for wired and figured glass as may be required. All glass panes shall have properly squared corners and straight edges.

6.5 Screws

6.5.1 Screw threads of machine screws used in the manufacture of industrial sashes shall conform to the requirements of IS : 4218 (Parts I to VI)-1967§.

6.5.2 Wood screws used in the fixing of sashes shall conform to IS : 451-1972‖ .

6.6 All bolts, nuts, screws, washers, peg stays and other mild steel fittings shall be suitably corrosion treated.

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*Specification for hot-rolled steel sections for doors, windows and ventilators.

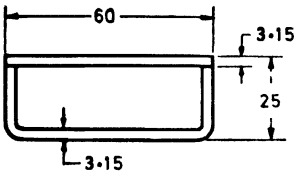
†Specification for structural steel (ordinary quality) (*first revision*).

‡Specification for structural steel (standard quality) (*fifth revision*).

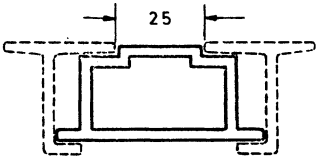
§Specification for ISO metric screw threads:

Part I Basic and design profiles
Part II Pitch diameter combinations
Part III Basic dimensions for design profiles
Part IV Tolerancing system
Part V Tolerances
Part VI Limits of sizes for commercial bolts and nuts (diameter range 1 to 39 mm).

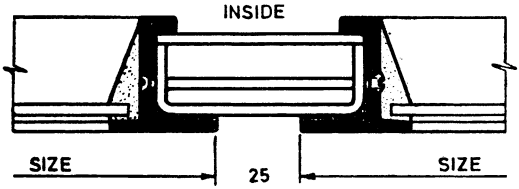
‖Specification for technical supply condition for wood screws (*second revision*).



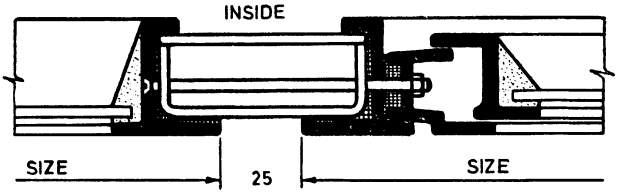
2A STEEL COUPLING BAR



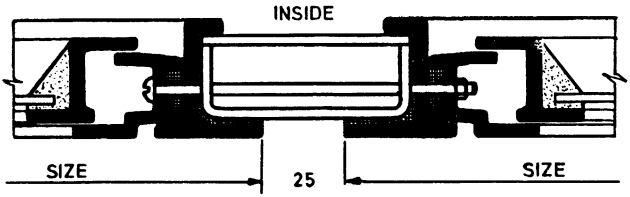
2B EXTRUDED ALUMINIUM ALLOY COUPLING BAR



2C COUPLING OF TWO FIXED SASHES



2D COUPLING OF A FIXED AND OPEN SASH



2E COUPLING OF TWO OPEN SASHES

All dimensions in millimetres.

FIG. 2 COUPLING DETAILS — HORIZONTAL AND VERTICAL

7. CONSTRUCTION

7.1 Sashes shall be square and flat.

7.2 Sashes shall be constructed of sections which have been cut to the required length and mitred. The corners of fixed and opening frames shall be welded to form a solid fused welded joint conforming to the requirements given in **7.2.1**. All frames shall be square and flat. The process of welding adopted may be flash butt welding or any other suitable method which gives the desired requirement.

7.2.1 *Requirements of Welded Joints*

7.2.1.1 *Visual inspection test* — When two opposite corners of the frame are cut, paint removed and inspected, the joint shall conform to the following:

a) Welds should have been made all along the place of meeting the members;

b) Welds should have been properly ground; and

c) Complete cross section of the corner shall be checked up to see that the joint is completely solid and there are no cavities visible.

7.2.1.2 *Micro and macro examinations* — From the two opposite corners obtained for visual test as in **7.2.1.1**, the flanges of the sections shall be cut with the help of a saw. The cut surfaces of the remaining portions shall be polished, etched and examined.

The polished and etched faces of the weld and the base metal shall be free from cracks and reasonably free from under cutting, overlaps, gross porosity and entrapped slag.

7.2.1.3 *Fillet weld test* — The fillet weld in the remaining portion of the joint obtained in **7.2.1.2**, shall be fractured by hammering. The fractured surfaces shall be free from slag inclusions, porosity, crack, penetration defects and fusion defects.

7.3 Tee sections for glazing shall be tenoned and riveted into the frames and where they intersect, the vertical tie shall be broached and the horizontal tee threaded through it, and the intersection closed by hydraulic pressure.

7.4 Ventilators, consisting of an inner opening frame and an outer fixed frame, shall be made as separate units which shall be bedded in mastic and screwed into the sash frames or tees with steel screws. The bars forming the vertical members of the inner and outer frames of centre-hung ventilators shall be reversed at the point of pivot; the top bars of inner and outer frames of top-hung ventilators, and the bottom bars of inner and outer frames of bottom-hung ventilators shall also be reversed (*see* Fig. 3).

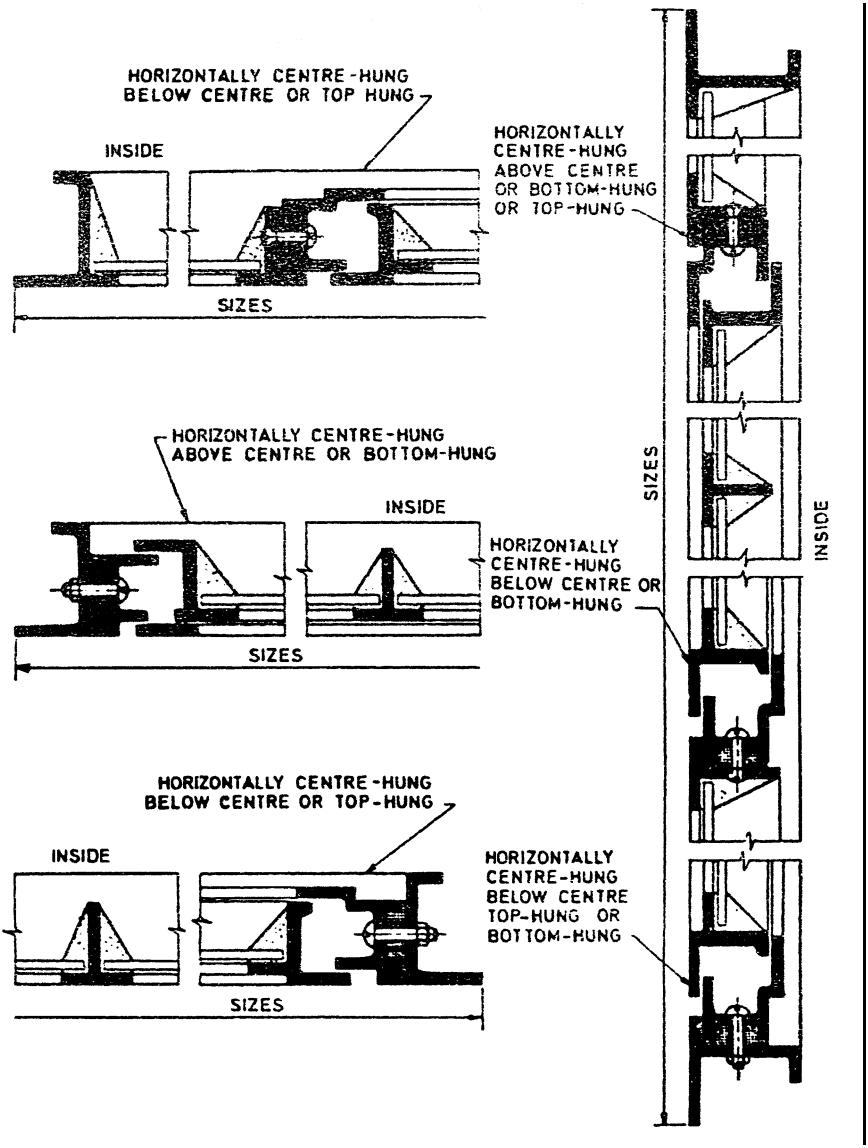


FIG. 3 SECTIONAL DETAILS THROUGH SASHES

8. HOLES FOR FIXING, COUPLING AND GLAZING

8.1 Holes for fixing and coupling sashes shall be provided in the web of the outside frame sections (and of the outer ventilator frame sections where these occur at the perimeter of the sash) as shown in Fig. 4. These holes shall be of 8 mm diameter, countersunk and shall be located 14 mm from the outside face of the frame section in position as shown in Fig. 5.

8.2 Holes for glazing clips shall also be provided, one hole being located in the web of the section or tee, on each side of each pane.

9. FITTINGS AND FIXING MATERIALS

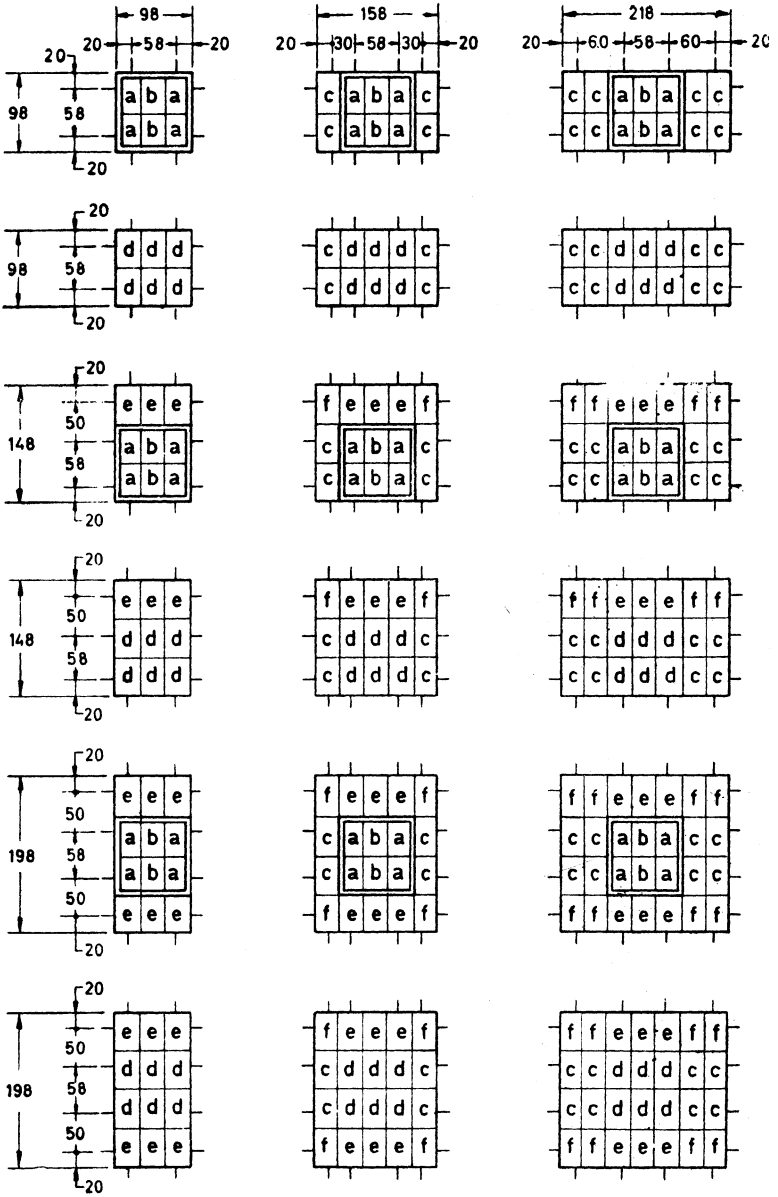
9.1 Centre-hung ventilators shall be mounted on a pair of brass cup pivots, each pivot consisting of an inner and an outer cup, permitting the swinging of the ventilator through an angle of at least 85°, and so balanced that the ventilator shall be capable of remaining open in any desired position under normal conditions.

9.2 Centre-hung ventilators shall be provided with a pulley (consisting of a brass pulley-wheel in a mild steel or malleable iron bracket) in the centre of the bottom section of the ventilator, and attached with brass or steel screws (*see* Fig. 5). They shall also be provided with a mild steel or malleable iron cord-eye riveted or welded to the bottom inner frame section of the ventilator in a position corresponding to that of the pulley (*see* Fig. 5).

9.3 Centre-hung and bottom-hung ventilators shall have a bronze (gunmetal) spring catch in the centre of the top section of the ventilator, suitable for operation by hand or pole [and by cord, in the case of centre-hung ventilators (*see* Fig. 5)]. This spring catch which shall be screwed to the frame with brass screws, shall close into a mild steel or malleable iron catch plate riveted or welded to the outside of the outer ventilator frame section.

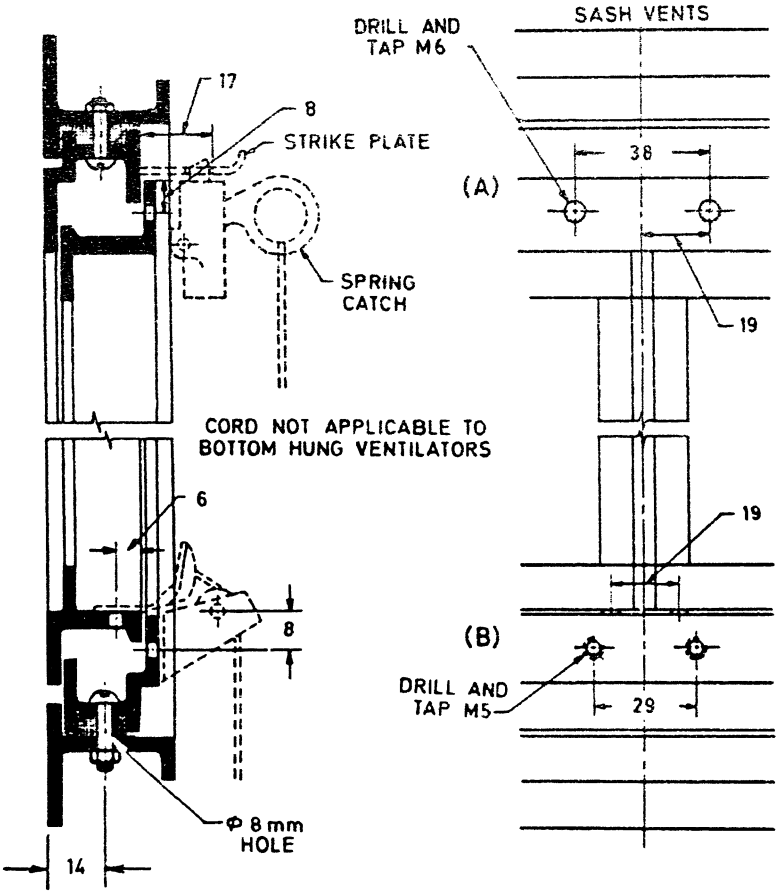
9.4 Bottom-hung and top-hung ventilators shall be hung on strong hinges made of steel or malleable iron or of non-ferrous metal.

9.5 Bottom-hung ventilators shall be provided with a pair of sherardized steel or malleable iron folding side arms to limit the opening of the ventilator (*see* Fig. 6). When the ventilator is closed, these side arms shall be invisible.



All dimensions in centimetres.

FIG. 4 FIXING HOLE CENTRES AND TYPES OF GLASS PANES



(A) Preparation for spring catch on horizontally pivoted and bottom hung ventilators
(B) Preparation for pulley and cord-eye on horizontally pivoted ventilators

NOTE — Mastic should be applied to joints where hatching shown.

All dimensions in millimetres.

FIG. 5 SPRING CATCH, PULLEY AND CORD-EYE

9.6 Top-hung ventilators shall be provided with a 30 cm peg stay of steel or of non-ferrous metal, mounted on a jaw bracket of mild steel or malleable iron, welded or riveted to the bottom inner ventilator section and locking into a locking bracket of similar material welded or riveted

to the bottom inner or outer ventilator section, and with a sherardized steel or non-ferrous metal peg welded or riveted to the bottom outer ventilator section (*see* Fig. 7).

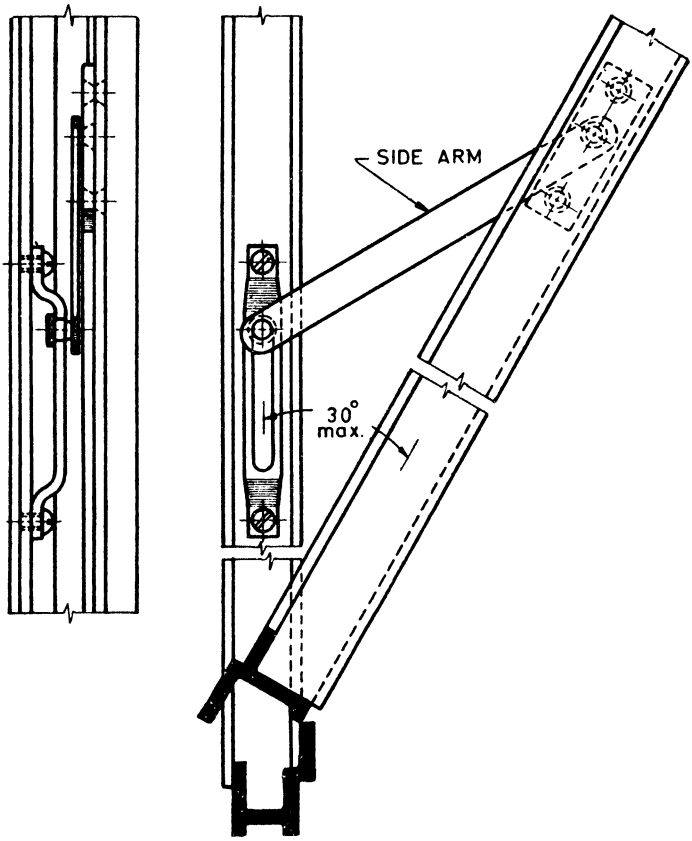
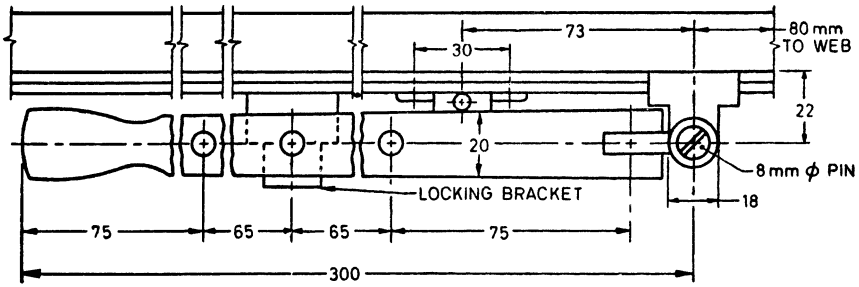


FIG. 6 FOLDING SIDE ARMS FOR BOTTOM-HUNG VENTILATORS

9.6.1 Alternatively, top-hung ventilators may be provided with a 30 cm bronze cam opener screwed to the ventilator with brass screws (*see* Fig. 8).



All dimensions in millimetres.

FIG. 7 A TYPICAL PEG STAY FOR SIDE-HUNG SHUTTERS AND TOP HUNG VENTILATORS

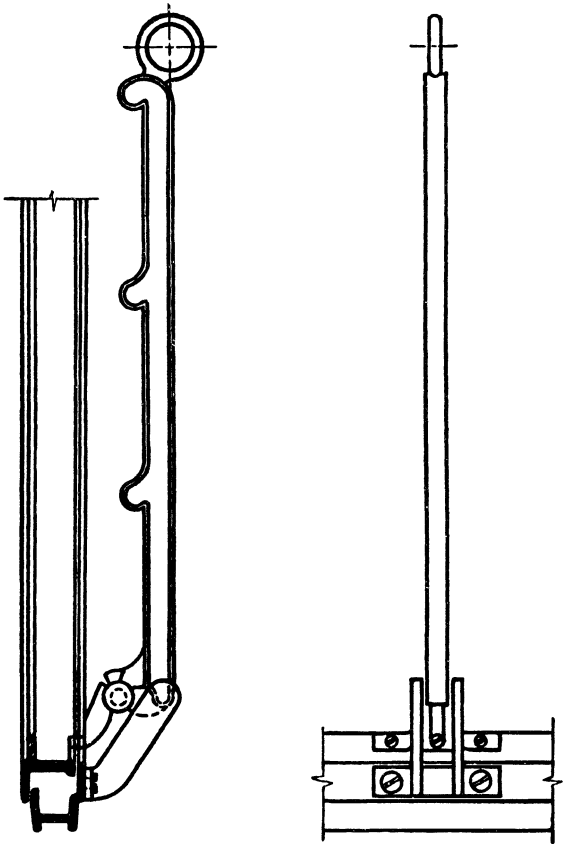
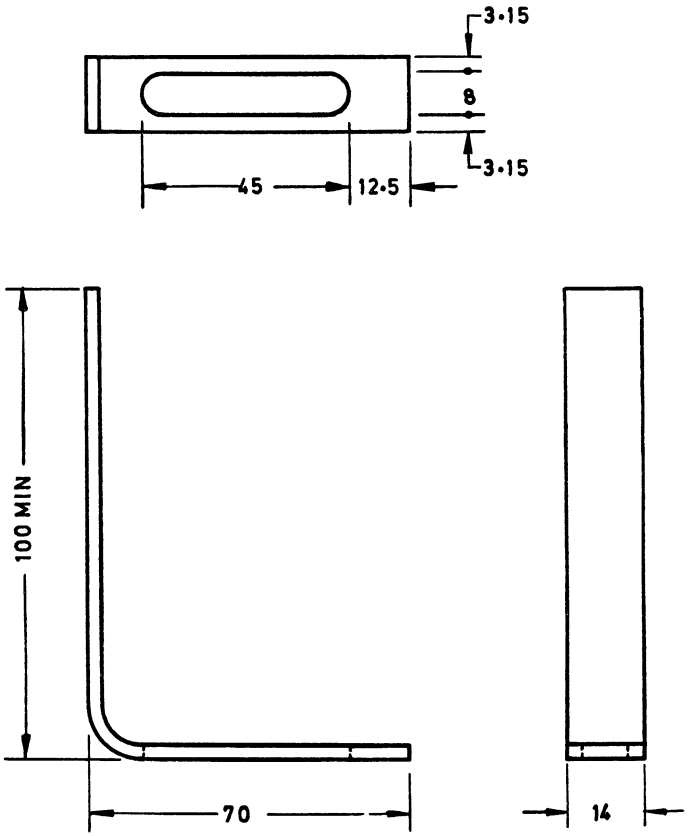


FIG. 8 CAM OPENER

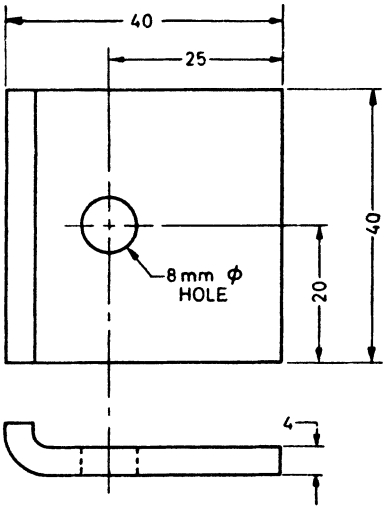
9.6.2 Both peg stay and cam opener shall be capable of holding the ventilator open in three different positions.

9.7 All sashes shall be provided with fixing fittings for the fixing holes shown in Fig. 4. These may be slotted reversible steel lugs (holdfasts) (*see* Fig. 9) complete with countersunk steel nuts and bolts for fixing to brickwork; wood screws for fixing to wood, plugged concrete or stone; or steel screws, or mild steel fixing clips with steel nuts and bolts (*see* Fig. 10) for fixing to steel. Lugs shall be manufactured from 3.15 mm thick mild steel sheet.



All dimensions in millimetres.

FIG. 9 SLOTTED FIXING LUG FOR BRICKWORK



All dimensions in millimetres.

FIG. 10 FIXING CLIP FOR STEEL WORK

9.8 For coupling sashes with members specified to form composite windows, countersunk steel bolts and cone-nuts, of suitable length and in the quantities specified for fixing, shall be provided.

NOTE — Where ventilation occur, lug screws and coupling screws may be of round head type.

9.9 Two spring glazing clips per pane shall be provided for putty glazing. These shall be made of spring steel to the design shown in Fig. 11.

9.10 Sashes may also be prepared for bead glazing made from either 9.5 × 9 5 mm aluminium channel of 1 mm thickness or 9.5 × 9 5 mm pressed steel channel of 0.375 to 0.45 mm thick galvanized sheet. Self-tapping screws shall be used for fixing bead or as an alternative bead fixing may be done with concealed screws. Back putty or 'U' shaped rubber channel shall be provided for glazing. No spring glazing clip shall be required for bead glazing.

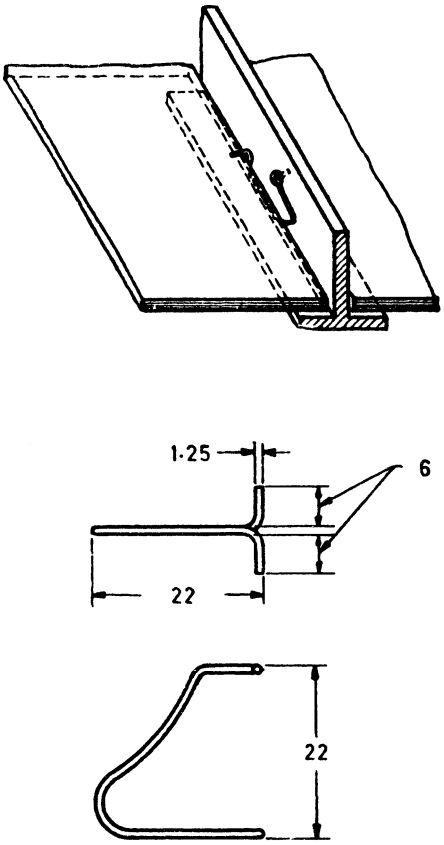
10. COMPOSITE WINDOWS

10.1 Composite windows shall be despatched unassembled, but complete with necessary coupling components. In composite windows each coupling member will increase the overall height or width by 25 mm maximum which includes manufacturing tolerances.

11. GLASS

11.1 The sizes of glass panes for windows shall be as given in Table 1. Allowance for clearance has already been made while arriving at the sizes of glass panes given in the table. The number and sizes of glass panes for each type of window shall be as shown in Fig. 4.

11.1.1 Sashes shall be inside glazed and prepared for putty glazing unless otherwise specified.



All dimensions in millimetres.

FIG. 11 SPRING STEEL GLAZING CLIP

TABL.E 1 GLASS PANE SIZES

(*Clause* 11.1)

PANE DESIGNATION	WIDTH	HEIGHT
(1)	(2)	(3)
	mm	mm
a	269	425
b	304	425
c	292	460
d	304	460
e	304	492
f	292	492

12. FINISH

12.1 All sashes and coupling members shall be either galvanized or painted. All steel surfaces shall be thoroughly cleaned free of rust, scale, or dirt by pickling or phosphating and immediately painted with two coats of red oxide conforming to IS : 102-1962* before despatch, or alternatively galvanized by the hot dip, zinc spray or electrogalvanizing process.

12.2 Material finished by hot-dip galvanizing shall be despatched unpainted. Zinc sprayed and electrogalvanized material shall be given one coat of red oxide paint.

12.3 The thickness of zinc coating by hot-dip galvanizing or metal spray shall be uniform and not less than 0.5 kg/m^2.

13. MARKING

13.1 All industrial sashes shall carry an identification of the manufacturer or trade-mark, if any.

13.1.1 The unit may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

*Specification for ready mixed paint, brushing, red lead, nonsetting, priming (*revised*).

14. PACKING

14.1 Industrial windows shall be despatched with the opening parts suitably secured to preserve alignment when fixing and glazing.

14.2 Fixing lugs, coupling fittings and all hardware shall be despatched separately.

14.3 Composite windows shall be despatched uncoupled.

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This Indian Standard has been developed by Technical Committee : BDC 11

Amendments Issued Since Publication

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