भारतीय मानक **IS 4351 : 2024**

Indian Standard

दरवाजों के लिए स्टील फ्रेम — विशिष्टि

(तीसरा पुनरीक्षण)

Steel Frames for Doors — Specification

(Third Revision)

ICS 91.060.50

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Doors, Windows and Shutters Sectional Committee, CED 11

FOREWORD

This Indian Standard (Third Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Doors, Windows and Shutters Sectional Committee had been approved by the Civil Engineering Division Council.

This standard was first published in 1967 and revised in 1976. In the second revision in 2003, the standard was modified to use galvanized steel sheets, additional profiles, powder coating of surfaces, etc. Considering the developments in the availability of different types and grades of steel for door frames, and adoption of different sizes and cross-sections used in India, the standard has been taken up for revision. The following modifications have been incorporated in the revision:

a) Title of the standard has been modified;

b) Steel frame nomenclatures have been defined;

c) Pre-painted galvanized steel sheet has been added as material for steel frames for doors. Thickness of the sheets have been also revised;

d) Sizes, designations and tolerances and type of profiles have been revised;

e) Tubular steel frame profile and their required provisions have been added;

f) Clauses related to hinges and fittings have been modified;

g) Finishes, requirements have been revised; and

h) Additional clause for frame installation recommendation has been added.

The composition of the committee responsible for the formulation of this standard is given in Annex E.

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 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

STEEL FRAMES FOR DOORS — SPECIFICATION

(Third Revision)

1 SCOPE

1.1 This standard lays down the requirement regarding materials, dimensions and construction of steel frames for doors for internal and external use.

1.2 The standard contains provisions for pressed steel frames and tubular steel frames for doors.

2 REFERENCES

The standards listed in Annex A contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of these standards.

3 TERMINOLOGY

For the purpose of this standard the definitions given in IS 10428 shall apply, as applicable. For steel frames nomenclature *see* Fig. 1.

4 HANDLING

For the purpose of hinges provisions to the door frames, hardware fittings handling and direction of closing of doors shall be designated in accordance with IS 4043.

5 MATERIAL

Steel frames shall be manufactured from the materials conforming to relevant Indian Standards and corresponding thickness as given in Table 1.

In case of pre-painted galvanized steel sheets, the top coat shall be of paint material such as epoxy/polyester/polyurethane/polyvinylidene fluoride (PVDF)/silicon modified polyester (SMP) and shall have minimum coating thickness of 20 microns. The back coat shall be of alkaloid epoxy or polyester and shall have coating thickness of minimum 7 microns.

NOTE — The top coat and its colour shade provided in paint material as agreed between the manufacturer and the purchaser.

6 STANDARD WALL OPENING, DIMENSIONS, SIZES AND TOLERANCES

6.1 Wall Opening Size

6.1.1 Wall opening or the masonry opening is a finished plastered opening which is provided for fixing of frame inside the opening. For partition walls and steel structure the same will apply (*see* Fig. 2). Additional frame screed depths may be defined by the user based on construction requirement along with the base ties for frame alignment.

6.1.2 Frame opening width (FOW) is the frame outer to outer dimension as shown in Fig. 2 for widths and heights. This is less than the wall opening width for fixing the frame inside the opening. For masonry opening, precast, shear-wall, steel and partition walls the recommended gap on all three sides for fixing is 5 mm.

6.1.3 This is the dimension between the frame soffit for width and between soffit of head member and finished floor level for height.

NOTE — However, it need to differentiate between the frame clear passage and the actual clear passage while calculating the exact dimension for movement of equipment. Actual clear passage may get impacted because of the shutter thickness and hardware projection (*see* Fig. 2) in open condition.

6.2 Dimensions

The dimension of the wall opening will be used to define the requirement of suitable door set including frame and shutter for that opening and is normally mentioned as width × height and expressed in millimetres (mm).

6.3 Sizes

The standard wall opening sizes for different doors codes are as given in Table 2.

6.4 Tolerance

The following manufacturing tolerances shall apply:

Sl No.	*Dimensions*	*Tolerance*
(1)	(2)	(3)
i)	Frame width	+/- 1.5 mm
ii)	Frame height	+/- 2.0 mm

6.5 Shapes/Style of Door Frames

The door frames may be provided with side light and fan light. Further, these may be provided with transom/mullion as shown in the Fig. 3.

7 STEEL FRAME PROFILE FOR DOOR

Steel frame profiles for doors are classified as follows:

a) Pressed steel frame profiles; and

b) Tubular steel frame profiles

7.1 Pressed Steel Frame Profile

7.1.1 The pressed steel frame profiles may be single rebate or double rebate, with grooved sealing or without groove (*see* Fig. 4). The commonly used steel frame profile sizes are given in Table 3. However, other steel profile sizes may be used based on design requirements and as agreed between the manufacturer and the purchaser and shall be declared by the manufacturer. The sizes of steel frames are designed to suit wall opening depths and that can vary from 90 mm to maximum 350 mm.

NOTE — Additional frame profile with architrave may be provided for aesthetic and to meet architectural requirement. Architrave frames are handed and the same can be provided on push side, pull side or on both sides of the shutter, hence proper care will be taken before manufacturing the same, (*see* Fig. 4).

7.1.2 *Construction and Workmanship*

7.1.2.1 *Frame construction*

Each door frame shall consist of hinge jamb, lock jamb, head, steel base ties at the bottom of the door frame, transoms, mullions and their top mitre joint/butted joint, the whole frame shall be either knock-down field assembled type, or welded unit. The sheet thickness and profile size shall be as per Table 1 and Table 4.

These frames shall be designed to be mounted on various types of opening namely, masonry, dry wall, steel structure, concrete structure, shear-wall, etc by just changing the fixing anchors.

Frames shall have grooved profile to take inbuilt sealing system on the rebate stop. Wherever, it is not possible to provide grooved profile due to design or material thickness, surface seals to be used for protection against loss of energy. All frames shall have back bend so that at the time of fixing it does not take the shape of the wall.

7.1.2.2 *Hardware reinforcement*

Provide hardware reinforcement of minimum sheet thickness as given in Table 5 and for additional information, the guidelines for installation of frames for doors and hardware, may be followed (*see* Annex D). Frames shall be mortised, reinforced, drilled and tapped to receive mortised hinges, locks, latches, and flush bolts as required (*see* Fig. 5 and Fig. 6).

7.1.2.3 *Mortar guards*

Mortar guard galvanized sheet of minimum 1.00 mm thick shall be welded or clipped to the frame preparation for hinges, mortise locks, latches slots, etc.

7.1.2.4 *Lock strike plate*

Provision shall be made to fix lock strike plates of mortise locks or latches. A slot suitable for lock strike plate shall be made into the rebate of the frame and necessary fixing arrangement and mortar guard from the inside of the frame shall be provided (*see* Fig. 5).

7.1.2.5 *Shock absorbers*

For side-hung door there shall be not less than two buffers of rubber or other suitable material inserted in holes in the rebate of the strike jamb and the top head member. Shock guard may be provided at location of minimum 300 mm from top closing edge.

7.1.2.6 *Rubber/EPDM seal*

The rubber/EPDM seal of suitable size shall be provided to the grooved profile steel door frame.

7.1.2.7 *Base ties*

Permanent base ties shall be of pressed mild steel or galvanized steel angle of size 20 mm × 20 mm × 1.25 mm (two numbers) either screwed or welded. A temporary base tie shall be screwed and to be removed at the time of fixing door shutter to the frame (*see* Fig. 7).

7.1.2.8 *Aldrop, sliding bolts and tower bolts*

Provisions shall be made for aldrop, sliding bolts and tower bolts in the frames as per mutual agreement between manufacturer and purchaser. Zinc electroplated mild steel, or nylon/PVC bushes shall be provided inside the pressed steel door frames along with the steel mortar guard.

7.1.3 *Frame Assembly*

7.1.3.1 *Knockdown frame*

Knockdown frame shall be either butted or mitred in construction. Butted frames shall be perpendicular assembled with bolts, the head jamb of the profile shall be 3 mm short of the side jambs for better seating.

7.1.3.2 *Mitered frame*

Mitred frames shall be assembled by mechanical means with self-tabs and with 45 degree cut on the face of the frame or pressed lock plates with 45 degree cut to the profile as per manufacturer's design. Frames shall be checked once assembled for rigidity and alignment for better performance (*see* Fig. 8).

7.1.3.3 *Welded frame*

In welded frames the joint between the head and jamb faces shall be welded along their length either internally or externally. The remaining elements of the frame profile, that is, soffit, stops, rabbets, are not welded. Face joints shall be ground and finished smooth with no visible seam. Face joints at meeting mullions or between mullions and other frame members shall be completely arc welded externally, ground, and finished smooth (*see* Fig. 8).

Since welded frame are assembled and shipped from factory, additional tie rod or spreader bar shall be provided for shipping and handling of frames. This temporary spreader bar shall be removed and a setting spreader shall be used for installation of the frame.

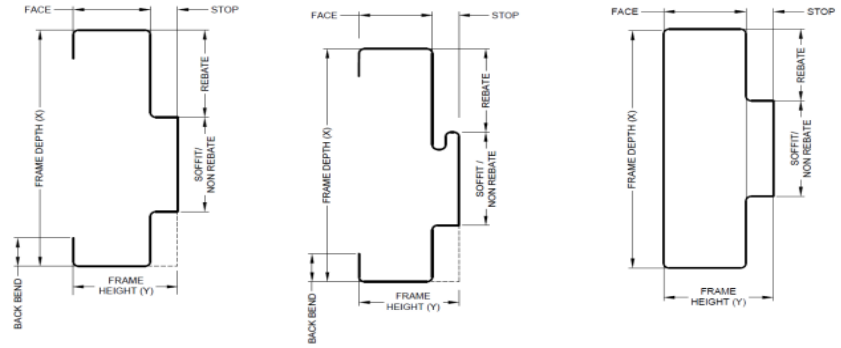


FIG. 1A STANDARD PROFILE FIG. 1B GROOVED PROFILE FOR SEAL FIG. 1C TUBULAR PROFILE

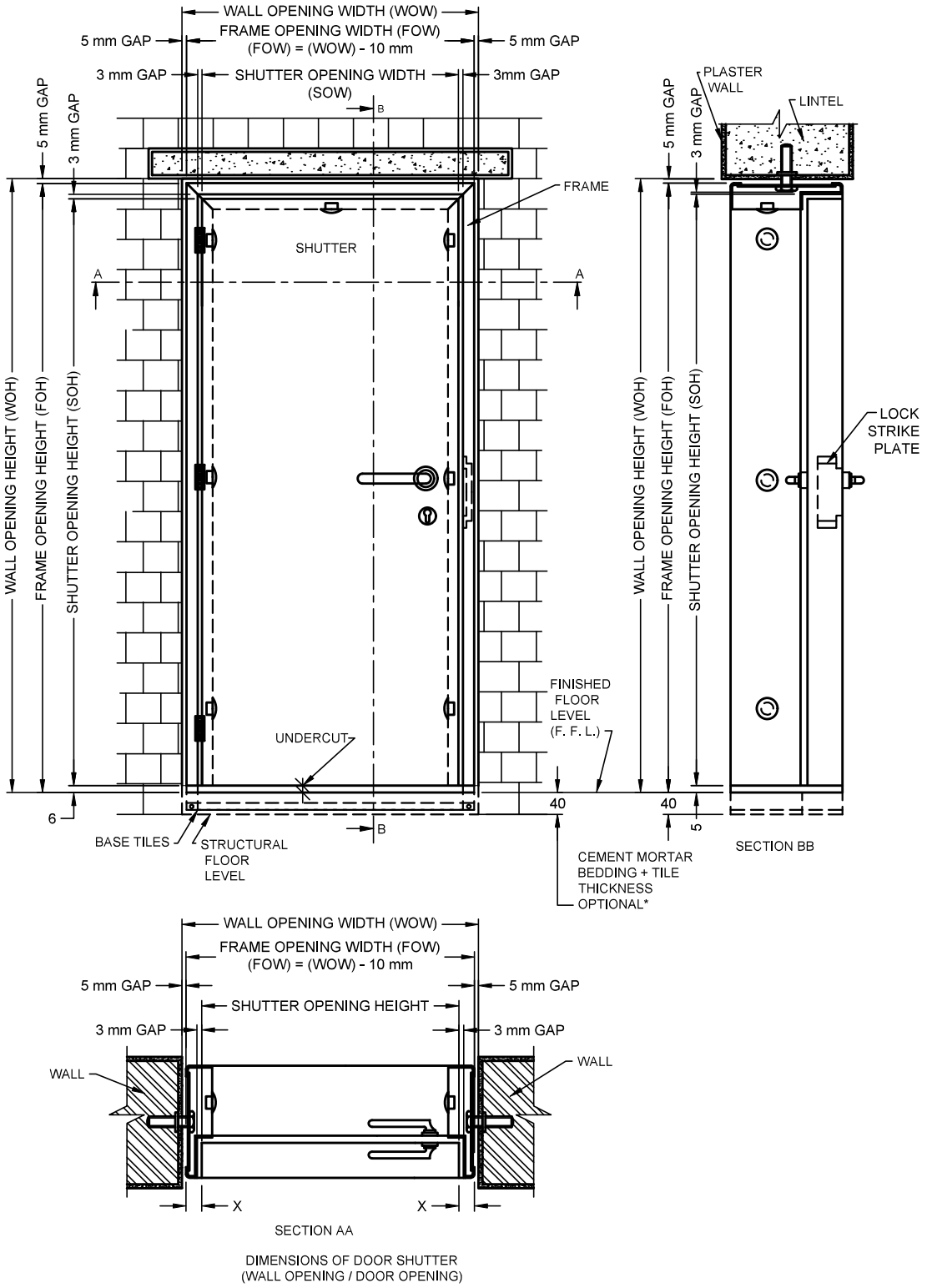
FIG. 1 STEEL FRAME NOMENCLATURE

Table 1 Material for Steel Frames for Doors

(*Clause* 5 *and* 7.1.2.1)

Sl No.	Material	Thickness (*see* Note) mm	Refer to Indian Standard
(1)	(2)	(3)	(4)
i)	Mild steel sheet (cold rolled)	1.25/1.60	IS 513 (Part 1)
ii)	Galvanized sheets — Plain grade — Lock forming (GPL), zinc coating 120 g/m^2 *Min* (inclusive of both sides with zero spangles)	1.2/1.60	IS 277
iii)	Stainless steel Grade — X04Cr17Ni12Mo2 (316) or X02Cr17Ni12Mo2 (316L) or X04Cr19Ni9 (304S1) or X02Cr19Ni10 (304S2)	1.20/1.60	IS 6911
iv)	Pre-painted galvanized steel sheets	1.20/1.60	IS 14246

NOTE — The thickness requirements are steel sheets used in manufacturing of pressed steel door frames. However, for tubular steel door frames the thickness of steel sheet shall be minimum 1.2 mm and may up to 2.5 mm.



All dimensions in millimetres.

FIG. 2 WALL OPENING/FRAME OPENING/SHUTTER OPENING (WIDTH × HEIGHT)

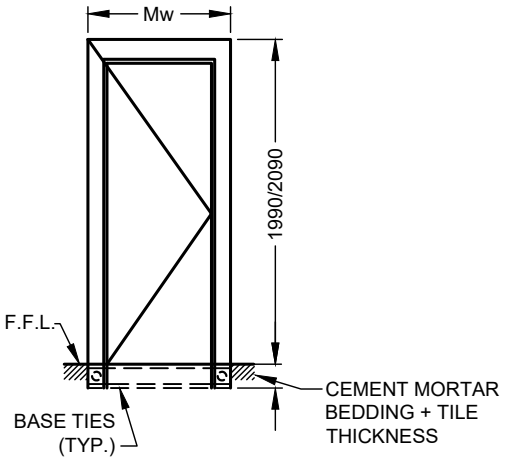


FIG. 3A STANDARD DOOR FRAME — SINGLE LEAF

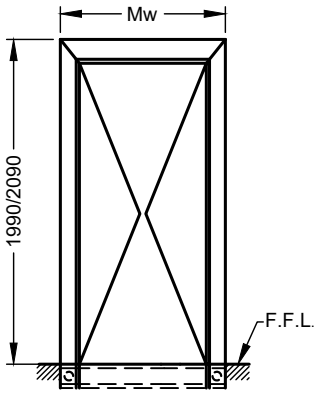


FIG. 3B STANDARD DOOR FRAME — DOUBLE LEAF

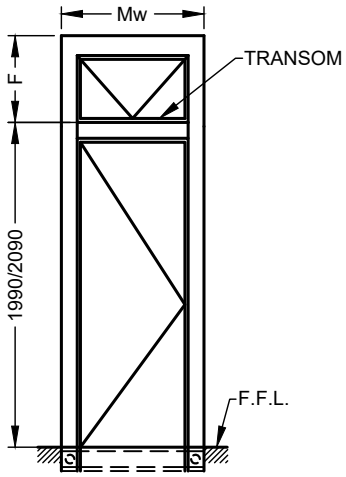


FIG. 3C FAN LIGHT/TOP HUNG FRAME

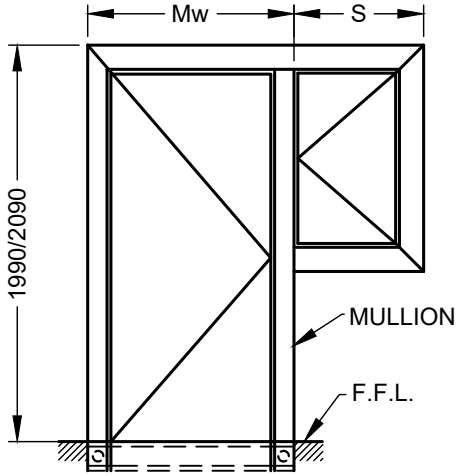


FIG. 3D SIDE LIGHT/SIDE HUNG SHUTTER FRAME

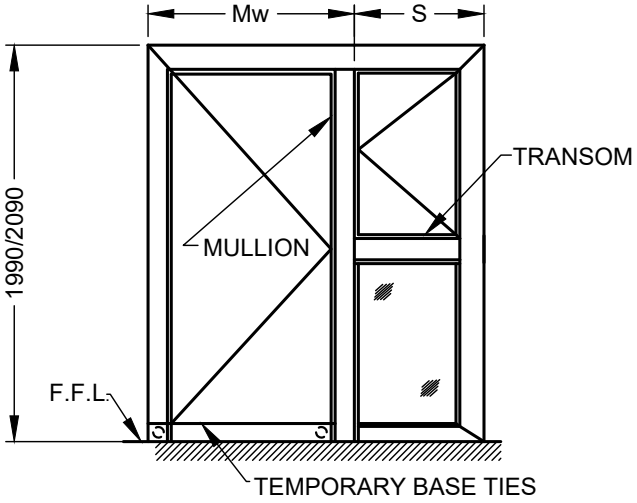


FIG. 3E SIDE LIGHT AND SIDE HUNG SHUTTER FRAME

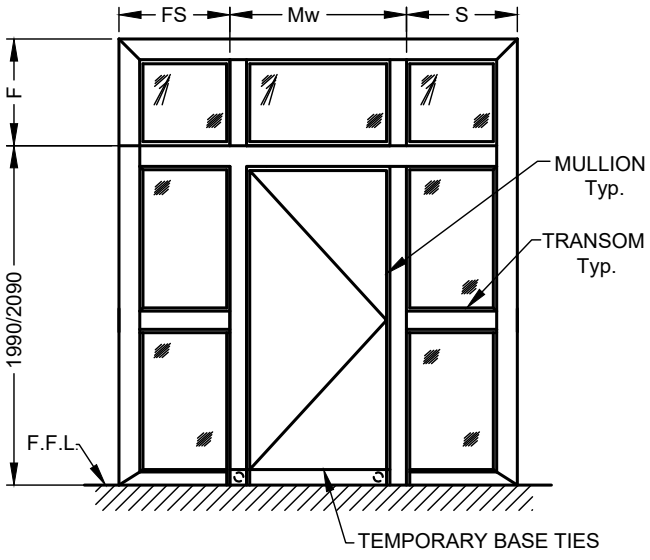


FIG. 3F FAN LIGHT AND TWO SIDE LIGHT FRAME

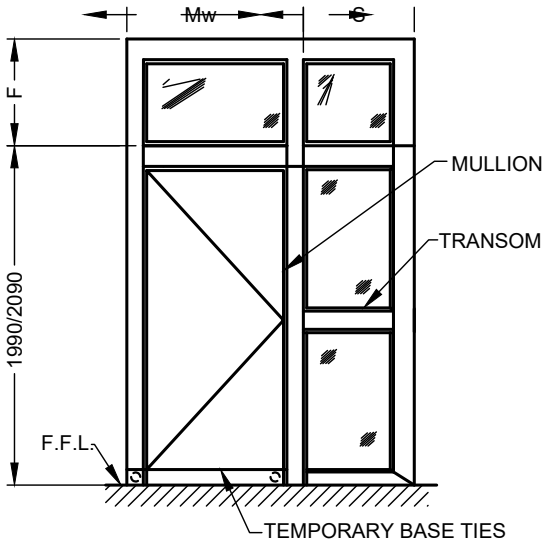


FIG. 3G FAN LIGHT AND ONE SIDE LIGHT SHUTTER FRAME

All dimensions in millimetres.

FIG. 3 SHAPE/STYLE OF STEEL DOOR FRAMES

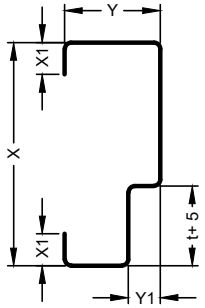


FIG.4A STANDARD SINGLE REBATE PROFILE

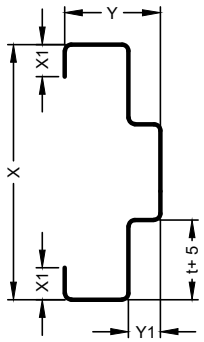


FIG.4B STANDARD DOUBLE REBATE PROFILE

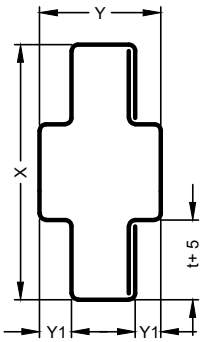


FIG.4C STANDARD DOUBLE REBATE TRANSOM / MULLION

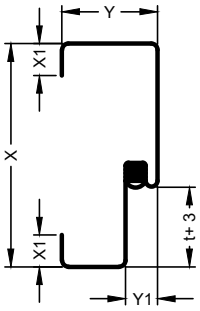


FIG.4D GROOVED SINGLE REBATE PROFILE

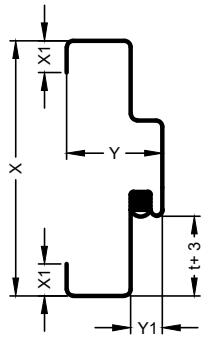


FIG.4E GROOVED DOUBLE REBATE PROFILE

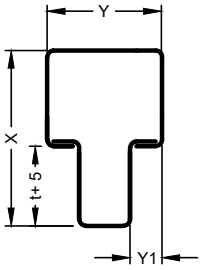


FIG.4F STANDARD SINGLE REBATE TRANSOM/MULLION

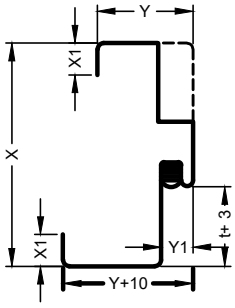


FIG.4G GROOVED SINGLE/DOUBLE REBATE WITH PULL SIDE ARCHITRAVE

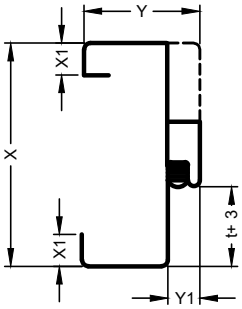


FIG.4H GROOVED SINGLE/DOUBLE REBATE WITH BOTH SIDE ARCHITRAVE

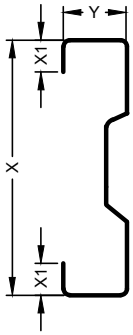


FIG.4J SINGLE REBATE DOUBLE SWING

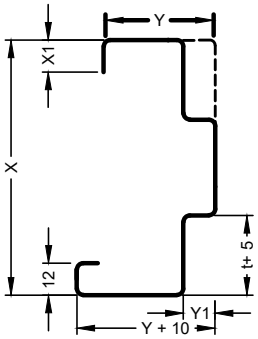


FIG.4K SINGLE/DOUBLE REBATE WITH PULL SIDE ARCHITRAVE

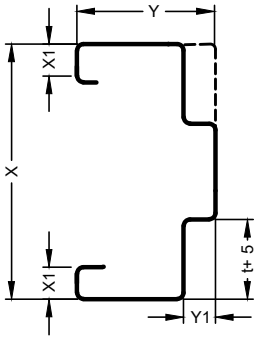


FIG.4L SINGLE/DOUBLE REBATE WITH BOTH SIDE ARCHITRAVE

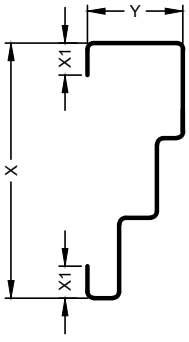


FIG.4M DOUBLE EGRESS

X= FRAME DEPTH
Y= FRAME HEIGHT
X1= BACK BEND (12MM MINIMUM)
Y1= STOP (15 MM MINIMUM)
t= THICKNESS OF THE SHUTTER

All dimension in milimetres.

FIG. 4 EXAMPLE OF PRESSED STEEL FRAME PROFILES

Table 2 Standard Wall Opening Sizes

(*Clause* 6.3)

Sl No.	Door Designation	Wall Opening Width (WOW)	Wall Opening Height (WOH)	Frame Opening Width (FOW)	Frame Opening Height (FOH)
		mm	mm	mm	mm
(1)	(2)	(3)	(4)	(5)	(6)
			Single Leaf		
i)	SD7	750	2 000/2 100	740	1 990/2 090
ii)	SD8	800	2 000/2 100	790	1 990/2 090
iii)	SD9	900	2 000/2 100	890	1 990/2 090
iv)	SD10	1 000	2 000/2 100	990	1 990/2 090
v)	SD11	1 100	2 000/2 100	1 090	1 990/2 090
vi)	SD12	1 200	2 000/2 100	1 190	1 990/2 090
			Double Leaf		
vii)	DD12	1 200	2 000/2 100	1 490	1 990/2 090
viii)	DD15	1 500	2 000/2 100	1 490	1 990/2 090
ix)	DD18	1 800	2 000/2 100	1 790	1 990/2 090
x)	DD20	2 000	2 000/2 100	1 990	1 990/2 090
xi)	DD22	2 200	2 000/2 100	2 190	1 990/2 090
xii)	DD24	2 400	2 000/2 100	2 390	1 990/2 090

NOTES

1 The designation refers to modular sizes of wall openings. First two letter stands for number of shutters that is SD stand for single door frame and DD for double door frame, Last digits stand for wall opening width (WOW). For example, SD10 means single door frame for wall opening width of 1 000 mm.

2 Sizes mentioned are for standard wall opening height (WHO), however additional heights may be provided as per manufacturer's recommendation up to 2 400 mm, 2 700 mm and 3 000 mm.

3 Door frames can be provided with transoms above wall opening heights above 2 100 mm.

4 Different types of side light and fan light door frames may be provided with transom and mullion as per purchaser's requirement by keeping dimensions of wall openings for doors as above and side light and fan light may be added as required.

Table 3 Standard Pressed Steel Frame Profile

(*Clause* 7.1)

Sl No.	Profile Designation	Type	Size		Rebate
			X (Depth) mm	*Y* (Height) mm	
(1)	(2)	(3)	(4)	(5)	(6)
i)	A	Non-grooved	90	60	Single
ii)	B	Non-grooved	105	60	Single
iii)	C	Non-grooved	125	60	Single
iv)	D	Non-grooved	125	60	Double
v)	E	Non-grooved	165	60	Double

Table 3 (*Concluded*)

Sl No.	Profile Designation	Type	Size		Rebate
			X (Depth) mm	*Y* (Height) mm	
(1)	(2)	(3)	(4)	(5)	(6)
vi)	F	Grooved	125	55	Single
vii)	G	Grooved	150	55	Double
viii)	H	Architrave	125	70	Single
ix)	J	Architrave	150	70	Double
x)	K	Double swing	150	40	NA
xi)	L	Double egress	150	70	Triple

Table 4 Wall Depths with Sheet Thickness and Number of Anchors

(*Clauses* 7.1.1 *and* 7.1.2.1)

Sl No.	Frame Type	Wall Depth, *Min*, mm	Wall Depth, *Max*, mm	Sheet Thickness, *Min*, mm	No. of Anchor on Wall Depth
(1)	(2)	(3)	(4)	(5)	(6)
i)	Grooved frame/non grooved frame/with architrave one side	125	200	1.2	1
		201	350	1.6	2
ii)	Double swing door frame	150	150	1.2	1
iii)	Double egress door frame	150	150	1.2	1

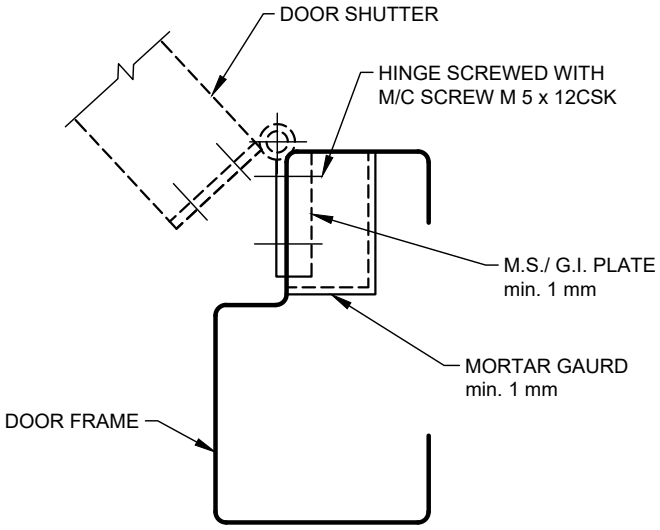


FIG. 5A FOR DOOR SHUTTER THICKNESS 30 mm TO 35 mm

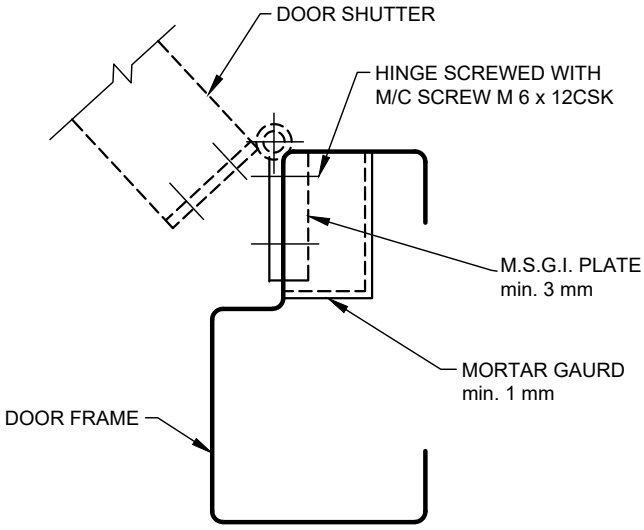


FIG. 5B FOR DOOR SHUTTER THICKNESS 40 mm TO 50 mm

FIG. 5 FIXING OF HINGE TO THE PRESSED STEEL DOOR FRAME

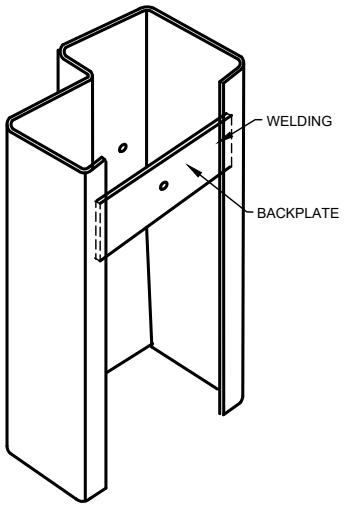
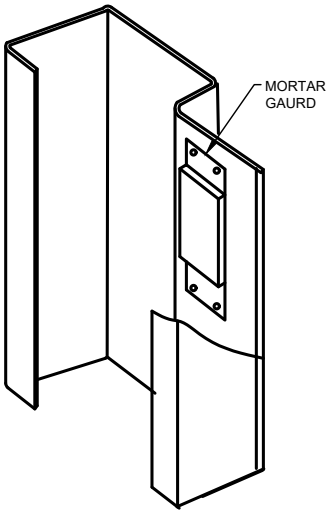


FIG. 6A BACK PLATE FOR ANCHOR FIXING



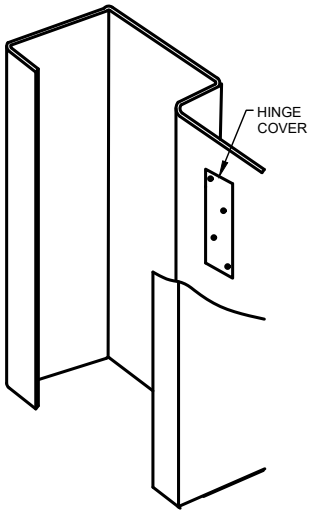


FIG. 6B MOTOR GUARD

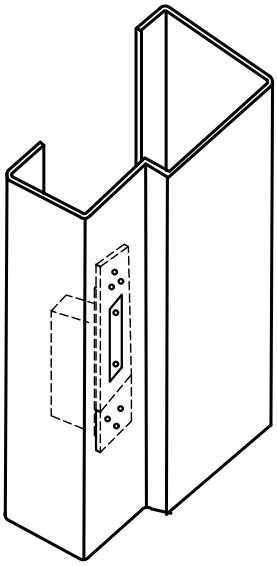


FIG. 6C STRIKE PLATE PREPERATION

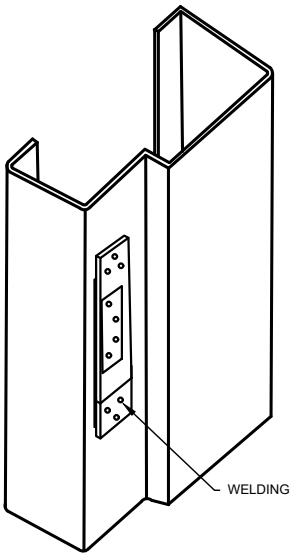


FIG. 6D HINGE PREPERATION

FIG. 6 HARDWARE REINFORCEMENT

Table 5 Sheet Thickness for Hardware Reinforcement

(*Clause* 7.1.2.2)

Sl No.	Hardware Items	Minimum Steel Sheet Thickness to be Used mm
(1)	(2)	(3)
i)	Steel or stainless steel butt hinges — Medium weight for shutter thickness 30 mm to 35 mm	3
ii)	Stainless steel ball bearing hinges — 100 mm × 58 mm × 2.5 mm thick for shutter thickness 30 mm to 35 mm	3
iii)	Parliament hinges and steel rising butt hinges for shutter thickness 30 mm to 35 mm	3
iv)	Stainless steel ball bearing hinges — 100 mm × 75 mm × 3 mm thick for door shutter thickness 40 mm to 50 mm	3
v)	For strike plates of mortise lock or mortise latch or dead bolt	1.6

Table 5 (*Concluded*)

Sl No.	Hardware Items	Minimum Steel Sheet Thickness to be Used mm
(1)	(2)	(3)
vi)	Tower bolt and flush bolt front	1.6
vii)	Door closer, external trim latch of panic bar	1.6
viii)	For pivot of checking floor hinge	3

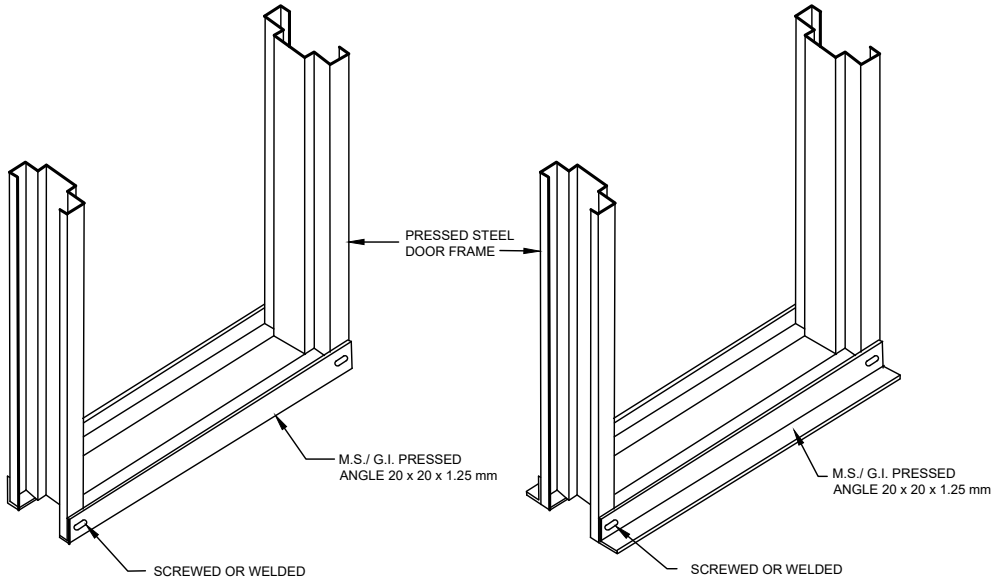


FIG. 7A PERMANENT BASE TIES

FIG. 7B TEMPORARY BASE TIES

FIG. 7 BASE TIES FOR PRESSED STEEL DOOR FRAME

7.2 Tubular Steel Frame Profile

7.2.1 The tubular steel frame profiles may be single rebate or double rebate or four rebate or mullion (*see* Fig. 9). These frames may be with or without fanlight. The commonly used frame profile sizes are given in Table 6. However, other sizes may be used based on design requirements and as agreed between manufacturer and the purchaser and shall be declared by the manufacturer. The tubular steel frames for door may be made with of without fanlight.

7.2.2 *Tubular Frame Construction*

Tubular steel frames for doors, transoms, sidelights, mullions and other openings (when provided), shall be either modular field assembled type, or welded unit. Tubular frame section thickness shall be from 1.2 mm to 2.5 mm. These frames shall be designed to be mounted on various types of opening namely, masonry, dry wall, steel structure, etc by just changing the fixing anchors.

7.2.2.1 Tolerance of ± 1.5 mm on all the dimensions of profile shall be permissible. The external corner radius shall be minimum 1.5 mm and shall be measured as per IS 4923.

7.2.2.2 Concavity and convexity shall be 1 percent or 1 mm, whichever is greater for both side when measured as per IS 4923.

7.2.2.3 Each door frame shall consist of hinge jamb, lock jamb, head and steel base ties at the bottom of the door frames. The whole frame shall be bolted or welded or rigidly fixed together by mechanical means. While designing the tubular steel frames the direction of ERW weld seam shall be on wall side.

7.2.3 *Base Ties*

For tubular frames base ties shall be pressed mild steel angle of size 20 mm × 20 mm × 1.25 mm thick to suit floor thickness of 25 mm, 30 mm, 35 mm or 40 mm either screwed or welded as shown in Fig. 11.

7.2.4 *Hardware Fixing*

Hardware fixing shall be through riveted bolts typically as shown in Fig. 11.

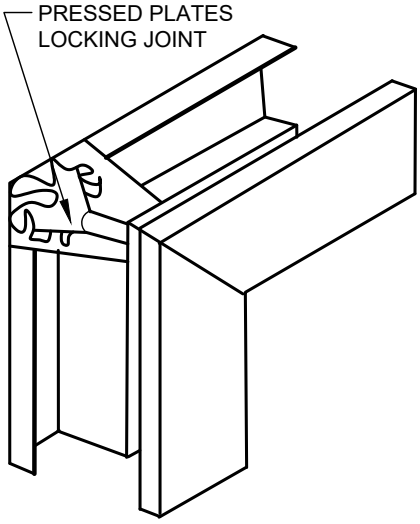


FIG. 8A MITERED FRAME (KNOCKDOWN DOOR FRAME)

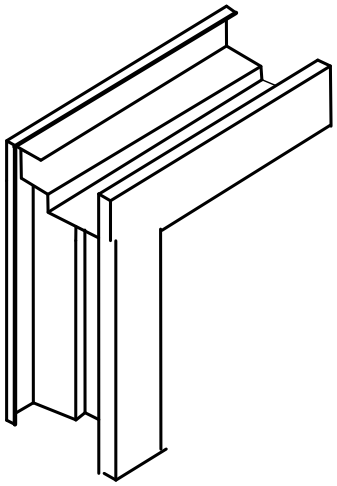


FIG. 8B WELDED FRAME

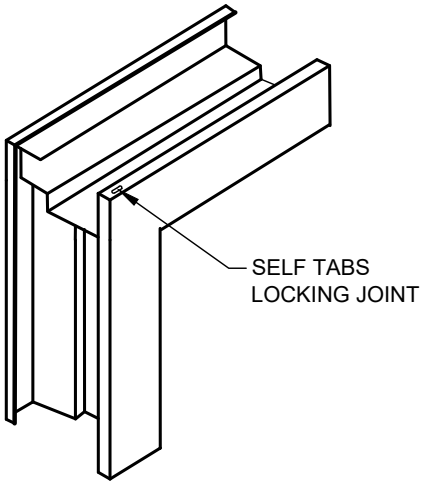


FIG. 8C MITERED FRAME (KNOCKDOWN DOOR FRAME)

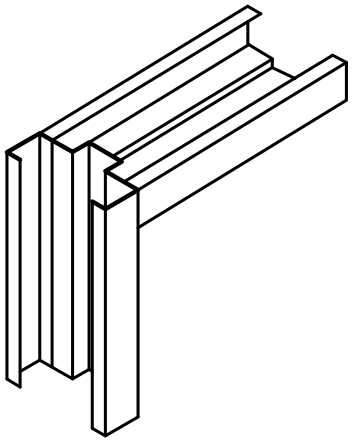


FIG. 8D BUTTED FRAME (KNOCKDOWN DOOR FRAME)

FIG. 8 FRAME ASSEMBLY

Table 6 Indicative Standard Tubular Steel Frame Profiles

(*Clause* 7.2.1)

Sl No.	Profile Designation	Size		Rebate
		X mm	*Y* mm	
(1)	(2)	(3)	(4)	(5)
i)	L	80	40	Single
ii)	M	100	50	Single
iii)	N	80	60	Double
iv)	P	130	55	Double
iv)	Q	130	65	Double
v)	R	80	80	Mullion
vi)	S	130	80	Mullion

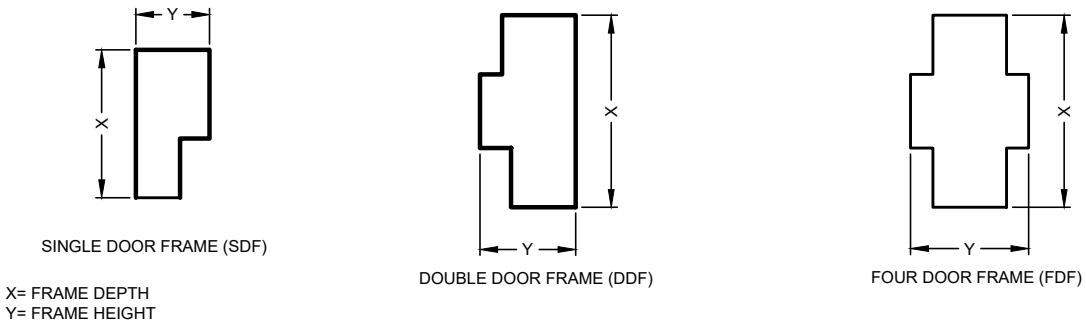


FIG. 9 EXAMPLES OF TUBULAR STEEL DOOR FRAMES PROFILES

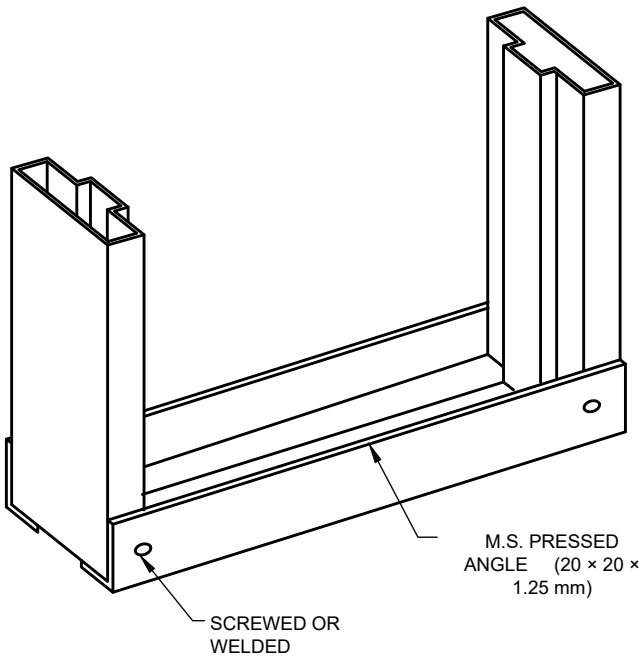


FIG. 10 ARRANGEMENT AT BASE OF TUBULAR STEEL DOOR FRAMES

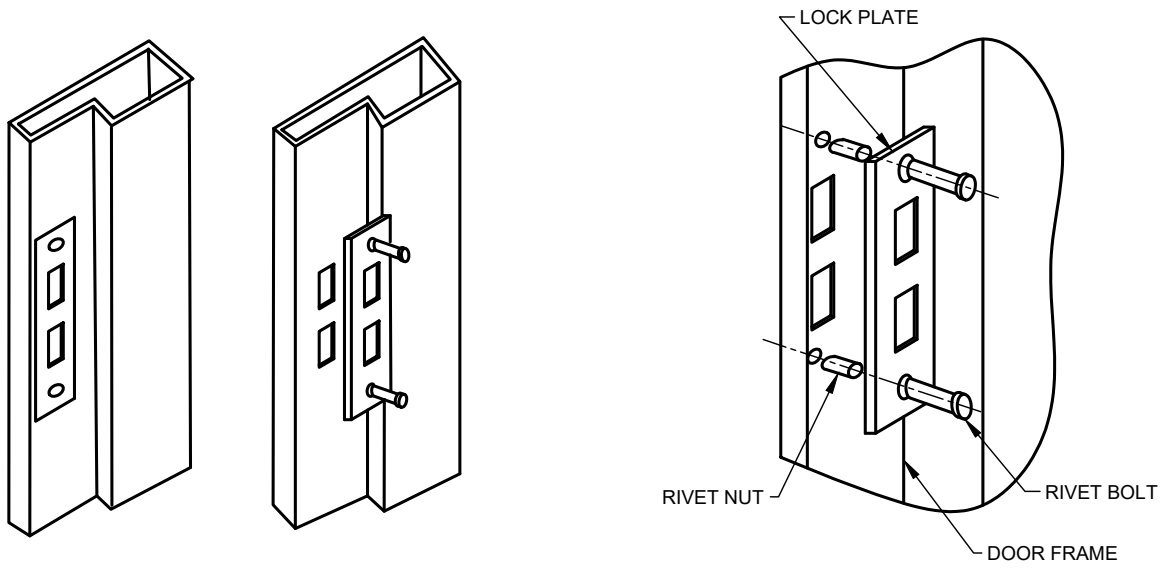


FIG. 11 HARDWARE FIXING TYPICAL DETAILS FOR TUBULAR FRAME

7.2.5 *Frame Assembly*

7.2.5.1 *Modular mitered frame*

Modular mitred frames shall be assembled with self-tabs and with 45° cut on the face of the frame. Head and jamb shall be assembled with L-angle of suitable length as per frame depth. This assemble frame is also referred as zero welding frame (*see* Fig. 12).

7.2.5.2 *Mitred frame*

Mitred frames shall be assembled with self-tabs and with 45° cut on the face of the frame. Frames shall be checked once assembled for rigidity and alignment once assembled for better performance (*see* Fig. 12).

7.2.5.3 *Welded frame*

In welded frames the joint between the head and jamb faces shall be welded along their length either internally or externally. Face joints shall be ground and finished smooth with no visible seam. Face joints at meeting mullions or between mullions and other frame members shall be completely arc welded externally, ground, and finished smooth (*see* Fig. 12).

Since welded frame are assembled and shipped from factory additional base tie shall be provided for shipping and handling of frame (*see* Fig. 10). This temporary spreader bar shall be removed and a setting spreader shall be used for installation of the frame.

8 HINGE LOCATION

8.1 Types of Hinges

Frame shall be provided with the different types of hinges conforming to the standards as given in Table 7.

NOTE — Hinges other than mentioned above may be provided as agreed to between the manufacturer and purchaser.

8.2 Location of Hinges

In all cases the hinges shall be so fixed that the distance from the inside of the head rebate to the top of the upper hinge is approx. 200 mm and the distance from the bottom of the door frame to the bottom of the bottom hinge is also kept approximately 200 mm (*see* Fig. 13). The middle hinges shall be at equal distance from lower and upper hinges or as agreed to between the purchaser and the frame manufacturer.

The recommended number of hinges for the frame up to door opening (wall opening) up to 2 100 mm shall be as follows. However, the manufacturer can decide on the higher side based on the shutter weight and weight carrying capacity of each hinge.

Sl No. (1)	*Frames Specification* (2)	*No. of Hinges Requirement* (3)
i)	Frame for shutter 1 100 mm wide and below	Minimum 3 hinges screwed to one jamb
ii)	Frame for shutter more than 1 100 mm wide	One number hinges to be added to the overall height
iii)	Frame of height more than door opening (wall opening) more than 2 100 mm	Number of hinges to be provided as per manufacturer's recommendation or as given in Fig. 14
iv)	Fanlight and side light frame	Two hinges shall be provided for top hung ventilator/side hung window shutter

8.3 Fixing of Hinges

In case of door shutter of thickness 30 mm to 35 mm, mild steel or G.I. hinge plate of minimum size 200 mm × 40 mm × 3 mm thickness shall be welded inside the pre-punched slot of the frame. The plate shall be threaded to the required size of machine screw (M5 × 12 mm CSK head) conforming to IS 1365 (only for pressed steel door frames).

In case of door shutter of thickness 40 mm to 50 mm, mild steel or G.I. hinge plate of minimum size 200 mm × 50 mm × 3 mm thickness shall be welded inside the pre-punched slot of the frame. The plate shall be threaded to the required size of machine screw (M6 × 12 mm countersunk head) conforming to IS 1365 (only for pressed steel door frames).

In case of door shutter of thickness more than 50 mm fixing provision of hinges shall be made as per manufacturer's recommendation (*see* Fig. 13).

8.4 Hardware Location

Recommended hardware location for frames (*see* Fig. 14).

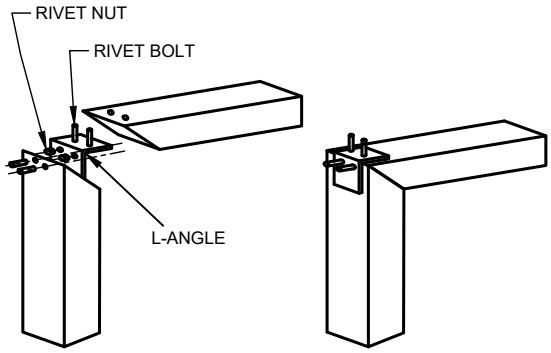


FIG. 12A TABULAR MODULAR MITERED FRAME

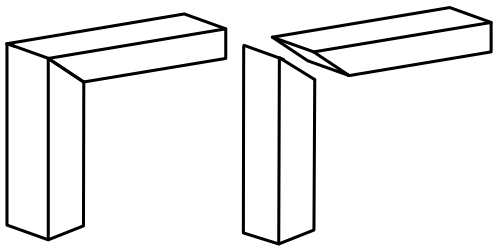


FIG. 12B TABULAR MITERED WELDED FRAME

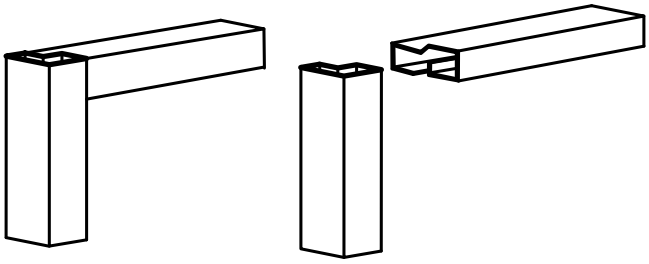


FIG. 12C TABULAR BUTT WELD FRAME

FIG. 12 TYPICAL FRAME ASSEMBLY TUBULAR FRAME

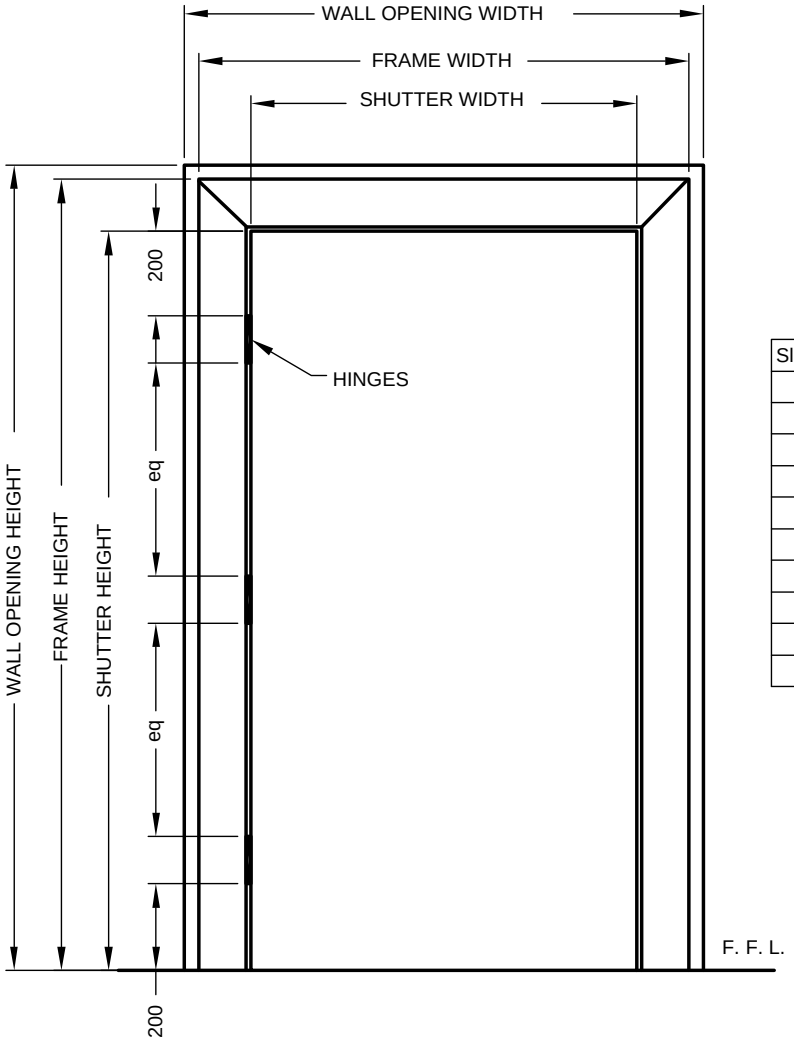
Table 7 Types of Hinges for Use in Frame

(*Clause* 8.1)

Sl No.	Type of Hinge	Size of Hinge mm			Ref to Indian Standards	Suitable for Shutter Thickness mm
		Length A	Width B	Thickness C		
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	Steel butt hinge – Medium weight	100	58	1.9	IS 1341	30 to 35
ii)	Stainless steel ball bearing hinges	100	58	2.5	–	
iii)	Stainless steel butt hinges	100	58	1.9	IS 12817	
iv)	Mild steel parliament hinges	125	100	2.5	IS 362	
v)	Steel rising butt hinges	100	65	2	IS 9106	

Table 7 (*Concluded*)

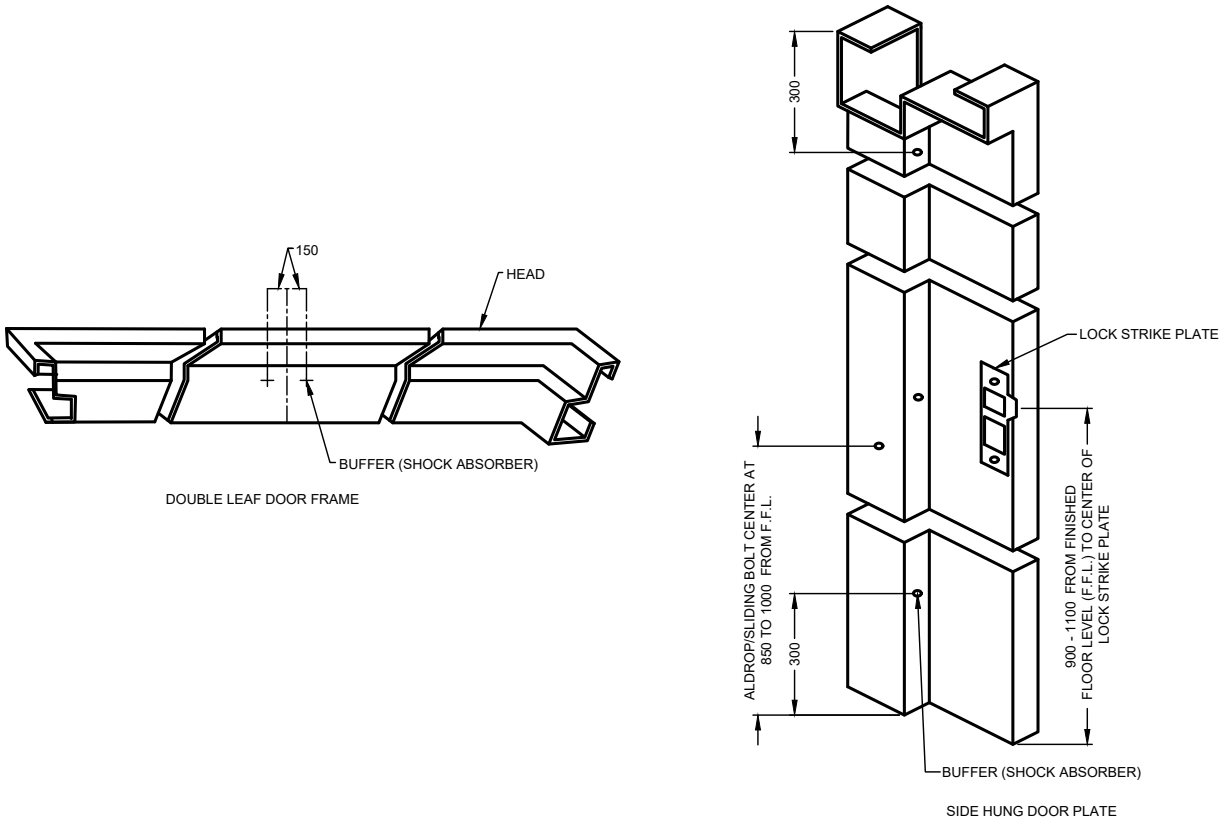
Sl No.	Type of Hinge	Size of Hinge mm			Ref to Indian Standards	Suitable for Shutter Thickness mm
		Length A	Width B	Thickness C		
(1)	(2)	(3)	(4)	(5)	(6)	(7)
vi)	Stainless steel ball bearing butt hinges	100	75	3	–	40 to 50



Sl No.	W. O. H.	HINGE QTY
1	2100	3
2	2200	4
3	2300	4
4	2400	4
5	2500	5
6	2600	5
7	2700	5
8	2800	6
9	2900	6
10	3000	6

All dimensions in millimetres.

FIG. 13 RECOMMENDED HINGE LOCATION WITH MINIMUM HINGE QUANTITY



All dimensions in millimetres.

FIG. 14 HARDWARE LOCATION (LOCATION OF ALDROP, SLIDING BOLT, MORTISE LOCK OR LATCH AND SHOCK ABSORBERS)

9 FINISH

9.1 Pre-treatment and Phosphating

9.1.1 *Door Frames of Mild Steel* (*Cold Rolled*)

The surface of the door frames manufactured from the material mild steel cold rolled shall be thoroughly cleaned free from rust, dirt, oil, etc either by mechanical means, for example, sand or shot blasting or by chemical means, for example pickling, and phosphating as per IS 1477 (Part 1), then finished with either painting or powder coating as may be agreed to between the purchaser and the manufacturer. Tubular frames shall be processed for anti-corrosive treatment and protection from inside any means as agreed between the manufacturer and the purchaser.

9.1.2 *Door Frames of Galvanized Plain Steel Sheets*

The surface of the door frames manufactured from the material galvanized plain steel sheet shall be pretreated and phosphate by chemical means as per IS 1477 (Part 1). No pickling is required for galvanized surface. Then frames shall be finished with either painting or powder coating as may be agreed to between the purchaser and the manufacturer.

9.1.3 *Stainless Steel Door Frames*

The surface of the stainless steel frames shall be pretreated as per the procedure laid down in IS 1477 (Part 1) in which pickling shall be carried out by using mixed acid of nitric plus hydrofluoric and then passivate the surface by using nitric acid followed by water rinsing and drying. Generally stainless steel door frames need no painting but if any purchaser require painted or powder coated frames to blend with the interior decor, this can be done by spray painting or by powder coating.

9.2 Painting

After pre-treatment and phosphating of the surface of the frames, two coats of any of the ready mixed paint, air drying, red oxide zinc chrome, priming [*see* IS 2074 (Part 1)] shall be applied by spraying or dipping method as per procedure laid down in IS 1477 (Part 2). Paint other than above may be used, as agreed to between the purchaser and the manufacturer.

9.3 Powder Coatings

After pre-treatment and phosphating the surface of the frame shall be powder coated conforming to IS 13871. The colour, taken from colour shade card of indigenous powder manufacturer shall be

used as agreed to between the purchaser and the manufacturer.

9.4 Wood Grain Effect Finish

After pre-treatment and phosphating the surface, the frame may be given wood grain effect finish either by powder coating and sublimation of polyesterfilm or by staining wood grain effect with special liquid paint. The colour shade such as natural teak, walnut, dark mahogany, moorish teak, pine, oak, beech, etc may be used as agreed to between the purchaser and the manufacturer.

10 SAMPLING

The method of drawing representative samples of steel door frames and the criteria for conformity shall be as given in Annex B.

11 MARKING

Each steel door frame shall be marked with the following information:

a) Name of the manufacturer or trade-mark, if any;

b) Door designation of the steel door frame;

c) Profile designation and dimensions;

d) Batch number;

e) Year of manufacture; and

f) Suitable for wall opening size.

11.2 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the products may be marked with the Standard Mark.

12 DELIVERY

The purchaser shall supply the information as given in Annex C, when ordering for steel door frames.

ANNEX A

(*Clause* 2)

LIST OF REFERRED STANDARDS

IS No.	*Title*
IS 277 : 2018	Galvanized steel sheets (plain and corrugated) — Specification (*seventh revision*)
IS 362 : 1991	Parliament hings — Specification
IS 513 (Part 1) : 2016	Cold reduced carbon steel sheet and strip: Part 1 Cold forming and drawing purpose (*sixth revision*)
IS 1341 : 2018	Steel butt hinges — Specification (*sixth revision*)
IS 1365 : 2022	Slotted countersunk flat head screws — Product Grade A (*fifth revision*)
IS 1367	Technical supply conditions for threaded steel fasteners:
(Part 1) : 2014/ ISO 8992 : 2005	General requirements for bolts, screws, studs and nuts (*fourth revision*)
(Part 2) : 2002/ ISO 4759-1 : 2000	Tolerances for fasteners — Bolts, screws, studs and nuts — Product grades a, b and c (*third revision*)
(Part 3) : 2017/ ISO 898-1 : 2013	Mechanical properties of fasteners made of carbon steel and bolts, screws and studs (*fifth revision*)
(Part 5) : 2018/ ISO 898-5 : 2012	Mechanical properties of fasteners made of carbon steel and alloy steel — Set screws and similar threaded fasteners with specified hardness classes — Coarse thread and fine pitch thread (*fourth revision*)
(Part 6) : 2018/ ISO 898-2 : 2012	Mechanical properties of fasteners made of carbon steel and alloy steel — Nuts with specified property classes — Coarse thread and fine pitch thread (*fourth revision*)
(Part 7) : 1980	Mechanical properties and test methods for nuts without specified proof loads (*second revision*)
(Part 8) : 2020/ ISO 2320 : 2015	Prevailing torque type steel nuts — functional properties (*fifth revision*)
(Part 9)	Surface discontinuities,
(Sec 1) : 1993/ ISO 6157-1 : 1988	Bolts, screws and studs for general applications (*third revision*)
(Sec 2) : 1993/ ISO 6167-3 : 1988	Bolts, screws and studs for special applications (*third revision*)
(Part 10) : 2002/ ISO 6157-2 : 1995	Surface discontinuities — Nuts (*third revision*)
(Part 11) : 2020/ ISO 4042 : 2018	Electroplated coating systems (*fourth revision*)
(Part 12) : 1981	Phosphate coatings on threaded fasteners (*second revision*)
(Part 13) : 2020/ ISO 10684 : 2004	Hot dip galvanized coatings on threaded fasteners (*third revision*)
(Part 14)	Mechanical properties of corrosion-resistant stainless steel fasteners,
(Sec 1) : 2023/ ISO 3506-1 : 2020	Bolts screws and studs with specified grades and property classes (*fifth revision*)
(Sec 2) : 2023/ ISO 3506-2 : 2020	Nuts with specified grades and property classes (*fifth revision*)
(Sec 3) : 2018/ ISO 3506-3 : 2009	Set screws and similar fasteners not under tensile stress (*fourth revision*)

IS No.	*Title*
(Part 16) : 2002/ ISO 8991 : 1986	Designation system for fasteners (*third revision*)
(Part 17) : 2023/ ISO 3269 : 2019	Inspections, sampling and acceptance procedure (*fifth revision*)
(Part 18) : 1996	Packaging (*third revision*)
(Part 19) : 1997/ ISO 3800 : 1993	Axial load fatigue testing of bolts, screws and studs
(Part 20) : 1996/ ISO 898-7 : 1992	Torsional — Test and minimum torques for bolts and screws with nominal diameters 1 mm to 10 mm
IS 1477	Code of practice for painting of ferrous metals in buildings:
(Part 1) : 1971	Pretreatment (*first revision*)
(Part 2) : 1971	Painting (*first revision*)
IS 2074 (Part 1) : 2023	Ready mixed paint, air drying, red oxide — Zinc chrome, priming — Specification (*fourth revision*)
IS 4043 : 1969	Recommendations for symbolic designation of direction of closing and faces of doors, windows and shutters
IS 4905 : 2015	Random sampling and randomization procedures (*first revision*)
IS 4923 : 2017	Hollow steel sections for structural use — Specification (*third revision*)
IS 6911 : 2017	Stainless steel plate, sheet and strip — Specification (*second revision*)
IS 9106 : 1979	Specification for rising butt hinges
IS 10428 : 2022/ ISO 22496 : 2021	Glossary of terms relating to doors
IS 12436 : 1983	Specification for preformed rigid polyurethane (PUR) and polyisocyanurate (PIR) foams for thermal insulation
IS 12817 : 2020	Stainless steel butt hinges — Specification (*third revision*)
IS 13871 : 1993	Powder coating — Specification
IS 14246 : 2024	Continuously pre-painted galvanized steel sheets and coils (*second revision*)

ANNEX B

(*Clause* 10)

SAMPLING OF STEEL FRAMES

B-1 SCALE OF SAMPLING

B-1.1 Lot

In any consignment all the frames of the same size, designation, profile and manufactured under similar conditions of production shall be grouped together to constitute a lot.

B-1.2 Samples shall be selected and tested from each lot separately to determine its conformity or otherwise to the requirements of the standard.

B-1.3 The number of frames to be selected at random from a lot for inspection and testing shall depend upon the size of the lot and shall be in accordance with Table 8.

B-1.4 The samples from the lot shall be selected at random and to ensure the randomness of selection. For guidance IS 4905 may be followed.

B-1.5 All the frames selected in the sample shall be inspected for material (*see* 5), dimensions, gauge and tolerances (*see* 6), construction and workmanship (*see* 7.1 a nd 7.2), hinge location (*see* 8) and finish (*see* 9).

Table 8 Sample Size and Permissible Number of Defective

(*Clause* B-1.3)

Sl No.	Lot Size	Sample Size	Permissible Number of Defectives
(1)	(2)	(3)	(4)
i)	Up to 50	1	0
ii)	51 to 100	2	0
iii)	101 to 500	3	1
vi)	501 and above	4	1

B-2 CRITERIA FOR CONFORMITY

A frame which is found not meeting any one or more of these requirements inspected for (*see* B-1.5) shall be considered as non-conforming to the Indian Standard.

ANNEX C

(*Clause* 12)

INFORMATION TO BE SUPPLIED BY THE PURCHASER WHEN ORDERING

C-1 When ordering metal door frames, the purchaser shall clearly indicate the following:

a) Wall opening size — Designation, size and profile of door frame (*see* 6 and 7);

b) Material of steel door frame to be indicated with the type of coating;

c) Door handing, whether the door is required to open inwards or outwards;

d) Type of hardware to be used like hinges, locks, etc;

e) Frame type and assembly;

f) Suitable for door shutter thickness;

g) Finish of the frame;

h) Installation of door frame:

1) Method of frame fixing — Wet or dry type (*see* Annex D); and

2) Grouting of the frame by cement mortar or rigid polyurethane foam filling shall be of minimum density of 40 kg/m^3 as per IS 12436.

ANNEX D

(*Clause* 7.1.2.2 and *Annex* C)

RECOMMENDED GUIDELINES FOR FRAME INSTALLATION

D-1 GENERAL

Fixing of the door frame in the masonry, dry wall, steel structure, precast, shear-wall etc shall be done by any one following method as per requirement of the purchaser.

D-2 DRY FIXING WITH ANCHORS

D-2.1 Frames shall be installed plumb, level, rigid and in true alignment as recommended in the erection instructions for steel frames and installation guide for doors and hardware. All frames, other than drywall slip-on types, shall be fastened to the adjacent structure so as to retain their position and stability. Slip-on dry-wall frames shall be installed in prepared wall openings in accordance with manufacturer's instructions. The maximum allowable gap between the frame and wall shall not be more than 5 mm to 8 mm and should be sealed with proper sealant once the frames are installed. It is critical that correct methods of installation are adopted to ensure that it can take suitable shutters. For anchor locations please (*see* Fig. 15) and Table 9.

It is recommended that installation of doorsets is carried out by the manufacturer or, alternatively, by installers trained in fixing metal doorsets in accordance with the manufacturer's fixing instructions. The same should be guaranteed by the manufacturer on completion of installation.

D-2.2 Expansion Anchor Bolts

There shall be minimum three metal or polyamide nylon sleeve anchor bolts. The recommended size may be 8 mm in diameter and length 80 mm to 120 mm for door frame having sheet thickness 1.20 mm/1.25 mm and of size 10 mm diameter and length 80 mm to 120 mm for door frame having sheet thickness 1.6 mm long to be provided to each jamb without fanlight and four for jamb with fanlight. The material for expansion bolt or screw for nylon anchor shall be zinc electroplated for regions away from sea and for coastal areas it shall be either hot dip galvanized or zinc flake coated and shall conform to relevant parts of IS 1367. There shall be one expansion anchor bolt to be provided at the center of top head of door frame for door opening (wall opening) 1 000 mm to 1 200 mm and for width more than 1 200 mm to expansion anchor bolt shall be provided. For concrete masonry, metal expansion anchor bolt shall be used; and for AAC, and bricks wall, polyamide nylon sleeve anchors shall be used.

For expansion anchor bolt fixing, back plate made out of mild steel or G.I. sheet of minimum 3 mm thickness and width 35 mm shall be provided behind the door frame profile. A round hole of suitable size is to be punched into door frame profile for inserting the bolt. After installation of the door frame in the masonry these holes shall be covered with PVC/nylon caps (Fig. 16).

For non-standard door frames expansion anchor bolts shall be provided as per manufacturer's recommendation.

D-2.3 Sealing between Door Assembly and Surrounding Structure

In order to close the gap between the wall or any partition when fitted with a door assembly, the junction between the two elements should be adequately sealed. Ideally a wall or partition should be built up to the rear of the door frame without gaps. This is not always possible, and to ensure easy installation of the door assembly, the opening should be made within the permissible tolerance of 5 mm on all three sides. The gap between door frame and wall opening can vary greatly and is usually masked with an architrave or with sealant. For partitions, the maximum gap shall not be more than 2.5 mm on all three sides.

D-2.4 Grouting of Frames (Only for Pressed steel door frames)

Where grouting is required in masonry installations, frames shall be braced or fastened in such a way that will prevent the pressure of the grout from deforming the frame members. Head members of frames shall not be grouted with the grout mixture. Grout shall be mixed with cement and sand slurry in 1 : 4 ratio.

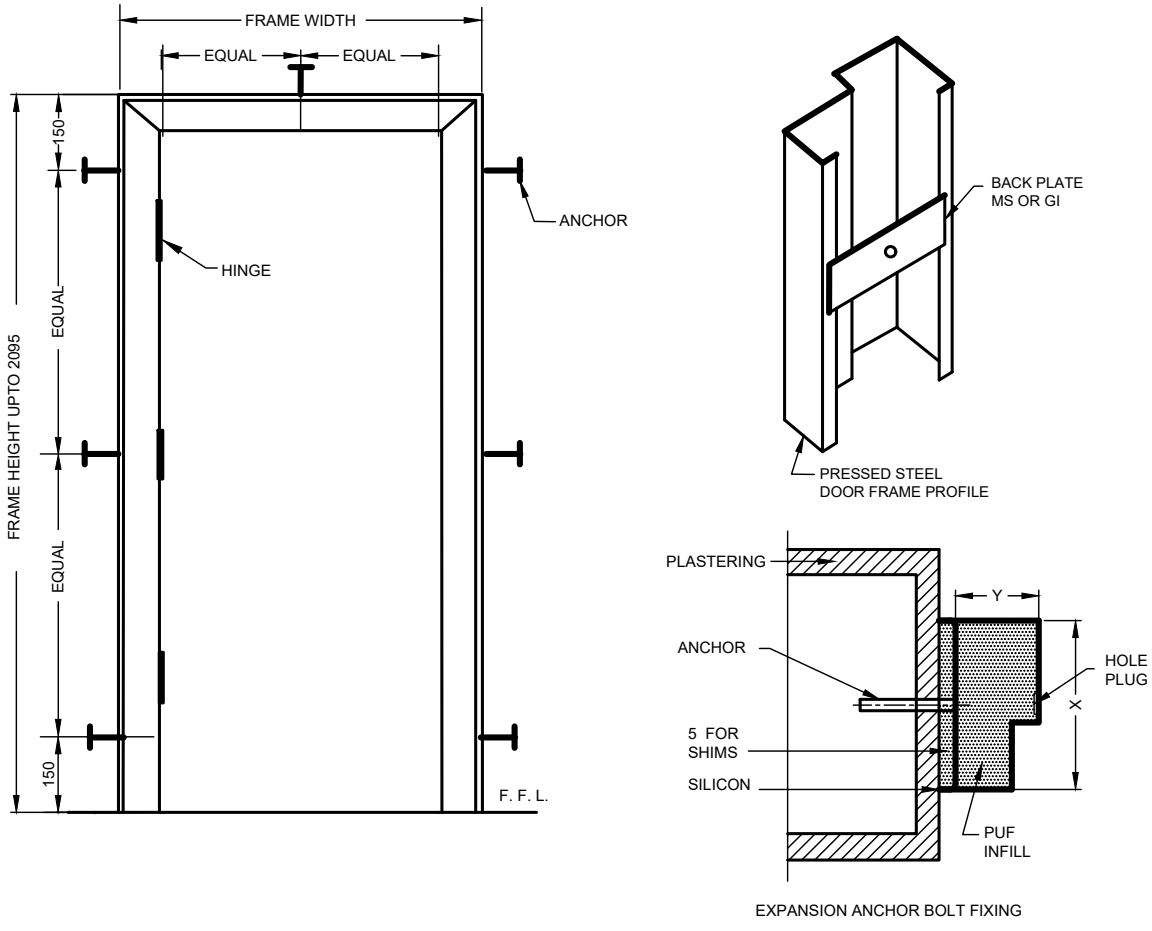
Steel frames, may not necessarily require grouting, and however grouting may be done based on the wall construction to keep the anchors intact. Grouting shall not be used for frames installed in plasterboard walls and steel structure.

Alternatively, use of polyurethane foam is also recommended for all kind of frames, which is available from various manufacturers for dry fixing.

Table 9 Number of Anchors as per Door Height

(*Clause* D-2.1)

Sl No.	Wall Opening Height (WOH)	Number of Anchors for Hinge and Strike Jambs	
	Up to	1.2 mm Frame Sheet	1.6 mm Frame Sheet
(1)	(2)	(3)	(4)
i)	2 100	3	4
ii)	2 200	4	5
iii)	2 300	4	5
iv)	2 400	4	5
v)	2 500	5	6
vi)	2 600	5	6
vii)	2 700	5	6
viii)	2 800	6	7
ix)	2 900	6	7
x)	3 000	6	7



All dimensions in millimetres.

FIG.15 DRY FIXING ANCHOR LOCATION

D-3 WET FIXING OR FIRST FIX WITH HOLD FAST

D-3.1 Fixing Lugs (Hold Fasts)

There shall be three adjustable lugs (*see* Fig. 16) with split end tail to each jamb without fanlight and four for jamb with fanlight.

D-3.2 The head shall be made from steel strip 25 mm wide and having nominal thickness of 1.25 mm. The length of strip is to be taken as: frame depth (x) minus 5 mm (x – 5 mm).

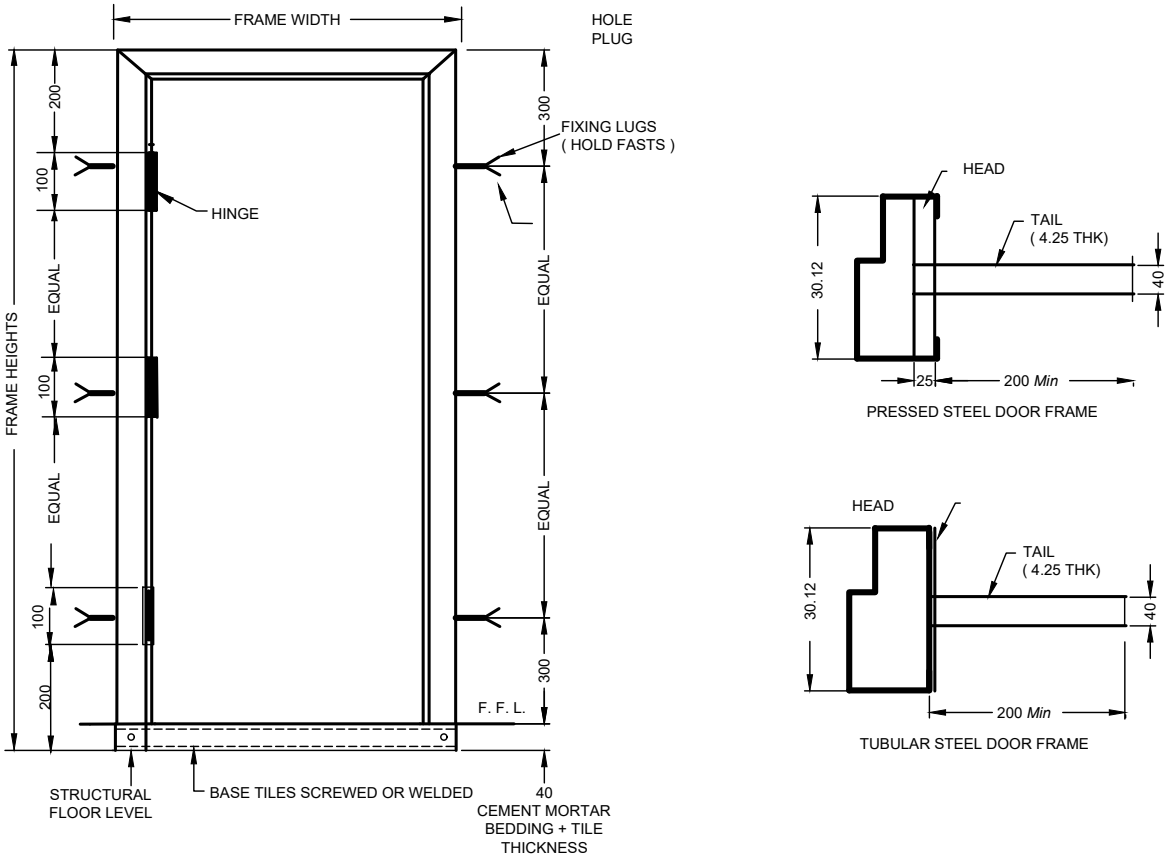
D-3.3 The tail of the lugs shall be 200 mm long and made from steel strip not less than 40 mm wide and having nominal thickness of 1.25 mm.

D-3.4 Frame shall be fixed to the masonry side by using fixing lugs/holdfasts as shown in Fig. 16A. The specification of these fixing lugs for R.C.C. column are same as per above fixing lugs/ holdfasts (*see* Fig. 16 B) except length of tail shall be minimum 300 mm with holes for the plumbing nails of suitable size to fix the door frame with R.C.C. column.

D-3.5 The material of steel strips used for fixing lugs /hold fasts shall conform to IS 513 (Part 1) or IS 277.

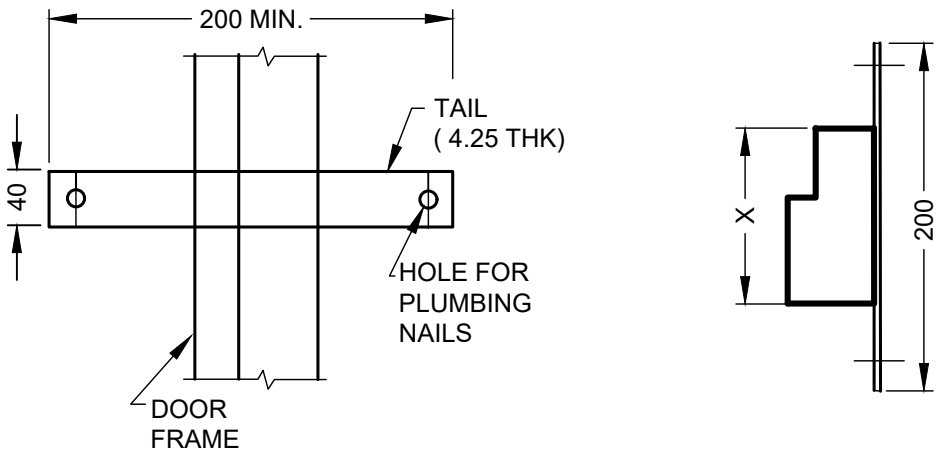
D-3.6 The fixing lugs/holdfast shall be painted with red oxide zinc chromate primer paints [*see* IS 2074 (Part 1)] by brushing, spraying or dipping method.

D-3.7 For frames with screed depth of 40 mm of the door, the frame shall be embedded below finish floor level (FFL).

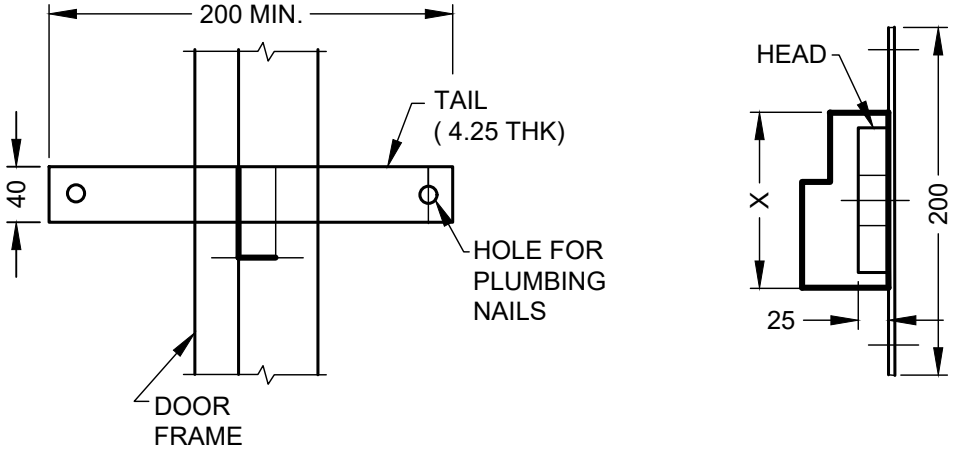


All dimensions in millimetres.

FIG. 16 A FIXING LUG (HOLD FASTS) REQUIRED FOR MASONRY



TUBULAR STEEL DOOR FRAME



PRESSED STEEL DOOR FRAME

All dimensions in millimetres.

FIG. 16B FIXING LUG (HOLD FAST) REQUIRED FOR RCC COLUMN SIDE

FIG. 16 WET FIXING HOLDFAST LOCATION

ANNEX E

(*Foreword*)

COMMITTEE COMPOSITION

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