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HINDUSTAN PETROLEUM CORPORATION LIMITED

GURU GOBIND SINGH REFINERY
PRODUCTS EVACUATION PROJECT
(GGSRPEP)

SPECIFICATIONS FOR DOORS, WINDOWS AND ROLLING SHUTTERS

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1. SCOPE

This Specification defines the requirements regarding material, sizes, construction, workmanship, finishes and installation for doors, windows, ventilators and rolling shutters.

2. REFERENCE DOCUMENTS

2.1 Codes and Standards

The Indian Standards and other referred standards (including all amendments and revisions) shall be considered as part of this Specification. In case any particular aspect of work is not covered specifically by these or any other relevant Indian Standard Specification, any other good engineering practice as may be specified by the company shall be followed:

Following Indian standards including all amendments and revisions shall be considered as part of this specification.

Indian Standards

IS 205 Indian Standard Specification for non-ferrous metal butt hinges.

IS 287 Indian Standard Recommendations for permissible moisture content for timber used for different purposes.

IS 303 Indian Standard Specification for plywood for general purposes. IS 513 Cold-rolled low carbon steel sheets andtrips

IS 710 Indian Standard Specification for Marine plywood.

IS 733 Wrought Aluminum and Aluminum Alloy Bars, Rods and Sections for General Engineering Purposes.

IS 737 Wrought aluminum and aluminum alloy sheet and strip for general engineering purposes.

IS 848 Indian Standard Specification for Synthetic resin adhesives for plywood (phenolic and aminoplastic).

IS 851 Synthetic resin adhesives for construction work (non-structural) in wood.

IS 1003 Indian Standard Specification for Timber panelled and glazed shutters - part 1 - door shutters, Part 2 - windows and ventilator shutters.

IS 1038 Indian Standard Specification for steel doors, windows and ventilators.

IS 1081 Indian Standard Code of practice for fixing and glazing of metal (steel and aluminum) doors, windows and ventilators.

IS 1141 Seasoning of Timber – Code of Practice

IS 1161 Steel Tubes for Structural Purposes

IS 1200 Indian Standard Specification for method of measurement of building and civil engineering works, Part 2: wood work and joinery.

IS 1285 Wrought aluminum and aluminum alloy extruded round tube and hollow sections (for general engineering purposes).

IS 1328 Veneered decorative Plywood

IS 1341 Indian Standard Specification for steel butt hinges

IS 1351 Indian Standard Specification for steel door frames.

IS 1361 Steel Windows for Industrial Buildings

IS 1477 Indian Standard Code of practice for painting of ferrous metals in buildings Part I - Pre- treatment, Part-2 Painting.

IS 1642 Indian Standard Code of practice for fire safety of buildings (general): Details of construction

IS 1948 Aluminum Doors, Windows and Ventilators

IS 1949 Aluminum Windows for Industrial Buildings

IS 2191 Indian Standard Specification for wooden flush door shutters (cellular and hollow core typed part 1 - plywood face panels, part 2, particle board and hardboard face panels

IS 2202 Indian Standard Specification for wooden flush door shutters (solid core type) part I - plywood face panels, part 2 - particle board face panels and hard board face panels.

IS 2338 Indian Standard Code of practice for finishing of wood and wood based materials, part 1 - operations and workmanship, part 2 – schedules.

IS 2553 Indian Standard Specification for safety glass. part 1 - General purpose. IS 2835 Indian Standard Specification for flat transparent sheet glass.

IS 3087 Indian Standard Specification for wood particle boards (medium density) for general purposes.

IS 3097 Indian Standard Specification for veneered particle boards.

IS 3548 Indian Standard Code of practice for Glazing in buildings.

IS 3614 Fire check Doors (Parts 1 & 2)

IS 4020 Indian Standard Specification for door shutters, method of tests, Parts 1 to 17.

IS 4021 Indian Standard Specification for timber door window and ventilator frames- Specifications.

IS 4043 Recommendations for symbolic designations of Direction of Closing and faces of Doors, Windows and Shutters

IS 4218 ISO Metric Screw Threads (Parts 1 to 6)

IS 4351 Specification for Steel Door Frames

IS 4454 Steel wires for cold formed springs

IS 4537 Indian Standard Specification for figured, rolled and wired glass.

IS 4835 Specification for polyvinyl acetate dispersion based adhesives for wood

IS 4913 Code of Practice for Selection, Installation and Maintenance of timber doors and windows.

IS 5807 Indian Standard Specification for methods of tests for clear finishes for wooden furniture, Part I - resistance to dry heat, part 2 - resistance to wet heat.

IS 5986 Hot rolled steel plates, sheets, strips and flats for flanging and forming operation

IS 6245 Indian Standard Specification for metal rolling shutters and rolling grills. IS 6248 Specification for Metal Rolling Shutters and Rolling Grills.

IS 7452 Hot Rolled Steel Sections for Doors, Windows and Ventilators.

IS 12406 Indian Standard Specification for Medium density fiber boards for general purposes.

2.2 Other Standard/Specifications

Specification for Concrete Work

Specification for Structural Steel Work

3. TIMBER DOORS, WINDOWS AND VENTILATORS

Design, manufacturing and installation of timber shall be in accordance with the Engineer's drawings and the following codes IS 1003 (Parts 1 & 2), IS 2191 (Parts 1 & 2), IS 2202, IS 4021, IS 4043 and IS 4913. The Contractor shall submit for the EIC's approval one or more sample of Door, Window / Ventilator. Mass fabrication shall start only after Engineer In-charge's (EIC) approval, taking his comments into consideration. The Contractor shall purchase Flush Doors, Hardware and Fixtures from approved manufacturers only.

3.1 Frames

3.1.1 Material

Superior Grade Indian Teakwood

Or First Grade Deodar Wood

Or First Grade Non-Coniferous Timber other than Teak

Seasoning of Timber shall be in accordance with IS 1141. The timber shall be free from decay, fungal growth, pitch pockets, streaks on the exposed edges, borer holes, splits and cracks. All members shall be straight without any warp or bow and shall have smooth, well planed edges at right angles to each other. The surface touching the wall, however, need not be planed. The frames shall have overall joints at the corners. The jamb post shall be through tenoned into the mortices of the transom to the full width of the transom and thickness of the tenon shall not be less than 15 mm. The tenon shall be closely fitted into the mortises and pinned with corrosion resisting star shaped metal pins not less than 8 mm dia or with wood dowels not less than 10 mm dia. The depth of the rebate in the frame for housing the shutter shall be 15 mm. The contact surfaces of tenons and mortices shall be treated with suitable adhesive. The adhesive shall be a bulk type synthetic resin adhesive conforming to IS 851 or synthetic resin adhesive (Phenolic and Aminoplastic) conforming to IS 848 or polyvinyl acetate dispersion based adhesive conforming to IS 4835.

3.1.2 Sizes of Frames (Unless shown differently on drawings)

Door Frame: 140 x 65 mm

Window/Ventilator Frame: 100 x 50

The general tolerance allowed shall be + 3 mm

3.1.3 Holdfasts

For Door and Window Frames

i. Door Frames - A minimum of 3 Holdfasts on each side

ii. Window and Ventilator Frames

For heights less than 1000 mm: 2 Holdfasts shall be fixed at quarter points of frame on each side. For height greater than 1000 mm: 3 Holdfasts shall be fixed on either side.

iii. Holdfasts shall be MS flat 30 x 3 x 300 long, the ends of the flat being bent in opposite direction for 75 mm, leaving 150 mm between the bent ends. The face of the frame in contact with side walls and top lintel shall be given a coat of coal tar. All surfaces of the frame which are to be painted shall be given a coat of white lead based primer. In case of frames to be polished or varnished, the surface shall receive a priming coat of suitable polish or varnish. Frames without a timber threshold shall be braced with a sturdy base tie (12 mm dia MS rod) to hold the frame rigid during transit and erection.

3.1.4 Installation of Frames

Frames shall be installed either by “Built-in-Method” or “Prepared Opening Method”. In “Built-in- Method”, frame shall be installed at the required place. Masonry or concrete in the wall shall be built after installation of the frame so that holdfasts and pins at the bottom are well anchored into them.

In the “Prepared Opening Method”, frames shall be placed in the opening already provided in the wall. The holdfasts and pins shall then be grouted, Prepared. Built-in-Method shall be preferred over Opening Method of Installation. The datum line for the sill of door, window or ventilator shall be taken from a fixed point on the wall, finished floor or ceiling with the help of a level.

3.2 Door, Window and Ventilator Shutter

3.2.1 Paneled and Glazed Shutter

i. Rails, Styles, Glazing Bars

The material for these shall be same as specified for frames. The jointing shall be in mortice and tenon joints.

ii. Shutter Paneling

The material for this can be either timber or plywood or Float glass.

Timber Paneling

The material shall be same as specified for the door frame. The thickness of the panel shall not be less than 15 mm. The panel shall be in one single piece and its area shall not exceed 0.5 m2. The timber panels shall be framed into the groove and faces shall be closely fitted to the sides of the groove. Additional beadings shall be provided on one or both sides if specified on drawings.

Plywood Paneling

This shall conform to IS 710. Thickness of plywood shall be 10 mm for 2 or more panel construction and 12 mm for single panel construction. Panels shall be fixed to the shutter frame by providing grooves in frame as described for timber panels or by using beading or both.

Float Glass Panels

This shall be good and durable weighing not less than 7.5 kg/m2. The glass panel shall be embedded in putty and secured to the rebate by wooden beads of suitable size and shape. For external glazed doors, windows and ventilators, beading shall be fixed from outside. The contact surfaces of tenon and mortice, tongue and grooved joints shall be treated before putting together, with suitable synthetic resin adhesive
as specified for door shutter.

The thickness of Door shutter shall be 40mm, while for windows/ventilators; shutters shall be 20 mm, 25 mm or 38 mm as specified on the drawings.

Wherever shown in the drawings, the vision panels shall be provided in the shutters with teakwood beadings on both sides. Unless otherwise specified, the vision panel shall have minimum dimensions of 250 mm height and 200 mm width with bottom located at 1400 mm from shutter bottom.

The minimum hardware and fixtures to be provided shall be according to the Table No. 1 unless specified otherwise.

All surfaces of door shutters which are required to be painted ultimately shall be covered with a priming coat of suitable primer. In case of doors to be polished or varnished, a priming coat of suitable polish or varnish shall be given before installation.

4. SOLID CORE FLUSH DOOR SHUTTERS

4.1 Core

This shall conform to IS:2202 (Part I). It shall be made from block board consisting of pinewood strips placed end to end. The width of each strip shall not exceed 25 mm. The strips shall be placed side by side and glued together to form a slab which shall then be glued between two or more veneers. The direction of the grain of the core blocks shall be at right angles to that of the adjacent veneers.

4.2 Plywood Surfacing

Commercial plywood or decorative plywood conforming to IS 303 and Grade I of IS 1328 respectively shall be used. Wherever mentioned, marine grade ply conforming to IS 710 shall be used.

Frame

This will be provided for holding the core. The width of the frame including lipping shall be 50 to 100 mm wide.

Gluing

Only phenol formaldehyde resin glue shall be used.

Vision Panel/Venetians

These shall be provided where specified on the drawings.

Hardware

Minimum hardware and fixtures shall be provided as per Table 1. Additional hardware shall be as per drawings.

5. STEEL DOORS, WINDOWS AND VENTILATORS

Steel Doors, Windows and Ventilators shall conform to IS 1038, IS 1361, IS 1081 and IS 4351 and shall be as per drawing issued by the EIC. The Contractor shall submit for the EIC's approval the shop drawing covering all dimensions, details of fabrication, construction and installation. After approval of shop drawing, the Contractor shall submit one or more samples of the fabricated item of each for the EIC's approval before mass fabrication. Engineer's comments if any shall be incorporated during mass fabrication.

5.1 Frames

Frames for Pressed Steel Door

Frames shall be manufactured out of 18 gauge (1.25 mm) Galvanised Steel Sheet. Each door frame shall have hinge jamb, lock jamb, head and, if specified in drawing angle threshold. The entire assembly shall be welded. Where threshold is not specified a temporary base tie shall be screwed to the feet of the frames. The base tie shall be out of 18 gauge MS pressed steel section adjusted within floor finish thickness. The frame shall have a brass lock strike plate with mortar guard. For single leaf door, there shall be a minimum of three rubber buffers fixed to the frame. The

middle buffer shall be fixed on centre line of lock strike plate, and the other two 450 mm above and below the middle one. For double leaf door there shall be two rubber buffers in the head frame spaced 300 mm symmetrical about centre Line of door, and two buffers in the rebate of the lock jambs.

Frames for Steel Windows and Ventilators

These shall conform to IS 1361 and shall be made from rolled sections to IS 7452. The steel shall conform to IS 2830 or IS 2831. The sections shall be cut and mitered. The corners of the frames shall be flash butt welded. The frames shall be square and flat. Neoprene or silicone seal weather strips shall be provided on the jambs.

5.2 Shutters

Pressed Steel Doors

These are made from 22 gauge (0.8mm) Galvanised Steel Sheets. These shall be provided on both sides of the shutter and reinforced by MS stiffener channels from inside. All four sides of the shutter shall have an MS channel as stiffener. The shutters shall be 45 mm thick unless specified differently on drg. Space between fully flush skin sheets shall be filled with core infill of honeycomb kraft paper or polyurethane foam (PUF). Vision panel and venetians shall be provided, if specified, as indicated in the drawing. The vision panels shall preferably be of flush type – 2 nos, 5 mm thk each clear float glasses with spacer frame all around and desiccants in it. The fixtures shall be provided as specified in Table 2.

Windows and Ventilators

Sashes shall be square and flat. Sashes shall be constructed of sections which have been cut to the required length, mitered and welded at corners. All the corners shall be through right angles and welds shall be neatly cleaned off. Tee sections for glazing shall be tenoned and riveted into the frames and where they intersect, the vertical tee shall be broached and the horizontal tee threaded through it, and the intersection closed by hydraulic pressure.

5.3 Procedure for Fixing

Doors, Windows and Ventilators shall not be built in at the time the walls are constructed but shall be subsequently fixed into prepared openings, in accordance with IS 1081. Holes for fixing lugs are to be left or cut, and the doors and windows fixed after all the rough masonry and plaster work has been finished. The frames of units shall be set in the opening by using wooden wedges at the jambs, sill and head, and shall be plumbed in position. The lugs shall then be grouted into their holes with concrete (1:2:4). When RCC members (beam or column) form the sides of the opening, rawl plugs shall be fixed in RCC and frames fixed to the members by 63 mm (2 ½") x No. 10 galvanised wood screws. In the case of steel work openings a mild steel or hard wood fillet shall be provided around the frame to facilitate erection. The height of the unfinished opening shall depend on whether a threshold is required or not. While fixing the door, care shall be taken to see that at least 5 mm space is left between door shutter and finished floor.

Tolerance

The sizes of doors, windows and ventilators shall not vary by more than + 1.5 mm than the size specified on drawings.

Finish – Doors

Frames and shutters shall be given a thermosetting polyester powder coating to 70 micron DFT or PU paint. Colour shades shall be as specified by architects on drgs.

Finish – Windows & Ventilators

After the fabrication of units all the steel surfaces shall be thoroughly cleaned free of rust, mill-scale, dirt, oil, etc. and two coats of red oxide zinc chromate primer shall be applied. Two coats of approved synthetic enamel shall be applied after installation of the door, window or ventilator.

6. ALUMINIUM DOORS, WINDOWS AND VENTILATORS

Aluminium Doors, Windows and ventilators shall conform to IS:733, IS 1948, IS:1949, and IS:1081 shall be as per drawings issued by the Engineer. The contractor shall submit for EIC's approval the shop drawings covering all dimension details of fabrication, construction and installation. After approval of shop drawings the contractor shall submit one or more samples of the fabricated item of each type for the EIC's approval before mass fabrication.

6.1 Material

Aluminium Alloy Extruded Sections

Aluminium alloy used in the manufacture of doors, windows and ventilators shall conform to IS designation HE 9-WP of IS:733 or HV9-WP of IS 1285. Aluminium Alloy AA 6063 of hardness T5 or T3 which has the following properties is also acceptable,

Density, kg/mm^3	Modulus of Elasticity, Mpa	Ultimate Tensile Strength, Mpa	Coefficient of Linear Expansion, m/m.k	0.2% Proof Stress, Mpa
2.7×10^{-8}	69×10^{3}	185	23×10^{-8}	110

The sectional properties of extruded sections shall be as given in IS 733 or as manufactured by Jindal, Hindalco or Bhoruka. The section shall be uniform in appearance, free from die lines and handling marks.

Glass panes

Glass panes shall be annealed or float glass as specified in the drawing and shall weigh at least 7.5 kg / m2. Glass panes shall also be free from flaws, specks or bubbles. All panes shall have properly squared corners and straight edges. The sizes of glass panes for use shall be in accordance with Table I of IS:1948.

Thickness of glazing to be used for various pane sizes shall be as follows:

Size of Pane Thickness of glazing

up to 1.2 sq.m 4 mm float glass

1.2 sq.m to 2.0 sq.m 5.5 mm float glass

above 2.0 sq.m 8 mm float glass

twin style entrance door 12 mm float glass

Heat strengthening or Toughening of glass wherever required shall be as indicated on drgs.

Screws, Fasteners

Screws and fasteners shall be of aluminium alloy or brass oxidised. Screw thread of machine screws used in the manufacture of aluminium doors, windows and ventilators shall conform to the requirement of IS:4218.

For opaque portion of shutters panels can be of 12 mm thk marine ply cladded on both sides with 24 gauge aluminium sheet.

6.2 Standard sizes, tolerances and designation

Size

Overall dimension of windows, doors, ventilators, shall be derived from masonry opening minus an allowance of 1.25 cm clearance on all sides for the purpose of fitting. However, type and overall sizes shall be in accordance with IS:1948.

Tolerances

The sizes for doors, windows or ventilator frames shall not vary by more than ± 1.5 mm from overall size as specified in drawing.

Designation

Doors, windows and ventilators shall be designated by symbol denoting their width, type and height in succession as per IS : 1948.

Sectional dimensions and weights

Sectional dimensions and weights per unit length of the section shall conform to design drawing. However, uses of specific sections for specified units as per manufacturers' standard may be used with prior approval of Engineer.

6.3 Fabrication

Frames

Frames shall be square and flat, the corners of frame being fabricated to a true right angle. Both the fixed and opening frames shall be constructed of sections which have been cut to length, mitered and screwed at the corners.

Shutters

All hinges, pivots, etc. shall be provided and fabricated in accordance with provisions given in IS:1948. However, reference standards and drawings are also to be read in conjunction with the IS code.

6.4 Finishing

The aluminum sections to be used shall be properly buffed, cleaned by using mild acids and water. Then the same shall be anodised to have average anodic film thickness of 25 microns. To prevent damage to metal surfaces, a protective tape shall be applied after manufacturing and same shall be removed at site only after completion of rough trades.

6.5 Handling, Storage

The extruded section or the fabricated windows/doors shall be protected against abrasions, waterstains and any other damages caused by acids or alkaline chemicals. Cold metal shall preferably be placed in a dry storage area avoiding contact between it and other metals. Use of wood face shelving racks is recommended. It shall also be kept away from caustics, nitrates, phosphates, acids and cement.

6.6 Installation

The fabricated and assembled windows or door units (without glazing) shall be installed in accordance with IS 1081 being fixed in masonry opening properly plastered and finished. Straightness and diagonal dimensions of the opening shall not have tolerance more than ± 2 mm. Aluminium screws or bolts are to be used with teak wood block on the back of the sections to avoid dents and other mechanical damages during tightening of screws/bolts. All gaps between the aluminium section and the masonry surface must be sealed with gun grade polymer based sealant viz., silicone compound, polysulphide compound.

Cement mortar grout or cement mortar finishing of gaps after installation of aluminium units shall strictly be restricted to protect the surface treatments given to the aluminium like anodising, precoating, etc.

All glass panes shall be fixed only after major activities are over in the area. Glazing gaskets for doors and frames shall be EPDM elastomeric extrusions. All screws and miscellaneous fasteners shall be aluminium, stainless steel or zinc plated.

6.7 Hardware

Necessary hardware for aluminium doors and windows shall be compatible with the basic material and shall be provided along with the doors, windows and ventilators. Minimum hardware necessary to be provided shall be as specified in Table 3.

6.8 Drawings/Documents

Prior to fabrication, Contractor shall submit shop drawing indicating details of all members, sections and hardware for EIC's approval. All certificates against tests for anodising and other physical properties of material shall be produced to the Engineer for acceptance.

7. METAL ROLLING SHUTTERS AND ROLLING GRILLS

Metal Rolling Shutters and Rolling Grills shall conform to IS:6248, and shall be as per drawings issued by the Engineer. The Contractor shall submit for EIC's approval, the shop drawing covering all details of fabrication, construction and installation. After approval of shop drawing the Contractor shall submit one sample for approval before mass fabrication.

Rolling shutters shall be of following alternative types depending on the method of operation.

S.No.	Type	Clear Area of Shutter	Remarks
i.	Self Coiling or Pushing Pull Type	Up to 8 sq.m	Without ball bearing
		8 to 12 sq.m	With ball bearing
ii.	Gear Operated	12 to 25sq.m	With ball bearing. Operated by bevel gear box and crank
		25 to 35 sq.m	With ball bearing operated by chain wheel and hand
iii.	Electrically Operated type	35 to 50 sq.m	

7.1 Materials

Cold Rolled Steel Strips

Cold Rolled Steel Strips used for rolling shutter lath sections shall conform to temper No. 5, Dead soft quality of IS 513.

Mild Steel Sections

Mild Steel Sheets and Plates used for manufacturing the guide channels, brackets and lock plate shall be of hot rolled steel of thickness not less than 3.15 mm conforming to IS:5986. These shall be free from surface defects and the edges shall be cleanly sheared.

Steel Pipe

Mild Steel Pipes used for the suspension shaft of the roller shall be heavy duty pipe suitable for mechanical purposes and shall conform to IS:1161.

Cast Iron Castings

Cast Iron Castings used for roller pulley wheels, U-clamps and bevel gears shall conform to Grade 15 of IS:210. These shall be free of blow holes, surface defects such as cracks, burrs etc.

Springs

The springs used in the roller for counter balancing the rolling shutter shall be made either from high tensile spring steel wire or flat spring steel strip.

The spring steel wire used for helical spring shall conform to Grade 2 of IS:4454.

Flat spring steel strip used for spiral spring shall be from 0.8 to 1.0 percent carbon steel strip especially hardened and tempered.

Aluminium Alloy Sheets

Aluminium Alloy Sheets used for curtains in case of rolling grills, shall conform to 52000 (NS4), 53000 (NS5) or 64430 (HS30) of IS:737.

Aluminium Alloy Extrusions

Aluminium Alloy Extrusion for the components of rolling shutters of aluminium shall conform to 53000 (NE5) or 64430 (HE30) of IS:733.

7.2 Fabrication

Curtain

This shall be built up from interlocking lath sections. The lath sections shall be from 18 gauge (1.25 mm) section for curtains up to 9 metres in width. Curtain above 9 metres in width should be divided in two parts with provision of one middle fixed or movable guide channel or supported from the back to resist wind pressure. The lath section shall be rolled so as to have interlocking curls at both edges and a deep corrugation at the centre with a bridge depth of 16 mm to provide sufficient curtain stiffness for resisting manual pressure and normal wind pressure. Each lath section shall be continuous single piece without any welded joint. When interlocked, the lath section shall have a distance of 75 mm between rolling centres. Each alternate lath section shall be fitted with a malleable cast iron or mild steel clips securely riveted at either end, thus locking the lath section at both ends and preventing lateral movement of the individual lath sections. The clips shall be so designed as to fit the contour of the lath sections.

Lock Plate

The Lock Plate provided at the bottom of the shutter, shall be composed of a mild steel plate 3.15 mm thick, reinforced with mild steel angle 35 x 35 x 5 mm at bottom of the plate. The lock plate shall be fitted with sliding bolts at either end to engage with suitable receiving pockets at the bottom of the guide channel. The sliding bolts shall be capable of being locked by means of padlocks both from outside and inside. The lock plate shall also be provided with pulling handles, one handle for 2.5 m width and 2 handles for widths above 2.5 m. Pulling handles shall be fixed on both inside and outside faces of the lock plate.

Guide Channels

These shall be of mild steel deep channel section of rolled, pressed or built up (fabricated) construction. The thickness of the sheet used shall not be less than 3.15 mm. The depth of the guide should be such that there is sufficient clearance between curtain and inner surface of guide. The curtain shall project into the guide at least 40 mm for shutters up to 3.5 m width and 60 mm for greater widths. There shall be a clearance of 10 mm between guide wall and the end clips of the curtain.

Where the shutter is installed in heavy windy zones, special wind locking arrangements shall be provided to prevent the curtain coming out of the guide. The clear gap on either side of the curtain and inner faces of the guide channel shall be 5 mm. The depth and width of the guide channel shall be as follows:

Clear Width of	Depth of Guide Channel
Up to 3.5 M	65
3.5 to 8.0 M	75
8.0 m and above	100

Width of Guide Channel shall be 25 mm for lath sections with bridge depth of about 12 mm and 32 mm for lath sections with bridge depth of 16 mm.

Fixing Cleats

Each guide shall have a minimum of 3 fixing cleats. The spacing of cleats shall not exceed 0.75 m. Alternatively, the guide channels may also be provided with suitable dowels hooks or pins for embedding in the walls. The guide channel shall be attached to the wall plumb and true.

Bracket Plate

This shall be fabricated out of mild steel plate of 3.15 mm thick. Thicker plates may be used depending upon the height of the shutter. Dimensions shall be as given in IS:6248. The bracket plate may be square, circular or hexagonal with a U-shaped cast iron or mild steel clamp riveted or welded to it at the centre. The bracket plate should have sufficient cross sectional area to resist the shear arising out of the weight of the curtain, suspension shaft etc. and shall be held rigidly by suitable foundation bolts.

Roller

The suspension shaft of the roller shall be made of steel pipe conforming to heavy duty of IS:1161. The diameter shall be sufficient to limit deflection of shaft under the weight of the rolling shutter. The deflection of the shaft shall not exceed 5 mm per metre width of the shutter. Diameters of the steel pipe for various widths up to 6 m and height 5 m shall be as per IS:6248. Sizing of pipe diameter for greater widths and heights shall be designed giving due consideration for deflection limit mentioned above. The pipes of the suspension shaft which are clamped to the brackets shall be fitted with rotatable cast iron pulleys to which the curtain is attached. The pulleys and the pipe shaft shall be connected by means of pretensioned helical springs to counterbalance the weight of the curtain and to keep the shutter in equilibrium in any partly opened position.

Hood Covers

These shall be made of mild steel sheets not less than 0.9 mm thick, and shall be hexagonal, square or circular contour depending on the contour of the bracket plate. The hood cover shall be stiffened with angle or flat stiffeners at top and bottom edges to retain shape. The hood cover shall be fixed to the bracket plate by means of angle cleats. The hood cover shall also be supported all along the top at suitable intervals to prevent sagging.

Gears, Worms etc

These shall be machine cut. Worm gear wheels shall be of high grade cast iron or mild steel or phosphor bronze. The worms shall be of mild steel or gun metal or phosphor bronze.

Security Devices

For shutter widths exceeding 2.5 m, any one or both of the following security devices may be provided. Anchoring Rods as described in IS:6248. These shall be provided at the rate of one per extra 2.5 m width or part thereof above a clear width of 2.5 m.

Central Hasp and Staple

This shall be provided at the centre of the bottom lock plate. The hasp shall be embedded in the floor at the centre. The staple shall be fitted at the centre of the bottom

lock plate outside in an accurate position so that the hasp may properly engage with staple when the shutter is in a closed position. The hasp shall be embedded within the floor so as not to cause any obstruction. Normally one central hasp and outside staple will be sufficient for any width of shutter.

7.3 Optional Features

Intermediate Posts or Mullions

These shall be either of fixed, sliding or removable type, and are used for unusually wide openings or for providing multiple door entries. The mullion also forms the guide channels between the various sections of the rolling shutter. The sliding mullion may also be winch operated for large sizes. The fixing of the intermediate post shall be plumb and true when in position before closing the rolling shutter.

Wicket Door

Large rolling shutter fixed at the main entrance of mills and factories may also be provided with a subsidiary door known as wicket door. This is a hinged service door allowing pedestrian traffic without the need of rolling up the shutter. The wicket door size shall be 600 x 1200 mm for ordinary use and 900 x 1800 mm for large installations. Sizes larger than these are not recommended as these cause difficulties in installation and operation. The wicket door shall be of good robust construction and shall be fitted with a good lever lock operated by key and lockable from both inside and outside. The wicket door shall be erected in such a way so as not to foul with the main rolling shutter when opening or closing. The wicket door shall be swung clear of the opening before the Rolling Shutter is raised.

Galvanising

All components of the rolling shutter may be hot dip galvanised with a zinc coating containing not less than 97.5% pure zinc. The weight of the zinc coating shall be not less than 230 g/sq. m and the coating shall be free from flaking or peeling.

7.4 Operation

Push Pull Type

Push Pull Type shall be operated manually by pulling hooks with appropriate pulling handles in the lock plate. The length of the pulling handle shall be sufficient to push the lock plate up to the top most position.

Gear Operated Type

These shall be operated by two types of arrangement:

i. by bevel gear box and crank handle

ii. by chain wheel and chain.

The height of the bevel gear box or the bottom of the hand chain shall be 0.85 m from floor. If specified on drawing, the crank handle operation or hand chain operation shall be provided on both sides of the wall. The gear reduction shall be calculated to reduce the pressure exerted on the crank handle or the pull exerted on the hand chain to not more than 16 kgs.

Electrically Operated Type

These shall be operated by an electric motor operating on 400/440V, 3 phase 50 cycles A.C. supply. Arrangements shall also be made for emergency mechanical operation of the rolling shutter in the event of failure of the electric equipment or electricity. The emergency mechanical operation shall be by an auxiliary chain wheel and hand chain drive. The motor shall have a push button control, with a minimum of 3 buttons marked “Up”, “Down” and “Stop”. Limit switches shall also be provided to cut off current to the motor when the shutter reaches the limit of its travel in the “Up” or “Down” directions.

7.5 Rolling Grills

These are similar in design and operation to Rolling shutters. Hence, all provisions of Rolling shutters are applicable to rolling grills except for the curtain. The rolling grill curtain may be manufactured out of 8 mm diameter mild steel or aluminium alloy round bars.

Rolling Shutter Cum Grill

These shall be provided in situation where certain amount of ventilation and safety is called for, e.g. in substations and transformer rooms. The rolling shutter may have a small grill portion as specified in the drawing the height of this grill shall generally be 500 mm.

7.6 Painting

All components of Rolling shutter except springs and inside of guide channel shall be thoroughly cleaned free of rust, mill-scale, dirt, oil etc. and two coats of red oxide zinc phosphate epoxy paint shall be applied. Two coats of approved epoxy finish paint shall be applied after installation. Other painting systems shall be employed if specified on the drawings.

Marking

Each shutter shall be clearly and legibly marked with the following information:

i. Manufacturer’s Name or Trade Mark
ii. Size
iii. Year of Manufacture.

8. FIRE DOORS

Fire rated doors shall be for a minimum period of two hours (unless specified otherwise) and shall be approved by Tariff Advisory Committee (TAC). If sourced from outside India, the fire labelled hollow metal doors shall be approved by Underwriters Laboratories (UL). Testing conducted by Central Building Research Institute (CBRI), Roorkee shall be produced on demand. Testing shall be as per BS 476 Part 20 & 24, IS 3614 Part 2 and ISO 834.

The frames shall be made of 16 gauge (1.6 mm) galvanised steel sheets pressed bent to shape using bending machine and mitred with square edges. The shutter shall be formed by machine bending of 18 gauge (1.25 mm) galvanised steel sheets in the form of hollow box making an overall thickness of min 45 mm. Other requirements of stiffeners, core infill, finish, etc to be same as for steel doors described in section 5 of this specification. If vision panels are shown, the glass used shall have fire rating for same period as the door.

9. PVC DOORS AND WINDOWS

PVC doors and window frames shall be a complete system manufactured from acrylic modified high quality impact resistant white (or coloured as specified) unplasticised polyvinyl chloride, reinforced, rigid multi-chamber extrusion by a suitably qualified fabricator. Door and window fabrication shall meet basic performance requirements recommended for climatic and atmospheric conditions of site and in strict accordance with the system supplier's recommendations.

Door/ window type, size and style shall meet requirements specified in relevant door/window schedules.

Door, window design shall include factory finish glazing as required, purpose made thresholds/subcills, trickle ventilators and security/ locking devices as recommended by manufacturer.

All glazing shall meet safety requirements specified by relevant building regulations.

Fabricator shall submit evidence of door, window performance including method of weld finishing, weather tightness exposure category, compliance to relevant regulations, etc for approval prior to award of contract.

TABLE 6.1- TIMBER DOOR AND WINDOWS (MINIMUM HARDWARE)

Fittings	Door				Window		
	Double Leaf	Double Leaf Panele	Single Leaf	Single Leaf Panele	Double Leaf Shutte	Single Leaf Shutt	Ventilator Shutter
Butt Hinges 100mm Heav	6	6	3	3	-	-	-
Butt Hinges 75mm Heav	-	-	-	-	4	2	2
Mortice Lock (7	1	-	1	-	-	-	-
Aldrop 300mm	-	1	-	1	-	-	-
Door Latch 300mm	-	1	-	1	-	-	-
Flush Bolt 250mm	3	-	2	-	-	-	-
Tower Bolt 250mm	-	3	-	2	3	2	-
Handle 150mm	-	4	-	2	2	1	1
Hook and Eye Stay 300m	-	-	-	-	2	1	2
Stoppers (Buffers)	1	1	1	1	-	-	-
Peg Stay					2	1	-

Notes:

All the fittings shall be oxidized brass type unless otherwise specified.

Single leaf door shutters and ventilator shutters of more than 0.80 m width shall be provided with one extra hinge.

Where height of window shutter and door leaf exceeds 1.2 m and 2.15 m respectively one extra hinge shall be provided for every additional height of 0.5 m or part thereof and length of top bolt shall be increased by the height of the shutter/leaf above 2.15 m from floor level.

In double leaf shutters of doors, two tower bolts shall be fixed to the first shutter top and bottom and one

to the closing shutter at the top. In case of double shutter windows, two tower bolts shall be fixed to closing shutter top and bottom and one to the first shutter at top.

All hardware shall conform to the applicable Indian Standards.

TABLE 6.2- STEEL DOOR AND WINDOWS (MINIMUM HARDWARE)

Fittings	Doors		Windows		Ventilators	
	Single Shutter	Double Shutter	Single Shutter	Double Shutter	Top Hung Shutter	Centre Hung Shutte
4" x 4" SS Hinges with two ball bearings	3	6	-	-	-	-
Hinges (Heavy) 75mm Wide	-	-	2	4	2	-
Aldrop 300mm	1	1	-	-	-	-
Push and Pull type Handle (100mm)	2	2	-	-	-	-
SS Tower Bolts (300mm)	1	3	-	-	-	-
Two Point nose handle with striking plate	-	-	1	2	1	-
Peg Stay 300mm	-	-	1	2	1	-

Notes:

i. All the fittings shall be in S.S. unless otherwise specified.

ii. Single leaf door shutters and ventilator shutters of more than 0.80 m width shall be provided with one extra hinge.

iii. Where height of window shutter and door leaf exceeds 1.2 m and 2.15 m respectively one extra hinge shall be provided for every additional height of 0.5 m or part thereof and length of top bolt shall be increased by the height of the shutter/leaf above 2.15 m from floor level.

iv. Double leaf shutters of doors, two tower bolts shall be fixed to the first shutter top and bottom and one to the closing shutter at the top.

v. All hardware shall conform to the applicable Indian Standard.

vi. Door Closure

Requirement of door closure, its type – Surface mounted or concealed, with or without Hold Open option

shall be as mentioned on Architectural drg.

TABLE 6.3- ALUMINIUM DOORS AND WINDOWS (MINIMUM HARDWARE)

Fitting	Door		Casement Windows	
	Single Shutter	Double Shutter	Single Shutter	Double Shutter
Mortice Lock 7 Lever	1	1	-	-
Tower bolts	1	3	-	-
Butt Hinges (heavy)	-	-	2	4
Floor Spring (Shutter on	1	2	-	-
Two point nose handle with striking plate	-	-	1	2
Peg Stay 300mm	-	-	1	2

Notes:

i. All the fittings shall be anodized aluminium (finish compatible with original frame) type unless otherwise specified.

ii. Single leaf door shutters and ventilator shutters of more than 0.80 M width shall be provided with one extra hinge.

iii. Where height of window shutter and door leaf exceeds 1.2 M and 2.15 M respectively, one extra hinge shall be provided for every additional height of 0.5 M or part there of. Length of top bolt shall be increased by the height of shutter / leaf above 2.15 M from floor level.

iv. In double leaf shutters of doors, two tower bolts shall be fixed to the first shutter at top & bottom and one to the closing shutter at top.

v. All hardware shall conform to applicable Indian Standards.