



Uhde India Limited

**PART – II
SECTION-6
TECHNICAL SPECIFICATIONS
DOORS, WINDOWS & PARTITIONS**

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CI-UCH-016-06

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6.1 SCOPE

The work in general shall consist of supplying assembling and/or erecting and installing of all doors, windows, ventilators, louvers, rolling shutters, glazed partitions, etc. as shown on drawings with all materials complete including supply and fixing of glass and glazing.

6.2 APPLICABLE CODES AND SPECIFICATIONS:

The following codes, standards and specifications are a part of this specification. All standards, tentative specification, specifications, codes of practices referred to herein shall be the latest edition including all applicable official amendments and revisions.

In case of discrepancy between this specification and those mentioned elsewhere, this specification shall prevail.

IS : 4021 - Timber doors, window and ventilator frames.

IS : 2202 - Wooden flush door shutters (Solid core Type)
(Part I & II)

IS : 1003 - Timber panelled and glazed shutters.
(Part I & II)

IS:4020 - Methods of tests for wooden flush doors: Type tests.

IS:2835 - Flat Transparent sheet glass

IS:4351 - Steel door frames

IS:1038 - Steel doors, windows and ventilators

IS:1361 - Steel windows for industrial buildings

IS:1081 - Code of practice for fixing and glazing of metal (Steel and aluminium) doors, windows and ventilators.

IS:5807 - Method of test for clear finishes for wooden furniture (Part I & III)

IS:1477 - Code of practice for painting of ferrous metals in buildings and allied finishes (Part I & III)

- IS:2338 - Code of practice for finishing of wood and wood-based materials (Part I)
- IS:1948 - Aluminium doors, windows and ventilators
- IS:1949 - Aluminium windows for industrial buildings
- IS:3548 - Code of practice for glazing in buildings
- IS:6248 - Metal Rolling Shutters and Rolling grills

6.3 INSTALLATION

6.3.1 Materials:

6.3.1.1 Woodwork in doors & windows:

Wood used for all work shall be the best of the respective class specified, and properly seasoned by at least 6 months air drying, suitable for joiner's work, should be of natural growth, uniform in texture, straight grained, free from sapwood, dead knots, open shakes, boreholes, rot, decay and any and all other defects and blemishes.

The thickness specified for joiner's wrought timbers are, unless otherwise specified, values prior to planning and 3 mm will be allowed from the thickness stated for each wrought face.

All joints shall be wrought on all faces and finished off by hand with sand paper, with slightly rounded corners.

The joints shall be pinned with hard wood pins and put together with white lead. Jointing shall be by means of mortice and tenon or dovetailed joints as approved.

Any joiner's work which shall split, fracture, shrink, or show flaws or other defects due to unsoundness, inadequate seasoning or workmanship, shall be removed and replaced with sound material at the CONTRACTOR's expense.

Doors, windows and ventilator frames, transomes and mullions shall rebated. All dimensions shall be as per drawings. The top framing member of doors and top and bottom framing of windows and ventilators shall be embedded 150mm in brick work. The verticals of door frames shall be embedded 50mm below finished floor.



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Surface coming in contact with brick / concrete work shall be painted with bitumen as directed by the Engineer. Each of the door and window frames shall be provided with 3 Nos. M.S. 25x6 flat split, 225 mm long holdfasts with split ends

and these shall be embedded in masonry or concrete work. Each of the window frames shall be provided with 2 Nos. 25 x 6 flat, 150 mm long holdfasts with split ends. The work shall conform to IS : 4021.

The doors shall be panelled or solid flush doors as described in the item of work. All flush doors shall be supplied with approved fittings such as hinges, mortice lock of approved make with handles on both sides, oxidized brass tower bolts and latch arrangements, door stops etc. as shown in drawings but exclusive of door closures. Door closers, where separately specified shall be of heavy duty hydraulic type to be approved by Engineer. Panelled doors shall have the same fittings except that in place of union lock, aldrop shall be provided. Each door leaf shall have two 250 mm tower bolts, two aluminium or oxidized brass handles, and one door stopper mounted near the bottom of door. External flush doors shall be made of weatherproof plywood. Flush doors shall conform to IS:2202 (Part - I) (Refer to Data Sheet 'B' for recommended vendor / brand information).

Doors will generally have no sills but if a few have to be provided, the Contractor shall do so at no extra cost to the Owner.

The type of window shall be as specified. Each shutter shall have one pair of hinges, two tower bolts one 225 mm long and another 150 mm long, one handle and one hook with eye and pegstay. Ventilators shall have two m.s. hold fasts and hinges, one handle and one hook and eye at each end and one small tower bolt in the centre. Where so directed by the Engineer, the doors and windows shall be provided with parliamentary type hinges at no extra cost.

The workmanship of all door and window shutters shall conform to the requirements of IS:1003 (Part I & II) and IS:2202 (Part I). If required, flush door panels shall be got tested as per IS:4020.

The finish expected is of a very high order and the work shall be all inclusive whether or not all detailed specifications have been spelt out and the work shall be free from blemish.

No iron bars or grills are proposed to be provided in the windows or ventilators. Glass louvered ventilators where specified shall be provided.

Woodwork shall not be painted, oiled or otherwise treated before it has been approved by the Engineer.

6.3.1.2 Steel doors & windows and aluminium doors & windows

Steel section used for fabrication of doors, windows etc. shall be standard rolled steel sections specified in IS : 1038 and IS : 1361 or as specified in drawing and schedules.

Steel sheets for frames, shutters, louvers blades etc. shall be of a gauge mentioned in drawings and schedules.

Aluminium sections for fabricating doors, windows, partitions etc. shall be extruded sections conforming to IS : 1948 and 1949 or as manufactured by approved manufacturer. (Refer Data Sheet 'B' for recommended vendor / brand information). The alloy used shall conform to IS Designation HE 9-WP of IS : 733.

Hardware and fixtures shall be as specified in "Schedule of Fixtures" and the best quality from approved manufacturers (Refer to Data Sheet 'B' for recommended vendor / brand information) shall only be used. The tenderer shall specifically state the particular manufacturer's material he proposes to use. "Schedule of Fixtures" is for the purpose of stating the minimum requirement and improper alignment or faulty operation due to inadequate strength of hardware or fixture shall entirely be the Contractor's responsibility. All hardware and fixtures shall be able to withstand repeated use. Door closers shall conform to IS : 3564 and shall be suitable for doors weighing 61-80 kg. unless otherwise stated in schedule. Each closer shall be guaranteed against manufacturing defect for one year and any defect found within this period shall be rectified or the closer replaced free of charge. Concealed door closers shall be either floor mounted or transom mounted, and suitable for installation with metal doors. It shall conform to the performance requirements and endurance test stated in IS : 3564 - Appendix A.

The contractor shall submit samples of each type of hardware to the Engineer. The approved samples shall be retained by the Engineer for comparison of bulk

supply. The samples shall be returned to the Contractor towards the end for incorporation in the job.

The mastic for caulking shall be of best quality from a manufacturer approved by the Engineer. In general, the mastic for fixing of metal frames shall be as per IS:1081 and/or as approved by the Engineer.

6.3.1.3 Air tight and sound insulated doors.

The air tight and sound insulated doors shall be supplied by manufacturers (Refer to Data Sheet 'B' for recommended vendor / brand information). The doors shall be made from 16 g.MS sheets sandwiched with 50 mm thick insulation. Sturdy hinges of shaft and barrel type shall be provided to withstand heavy and repeated industrial use. Sealing gasket shall be provided all round the door frame. The arrangement of the gasket shall be such as to allow easy replacement. The handles shall be made of brass and chromium plated. The design of handles shall be such as to ensure effective sealing. Alternatively design drawings will be furnished by UIL for the supply, fabrication, erecting and fixing the door.

6.3.1.4 Fire resistant doors.

The fire resistant doors shall be plate type, complete with door frames etc. made with 6 mm thick MS plate, angles & flats. Styles shall be rivetted. These doors shall be supplied by approved manufacturer and shall be as per IS:3614 (Part I). Alternatively design drawings will be furnished by UIL for the supply, fabrication, erecting and fixing the door.

6.3.1.5 Blast proof doors.

The blast proof shall be specifically designed to resist, the design blast pressure. These shall be plate type made from 6 mm thick (min.) MS plates. Hollow MS, Rolled Sections or 'Z' Sections shall be used as stiffeners. Hinges shall be made from roller thrust bearings. The contractor shall furnish the detailed drawings to the Engineer for approval. Alternatively design drawings will be furnished by UIL. The contractor shall supply / erect / fix in position including all fittings.

6.3.2 Fabrication:6.3.2.1 Steel Doors, Windows, Ventilators, Louvers etc. :a) Door Frames:

Frames shall be fabricated from 16g sheets. They shall be mortised, reinforced, drilled and tapped for hinges and lock and bolt strikes. Where necessary, frames shall be reinforced for door closers, Welded construction with mitered corners shall be used. Rubber door silencers shall be furnished for the striking jamb. Loose "T" masonry anchors shall be provided.

Frames shall finish flush with floor and adjustable floor anchors shall be supplied. Frames shall be brought to site with floor ties/weather bars installed in place.

b) Double Plate Flush Door Shutters:

Door shutters shall be 45mm thick, completely flush design and shall comprise of two outer 18G steel sheets, rigidly connected and reinforced inside with continuous vertical 20G stiffeners, spot welded in position at not more than 150mm on centres.

c. Sliding doors:

Shall be either double plate or single plate construction as called for in drawings and schedules made out of 18 gauge steel sheets with adequate stiffeners. The Contractor shall specify the weight of the door in his shop drawing and submit the manufacturer's catalogue of the sliding gear he proposes to use. Where shown on drawings or called for in the Schedule of Items, the Contractor shall make provisions for openings in the door for monorail beams etc. Doors shall close positively to exclude rain water from seeping in. When called for in schedule, sliding doors shall withstand

specified wind loads without buckling of jamming. The door shall slide freely under all ambient conditions.

d) Door Threshold:

Door thresholds shall be provided as shown on drawing. Door without threshold shall have bottom tie of approved type.

e) Steel Windows, Sashes, Ventilators etc.

These shall conform in all respects to IS:1038 and IS:1361 latest editions and as shown on drawings. The details as called for in the above codes shall be applicable for coupling mullions, transoms, weather bars, pivot arrangements for ventilators, etc. or as shown on drawings or called for in the Schedule of Items.

All welds shall be dressed flush on all exposed and contact surfaces.

Where composite unit openings are shown on drawings, the individual window units shall be joined together with requisite transoms and mullions as shown on drawings. All windows shall be outside glazed, fixed with putty or metal glazing beads as shown on drawings and/or specified under Schedule of Items.

Where aluminium glazing beads are specified, they shall be extruded aluminium channel 9.5 mm x 9.5 mm x 1.6 mm (Indian Section No. 2209) unless otherwise shown on drawings. Aluminium beads shall be given one coat of zinc chromate primer before fixing to windows. Both edges of doors shall be jointed and reinforced full height by steel channels placed immediately inside and welded to the door faces. Top and Bottom of doors shall be reinforced horizontally as shown on drawing by steel channels running full width of door. Doors shall not have more than 2.5 mm clearance at jambs and heads shall have proper bevel on lock stiles and rails to operate without binding, and shall be reinforced at corners to prevent sagging or twisting. Pairs or double doors shall have meeting stile edges bevelled or rebated. Where shown on drawing, or called for in the

schedule of items, the doors shall be sound insulated by filling the inside voids with mineral wool or other suitable approved materials.

Doors shall be morticed, reinforced, drilled and tapped in shop for hinges, hooks and bolts. They shall also be reinforced for closers, push plates and other surface hardware where necessary. Any drilling and tapping required for surface hardware shall be done at site. Where shown in drawing, provision shall be made for fixing glazing, vision panels, louvers etc. Glazing mouldings shall be of 18g steel or extruded aluminium sections with profiles shown in drawing and suitable for fixing glass. Louvers blades shall be V or Z shaped and made out of 16g sheets.

f) Single Sheet Door Shutters :

Single sheet doors shall be made from best quality 18g mild steel sheets, and shall present a flush surface on the outside. The inside shall be stiffened with semitubular edge and central stiffening rail which shall hold the lock and other furniture. The frames shall be made from best quality 16g mild steel sheets.

Wherever required as shown on drawing, provisions for fixing glass panes, louvers etc. shall be made.

The manufacturing shall be done as specified in (e) "Double Plate Flush door shutters".

6.3.2.2 **Aluminium Doors, Windows and Frames:**

Extruded sections shall have a minimum 3mm wall thickness. All sections shall be approved by the Engineer before fabrication is taken up. Doors, frames mullions, transomes etc. shall be anodized in bath of sulphuric acid to provide a clear coating. The anodized materials shall then be sealed by immersing in boiling water for 15 minutes. A protective transparent coating shall be applied to the sections before shipment from the factory.

All work shall be fitted and shop assembled to a first class job, and ready for erection. Shop joints shall be made to hair lines and then welded or braced by such method as will produce a uniform colour throughout the work. Work on the above, other than described, shall be carefully fitted and assembled with neat joints with concealed fasteners. Whenever possible, joints shall be made in concealed locations and on edges of doors. Field connections of all work may be

made with concealed screws or other approved type of fasteners. Glazing beads shall be snap fit type without visible screws and shall be of sizes to accommodate 6mm thick glazing. All work shall be adequately braced and reinforced as necessary for strength and rigidity.

6.3.2.3 Aluminium Partitions

Aluminium partitions shall be made out of framing and adequate stiffeners of standard Aluminium sections of approved make, heavy or medium duty conforming to IS:733 IS:1285, having 3 mm minimum wall thickness. The aluminium sections shall be anodised in natural matt finish and thickness of anodic film shall be 15 microns (± 3 microns). The top portion of the partition shall be fitted with 4/5.5 mm thick clear transparent or translucent sheet glass with ethylene / propylene / rubber / PVC gaskets. The bottom portion shall be of panels of double aluminium sheeting, suitably framed with the interspace being filled with thermal / sound insulation. Sliding / hinged openable shutters with glazing at top shall be provided as required and all work shall be carried out as detailed in drawings.

6.3.2.4 PVC Partitions

Partitions shall have robust frames and stiffeners all of plastic made out of UV-stabilised special compounds / grades of PVC of approved make, reinforced with steel sections concealed inside the cavity of PVC sections with EDPM weather sealing strips, along with fixed PVC sheets and sliding / (brass) hinged openable PVC shutters with or without glazing at top. PVC partitions including doors shall be obtained from reputed and approved manufacture.

6.3.2.5 FRP door shutters

Fibre Glass Reinforced Plastic (FRP) door shutters shall be obtained from reputed and approved manufacturer. The door shutters shall exhibit qualities of being waterproof, weatherproof, chemical resistant, abrasion resistant, light weight, non-porous and U.V. stabilised.

6.3.2.6 Rolling Shutters:

Rolling shutters shall conform to IS:6248.

Rolling shutter shall be of the size to suit the openings and shall be positioned as shown on the drawing and/or as directed by the Engineer.

The rolling shutter shall be fabricated from 0.9 mm thick steel for shutters upto 3.5 M width and 1.2 mm thick sheet for shutters over 3.5M width. The shutter shall be rolled with lath sections of effective bridge depth 12mm at 75 mm rolling centres, interlocked with each other and ends locked with malleable cast iron or mild clips.

The guide shall either be rolled or pressed deep channel sections, fitted with necessary fittings and fixtures. The width of the channel shall be 25 mm and the depth 75 mm upto 8 M wide shutter. The depth shall be 100 mm for shutters above 8 M width.

The hood covers shall be made of 20 gauge G.I sheets with necessary stiffeners and frame work to prevent sag. The bottom lock plate shall be made of 3mm thick M.S. plate and 95 mm wide reinforced with angle iron of suitable section with 6mm dia. M.S rivets interlocked with stride of curtain.

Unless otherwise specified for overall area of rolling shutters up to 8 Sq.m pull and push type hand operated shutters shall be used. For area between 8 and 10 Sq.metre, push and pull type shutters shall be provided with ball bearings.

For area larger than 10 Sq. meter mechanical gear type or electrically operated shutters shall be used. Operation of shutters shall be by means of worm and worm wheel and shaft arrangement and it shall be possible to operate the door either from inside or from outside. The shutter shall be capable of withstanding horizontal forces up to 100 kg/m² without any appreciable deflection.

6.3.3 SHOP COAT OF PAINT



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The shop paint for steel doors, windows etc. shall be best lead or zinc chromate primer paint from approved manufacturer. All surfaces shall be thoroughly cleaned of rust, grease, loose mill scales etc. and given one coat of shop paint. Portions like mullions, transoms etc. which will be inaccessible after assembly of units shall be given an extra coat of paint before assembly.

Where called for in the Schedule of Items, all steel doors, Windows etc. shall be hot dip galvanized to give a coating weight of 1.5 to 2 oz. per sft. One coat zinc chromate primer coat shall then be applied as shop paint.

Portions of aluminium frame which come in contact with masonry construction, shall, before shipment from workshop, be protected with a heavy coat of alkali resistant paint. Aluminium coming in contact with other incompatible metals shall be coated with zinc chromate primer.

6.4 HANDLING & STORAGE OF FABRICATED MATERIALS:

All doors windows, etc. shall be packed and crated properly before despatch, to ensure that there will be no damage to the fabricated materials. Loading into wagons and trucks shall be done with all care to ensure safe arrival of materials at site in undamaged condition.

When taking delivery of items supplied by Owner, the Contractor shall satisfy himself that the items supplied are up to the specified standard. Any defect detected shall promptly be brought to the notice of the Engineer.

All doors, widows etc. shall be stored under cover in a way to prevent damage or distortion. Special care shall be taken to prevent staining of aluminium products by rust, mortar etc.

6.5 ASSEMBLY & ERECTION AT SITE:

In general, the fixing of steel doors, windows, ventilators, louvers, etc. shall conform to IS:1081 and as shown on drawings. The contractor shall assemble and install all steel doors, windows, sashes, fixed metal louvers, etc. including transoms and millions for composite units in respective places as shown on drawings, keeping proper lines and levels, and in approved workmanship manner, to give trouble free and leak-proof installations. The installation shall be done according to the instructions of the manufacturer, and/or as approved by the



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Engineer. If required by the Engineer, the installation shall have to be carried out under the supervision of the manufacturer's staff. The contractor shall take every precaution against damage of the components during installation. Necessary holes, chases, etc. required for fixing shall be made by the Contractor and made good again as per original, after installation, without any extra charge.

After installation of steel doors, windows, etc. all abrasions to shop-coat of paint shall be retouched and made good with the same quality of paint used in shop coat.

All coupling mullions, transoms, frames etc. in contact with adjacent steel and other members, shall be well bedded in mastic. The Contractor shall bring to the site the mastic cement in original sealed containers of manufacturer and shall apply it as per the instructions. For all frames supplied by either the Owner or the contractor, mastic shall be supplied by the Contractor and caulking done properly as per drawings, specifications and as per instructions of the Engineer. Door shutters partitions hardware fixtures etc. shall be fixed only after major equipments have been installed in rooms.

Wherever required, nylon cords of approved quality shall be supplied along with pivoted sashes and shall be of adequate length to terminate one meter from the floor. Loose ends of cords shall end in metal or plastic pull as approved by the Engineer.

6.6 ACCEPTANCE CRITERIA:

6.6.1 For Fabricated Items:

- a) Overall dimensions shall be within $\pm 1.5\text{mm}$ of the size shown on drawings.
- b) Mullions, transoms etc. shall be in one length and permissible deviations from straightness shall be limited to $\pm 1.5\text{ mm}$ from the axis of the member.
- c) Door and windows shutters shall open without jamming. The clearance at head and jamb for door shutters shall not exceed 1.5 mm. For double leaf doors, the gap at the meeting stiles shall not be more than 1.5 mm.
- d) Door leaves shall be undercut where shown on drawings.

- e) Doors, windows, frames, etc. shall be on a true plane, free from warp of buckle.
- f) All welds shall be dressed flush on exposed and contact surfaces.
- g) Correctness of location and smoothness of operation of all shop installed hardware and fixtures.
- h) Provision for hardware and fixtures to be installed at site.
- i) Glazing beads shall be cut with mitered corners.
- j) Glazing clips, fixing devices etc. shall be supplied in adequate numbers.
- k) Shop coats shall be properly applied.
- l) Exposed aluminium surfaces shall be free from scratches, stains and discolouration. Anodised surfaces shall present a uniform and pleasing look.

6.6.2 For Installed Items :

- a) Installations shall be at correct location, elevation and in general on a true vertical plane.
- b) Fixing details shall be strictly as shown on drawings.
- c) Assembly of composite units shall be strictly as per drawings, with mastic caulking at transoms and mullions, gaskets, weather strips etc. complete.
- d) All frames on external walls shall be mastic caulked to prevent leakage through joint between frames and masonry.
- e) All openable sections shall operate smoothly without jamming.
- f) Locks, fasteners etc. shall engage positively, Keys shall be non-interchangeable.

g) Cutting to concrete or masonry shall be made good and all abrasions to shop paint shall be touched up with paint of same quality as shop paint.

h) Aluminium doors, windows etc. shall be free from scratches, stain or discolouration.

6.7 **INFORMATION TO BE SUBMITTED:**

6.7.1 **With Tender :**

- a) Names of manufacturers for doors, windows etc.
- b) Manufacturer's catalogue for all hardware and fixtures proposed to be used.

6.7.2 **After Award :**

- a) Before starting fabrication of all metal doors, windows, etc. the Contractor shall submit detailed fabrication drawings to the Engineer for approval. The fabrication shall be started only after approval of drawings.
- b) Before bulk supply, he shall submit for the approval of the Engineer samples of all bought out items and samples of each type of fabricated item. The samples shall be retained by the Engineer for comparison of bulk supply and returned to the Contractor towards the end for the final incorporation in the job.

6.8 **GLASS AND GLAZING**

6.8.1 **Scope**

The work in general shall consist of supplying and fixing all glass and glazing including all clips, putty, mastic cement etc., wherever required as shown on drawings and specifications.

6.8.2 **Applicable codes and specifications**

The following codes, standards and specifications are made a part of this specification. All standards, codes of practices referred to herein shall be the latest edition including all applicable official amendments and revisions.

In case of discrepancy between this specification and those referred to here, this specification shall govern:

IS:3548 Code of practice for glazing in building

IS 1081 Code of practice for fixing and glazing metal doors, windows and ventilators.

6.8.3 Installation

General

The Contractor shall supply and install all glass and glazing as required for various doors, windows, ventilators and fixed louvers, miscellaneous glazing and partitions, having uniform refractive index and free from flows, specks and bubbles. Glass shall be obtained from approved manufacturer. (Refer to Data Sheet 'B' for recommended vendor / brand information).

The glass shall be brought to site in the original packing from the manufacturer and cut to size at site. The cut edge shall be straight and free from chips, spalls or any other damage.

Materials

- a) Glare reducing or heat absorbing glass shall be of approved make and special care shall be taken to grind smooth and round off the edges before mixing.
- b) Clear glass shall be flat drawn sheet glass and shall be at least 4 mm thick, unless specified in drawings. Sheet glass for doors shall be minimum 5.5 mm thick.
- c) Wired glass shall be thick rolled glass with centrally embedded 24 g wire mesh of Georgian type. This may be of clear or coloured glass, as shown in drawings or schedules.
- d) Obscure glass shall have a cast surface on one side.
- e) Coloured and figured glass shall be as per approved sample.
- f) In general, the putty shall conform to IS:400 and be of best quality from approved manufacturer. It shall be brought to site in the manufacturer's original packing. Quick setting putty shall be used for windows and sashes except when glare reducing glass is used where it shall be of non-setting type.
- g) Neoprene gasket with snap-fit glazing beads shall be fixed as per manufacturer's instructions and shall sit snugly against glass to give a leakproof installation.

6.8.4 Glazing, setting and finish

All glazing clips, bolts, nuts, putty, mastic cement etc. as required shall be supplied by the Contractor.

All glass shall be thoroughly cleaned before putting in position. Each glass pane shall be held in place by special glazing clips of approved type. As specified in relevant I.S. Codes, four glazing clips shall be provided per glass pane, except for large panes where six or more clips shall be used as per Engineer's instruction. All holes that may be necessary for holding the clips, glazing beads and all other attachments shall be drilled by the Contractor.

Glass panes shall be set without springing and shall be bedded in putty and putted, except where moulding or gaskets are specified. Putty, mastic cement etc. shall be smoothly finished to a true even line. Obscure and figured glass shall be set with smooth side out.

Where glass will be supplied by Owner, the Contractor shall cut it to size and fix them in the same way as specified above.

Glazing clips, putty, mastic cement etc. shall be supplied by the Contractor. The Contractor shall be responsible for damage of glass supplied by the Owner, during handling, transportation, fixing etc. Maximum wastage allowance shall be 5%.

After completion of glazing work, the Contractor shall remove all dirt, stains, excess putty etc. clean the glass panes and leave the work in perfectly acceptable condition. All broken cracked or damaged glass shall be replaced by new ones at the Contractor's own cost.

6.8.5 Acceptance criteria

- a) All installations shall be free from cracked, broken or damaged glass. Edges of large panes of thicker glass and heat absorbing glass shall be inspected carefully for chipped, cracked or unground edges.
- b) Glazing shall be carefully done to avoid direct contact with metal frames.
- c) All glass shall be embedded in mastic or fixed by neoprene gaskets to give a leak-proof installation.

- d) At completion the panes shall be free from dirt, stains, excess putty etc. to the complete satisfaction of the Engineer.

6.9 **RATES :**

- a) Rates shall be unit rates for items described in the schedule.
- b) Rates for supply and / or installation of different kinds of glass are to be included in the rates as mentioned in the Schedule of Items.
- c) No separate payment shall be made for glazing clips, mastic cement, putty, nails etc. for drilling holes in frames for inserting glazing clips.
- d) No separate payment shall be made for cutting of glass to required size, edge finishing etc., if the glass is supplied by the Contractor.
- e) No separate payment shall be made for cleaning the glass after installation.

6.10 **METHOD OF MEASUREMENTS:**

- a) Supply and installation of doors, windows, ventilators and rolling shutters shall be measured in square metre for each type used. The types shall be as shown on drawings and described in Schedule of Items. The actual size shall be measured to the outside of the framework.
- b) Supply and installation of louvers shall be measured for area of opening in which the louvers is to be installed.
- c) Glazing beads, weather stripping, fixing devices locks, keys, bolts, hinges etc. shall not be measured separately but shall be included in the supply rate of respective items.
- d) Any curing or grouting to concrete and masonry or welding and drilling to steel required for installation shall be included in the installation rate. No separate payment shall be made for caulking and jamming of frames or making good to concrete or masonry.



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- e) The rate shall also include cost of painting. Painting shall be as described in the respective specification.
- f) Glass and glazing shall be measured and paid under relevant items.

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