8.1 Indian Standards

The following IS apply to this section:

<table>
<thead>
<tr>
<th>I.S No</th>
<th>Subject</th>
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<tbody>
<tr>
<td>303-1975</td>
<td>Specification for plywood for general purposes (second revision) with</td>
</tr>
<tr>
<td></td>
<td>Amdt No.1 to 3.</td>
</tr>
<tr>
<td>1328-1982</td>
<td>Specification for veneered decorative plywood (second revision)</td>
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<td>1659-1979</td>
<td>Specification for block boards (first revision)</td>
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<tr>
<td>2202 (part I) - 1983</td>
<td>Specification for wooden flush door shutters (solid core type), part I,</td>
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<tr>
<td></td>
<td>plywood face panels (fourth revision)</td>
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<tr>
<td>3087-1985</td>
<td>Wood Particle boards, (Medium density) for general purposes (first</td>
</tr>
<tr>
<td>3097-1980</td>
<td>Specification for veneered particle boards (first revision)</td>
</tr>
</tbody>
</table>

8.2 Plywood

Plywood used for paneling of door shutters shall be B WR grade conforming to IS 303-1975. Specification for plywood for general purposes. Decorative plywood panels where indicated, shall conform to IS 1328, specification for veneered decorative plywood.

8.3 Block Board

Block boards used for paneling of doors shutters shall be grade I, exterior grade commercial type and conform to IS 3087 and shall have been bonded with BWR type of synthetic resin adhesive.

8.4 Veneered Particle Board: Veneered particle board used for panels shall be bonded with BWR type synthetic resin adhesive and shall conform to exterior grade of IS 3097, specification for veneered particle boards. Where indicated veneered particle boards shall be decorative type. Particle board used for core of veneered particle board shall be type Ex. SO GP or SOD conforming to IS 3087 and shall have been bonded with BWR type of synthetic resin adhesive.

8.5 Joiner’s Work Generally

8.5.1 Species of Timber: Only the species of timber indicated shall be used.

8.5.2 All exposed surfaces of joinery shall be planed smooth (wrought) and neatly and truly finished to the full dimensions, rebates, rounding and mouldings as indicated. Unless dimensions
are indicated to be finished dimensions, a tolerance of 1 mm shall be permitted for each wrought face.

8.5.3 Jointing: The contractor shall observe the following principles in forming joints:

(a) To cut the joints and arrange the fastenings in such a way so as to weaken as little as possible the pieces of timber they connect.

(b) To place each abutting surface in a joint, as nearly as possible, perpendicular to the pressure it has to transmit.

(c) To form and fit accurately every pair of surfaces that come in contact.

8.5.4 Joints shall be made carefully and accurately. All mortice and tenon and other joints shall fit fully and truly with out wedging or filling and finished neatly. Where indicated, butt joints shall be cross tongued. The tongue shall be cut at right angles or diagonally to the grains of the wood.

8.5.5 Defective knots, when permitted on surfaces exposed to view, shall be completely bored or cut out and tightly plugged with the same timber species and properly glued in. The grains of plug shall run in the direction of the grains of piece.

8.5.6 Framing shall be done in the best possible manner. Members shall be fabricated neatly and accurately so that these can be assembled without being unduly packed. Strained or forced into position and when built up shall be true to shape and free from twist or open joints. Framed joints shall be glued together and pinned with bamboo or hard wood pins.

8.5.7 All joiner's work shall be cut and framed together well ahead of their incorporation in the work but shall not be edged up until required for fixing in position and passed by the EIC. Any portion that may warp or develop shakes or other defects shall be replaced with new before being wedge up.

8.5.8. The contact surfaces of mortice and tenon shall be glued before putting together with bulk type synthetic resin adhesive to IS 851-1978 suitable for construction work in wood. Tongued and grooved joints shall also be . properly glued together with a suitable adhesive.

8.6 Nailing, Screwing etc.

Nailing screwing etc., of the various members of joinery, where necessary shall be done as directed by the EIC. When driving the screws, it is advisable that in case of hard timbers pilot holes are drilled before fixing the screw. The screws shall be driven tight fit and straight.

8.6.1 Clearing:

After the plaster and grouting have dried, all splatter and marks of cement shall be removed and the frames cleaned.

8.6.2 In the case of frames without sill the vertical members shall be buried in the floor for the full thickness of the floor finish.

8.6.3 The holdfasts shall be tightly fixed to the frame by means of bolts or wood screws as indicated, the bolt hole in the frame being plugged suitably and finished neat unless otherwise indicated.

8.7 Shutters Generally

8.7.1 The types of shutters for doors, windows, ventilators, cupboards, etc., viz. panelled, glazed, wire gauzed, partly paneled and partly glazed or gauged, ledged braced and battened, louvered etc., shall be as indicated, and detailed in the drawings.

8.7.2 All members of "the shutter shall be made out of one piece and shall be straight without any warp or bow. They shall have smooth, well planned surfaces at right angles to each other. The
right angles of the shutters shall be checked by measuring the two diagonals from one extreme corner to the opposite one.

8.7.3 The contact surfaces of mortice and tenon and tongued and grooved joints shall be glued before putting together.

8.7.4 In the case of double leaved shutters the meeting 'stiles shall be rebated 20 mm or as shown on drawings. The rebating shall be splayed or square, as directed.

8.7.5 All shutters shall be finished smooth with well planned faces. 8.7.6 Tolerance in the thickness of joinery shall be ±2 mm.

8.7.7 Shutters shall be of correct size and shall, fit into the frames without excessive cutting at the edges. Adding of wooden strips etc., to make up the size shall not be allowed.

8.7.8 Factory made shutters:

Where indicated the contractors shall supply flush, paneled glazed and gauzed door and window shutters made in an approved factory. Tolerance on the width and height of factory made shutters shall be ±3 mm provided the shutter snugly fits into the frame, glass in case of glazed shutters and of wire cloth in case of gauzed shutters.

8.8 Flush Door Shutters:

8.8.1 Flush door shutters shall be factory made solid core types with block board core, and shall conform to IS 2202 (part 1)-1999. Specification for wooden flush door shutters (solid core type) Part I plywood face panels; except with regard to the sizes’ of shutters which shall be as indicated. Flush door shutters shall be non-decorative (commercial) type or decorative type where indicated.

8.8.2 Flush door shutters shall be internally lipped. Internal lipping may be provided separately or as one piece with the frame. The width of frame including lipping shall not be less than 50 mm. Internal lipping shall have a total depth of not less than 25 mm. Joints shall not be permitted in lipping.

8.8.3 In the case of double leaved shutters, rebating shall be splayed or square as directed. Where separate lipping is indicated, the depth of lipping at the meeting of the stiles shall not be less than 35 mm.

8.8.4 Flush door shall be free from twist or wrap in plane ‘and all the four edges of the door shutter shall be square. Both the faces of the door shutter shall be sanded to a smooth even texture.

8.8.5 Tolerance on nominal thickness shall be +/-1.2 mm. Thickness of shutter shall be uniform through out with the variation not exceeding +/-0.8 mm when measured at any two points.

8.8.6 Opening for Glazing:

Where indicated, opening for glazing with minimum size of 25x20 cm shall be provided, which shall be lipped internally with solid timber.

8.8.7 Locks:-

Shutters shall be shop prepared for taking mortice locks and latches.

8.8.8 Flush door shutters fixed in bathrooms and toilets shall be protected by providing aluminium sheet cover 0.5 mm thick where indicated. Aluminium sheets shall conform to IS 737-1986. Aluminium sheet shall be fixed to the door with chromium plated steel round headed screws.
conforming to IS 1284-1974 at a distance not exceeding 10 cm centre to center.

8.9 **Fixing of Shutters**

8.9.1 The size of the openings and the frames shall be checked and also the verticality of the side frames and the level position of the floor and the wall. Any adjustment necessary shall be made before installation of the shutters. The shutters shall be installed only after the walls on either side have dried.

8.9.2 Any transit defects or storage defects in shutters shall be filled up with a good putty. Any corner opening may be rectified by the use of glued and pressing by ‘c’ clamps. Any damage to moulding or glazing bars or other fixtures shall be rectified at site by use of similar materials.

8.9.3 Width of hinges shall suit the shutter thickness.

8.9.4 Cleats, where indicated, shall properly fit in the rebates of the chowkats to effectively stop the shutter from closing.

8.9.5 When driving screws it is advisable that in case of hard timbers pilot holes are drilled before fixing the screws. The screws shall be driven tight fit and straight.

8.9.6 Shutters shall be checked after fixing for proper location alignment and swinging. After all the fixtures have been fitted, the shutters shall be tried again for proper closure, handling and movement. Any rectification necessary shall be done.

8.9.7 **Fixed Shutters:**

Shutters fixed in the frames shall be secured to the frames with wood screws of adequate size at intervals of not more than 40 cm, unless otherwise indicated.

8.10 **Fire Doors (120 Minutes)**

**Material**

Door Frames and Shutter are made from G.I Sheets and should confirm to IS - 3614(Part 2)1992 BS 476 (Part 20 and 22) and ISO 834 and all testing procedures shall be followed as per the given code.

**Door Shutter**

Door shutters should be constructed from 1.20mm thick G.I. sheet formed to provide a 46mm thick fully flush, double skin door shell with lock seam joints at stile edges. Internal Reinforcements are provided at top, Bottom and Stile Edges for Fire Rating. The inner core is a light weight Honey Comb Raisned Board containing no asbestos or other inorganic fibers. The internal construction of the doors varies with the degree of Fire Rating as tested.

**Door Frames**

Produced from 1.6mm thick galvanized steel sheet formed to single/double rebate profile of size 143mm x 57mm (+/- 0.3mm) with a maximum bending radius of 1.4mm.

The door frames may be built into the brick or block walls using corrugated “TEE” Anchors not welded to the frame (first fix). Frames may also be fixed on plastered openings with the help of Metallic Expansion Shield with counter sunk screw (second fix). Doors Frames are supplied to knock-down form with butt joints for bolted assembly at site.

**Finish**

The door frames and door shutters are primed with epoxy based Primer and finished with
polyurethane aliphatic grade, UV resistant oven dried paint as required up to a minimum of 70 microns.

8.11 Acoustic Doors

**Material**

Door Frames and Shutter are made from G.I Sheets and should confirm to IS: 3614 (Part) 1992) and all testing procedures shall be followed as per the given code. Acoustic doors shall have an STC Rating of 36Db or as per manufacturers specification for rigidity and sound insulations and ARAI (Pune) Tested.

**DOOR AND FRAME FEATURES:**

**Testing:** Stop Noise Door products are tested in accordance with the most recent ASTM E90 standards at accredited Acoustical Laboratories.

**Services:** Contractor shall provide the necessary shop drawings for approval of the Consultant and Engineer – in – Charge.

**IRONMONGERY**

**HINGES**

SS Ball bearing butt Hinges 4mm thick and 150x102mm (3 numbers or More), fixed flushed to the frame and shutter.

**LOCK**

Mortise Sash Lock with Lever Handles, Mortise Dead Bolt, Mortise Latch, Panic Devices etc

**FLUSH BOLTS (DOUBLE DOOR)**

Concealed extended lever action flush bolts provided on the top of the door to the leading stile edge.

**DOOR CLOSERS**

Suitable Door Closers shall be provided as directed by the Consultant / EIC.

**ADDITIONAL ACCESSORIES**

Electro Magnetic Hold Open Device, Smoke Seals for Air tightness, Automatic Door Bottoms etc., can be provided if required.

**Mode of measurements :**

The door shall be measured including the frame outer to outer The square meter areas for shutters shall be measured outside to outside for the exposed surfaces of shutter including the frame. The linear dimensions shall be measured upto two places of decimals of a meter. The area for payment shall be worked out correct upto two places of decimals of a square meter. The rate for shutters shall include:

- Cost of supply assembly and erecting in position.

- Cost of labour for making adjustments in frames, if required, shutters and also for fixing required fittings and fixtures mentioned in above paragraph.

- Cost for individual item mentioned in the schedule of quantities shall include cost of shutters, labour for provision of glass for vision panel, hardware fittings mentioned in the ironmongery heading, transporting charges and labour for fixing of fixtures and fastening fixing of door closers and painting and polishing to match the wall panel surface as specified.

Signature of the bidder with seal Page 5 of 26 EPI
### 9.1 Indian Standard

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<td>Specification for tower bolts, Part I, Ferrous tower bolts (fourth revision)</td>
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<tr>
<td>204-1978</td>
<td>Specification for tower bolts, Part II, Non Ferrous tower bolts (fourth revision with Amdt. No.1)</td>
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<tr>
<td>205-1978</td>
<td>Specification for Non ferrous metal butt binges (third revision)</td>
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<tr>
<td>206-1981</td>
<td>Specification for tee and strap hinges (third revision with Amdt. No.1)</td>
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<tr>
<td>207-1964</td>
<td>Specification for gate and shutter hooks and eyes (revised)</td>
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<td>208-1979</td>
<td>Specification for door handles (third revision)</td>
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<tr>
<td>281-1973</td>
<td>Specification for mild steel sliding door bolts for use with padlocks (second revision)</td>
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<td>362-1982</td>
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<td>Specification for mortice lock (vertical type) (third revision with Amdt. No. 1 &amp; 2)</td>
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<td>Specification for non-ferrous metal sliding door bolts (Aldrops) for use with padlocks (second revision with Amdt.No 1 &amp; 2)</td>
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<td>3564-1986</td>
<td>Specification for door closers (hydraulically regulated) (third revision with Amdt. No.1)</td>
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<td>Specification for flush bolts (first revision with Amdt. No 1)</td>
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<tr>
<td>5930-1970</td>
<td>Specification for mortice latch (vertical type with Amdt .No1)</td>
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9.2 Builder’s Hardware Generally

9.2.1 Materials:

Articles of builder’s hardware (fittings) shall be of mild steel, cast iron, brass, aluminium alloy etc., as indicated. The type and size of fittings shall also be indicated. Fittings shall be of approved make.

9.2.2 Shape and dimensions:

The shape and dimensions of the fittings shall conform to the shape and dimensions given in the relevant IS specifications, unless otherwise indicated. Where however, shape of fittings or its components are indicated in the relevant IS Specification, as illustrative, they are not intended to limit their design. Such fittings or components shall be provided of the shape as approved by the consultant and EIC.

9.2.3 Where no IS Specification are indicated, such fitting shall be provide as approved and directed by the consultant and EIC.

9.2.4 Finish:

Except where otherwise specified, articles of builder’s hardware shall have the following finish:

| (a) | Mild steel and cast iron fittings | : | Stove enabled black |
| (b) | Brass fittings | : | Finished bright or satin finish |
| (c) | Aluminium fittings | : | Powder coated |

9.2.5 Manufacture:

Fittings shall be well made and finished to the correct shape and size, free from surface defects and flaws and shall have smooth action. Cast fittings or components shall be free from casting and other defects. All burrs, sharp edges and corners shall be removed and finished smooth.

9.2.6 Screws:

Unless otherwise indicated, brass articles shall be fixed with brass or stainless steel screws and mild steel, cast iron and aluminium articles with steel chromium plated screws or as indicated. Screws shall be of sizes as indicated in the I.S specification for the fittings or as required.

9.2.7 Tower

Bolts

9.3.1. Generally:-

Steel tower bolts shall comply with IS 204(part-I)-1978, specification for tower bolts, part-I, ferrous metals, brass and aluminium tower bolts shall comply with IS 204(part-I)-1978. Specification for tower bolts. Part-II, non-ferrous metals. The type and size of the tower bolts shall be as indicated.
9.3.1.1 Barrel and skeleton tower bolts, wherever possible, shall have the knob integral with bolts. In case it is not possible to provide a single piece construction of bolts, the knob may preferably be fitted to the bolts with a pin or alternatively screwed and riveted to the bolts, and its shape may be round, half round spherical or conical as indicated and of robust construction.

9.3.1.2 Where diameter of bolts of particular size of tower bolt is stated in the IS as 10 or 12 mm, the bolt shall be of 10 mm dia upto size 125 mm and 12 mm dia for sizes 150 mm and above.

9.3.1.3 All M.S tower bolts made with steel 1.2 mm thick M.S sheet and above shall have countersunk screw holes.

9.3.1.4 Non-Ferrous Tower Bolts: -

Brass and aluminum tower bolts shall be of types as given above. These shall be provided with a small spring and ball on the inside of the barrel for smooth working. Brass bolts and barrels shall be polished bright. Aluminium alloy bolts and barrels shall be powder coated, size of bolt shall be as indicated. Aluminium barrel tower bolts with barrel and bolt of extruded sections of aluminium alloy.

9.4 Flush Bolts.

Flush bolts shall comply with IS 5187 specification for flush bolts. These shall be of type –2 and of the following material and finish, as indicated: -

(a) Brass flush bolt with cast brass body and plate and cast brass or extruded brass bolt, and steel strip spring.
(b) Aluminium flush bolt with cast aluminium alloy or extruded aluminium alloy body and plate and extruded aluminium alloy bolt and steel strip spring.

9.3.1 Brass flush bolts shall be bright finished. Aluminium flush bolts shall be powder coated. 9.5 Sliding Door Bolts

9.5.1 Mild Steel Sliding Door Bolts:

These shall be bolt type and comply with the requirement of IS 281. Hasp, clips, and staple plate shall be made from mild steel sheets. Sliding bolts shall be made from round mild steel bar.

Hasp, bolt, staple and clips or fixing bolts shall be copper oxidised in accordance with IS 1378 or plated with nickel or chromium in accordance with IS 1068 as indicated.

9.5.2 Non-Ferrous Metal Sliding Door Bolts: -

These shall comply with IS 2681, specification for non-ferrous sliding door bolts for use with padlock.

9.5.2.1 The sliding door bolt shall have a smooth sliding action. The hasp, when not cast integral with the bolt, shall be properly secured to the bolt. Sliding bolts shall be provided with fixing bolts. Brass bolts shall have satin finish or polished. Aluminium bolts shall be powder coated.

9.6 Steel Locking Bolts

These shall comply with IS 7534, specification for mild steel locking bolts with holes for padlocks. Locking bolt shall have smooth sliding action. Bolt shall be made from mild steel and polished bright. The plate and strap shall be firmly riveted or spot welded and shall be stove enameled black. Locking bolt shall be Type II size of bolt shall be indicated.

9.7 Hinges

Signature of the bidder with seal
9.7.1 Generally:

Hinges shall be well made and shall be free from flaws and defects. All hinges shall be cut clean and square. The hole for the hinge pin shall be central and square to the, knuckles/ boss. All sharp edges and corners shall be removed. The sides of the knuckles shall be straight and at right angles to the flap. The movement of the hinges shall be free, easy and square and working shall not have any play or shake. The hinge pin shall fit inside the knuckles firmly and riveted in the case of steel hinges, and riveted or firmly notched in the case of non-ferrous metal butt hinges and properly finished. Rivet bead shall be well formed so as not to allow any play or shake. All screw holes shall be clean countersunk, suitable for countersunk head wood screw.

9.7.2 Steel butt hinges shall be of cold rolled mild steel and shall comply with IS 1341 specification for steel butt hinges. Steel butt hinges are classified as lightweight, medium weight and heavy weight. Hinges shall be of heavy weight, unless otherwise indicated. The pins shall be of mild steel/stainless steel. Hinges shall be finished bright with smooth surface.

9.7.3 Non-Ferrous Metal Butt Hinges:
Brass and Aluminium butt hinges shall comply with IS 205 specification for non-ferrous metal butt hinges and shall be of cast brass, extruded brass or extruded aluminium alloy, as indicated. Brass hinges shall be polished bright or stain finished. Aluminium hinges shall be powder coated.

9.7.3.1 In case of brass hinges, the hinge pin shall comply with IS 205. In case of aluminium alloy hinges, the hinge pin shall be of mild steel/stainless steel, galvanized, where indicated.

9.7.3.2 Non ferrous metal butt hinges shall be of the size as indicated 9.7.4 Mild Steel Tee Hinges:

M.S.Tee hinges shall comply with IS 206. Specification for tee and strap hinges' and shall be of medium type; or of heavy type where indicated. Tee hinges shall be finished stove enameled black.

9.7.5 Parliament Hinges:
Parliament hinges shall comply with IS 362 specification for the parliament hinges. Requirement of the hinge pin and finish of the hinges, shall be as described for butt hinges.

9.7.6 Continuous (piano) Hinges:
Continuous (piano) hinges shall be as per IS 3818 Type II specification for continuous (piano) hinges. These shall be of mild steel galvanized or aluminium alloy as indicated. In the case of aluminium hinges, the hinge pin shall be of aluminium and in the case of steel hinges, the hinge pin shall of mild steel Mild steel hinges shall be bright polished chromium plated. Aluminium hinges shall be anodized.

9.7.7 Double Acting Spring Hinges:
Double acting spring hinges shall comply IS 453. Specification for double acting spring hinges. MS hinges shall be finished store enameled black.

9.7.8 Door Springs Rat-Tail Type:
These shall conform to IS 452-1973 specification for door springs, rat-tail type and shall be of mild steel or brass as indicated. In case of mild steel door springs, casing, tail rod, spindle cap and base plate shall be stove enamelled, black, spindle, roller plate and roller shall be bright finished. Brass door spring shall be bright finished. Spring for both mild steel and brass door spring shall be of mild steel wire, copper oxidized or electro galvanized as indicated.
9.8  **Latches**
Latches shall be supplied left handed or right handed depending on the type of door to which they are fitted and as directed.

9.8.1  **Rim Latches:**

These shall comply with Type I of IS 1019. Specification for rim latches. They shall be of mild steel brass or aluminium alloy as indicated. Locking pin shall be provided to facilitate locking from one side. In case of mild steel rim latches, the body, striking box, spindle and back plat shall be of mild steel; the latch bolt, follower, locking pin, knobs, and disc shall be of brass. In the case of brass and aluminium alloy latches, body striking box and back end plate and disc shall be of brass and aluminium alloy respectively. All other components shall be of brass. Spring for mild steel, brass and aluminium rim latches shall be of steel wire. Spring type lever handles may be provided in lieu of knobs where indicated. When the knob / lever handle of the latch bolt shall draw smoothly into the body.

Mild Steel rim latches shall be finished stovenameled black. Brass latches shall have bright or satin finish. Aluminium latches shall be powder coated.

9.8.2  **Mortice Night Latch:**

Mortice night latch shall conform to IS 3847. Specification for mortice night latches. These shall be of mild steel brass or aluminium alloy as indicated.

Various components and finish shall be as described for mortice locks (vertical type) Face plate shall be provided in front of case plate.

9.8.3  **Mortice Latch (Vertical Type):**

Mortice latch (vertical type) shall conform IS 5930. Specification for mortice latch (vertical type). These latches shall be capable of being operated both from inside and outside and shall be provided with a thumb turn knob fitted on the handle plate in order to close the door from inside. The latches will be of mild steel or brass or aluminium alloy as indicated. Various components and finish shall be as described for mortice locks (vertical type). Face plate shall be provided in front of the case plate, size of latch shall be indicated.

9.9  **Locks**

9.9.1  **Generally:**

Number of levers shall be as indicated. The locks shall be supplied with two keys. Where more than one lock is provided no key of the lock shall fit any other lock supplied. All components of the locks and keys shall be finished smooth to minimize frictional resistance in the working. The size of lock shall be indicated.

9.9.2  **Mortice locks (Vertical Type):**

These shall conform IS 2209. Specification for mortice lock (vertical type). These shall be of mild steel, brass or aluminium as indicated. No. of levers shall also be as indicated.

9.9.2.1 The lock shall be made easy working with lever and shall be capable of being opened with the key from both inside and outside. Face plates shall be provided in all locks. Mild steel body shall be given a protective coating such as painting. Brass body shall be finished bright. Aluminium alloy body shall be powder coated. Face plate and striking plate shall be finished smooth, and finished bright for brass and mild steel locks; and powder coated for aluminium locks.

9.9.3  **Rebated Mortice Locks:**

These shall conform to IS 6607. Specification for rebated mortice locks (vertical type). These shall be of mild steel, brass or aluminium as indicated. Material for various components of rebated mortice locks and their finish shall be as described for mortice locks(vertical type).
9.10 **Hasps and Staples**
These shall conform to IS 363. Specification for hasp and staples. These shall be of the following types as indicated:-

- Mild steel hasp and staple-wire type.
- Mild steel hasp and staple-safety type.
- Brass hasp and staple-safety type.
- Aluminium alloy hasp and staple-safety type.

9.10.1 Hasps and staples shall be well made and free from defects. The hinge pin shall be of mild steel in the case of hasp and staples. The hasps shall fit the staples correctly. The staple, except in the case of cast one, shall be riveted properly to its plate. The hinge pin for the safety type hasp shall be riveted and rivet head properly formed and finished. Screw holes shall be clean and counter sunk to suit counter sunk head wood screws.

9.10.1.2 Mild steel hasps and staples shall be stove enameled black. Brass hasps and staples shall be finished bright and covered with clear lacquer. Aluminium alloy hasps and staples shall be powder coated.

9.11 **Handles**
These shall conform to IS 208. Specification for door handles.

9.11.1 Door handles shall be finished smooth. When the grip portion of the handle is joined with the base piece by mechanical means, the arrangement shall be such that the assembly handle shall have adequate strength. Cast iron, malleable cast iron and mild steel door handles shall be finished stove enamelled black. Brass handles shall be with bright polished finish. Aluminium handles shall be powder coated.

9.12 **Floor Door Stoppers**
These shall conform to IS 1823. Specification for floor door stoppers.

9.12.1 The door stopper shall be well made and shall have smooth action. The body or housing of the door stopper shall be cast in one piece and it shall be fixed to the cover plate by means of brass or aluminium screws. The spring shall be fixed firmly to the pin. The tongue, which would be pressed while closing or opening of the door, shall be connected to the lower part by means of copper pin. On the extreme end, a rubber piece shall be attached to absorb shocks due to the pulling action of the door.

9.12.1.1 The exterior of the brass door stopper, which will be in flush and above the floor, shall be finished bright or satin and exterior of aluminium stopper shall be powder coated.

9.13 **Door Closers (Hydraulically Regulated)**
These shall comply with IS 3564, specification for door closer and shall be of designation as indicated. Door closers shall have aluminium alloy body, as indicated. Closers shall be universal type suitable for both anticlockwise and clockwise without any change in parts of the closers.

Door closers with aluminium body shall be as per IS.

The surface of the closer shall be clean; without sharp edges, free from cracks, burrs, dents or any other visible surface defects. The door closer shall not allow any sign of leakage under working conditions. The closing time shall be easily adjustable by means of regulating screw.

**WORKMANKSHIP**

9.15 **Generally**
All builder's hardware shall be fixed to joinery in a secure and efficient manner. Special attention shall be given to the following:

- Signature of the bidder with seal
shall be given to the size and fixing of screws to ensure that the screws are driven (and not hammered) tight and the heads of the screw do not protrude.

9.16 **Hinges**

All hinges except T or strap hinges shall be countersunk into the edge of timber joinery and frames to a depth equal to the thickness of the leaf of the hinge.

9.17 **Fanlight, etc.**

When fanlights or windows are center hung, fanlight pivots shall be fixed slightly off the center so that the fanlights and windows may normally remain in the open position.

9.18 **Metal Sockets**

These shall be provided to all tower bolts and sliding bolts where the bolts enter brick, stone, or concrete. These shall be securely fixed flush with the surface into mortices and cemented. Mortice plates over holes shall be provided where the soots enter wood.

9.19 **Oiling**

All locks, bolts, springs, and other items of builder's hardware with moving parts shall be properly oiled and handed over in working condition on completion.

### ALUMINIUM WORK

10.1 **Indian Standards** The following IS with latest revision apply to this section:

<table>
<thead>
<tr>
<th>ISNo</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>733-1983</td>
<td>Specification for wrought aluminium and aluminium alloys bars, rods and sections (for general engineering purposes), (Third revision)</td>
</tr>
<tr>
<td>737-1986</td>
<td>Specification for wrought aluminium and aluminium alloys sheet and strip for general engineering purposes (Third revision)</td>
</tr>
<tr>
<td>1038-1983</td>
<td>Specification for steel doors, windows and ventilators (Third revision)</td>
</tr>
<tr>
<td>1081-1960</td>
<td>Code of practice for fixing and glazing of metals (steel and aluminium) doors, windows and ventilators.</td>
</tr>
<tr>
<td>1285-2002</td>
<td>Specification for wrought aluminium and aluminium alloys extruded round tube and hollow sections for general engineering purposes</td>
</tr>
<tr>
<td>1361-1978</td>
<td>Specification for steel windows for industrial buildings (First revision)</td>
</tr>
<tr>
<td>1868-1996</td>
<td>Specification for anodic coating on aluminium and its alloys (Third revision)</td>
</tr>
<tr>
<td>1948-1961</td>
<td>Specification for aluminium doors, windows and ventilators</td>
</tr>
<tr>
<td>1949-1961</td>
<td>Specification for aluminium windows for industrial buildings</td>
</tr>
<tr>
<td>3908-1986</td>
<td>Aluminium equal leg angles (First revision)</td>
</tr>
<tr>
<td>3909-1986</td>
<td>Specifications for aluminium unequal leg angles (First revision)</td>
</tr>
<tr>
<td>3921-1985</td>
<td>Aluminium channel (First revision)</td>
</tr>
<tr>
<td>4351-2003</td>
<td>Specification for steel doors frames (Second revision)</td>
</tr>
<tr>
<td>4923-1997</td>
<td>Hollow Steel sections for structural use : Specifications</td>
</tr>
<tr>
<td>4948-2002</td>
<td>Specification for welded steel wire fabric for general use (Second revision)</td>
</tr>
<tr>
<td>5384-1985</td>
<td>Aluminium I Beam (First revision)</td>
</tr>
<tr>
<td>5523-1983</td>
<td>Method of testing for anodic coating on aluminium and its alloys (First revision)</td>
</tr>
<tr>
<td>6248-1979</td>
<td>Specification for metal rolling shutters and rolling grills (First revision)</td>
</tr>
<tr>
<td>6445-1985</td>
<td>Aluminium tee sections (First revision)</td>
</tr>
<tr>
<td>13871-1993</td>
<td>Specifications</td>
</tr>
</tbody>
</table>

10.36. **ALUMINIUM WORK**

**Aluminium Sections:**
Aluminium sections used for fixed/openable windows, ventilators, partitions, frame work & doors etc. shall be suitable for use to meet architectural designs to relevant works and shall be subject to approval of the Engineer-in-Charge for technical, structural, functional and visual considerations. Chemical and mechanical properties of sections shall comply with requirements given in IS 733-1983, Specification for wrought aluminium and aluminium alloys bars, rods and sections, IS 737-1986, Specification for wrought aluminium and aluminium alloys sheet and strip for general engineering purposes and IS 1285-2002, Specification for wrought aluminium and aluminium alloys extruded round tube and hollow sections for general engineering purposes. The stainless steel screws shall be of grade AISI 304, Joining of sections, providing fittings, lugs, method of fixing etc shall be as per IS 1948 - 1961. The permissible dimensional tolerances of the extruded sections shall be as per IS 6477 and shall be such as not to impair the proper and smooth functioning/operation and appearance of door and windows.

Aluminium glazed doors, windows etc. shall be of sizes, sections and details as shown in the drawings. The details shown in the drawings may be varied slightly to suit the standards adopted by the manufacturers of the aluminium work, with the approval of Consultant and Engineer-in-Charge. Before proceeding with any fabrication work, the contractor shall prepare and submit, complete fabrication and installation drawings for each type of glazing doors, windows, ventilators and partition etc. for the approval of the Consultant and Engineer-in-Charge. If the sections are varied, the contractor shall obtain prior approval of Consultant and Engineer-in-Charge and nothing extra shall be paid on this account.

**Anodising:**

Standard aluminium extrusion sections are manufactured in various sizes and shapes in wide range of solid and hollow profiles with different functional shapes for architectural, structural glazing, curtain walls, doors, window & ventilators and various other purposes. The anodizing of these products is required to be done before the fabrication work by anodizing/electro coating plants which ensures uniform coating in uniform colour and shades. The extrusions are anodized up to 30 micron in different colours. The anodized extrusions are tested regularly under strict quality control adhering to Indian Standard IS 1868 and Testing of anodizing coating shall be in accordance with IS 5523-1983.

**Powder Coating Material:**

The powder used for powder coating shall be Epoxy/polyester powder of make approved by the Engineer-in-Charge. The contractor shall give detailed programme for powder coating in advance, to facilitate the inspection by Engineer-in-Charge or his authorized representative.

**Pre-treatment:**

Each aluminium alloy extrusion or performed section shall be thoroughly cleaned by alkaline or acidic solutions under the conditions specified by chemical conversion coating supplier and then rinsed. A chemical conversion coating shall be applied by treatment with a solution containing essentially chromate ions or chromate and phosphate ions as the active components as applicable. The amount of the conversion coating deposited depends on the type used by the conversion coating chemical supplier. The conversion coating shall be thoroughly rinsed either with the solution specified by the conversion coating chemical supplier or with de-mineralized water and then dried at the temperature for the time specified by the conversion coating chemical supplier. The contractor shall submit the detail specifications and application procedure for application of conversion coating for approval of Engineer-in-Charge. The metal surface after the conversion coating pretreatment and prior to the application of the coating shall be free from dust or powdery deposits.
**Process:**

The polyester powder shall be applied by electrostatic powder spray method. Before start of powder coating the contractor shall submit detail specification for application of polyester powder from manufacturer of the polyester powder for approval of Engineer-in-Charge. The powder coating shall be applied as per the specification approved by Engineer-in-Charge.

**Thickness:**

The thickness of the finished polyester measured by micron meter shall not be less than 55 micron and not more than 120 micron at any point.

**ALUMINIUM FRAME**

**WORK: Frame Work:**

First of all the shop drawings for each type particulars shall be prepared by using suitable sections based on architectural drawings, adequate to meet the requirement specifications and by taking into consideration varying profiles of aluminium sections being extruded by approved manufacturers. The shop drawings shall show full size sections of glazed doors, windows, ventilators etc. The shop drawings shall also show the details of fittings and joints. Before start of the work, all the shop drawings shall be got approved from the Engineer-in-Charge.

Actual measurement of openings left at site for different type of door/window etc. shall be taken. The fabrication of the individual door/windows/ventilators etc. shall be done as per the actual sizes of the opening left at site. The frames shall be truly rectangular and flat with regular shape corners fabricated to true right angles. The frames shall be fabricated out of section which have been cut to length, mitered and jointed mechanically using appropriate machines. Mitered joints shall be corner crimped or fixed with self tapping stainless steel screws using extruded aluminium cleats of required length and profile. All aluminium work shall provide for replacing damaged/broken glass panes without having to remove or damage any member of exterior finishing material.

**Fixing of Frames:**

The Frame work of particulars shall be fixed to Ceiling or wall with supporting materials and devices for rigidity as approved by the Consultant and the Engineer – in – Charge. The main and the Cross members shall be jointed with angle bracket as indicated in the fabrication Drawing, if not indicated it shall be 15mmx15mmx1.5mm, fixed with suitable bolts, nuts and washers etc., The panel size shall be as per the approved drawings. Fixing of Glazing Clips shall be done carefully and no hammer markings shall be seen on the same and only wooden mallet shall be used. The holes in concrete/masonry/wood/any other members for fixing anchor bolts/fasteners/screws shall be drilled with an appropriate electric drill. Windows/doors/ventilators etc. shall be placed in correct final position in the opening and fixed to Sal wood backing using stainless steel screws of star headed, counter sunk and matching size groove. of required size at spacing not more than 250 mm c/c or dash fastener. All joints shall be sealed with approved silicone sealants.

In the case of composite windows and doors, the different units are to be assembled first. The assembled composite units shall be checked for line, level and plumb before final fixing is done. Engineer-in-Charge in his sole discretion may allow the units to be assembled in their final location if the situation so warrants. Snap beadings and EPDM gasket shall be fixed as per the detail shown in the shop drawings.
Where aluminium comes into contact with stone masonry, brick work, concrete, plaster or dissimilar metal, it shall be coated with an approved insulation lacquer, paint or plastic tape to ensure that electrochemical corrosion is avoided. Insulation material shall be trimmed off to a clean flush line on completion.

The contractor shall be responsible for the doors, windows etc. being set straight, plumb, level and for their satisfactory operation after fixing is complete.

Before fabrication the size of the windows and opening shall be ascertained Performance Requirements for the Finish

**(i) Surface appearance:**

The finish on significant surfaces shall show no scratches when illuminated and is examined at an oblique angle, no blisters, craters; pinholes or scratches shall be visible from a distance of about 1 m. There shall not be any visible variation in the colour of finished surfaces of different sections and between the colours of different surfaces of same section.

**(ii) Adhesion:**

When a coated test piece is tested using a spacing of 2 mm between each of the six parallel cuts (the cut is made through the full depth of powder coating so that metal surface is visible) and a piece of adhesive tape, approximately 25 mm x 150 mm approved by the Engineer-in-Charge is applied firmly to the cut area and then removed rapidly by pulling at right angles to the test area, no pieces of the finish other than debris from the cutting operation shall be removed from the surface of the finish.

**Protection of Powder Coated / Anodizing Finish :**

It is mandatory that all aluminium members shall be wrapped with self adhesive non-staining PVC tape, approved by Engineer-in-Charge.

**Measurement:**

All the aluminium sections including snap beading fixed in place shall be measured in running meter along the outer periphery of composite section correct to a millimeter. The weight calculated on the basis of actual average (average of five samples) weight of composite section in kilogram correct to the second place of decimal shall be taken for payment. (Weight shall be taken after anodizing). The weight of cleat shall be added for payment. Neither any deduction nor anything extra shall be paid for skew cuts.

**Rate:**

The rate shall include the cost of all the materials, labours involved in all the operations as described in nomenclature of item and particular specification.
PARTITIONS AND LININGS

12.1 **Indian Standards** The following IS with latest revision apply to this section.

<table>
<thead>
<tr>
<th>I.S. No</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>373-1975</td>
<td>Specification for plywood for general purposes (second revision) (with Amdt No.1 to 3).</td>
</tr>
<tr>
<td>451-1972</td>
<td>Technical supply conditions for wood screws (second revision)</td>
</tr>
<tr>
<td>723-1972</td>
<td>Specification for steel countersunk head wire nails (first revision)</td>
</tr>
<tr>
<td>749-1978</td>
<td>Specification for hand loom cotton dungri cloth, grey (first revision)</td>
</tr>
<tr>
<td>848-1974</td>
<td>Synthetic resin adhesive for plywood</td>
</tr>
<tr>
<td>1328-1982</td>
<td>Specification for veneered decorative plywood (second revision)</td>
</tr>
<tr>
<td>1658-1977</td>
<td>Specification for fibre hard-boards (second revision)</td>
</tr>
<tr>
<td>1659-1979</td>
<td>Specification for block boards (second revision)</td>
</tr>
<tr>
<td>2046-1969</td>
<td>Specification for decorative thermosetting synthetic resin bonded laminated sheets (first revision)</td>
</tr>
<tr>
<td>2098-1964</td>
<td>Specification for asbestos cement building boards.</td>
</tr>
<tr>
<td>3087-1985</td>
<td>Specification for 'wood particle boards (medium density) for general purposes (first revision)</td>
</tr>
<tr>
<td>3129-1965</td>
<td>Specification for particle board for insulation purposes</td>
</tr>
<tr>
<td>3348-1965</td>
<td>Specification for fibre insulation boards</td>
</tr>
</tbody>
</table>
12.2 FITTINGS AND ACCESS PANELS

Lighting fittings, access panels and similar components are incorporated as part of the design requirements, consideration must be given to maintaining the integrity of the ceiling when fire resistance and sound insulation are also important factors.

12.3 DELETED

12.4 DELETED

12.5 Fibre Insulation Boards:

Fibre insulation boards shall conform to the requirements of IS 3348. Specification for fibre insulation boards. The boards shall be ordinarily type except where flame retardant type is indicated. The mean density of the boards shall not exceed 0.4 gm/cu.cm. Flame retardant boards may be treated on one face or both the faces, as indicated.

12.5.1.1 In the case of flame retardant boards on one face only, the face which is treated shall be clearly marked.

12.5.1.2 Tolerance: Permissible tolerance on the thickness of the fibre insulation board shall be as under:

- 12 mm thick boards: +/- 0.75 mm
- 18 mm thick boards: +/- 1.0 mm

12.6 Particle Boards for Insulation Purposes:

Particle boards for insulation purposes shall conform to the requirements of IS 3129-1985, Specification for particle board for insulation purposes. Boards shall have either flame retardant chemical mixed during manufacture or shall be impregnated with a solution of flame retardant chemical. The density of the board shall not exceed 0.4 gm/cu.cm and shall not vary from board to board by more than +/- 10 percent.

12.6.1 The permissible tolerances on the nominal thickness of finished boards shall be as follows:

- For boards up to 25 mm thick: ± 0.8 mm
- For boards above 25 mm thick: ± 1 mm

12.7 Medium Density Fibre Board:

Medium density fibre board shall conform to the requirement of IS 12406-1988. Grade of the board shall be indicated.

Designate

- Exterior grade phenol formal: EGSB
- Interior grade: IGSB

Thickness of the board shall be indicated.
12.8 Decorative Laminates:

Decorative Laminates shall be type 1 having only one side bearing the decorative surface and the other side being roughened or given appropriate treatment to promote adhesion to the base and shall conform to the requirements of IS 2046-1995, Specification for decorative thermosetting synthetic resin bonded laminated sheets. IS 2046 does not cover 1 mm thick decorative laminates which when specified, shall be of approved make.

12.8.1.1 The type of surface finish colour and pattern shall be as directed. The sheets shall be reasonably free from local deformation. Since sheets may vary slightly in colour and appearance, the sheets for anyone scheme shall be matched.

12.8.1.2 Tolerance:

Tolerance on thickness of sheets shall not exceed +/- 0.25 mm.

12.8.1.3 Sheets shall not split or crack when sawn, milled, drilled and tapped.

12.9 DELETED
12.10 DELETED

12.11 Plywood:

Plywood shall conform to requirements of IS 373-1975, Specification for plywood for general purposes. Plywood shall be of grades BWP (boiling water proof) or BWR (boiling water resistant), as indicated. The quality requirement of each face of the plywood as given in Table 1 of the IS, shall not be inferior than type B. Along with the thickness of plywood, the number of plies shall also be indicated.

12.11.1 Plywood boards shall be uniform thickness and free from warp and cracks. The faces of plywood boards shall be reasonably smooth with face veneers of uniform thickness. The edges of the boards shall be trimmed square.

12.11.2.1 Tolerance:

Permissible tolerance on the thickness of plywood boards shall be as under:

- For boards upto 5 mm thick: ±10 percent
- For boards nom 6 mm to 9 mm: ±7 percent
- For boards exceeding 9 mm thick: ± 5 percent

12.12 Decorative Plywood:

Decorative plywood shall be of Type 1 quality conforming to IS 1328-1996, Specification for veneered decorative plywood. Decorative plywood shall have decorative veneers of the specified species of timber and on one or both the faces, as indicated.

12.12.1.1 The adhesive for bonding of veneers shall be synthetic resin adhesive, confirming to IS 848-1974.

12.12.1.2 Tolerance: Permissible tolerances on the thickness shall be as under:

- Positive: 10 percent of nominal thickness.
- Negative: 5 percent of nominal thickness.

12.13 Block Boards:

Block boards shall conform to the requirements of IS 1959-2004, Specification for block boards. Block Boards shall be of grade 1 quality, exterior grade or grade 2 quality, interior grade and of decorative or commercial type as indicated. In case of decorative type it shall be indicated if one or both the faces shall have decorative face veneer. Strips of wood in the core may be laid separately or glued or otherwise jointed.
12.13.1 Block Boards shall be flat and square. Both faces of block board shall be sanded to a smooth even surface. Block boards shall be uniform in thickness with in the tolerance specified.

12.13.2 Tolerance permissible on the thickness of block boards shall be +/- 5 percent for boards upto 25 mm thickness and +/- 2.5 percent for boards above 25 mm thickness.

12.14 Particle Boards

Particle Boards shall conform to the requirements of IS 3087-2005, Specification for wood particle boards (medium density) for general proposes. Adhesive used for bonding purpose shall phenol formaldehyde as indicated.

12.14.1 Particle boards may be either Flat Pressed single layer type or Flat pressed there layer type, unless a particular type has been indicated. In case of three layer particle boards the construction shall be well balanced about the central plane. In the case of single layer particle board the particles shall be uniformly distributed.

12.14.2.1 Particle boards shall be of uniform thickness and uniform density throughout the board. Both faces of particle boards shall have sanded smooth finish.

12.14.3 Density

Mean density of the board shall be between 500 to 900 Kg / cum. The density shall not vary from one board to another by more than 10 Percent of the mean density.

12.14.4 Particle boards shall not crack or split when drilled, sawed or nailed perpendicular to the surface.

12.14.5 Tolerance

Tolerance permissible on the thickness of particle boards shall be ±5 Percent boards upto 25 mm thick and ±2.5 Percent for boards above 25 mm thick.

12.15 Veneered Particle Boards

Veneered particle boards shall conform to the requirements of IS:3097-1980, Specification for veneered particle boards. The boards shall be of interior or exterior grade with solid core, and shall be general purpose type or decorative type, as indicated. In case of decorative type it shall be indicated if one or both faces shall have decorative face veneer. Face veneers of commercial type veneered boards shall be not inferior then exterior grade phenol formaldehyde.

12.16 Finish & Tolerance

Finished and tolerance permissible on the thickness of veneered particle boards shall be same as specified under 'Block boards'.

12.17 Nails & Screws

Nails shall conform to IS 723-1972, specification for steel countersunk head wire nails. The nails shall be diamond pointed. Screw shall conform to IS 451-1999. Technical supply conditions for wood screws. Special nails recommended by the manufacturer, if any, shall be invariably used.

12.18 MATERIAL

The type of boarding etc. in ceiling and lining, their thickness/density and finish shall be as
12.19 Fixing Generally

12.19.1 When handling, boards and sheets shall be carried on edge and not flat to prevent buckling and cracking.

12.19.2 Before fixing, the board shall be conditioned to the humidity of the atmosphere by stacking then loosely on edge for a period of 24 hours so that air can have free access to both sides of each sheet during the period. Hardboards shall be conditioned as specified under 'Fixing Hardboards'.

12.19.3 Before fixing the boards, sheeting tiles, etc. to the Framework, the framework shall be checked with regard to the level, position and vertically of its outer side surface and for proper fixture and joints.

12.19.4 Boards, sheeting, tiles etc. shall be checked for correct sizes, squareness of adjacent sides and laying patterns.

12.19.5 Boards shall be cut to the required size and to conform to the pattern of panels as directed. Each panel shall be in one whole piece. The board should be sawn with the face-side up and a fine and even edge obtained. The joints in the boards shall be with the square or slightly rounded edges as directed. The edges shall be lightly sandpapered to make them smooth.

12.19.6 Fixing

Unless otherwise directed, boards shall be fixed with length parallel to all joints, centered over farming members. Where the joints are to be covered, the boards shall be closed butt jointed or spaced 3 to 6 mm apart as per manufacture’s instructions or as directed. Where joints are to be left exposed, the boards shall be butt jointed with a minimum clearance of 3 mm or as directed. The boards shall be supported and held tight to the background with timber pieces, these being marked outwards as the fixing proceeds. The boards are first fixed to the intermediate framing member proceeding from the center of the boards outwards, the edges being fixed last.

12.19.7 Where boards are fixed with nails, they shall be countersunk into the boards with suitable punch. Care shall be taken in driving the nails that the boards/sheets are not marked by hammer blows.
2.19.8 The screws shall be rustless and oiled before fixing.

12.19.9 Finishing

The exposed side of the board fixed in ceiling shall be truly level and plane except in the case of sloped ceiling and truly vertical when fixed in wall lining without any local bulges or sags. The joints shall be truly parallel and/or perpendicular to the walls. The width of joints shall be uniform.

Care shall be taken to ensure that the boards are not made dirty and uniformity of the colour or the boards is not spoiled during the fixing operations. Ceiling boards and wall linings, when fixed, shall present a neat and uniform appearance.

12.20 DELETED

12.21 Fixing of Plywood, Block board, Particle Board and Veneered particle Board

12.21.1 Decorative veneers shall be matched or mismatched to achieve a decorative effect in colour, figure and grain. Where directed decorative veneers boards shall be matched to particular design, for example quartered, centered, diamond or V matched or shall be arranged to from a group to give an overall general effect. The pattern and figure matching shall be decided, put on paper and boards preferably numbered for their positions. Any board so required shall be cut to the required plan.

12.21.2 The boards shall be carefully lifted and fixed to the frame-work with wood screws. All the edges shall be fixed to the frame members by screws spaced 7.5 cm center for 4 mm to 6 mm thick plywood, for thicker boards, the center-to-center spacing of screws maybe at about 15 times the thickness. The screws shall have a clearance of 10 mm from the edge line. At the line of intermediate support, the screws shall be countersunk. The screws shall be fixed starting from one comer and, extending to both sides to fix the board flat and level. The length of the screws shall be as follows:

a) For boards up to 7 mm thick 25 mm
b) For boards above 7 mm upto 12 mm thick 35 mm
c) For boards above 12 mm thick Thickness +20 mm

12.21.3 The joints, if left open, shall be filled with painters putty and brought to level or may be cut to "V" shape. They may also be left open" beveled or parallel grooved using plane and chisel or grooving cutter. The boards may also be pre-cut and edges rounded before fixing. In the case of decorative boards, the joints may be coloured to match the general colour and pattern of the ceiling boards. Alternatively, the open joints shall be covered by a beading or strips as indicated.

12.22 Galvanised Steel framework for false ceiling work

12.22.1 (a) Materials

i) Galvanised steel sections incorporated in framework shall conform relevant IS codes.

ii) The grid shall consist of galvanized steel main Tees of size 33 (H) mm x 24mm.

(b) Workmanship

i) Grid framework shall be suspended/ fixed from RCC/Structural steel roof using 3mm dia GI rod, 6mm nylon rawl plug and 6mm J bolt at every 1200mm intervals with necessary bolts, nuts and washers all as per manufacturer's instruction.

ii) The main Tees shall be provided at every 1.2M center to center, stitched cross Tee at 0.6m center to center fixed with suitable GI bolts, nuts and washers all as per manufacturer's instruction.
iii) The grid (main / cross tee section) shall be supported at ends all along the wall with GI angle as per consultant.

iv) GI coating shall conform to IS277 class coating for respective thickness and testing shall be all as directed.

v) PVC protected sheeting shall be used to avoid scratches, damage to the framework while fixing to ceiling.

vi) Powder coating to the exposed surface shall not be less than 22 microns.
GLAZING

16.1 Indian Standards

The following IS apply to this section:

<table>
<thead>
<tr>
<th>IS. No</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>419-1967</td>
<td>Specification for putty for use on window frames (First revision)</td>
</tr>
<tr>
<td>2835-1987</td>
<td>Specification for flat transparent sheet glass (Third revision)</td>
</tr>
<tr>
<td>5437-1994</td>
<td>Specification for wired and figured glass (First revision)</td>
</tr>
</tbody>
</table>

16.2 Sun Control Polyester Film-Reflective Type

16.2.1 Sheet Glass
Sheet Glass for glazing shall conform to IS 2835-1987 Specification for that transparent sheet glass and shall be of the following qualities:
(a) 'A' quality or selected quality (SQ) for selected glazing, where indicated.
(b) 'B' quality or ordinary quality (OQ) for glazing purposes.
(c) 'C' quality or greenhouse quality (GQ) for strips for flooring.

16.2.2 Sheet glass shall be flat transparent and clear as judged by the naked eye. It may, however, possess a light tint when viewed edgewise. It shall be free from any cracks and other defects.

16.2.3 Tolerance on the thickness of glass sheet shall be as under: Normal thickness

<table>
<thead>
<tr>
<th>Normal thickness</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.0, 2.5, 3.0 and 4.0 mm</td>
<td>± 0.2mm</td>
</tr>
<tr>
<td>4.8, 5.5 and 6.3 mm</td>
<td>± 0.3mm</td>
</tr>
</tbody>
</table>

16.3 Frosting or Obscuring
The grinding of glass shall be done uniformly and evenly so as to avoid any patchy look. The ground glass shall be thoroughly cleaned so that it does not catch stains.

16.4 Grinding, Polishing and Rounding of Edges
The edges of glass when rounded shall present a uniform and neatly finished edge.

16.5 Workmanship
The surface should be free from dust and oil. Sun control polyester film shall be fixed on the glass as per manufacturer's instructions.

16.6 Glazing in Steel Surrounds
16.6.1 Glazing with Beads
The glass shall be back puttiwed and secured in the rebates as specified under "Glazing with
putty". Beads shall be bedded against the glass with putty and secured to frame with screws. An adequate number of screws shall be used so as to prevent flexing or movement of the beads.

16.6.2 Cleaning of glazing
Glass shall be washed with warm water and soap or mild detergent followed by a clean water rinse and dried with cloth or wash leather. Glass with broken or textured surface shall be cleaned with a stiff plastic or bristle brush. For removing any obstinate dirt, glass shall be polished with whiting in water or
spirit. Organic solvents may be used for special purposes. Such as petrol or benzene for removing tar, turpentine for paint that has not dried hard and paraffin for grease. The solvent shall be carefully cleaned off the glass afterwards. Plaster or mortar splashes on the glass shall be removed with thin razor blade.

16.7 Anodiscd Aluminium Doors, Windows, Ventilators, Partitions, Composite units etc.

(e) Glazing:- Glass panes shall be as indicated. Unless otherwise indicated, fixing of glass panes shall be done with aluminium beading with CP brass or stainless steel screws spaced not more than 10 cm from each comer and intermediate not more than 20 cm apart. When glass panes are fixed with aluminium beading having mitred joints, epoxy resin or silicon sealant shall be applied between glass panes and sash bars and also between glass panes and beading. Aluminium beading shall also be from firm of sections used for fabrication of aluminium Doors, Windows, Ventilators, Partitions, Composite units etc. Joints shall be filled with PVC/ neoprene felt, cleats etc as indicated.

SECTION -17

LIST OF APPROVED MAKE/VENDOR

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Item</th>
<th>Approved Make /manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Aluminium Sections</td>
<td>NALCO, JINDAL</td>
</tr>
<tr>
<td>2</td>
<td>Glazing/Toughened Glass</td>
<td>Saint Gobin, Atul, Modi, Asai, Hindustan, IHG,</td>
</tr>
<tr>
<td>3</td>
<td>Brass / Copper Mortice Lock</td>
<td>GODREJ, Europa, ACME</td>
</tr>
<tr>
<td>4</td>
<td>Door Closer</td>
<td>Hardwin, Everite, Dorma, Godrej</td>
</tr>
<tr>
<td>5</td>
<td>Steel Door Frames</td>
<td>Guardian, Padma Eng. Works, SenHarvic, Radiant Eng,Ahalda Engrs, B.G.Shirke</td>
</tr>
<tr>
<td>6</td>
<td>Handles</td>
<td>Diana ,Jyothi</td>
</tr>
<tr>
<td>7</td>
<td>Tower Bolts</td>
<td>Jyothi , Diana</td>
</tr>
<tr>
<td>8</td>
<td>Plywood/ Shuttring plywood</td>
<td>Century, Kit ply, Green ply</td>
</tr>
<tr>
<td>9</td>
<td>Laminate</td>
<td>Fevicoal , Unicoal , vamicoal</td>
</tr>
<tr>
<td>10</td>
<td>Flush Door</td>
<td>Indian Plywood, Kit ply, Green ply</td>
</tr>
<tr>
<td>11</td>
<td>Laminates</td>
<td>Kitlam, Greenlam, Sun gloss, Feather touch</td>
</tr>
<tr>
<td>12</td>
<td>Particle Board</td>
<td>Novapan, Indian plywood, Kitply, Green ply.</td>
</tr>
</tbody>
</table>
Notes:-

The make/brand name mentioned elsewhere in this document or BOQ shall also be applied for the respective items/materials.

The make/brand/manufacturer’s name mentioned above is indicative and provided as a guide only. All the material shall conform to the specifications in the BOQ and relevant IS Codes or other international codes if relevant IS codes are not available.

In case the relevant material with above brand names are not available or the same are not in conformity with IS, the contractor shall provide equivalent or superior brand materials as approved by Engineer in Charge. Indication of brand name as above does not relieve the contractor from using the material with superior specification as per the directions of Engineer In Charge.

The MES SSR Part-I, Specifications -2009 shall form an integral part of the contract. The specifications on materials, workmanship, quality control specified in SSR PART-1 –2009 will be applicable for all the items required to be executed for the completion of work irrespective of those specified in this Technical specification book let or not.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Frequency</th>
<th>Tests to be carried out at</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVIL WORKS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Timber Moisture Content (IS 11215)</td>
<td>For every 1 Cum and part thereof</td>
<td>Outside Laboratory</td>
</tr>
<tr>
<td>12</td>
<td>Flush Door Emersion Test (IS 2191 and 22021)</td>
<td>As desired by the Owner &amp; Consultant</td>
<td>Outside Laboratory</td>
</tr>
<tr>
<td></td>
<td>Knife Test (IS 2191 and 22021)</td>
<td>— do —</td>
<td>— do —</td>
</tr>
<tr>
<td></td>
<td>Adhesion (IS 2191 and 22021)</td>
<td>— do —</td>
<td>— do —</td>
</tr>
<tr>
<td>13</td>
<td>Aluminum Doors, Windows &amp; Fittings Thickness of anodic coating or Gauge and size of the section</td>
<td>As desired by the Owner &amp; Consultant</td>
<td>Outside Laboratory</td>
</tr>
<tr>
<td></td>
<td>Weight of sections</td>
<td>— do —</td>
<td>— do —</td>
</tr>
</tbody>
</table>