TECHNICAL SPECIFICATIONS
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Note:

a) For detailed Technical specification of Civil works refer CD accompanying KPWD SR for the year 2011 -12

b) For Specification of works to be executed other than items found in the above CD the work shall be executed as per relevant IS Codes.

c) If item of works to be executed is not found either in (i) or (ii) above, such works shall be executed as per directions of Special Project Engineer.
CIVIL WORKS

1. CONTROLLED CONCRETE:

Controlled concrete shall be taken to mean that there shall be full field control of (1) predetermined grading of all aggregate that goes into concrete (2) predetermined proportion of course aggregate, fine aggregate, cement and water for the required strength.

Grade of Concrete: Compressive strength of 15 cm cube at 28 days after mixing conducted in accordance with relevant IS code.

<table>
<thead>
<tr>
<th>TEST – MIN</th>
<th>PRELIMINARY-MIN</th>
<th>WORKS TEST</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Kg / Sqcm.</td>
<td>Kg / Sqcm</td>
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<tr>
<td>M 10</td>
<td>135</td>
<td>100</td>
</tr>
<tr>
<td>M 15</td>
<td>200</td>
<td>150</td>
</tr>
<tr>
<td>M 20</td>
<td>260</td>
<td>200</td>
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<tr>
<td>M 25</td>
<td>320</td>
<td>250</td>
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<td>M 30</td>
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<td>M 35</td>
<td>440</td>
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<tr>
<td>M 40</td>
<td>500</td>
<td>400</td>
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To arrive at the proportion to be adopted to obtain the required grade of concrete the mix proportion should be designed based on laboratory tests conducted using the aggregates actually available at site and which would be used for making concrete. The design mix should give suitable work ability to enable it to be well consolidated to be worked into the corners of the shuttering and around the reinforcement.

Where difficulty is likely to be encountered in placing and compacting concrete and where there is crowding of reinforcements a separate mix is to be designed for required strength and used without extra cost the mix design along with the work ability obtainable with the designed mix should be furnished to the S.P.E. before hand and their approval obtained. A laboratory is to be established at the site to assess the moisture content of aggregate as frequently as necessary and as instructed by the Employer based on which correction is to be applied to the quantity of water to be used for mixing.

All aggregate are to conform strictly to IS specification IS- 383. The aggregate will be tested as frequently as directed by the S.P.E. to see that their specification is the same as adopted in the mix design. They must be stored on clean platform made for the purpose.

Concrete shall be weigh-batched. The details of weight batching unit to be used shall be checked with standard weights periodically. The Employer under special circumstances may allow the conversion of weights to volume. Despite the design for several mixes the following quantities of cement are the minimum to be used for the different grades of the concrete:
<table>
<thead>
<tr>
<th>Grades of concrete</th>
<th>Cement in KGS per Cum</th>
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<tbody>
<tr>
<td>M 15</td>
<td>240 KGS.</td>
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<tr>
<td>M 20</td>
<td>320 KGS.</td>
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<tr>
<td>M 25</td>
<td>340 KGS.</td>
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<tr>
<td>M 30</td>
<td>350 KGS.</td>
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<tr>
<td>M 35</td>
<td>375 KGS.</td>
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<tr>
<td>M 40</td>
<td>400 KGS.</td>
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</tbody>
</table>

For pre-casting and other works of specified nature, which involve the use of design mixes, use of Grade 53 cement is allowed. The minimum quantity of cement allowed in controlled concrete should strictly conform with SP 23 (Hand book on concrete mixes). Laboratory testing of content of cement in controlled concrete should conform to SP 23.

2. Aluminium Sub Frame for windows and Ventilators.

Aluminium sub frame of specified section shall be provided for all aluminium Doors, window, ventilators and fixed glazing all as shown on drawing and as specified.

2.1 Materials:

The members will be made out of aluminium alloy corresponding to IS 733 and will consists of extruded sections and of other sizes and gauges as shown in the drawings / described in accordance with the relevant IS Codes. The members shall be chosen to provide strength / stability and maximum resistance to wear and tear.

The IS specifications are to be strictly adhered. The alloy of extruded aluminium should be BS or IS 9 old HE9. Alcon 50 SWP To this effect test certificate has to be provided for the extruder.

Detailed fabrication drawings shall be furnished to suit the site installation for approval before taking up the work.

2.2 Finishing:

The extruded aluminium section has to be mechanically finished to remove all scratches, extrusion marks etc., and subsequently thoroughly cleared in an alkali bath prior to anodizing.

For anodizing IS 1868 would be strictly followed.

The anodizing finish should be in Black or Chocolate brown electro chemical process with minimum average thickness to 15 microns or other shade as required and to this effect the
tenderer must have to produce test certificate from authorized institutions Bureau of Indian Standard.
The anodized material should be sealed properly and it should be wrapped in gummed tape before fabrication to avoid scratches during fabrication and erection and shall be kept protected till handing over.

2.3 Fabrication:

Before commencing the fabrication the contractor is required to submit to Engineer In charge. for their approval detailed fabrication drawings, based on the Architects drawings and specifications and corresponding to the finished openings; left at site for Doors windows, ventilators, partitions. Fabrication is to be taken up only on approval of and in accordance with the approved drawings should there by any necessity. Architects may revise the sections and the same shall be followed for execution. However, the rate quoted for the relevant finished item shall be adjusted only for the difference in weight of Aluminium sections in KG between that specified by the tenderer at the time of tendering and that modified by the architect. All other elements of cost variation due to such modifications in the sections shall be deemed to have been included in the quoted rates.

Fabrication shall be done true to the drawings to correspond to the finished openings at the site, the sections cut to lengths to suit, mitred at the corners, to true right angles with joints made neatly to hair lines, with concealed fasteners, wherever possible joints shall be made in concealed locations.

All fabricated items shall be packed and carted properly before dispatch to site to prevent damage in transit. On receipt at site they shall be carefully stacked in protected storage to avoid distortion / damage. Such items shall also be in the safe custody of the contractor.

Field connections may be made with concealed screws, self tapping or other approved fasteners or may be made with weld due precautions being taken to avoid altogether distortion / discoloration of the finish.

Faces / Parts coming into account with masonry in the construction shall before shipment to the site be given a heavy coat of an alkali resistance bitumen paint. Aluminium coming in contact with other incompatible metals shall be given similarly a thick coat of Zinc chromate primer.

3. FLOORING WORKS:

NOTE: When the voids in the flooring cannot be filled with grout on detection of “hollow sound” when tapped, the slab shall be removed and reset to the complete satisfaction of the Engineer In-Charge.

3.1 GRANITE TILE FLOORING/SKIRTING:

Granite tile shall be mirror polished and shall be as specified for granite slab. Size of the tile shall be as specified in bill of quantities.
Before the operation for laying, the surface of base concrete shall be thoroughly cleaned of all dirt, loose particle, caked mortar droppings, by scrubbing with coir or steel wire brushes. If so directed by the engineer in charge, the surface shall then be cleaned with water and kept wet for 12 hours and surplus water shall be removed by mopping before the topping is laid. The tiles/slab should be laid over cement mortar as specified in the schedule of quantities.

### 3.1.1 Laying:

A bed of cement mortar consisting of one part of cement and four parts of sand shall be laid and properly leveled to an average thickness of 20 mm and the surface shall be kept slightly rough to have a satisfactory key for tiles. Neat cement paste of honey like consistency at the rate specified in the bill of quantities shall be spread over mortar bed, over such area at a time it would accommodate about 20 tiles. Tiles shall be soaked in water for at least 15 minutes and allowed to dry for the same duration. Tiles will then be fixed with a thin coat of cement pasted on back of each tile and then each tile is gently tapped with a wooden mallet so that it is properly bedded and in level with adjoining tile. Joint will be fine and as imperceptible as possible (not more than 1.5 mm thick).

After tiles have been laid for the day, surplus cement that may have come out of the tile edges may be wiped of gently and joints cleaned. A thick cement slurry colored with color pigment matching the color of tile shall be spread over and rubbed so as to seal even the thinnest joint and make it impervious. The flooring shall be cured for 14 days.

### 3.2 GRANITE FOR CILLS:

Granite slabs of approved shade, variety, size and thickness as specified in the item shall be used. They shall be of selected quality, dense, uniform and homogenous in texture and free from cracks or other structural defects. The exposed face shall have no veins or unsightly stains and defects. They shall have uniform coloured shade as specified/approved by Engineer-in-charge. Samples shall be got approved by Engineer-in-charge before ordering the slabs. The surface shall be fine polished and sides machine cut, true to square.

Granite shall be hard, sound, dense and homogenous in texture with crystalline and course grains. It shall be free from stains, cracks, decay and weathering. The place of quarrying, colour and quality and thickness should be as specified. Every stone must be machine cut to be minimum size of 58 cms (23 ½") in any direction and shape chisel dressed on all sides so as to be free from waviness and to give truly vertical, horizontal, radial and circular joints as required. Chisel dressing shall also be done on exposed faces to remove any waviness. The sides and top surfaces of Granite slabs shall be machine rubbed with course sand before using. Granite slabs in window cills shall be in full width and in single piece with rounded edges or angular edges as specified.

### 3.3 CEMENT TILE FLOORING

Before the operation for laying the floor is started, the surface of base concrete shall be thoroughly cleaned of all dirt, loose particle, caked mortar droppings, by scrubbing with coir or steel wire brushes. If so directed by the engineer in charge, the surface shall then the
cleaned with water and kept wet for 12 hours and surplus water shall be removed by mopping before the topping is laid. The tiles/slab should be laid over cement mortar as specified in the schedule of quantities.

The tiles shall be of selected quality, hard sound dense, homogeneous in texture, free from cracks, decay weathering and flaws and of thickness as specified. The heavy duty tiles shall be of the approved make and shall bear a crushing strength of 200kgs/sqcm of M-20 grade of concrete and of approved size and color.

3.3.1 Laying:

A bed of cement mortar consisting of one part of cement and three parts of sand shall be laid and properly leveled to an average thickness of 25mm and the surface shall be kept slightly rough to have a satisfactory key for tiles. Neat cement paste of honey like consistency shall be spread over mortar bed, over such area at a time it would accommodate about 20 tiles. Tiles shall be soaked in water for at least 15 minutes and allowed to dry for the same duration. Tiles will then be fixed with a thin coat of cement pasted on back of each tile and then each tile is gently tapped with a wooden mallet so that it is properly bedded and in level with adjoining tile. Joint will be fine and as imperceptible as possible (not more than 1.5mm thick).

After tiles have been laid for the day, surplus cement that may have come out of the tile edges may be wiped of gently and joints cleaned. A thick cement slurry colored with color pigment matching the color of tile shall be spread over and rubbed so as to seal even the thinnest joint and make it impervious. The flooring shall be cured for 14 days.

3.4 KOTA FLOORING/SKIRTING

The slabs shall be of selected quality, hard sound, dense, homogenous in texture, free from cracks, decay, weathering and flaws and of thickness as specified. The top exposed faces should have been roughly polished before bringing it to site. Unless otherwise specified the slabs should be cut to the required shape and size, machine cut as specified. All pieces should be of minimum 55 cm size and uniform color and texture.

A bed of cement mortar 1:6 shall be laid and properly leveled to an average thickness of 25mm and the surface be slightly rough to form a satisfactory key for the tiles. Neat cement paste of honey like consistency shall be spread over mortar bed over such an area so that the paste will not harden before laying tiles. Slabs shall be soaked in water for 15 minutes and allowed to dry. The slabs shall then be fixed as per approved pattern with thin coat of cement paste on back of each slab. They will be tapped with a wooden mallet till it is properly bedded in level with adjoining slabs. Joints shall not be more than 1.5 mm wide. The surplus cement grout that may have come out of the joints has to be wiped of gently and joints cleaned. The joints shall be filled up with grey or white cement with an admixture of pigments to match the shade of the slab. The flooring shall be cured for 14 days.

3.5 GRANITE WORK:
The slabs must be of uniform thickness as specified the variation in the thickness not exceeding 2 mm and must be from the same source. They shall be of uniform texture and colour free of any veins and streaks. All the edge shall be machine true to line, square and shape. The brushes in the joints are not more than specified thickness. The surface should be rough dressed / one line dressed / two lines dressed / three line dressed pulmane finish / mirror polish as specified.

3.6 CLAY TILES:

Clay tiles shall be machined pressed well burnt, uniform in colour and texture. Shade shall be terracotta. The size & thickness of the tile shall be as specified in the bill of quantities. The tiles should be laid over cement mortar and jointed and pointed with cement mortar mixed with red oxide to match with the shade of the tile as specified in the schedule of quantities.

3.7 MODE OF MEASUREMENT: The method of measurement for various items in the tender shall be generally in accordance with the IS: 1200 subject to the following:

Flooring shall be measured from skirting and where the wall surfaces are plastered or provided with dado it shall be measured from plaster to plaster or dado-to-dado.

4. WALL CARE PUTTY

4.1 Provide wall care putty to the specification catered for in the bill of quantity. Approved make of putty shall only be used.

4.1.1 Surface preparation:
Remove all loosely adhering material with a help of emery stone, putty blade or wire brush and clean water. The substrata should be clean, free from dust, grease loose materials. Dry and absorbent surface should be moistened with sufficient quantity of clean water. Mixing of putty shall be done with 33-35% clean water slowly mixing to make a paste till a uniform paste is formed.

4.1.2 APPLICATION:

The first coat shall be applied on already moistened wall surface from bottom to upward direction uniformly with help of patty blade after drying of first coat of putty the surface will be gently rubbed with wet sponge or with putty blade in order to remove the loose particle. Allow the surface to dry for at least three hours before applying the second coat of putty after drying of second coat marks if any will be removed with the help of moist sponge or with the putty blade.

Total thickness of coat shall be limited to 1.5mm

5. POLISHED / TOOL FINISHED GRANITE STONE CLADDING:
The cladding/fascia stone / slab shall be **MAGADI PINK / SIRA STONE** as specified in bill of quantities and shall conform to the specification under ‘Materials’ and it shall be erected as shown on the drawing or as directed.

The stone or stone slab shall be of size as shown on the drawing or as directed by the Engineer. The exposed faces, full beds and joints shall be dressed / finished as directed. The joints shall be cut square to the face and shall be at right angles to each other or as directed. The facing shall be fixed in cement mortar truly in plumb and in perfect plane straight or curved as shown on the drawing, the bed being fully flushed with mortar. The joints shall be exactly vertical and horizontal. The joints shall not exceed 1 mm to 1.5 mm for machine polished slab. Fine tooled / close punched and chisel dressed granite slab cladding shall be with 12mmx10mm grooves. The grooves shall be finished with cement mortar 1:3 with matching pigment. The stones shall break joints for about half the height of the course. Course shall be as shown on the drawing or as directed. The gap between the facing stones and the wall shall be filled with cement mortar. Stainless steel / copper pins and holdfasts shall be used as and wherever directed/indicated in drawing. Lead caulking shall be used for mixing holdfasts. The surface shall be protected from sun and rain and cured for ten days. The face shall be finished as specified or directed after filling the joints with matching shade cement / mortar of 1:1 proportion mixed with approved water proofing material.

**6.0 Ceramic Tiles:**

Ceramic Tiles Shall be of approved colour, design and size approved by the engineer conforming to IS: 777-1988. Granite: Polished granite slab and tiles shall be of the kind specified in the schedule of quantities conforming to samples approved by the engineer for colour & texture. The slab shall be machine cut to required dimension and shall conform to IS Standards.

**7.0 Plastic Emulsion Paint and Enamel Paint:**

Plastic (Acrylic) Emulsion Paint and Enamel Paint: Plastic emulsion painting will be of approved brand of paint and colour conforming to IS: 5411-1991 & will be applied over a coat of primer (including preparation of wall surface). Painting for the doors will be carried out with synthetic enamel paint of approved brand and colour over one coat of primer, all of relevant IS specifications 4511-1993.

**8.0 Solid Concrete Block:** Shall be of 100 mm / 150mm / 200mm thick and strength of 35 kg/sqm. Conforming to IS: 2185-1992

Blocks shall be regular in size and shape and of the specified strength. They should be manufactured by an approved agency, having mechanized machinery. The Contractor shall supply samples for the approval of the Engineer and all blocks supplied shall conform strictly to the approved samples.

Each batch of blocks shall be marked in a distinguishing manner. Blocks shall be properly cured before being brought to Site and shall have a texture such that plaster and/or render
will readily adhere to it. Half or three quarter size blocks may be used wherever required to make up lengths of walls but broken blocks shall not be used. All blocks shall be left with good sharp clean edges. All blocks not approved by the Engineer shall be immediately removed from the site at no cost to the employer and replaced by satisfactory blocks. Unload and handle blocks carefully without chipping or damaging.

The mortars for block masonry shall be as specified in the BOQ.

Block work shall be plumb, square and properly bonded with broken joints. The thickness of the courses shall be uniform with courses horizontal. All connected work shall be carried out at one level and no portion of the work shall be left more than one course lower than the adjacent work.

Blocks shall be laid so that all joints are well filled with mortar. Joined shall not be less than 6mm and not more than 8mm thick. Face joints shall be raked to a minimum depth of 10mm by raking tools during the progress of work when the mortar is still green so as to provide a proper key for pointing, plastering or rendering. When pointing, plastering or rendering is not required joints shall be struck flush.

For pointed block work or block work without plaster or render approved, smooth textured concrete blocks shall be used.

Faces of block work shall be cleaned daily and all mortar droppings cleaned off and removed. Top surfaces of each course shall be thoroughly cleaned before other courses are laid. If mortar in lower courses has begun to set joints shall be raked out to a depth of 12mm before laying is continued.

Where blocks are to be used for load bearing walls the uppermost course of blocks supporting slabs or other structural members shall be solid or treated as directed by the Engineer.

Openings, arches, chases, pockets and the like shall be provided as shown on the drawings to receive windows, louvers, doors frames and the like.

Wall ties and flashing shall be built into block work in accordance with the drawings and Specifications. It shall be clearly understood that the rates quoted by the Contractor shall be deemed to include for leaving openings, Forming arches, cutting chases pockets and the like in block work for various trades.

9. POLYCARBONATE SHEET WITH ALUMINIUM PROFILES FRAMEWORK WITH MILD STEEL TUBULAR STRUCTURAL SUPPORT FRAMEWORK SYSTEM

The item of work shall include designing providing, fixing and installing as per designs, drawings and details the following
d) 10 mm thick multi wall polycarbonate sheet of GE make or equivalent

e) Aluminum profile framework for fixing polycarbonate sheets

f) Welded M.S. tube (square or rectangular) structural support framework to support the aluminium profile framework

The work of polycarbonate sheet with aluminium profile framework and the M.S. tube structural support framework shall be got executed from specialized agency. The contractor shall submit names of at least three specialized agencies with details of their experience, capability etc. to the engineer-in-Charge who shall give the approval in writing. The work shall start only after approval of specialized agency.

The entire system shall be got designed from for wind loads, Dead & live loads, impact loads & deflection. The structural design calculations shall include calculations for aluminum profile framework including joints, M.S. Tube structural support framework, including welding, all M.S.brackets all fasteners and anchor bolts, screws for fixing polycarbonate sheet to aluminium frame work, screws for fixing aluminium framework to welded M.S. tube structural support framework etc.. The permissible bending stress in members of aluminum framework shall be 96 N/mm² as specified in IS 8147176 and the permissible stress in the welded M.S. Tube structural support framework shall be as specified in relevant BIS codes.

The Contractor shall submit the design and drawing from approved institution to the engineer-in-Charge for approval. The contractor shall incorporate the modifications required and suggestions made by the engineer-in-charge on the structural design and drawings. After approval of design & drawings, the contractor shall be required to submit six fair sets of the same to the Engineer – in-Charge.

The contractor shall provide drawings of all the members of aluminum profile framework including joints & all members of welded M.S. tube structural support framework including welding-clearly indicating dimensions, wall thickness & weight (Kg/m). The minimum moment of inertia of members of aluminium profile frame work shall be 350 x 104mm4

The anchoring of the welded M.S. Tube frame work to the RCC beams/walls shall be done with non corrosive galvanized M.S.brackets of approved design (galvanizing shall confirm to IS 475-16-8) microns thickness minimum Aluminum shims of various required thickness behind the brackets to Adjust to beam variations as per site requirements shall be provided and fixed HILTI/FISHER make flushed type fasteners of required size and length and 10 X 100 mm or more size stainless steel bolt shall be used for anchoring the brackets to provide minimum anchoring depth of 50 mm in the concrete to withstand the dead load & pressure/stresses due to wind. The contractor shall make arrangements with the fastener supplier- HILTI/FISHER to carry out random pull out tests at site of work to the satisfaction and director of Engineer-in-Charge.

EPDM gaskets of required thickness and width manufactured by Hanu Industries/Anand Lescuyer of equivalent shall be provided between aluminium –profile framework and the welded M.S. Tube structural support framework. EPDM gaskets of suitable profiles as manufactured by Hanu Industries/Anand Lescuyer or equivalent shall be provided at all required positions to make the system airtight.
All screws, Bolts, Nuts and washers used shall be only of stainless steel as manufactured by KUNDAN/PUJA/ATUL or equivalent.

The peripheral gaps between the welded M.S. Tube structural support framework and the RCC beam/wall shall be sealed by providing and fixing of 1mm thick aluminium sheet flashing bent to required profile & application of weather silicon sealant of DOW CORNING/GE SILICON or equivalent to make the joint water & air tight.

Fabrication and installation of polycarbonate sheets shall be as specified in “Annex A- Code of good fabricating practices “of IS-01443-1997”.

The tolerances in the width, length & thickness of sheet shall be as specified in Note 2 on page 3 of IS – 14443 – 1997.

The M.S. Tube shall conform to relevant BIS standards and shall be of steel grade ST-32.

The polycarbonate sheet with aluminium profile framework and welded M.S. TUBE structural support framework system shall be in conformity to the panel widths and sizes shown in the architectural drawings as well as to shape/profile in plan and elevation.

Nothing extra shall whatsoever be payable on this account.

8.1 TESTS TO BE CARRIED OUT BY THE CONTRACTOR.

The contractor should also submit samples for Testing of Physical and Chemical Properties and provide the Test Certificate of Aluminium Alloy Composition Test House /National Physical Test Laboratory, conforming to Alloy 63400 WP.

The contractor should submit a certificate duly certified by HILTI/FISCHER Company for their Dash fasteners for Anti-pullout Test.

8.2 MEASUREMENTS:

Poly carbonate sheet roofing with aluminium profile shall be measured in Square meter for finished exposed surface of polycarbonate sheet.

9. Timber:

(a) Unless otherwise specified, all timber for frames and shutters for doors, windows, ventilator, cupboards etc. Shall be TEAK WOOD well seasoned, approved and/without any flaws, sun cracks and other defects. The planed surface shall be smooth and free from blemishes and discolourisations.
(b) All timber for carpentry and joinery in touch with masonry or concrete shall be coal tarred of creosoted before fixing. All rough frame work in partitions, suspended ceiling and veneering to walls, etc. shall be treated with approved wood preservative/anti-termite treated as per manufacturer’s instructions and specifications. The rate quoted shall provide for such treatments.
(c) The timber members shall be fabricated out of well seasoned timber. The preparation of timber for joinery is to commence simultaneously with the be gaining of the project work generally and should proceed continuously until all the work is prepared and fixed/stacked on or the site as the case may be.

(d) Carpentry work:
The timber shall be properly planed and wrought in a workman like manner. Joints shall be true and fit properly, assembled, accurately and clamped together so as to square, flat and close jointed. The combed joints shall have two tongues on each member to be joined and shall be glued and jointed together with wooden pegs. Pegs shall engage on tongues and no tongue shall be less than 6 mm thick.

(e) In mortise and tenon joints all tendons shall not be less than 12 mm thick and shall be the full width of the members. Tendons shall be glued into the matrices. Through tendons shall in addition be pinned with wood dowels of not less than 6mm dia, or with non-ferrous metal dowels of not less than 6mm dia. alliteratively through tendons may be wedged if the notices are tapered. All the joints shall be coated with fevicol or equivalent jointing compound as per supplier’s instructions.

(f) All exposed faced of timber shall receive a primer coat of wood primer wherever required

9.1 Holdfasts:
Six holdfasts shall be fixed to each post of the door frame. The M.S. hold fasts shall be of the size 300 mm x 40 mm x 6mm and shall be fixed to the frames by means of screws and / or bolts and nails. The other end of the holdfast shall be fixed into jambs with cement concrete blocks of dimension 22 cmx10 cmx15 cm or as directed. Horns in frames shall be cut and shall be used for Rough grounds framing, hangers etc.

12.03 Workmanship:
- A) The workmanship shall be first class and to the approval of Engineer. Scanting and boarding’s shall be accurately sawn and shall be of required width and thickness. All carpenter’s work shall be wrought except where otherwise described. The workmanship and joinery shall be accordance with the drawings and shall be framed together and accurately fixed in approved manner and with properly glued with approved glue / fevicol to the satisfaction of the engineers.
  
  a) Screws:
   All screws to be used in woodwork and joinery shall be of brass or as specified or as directed by the engineer.
  
  b) Tolerances:
   1.5mm will be allowed for each wrought face of the sizes specifications except were described as finished in which case they shall be hold to be full dimensions.

  c) Protection:
   All wood work and joinery edges of timber frames etc shall be protected from being damaged during construction by providing rough timber casings securely fixed and with other adequate protective measures.
d) If decided by the owner to provide anti termite treatment, the contractor shall coordinate his work suitably as directed by the engineer.

e) Door window frames are fixed flush with plaster to wall, teak wood cover mould 40x12mm as per drawings shall be provided all round where the plaster is flush with the frame, painted or finished as in doors and rates quoted shall include for the same, unless otherwise specified.

9.2 Wooden flush door shutters (Solid core type):

Solid core flush shutters shall be as specified in the item of approved quality with ISI marking. An approved sample shall be deposited in the office of the engineer on site for reference. The shutters will be provided with T.W. lipping. Finished thickness of the shutter mentioned in the item. Flush doors shall be obtained as per approved makes annexure herewith and conform to IS 2202 Part I.

Teak Wood paneled shutters:

The thickness of styles and rails shall be as specified

Teak wood panels for shutters shall be of pattern and size as specified.

Whenever possible each panel shall be in a single width piece. But where two panel shall be in a single width place. But where two pieces are used, width of each piece should not be less than 12.5 cm. In order to avoid warping, splitting & cracking normally pieces not exceeding 20 cm in width should be used. When made from more than one pieces shall be joined with a continuous tongued and grooved joint and glued together and reinforced with metal dowels. The grains of solid panel shall run along the longer dimensions of the panel. Panels shall be framed into grooves to the full depth of the groove leaving an air.

9.3 Fixtures and fastenings:

Unless otherwise specified in the schedule of quantities each shutter shall be hung with four brass butt hinges of approved quality size and make with brass or other approved metal screws and the contractor’s rate shall cover for providing and fixing hinges to the shutters. (As per ISI for hardware)

9.4 Fittings:
All hardware fittings and fixtures shall be supplied & the same need to be fixed at no extra costs.

9.5 Mode of measurement:

Timber doors / Windows shall be measured in Sq.M over door / window frames.

10 - Double Skin metal roofing Panel

The leak proof mechanically **prefabricated sandwich panel** shall comprise of following:

The outer sheet shall be profiled Zincalume steel sheet of 0.5mm (Total coated thickness), high-tensile steel 345 Mpa having a coating, mass of 150 gm/sqm (Zinc aluminium coating, total of both sides as per AS : 1397) and finished with 20 microns colour coating of super polyester colour bond XRW quality paint as per AS/NZS - 2728 : 1997 (Category 3) over a 5 microns primer on exposed side and a neutral alkyd back coat of 5 micron on inner side over a 5 micron primer. The depth shall be 29.5 mm at a pitch distance 200mm. The inner sheet shall be of 0.40 mm (Total coated thickness) galvanized steel sheet having minimum 175 gm/sqm Zinc coating mass (total of both sides) of 240 Mpa conforming to IS : 277 & IS : 513. The inner liner sheet shall be in the form of a tray, having small notches in between. The core between outer profile sheet and the inner liner tray shall be of CFC free close cell high density rigid polyurethane foam 40 - 45 kg/cum having a thermal conductivity value of 0.020 w/mk at 10 deg. C. mean temperature conforming to IS : 12436. The core shall be 50mm thick average polyurethane foam insulation (58mm insulation at the profiles).

The panels shall be of required length & width with male and female edges on sides and shall be fixed through specialised agency prescribed by the manufacturer directly to the purlins using hot dip zinc coated self drilling fasteners of required size at required spacing with neoprene washers, butyle rubber sealing tape mechanically with the help of machines etc. complete as per manufacturer's specifications and directions of Engineer-in-charge.

The rate shall include the cost of preparing of shop drawing and cost of all materials, labour and T&P required for all operations described above for proper execution of the item as per drawings and directions of Engineer-in-charge.

For payment purposes, the superficial area of prefabricated panel roof covering shall be measured on the flat without allowances for laps and corrugation. Portion of roof covering over lapping the ridge or hip etc. shall be included in the measurements of the roof).

10.1 **GALVALUME SHEET** for Ridges - The material shall be cold rolled steel,550Mpa yield stress ( ASTM A446 Grade E ) With hot dipped metallic coating of aluminium Zink alloy ( 150gms/sqm total of both sides, AZ 150 as per ASTM A792 or AS per IS 1397), 0.5mm total coated thickness. The rate should be inclusive of laps, wastages, preparation of shop drawings, scaffoldings, screws, fasteners etc complete.

11. Hollow Tubular Truss
The hollow tubular truss shall be of medium and heavy section of different diameters confirming to IS 1161 (amended up to date) as indicated in drawings (in wind column, jack trusses, canopies, lattice girder, trusses, sub trusses, monitor roof, braces ties cladding posts, purlins connecting beams, of columns including anchor bolts, washer etc.) at all level and height the steel tubes when analysed in accordance with the method specified in IS 226-1975 shall show not less than .06 percent of sulphur, and not more than .06 percent of phosphors, tubes shall be cleaned, finished and free from scale cracks, surface flaws, laminations, and other defects and shall be cut clean and square with axis of tube.

The component part of structure shall be assembled in such a manner that they are neither twisted nor otherwise damaged and be so prepared that the specified chambers are maintained, All material before being assembled shall be straightened, if necessary, unless required to be of curvilinear form and shall be free from twist. Washer shall be specially shaped where necessary or other means used to give nuts and the heads of bolts a satisfactory bearing. For hoisting and erection proper equipments such as derricks, lifting tackles, winches, & ropes shall be used. The tubular steel work shall be painted with one coat of approved steel primer after fabrication but before erection. After erection the entire steel tubular steel surface shall be painted with two coats synthetic enamel paint paint of approved shade by sprayer and finished to matt finish. All fabrication and welding shall be done by the reputed fabrication. The profile cutting shall be employed for cutting and fabrication tubular section.

**12. - Precast Cement Concrete Jali**

The jali shall be of cement concrete 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate 6mm nominal size) reinforced with 1.6 mm dia mild steel wire unless otherwise specified.

The jali shall be set in position true to plumb and level before the joints sills and soffits of the openings are plastered. It shall then be grouted with the cement mortar 1:3 (1 cement: 3 coarse sand) and rechecked for levels. Finally the jambs, sills and soffits shall be plastered embedding the jail uniformly on the sides. The jali shall be measured for its gross superficial area. The length and breadth shall be measured correct to a cm. The thickness shall not be less than specified.

The rate shall be inclusive of materials and labor involved in all the operations described above except plastering of jambs, sills and soffits, which shall be paid for under relevant item of plastering.

Curing shall be done as per IS 456 latest. Pre cast work shall mature for at least 2 weeks before being incorporated into the Works.

The Contractor will be required to supply samples of all pre cast concrete units for the acceptance of the Engineer. Only when acceptance has been given may the supply of the units take place and any units supplied, which are inferior to the accepted sample, will be rejected and removed from Site.

A piece that is cracked or otherwise damaged during, before or after erection shall be
removed and replaced by the Contractor at his own expense.

13. Urinal Partitions

The partitions shall be Grey Granite slab embedded in the wall. The size and shape of the granite shall be as per direction of Engineer in charge. The portion of the slab to be embedded in the masonry shall be rough dressed. Dressing and rubbing of the exposed portion shall be as described in the nomenclature of the item. The dressed slab shall be of the thickness as specified with a tolerance of +/- 1.5mm. The slab shall be got approved from engineer in charge before fixing. Fixing shall be as specified except that the recess shall be 7.5cm wide. Fixing shall be done by cutting chase with chase cutter / fine tools in a recess of 7.5cmx7.5cm filled with cement concrete 1:2:4 (1cement :2 coarse sand:4 graded stone aggregate 6mm nominal size). Fixing can be done by epoxy grout in chase of 2.0x7.5cm as per direction of Engineer in charge.

The length and breadth shall be measured correct to a cm. The rate shall include the cost of labor and material involved in all the operations described above including cutting of recess in the wall, curves, finishing and polishing as specified.
## LIST OF APPROVED MAKES FOR CIVIL WORKS

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description of materials</th>
<th>Approved Make</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cement Ordinary Portland - 43 Grade</td>
<td>Coromandel / Vasavadatta / Ultra tech / ACC</td>
</tr>
<tr>
<td>2</td>
<td>TMT Fe-500 steel</td>
<td>RINL / SAIL / TATA Steel</td>
</tr>
<tr>
<td>3</td>
<td>Aluminum Sections</td>
<td>Jindal/Hindalco/Bhoruka</td>
</tr>
<tr>
<td>4</td>
<td>Glass</td>
<td>Saint Gobain / Modifloat/Asahi</td>
</tr>
<tr>
<td>5</td>
<td>Flush doors</td>
<td>Century / National / Archid ply / Greenply / Kutty</td>
</tr>
<tr>
<td>6</td>
<td>Marine Ply/Commercial ply /One Side Teak</td>
<td>Century / National / Kitply/ Archid ply/ Greenply</td>
</tr>
<tr>
<td>7</td>
<td>Laminates</td>
<td>Formica /Archidply/Greenply/Merino</td>
</tr>
<tr>
<td>8</td>
<td>Block Boards</td>
<td>Greenply/Century/Archidply</td>
</tr>
<tr>
<td>9</td>
<td>Silicone Sealant</td>
<td>Dow Corning/Wacker/Mc Coy Soudal</td>
</tr>
<tr>
<td>10</td>
<td>Vitrified Tiles - Glossy</td>
<td>Johnson /Kajaria/Regent</td>
</tr>
<tr>
<td>11</td>
<td>Vitrified Tiles - Antiiskid Matt Finish</td>
<td>Johnson/Kajaria/Nitco</td>
</tr>
<tr>
<td>12</td>
<td>Anti Skid Ceramic Tiles - Flooring</td>
<td>Johnson/Kajaria/Regent</td>
</tr>
<tr>
<td>13</td>
<td>Glazed Tiles - Dado</td>
<td>Johnson/Kajaria/Regent</td>
</tr>
<tr>
<td>14</td>
<td>Antitermite treatment</td>
<td>Pest Control India/Karnataka Wearhousing Corporation/Central Wearhousing Corporation</td>
</tr>
<tr>
<td>15</td>
<td>Construction Chemicals</td>
<td>Fosroc / Roffe / Sika</td>
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<tr>
<td>16</td>
<td>Plastic Emulsion Paint</td>
<td>Asian/Berger/Dulux</td>
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<tr>
<td>17</td>
<td>Enamel Paint</td>
<td>Asian/Berger/Dulux</td>
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<tr>
<td>18</td>
<td>Cement paint</td>
<td>Snowcem/Surfacoats</td>
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<tr>
<td>19</td>
<td>Putty for plaster finish</td>
<td>Birla white wall care/Asian wall putty</td>
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<tr>
<td>20</td>
<td>Melamine Polish</td>
<td>Asian/Berger/Sheenlac</td>
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<tr>
<td>21</td>
<td>Bitumen Impregnated Boards</td>
<td>Shalitex</td>
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<tr>
<td>22</td>
<td>Sandwich panel for Roofing (Polyurethane)</td>
<td>meTecno / Rinac/</td>
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<tr>
<td>23</td>
<td>Fire Door</td>
<td>Radiant / Kutty's</td>
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<tr>
<td>24</td>
<td>Elastomeric Bearing</td>
<td>Neoprene</td>
</tr>
<tr>
<td>25</td>
<td>Structural Steel</td>
<td>Tata / Jindal /</td>
</tr>
<tr>
<td>26</td>
<td>Polycarbonate sheet</td>
<td>Danpalon / Lexan / Tuflite</td>
</tr>
</tbody>
</table>

**Note:**
1. Samples along with test certificates must be produced and approval by the competent authority obtained before using on the works.

2. Selection of texture & colour will be at the discretion of the Architect and approved by the clients.
3 Non-availability of materials (approved) will not be entertained to change the brand and required quantity of materials should be procured well in advance.