

MUMBAI CRICKET ASSOCIATION



TENDER DOCUMENT

FOR

**PROPOSED REFURBISHMENT OF CORPORATE BOXES, PRESIDENT BOX,
PRESS BOX, COMMON TOILETS AND OTHER AREAS OF MUMBAI CRICKET
ASSOCIATION**

AT

WANKHEDE STADIUM, CHURCHGATE, MUMBAI

ISSUED TO:

CLIENT

MUMBAI CRICKET ASSOCIATION
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Churchgate,
Mumbai – 400 020

ARCHITECT

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VOLUME – II

TECHNICAL SPECIFICATIONS

TECHNICAL SPECIFICATIONS FOR CIVIL AND INTERIOR WORKS

All items of this schedule are to be executed as per CPWD 2019 specifications with upto date ammendments. CPWD Specifications shall be referred in detail as given in specifications book 2019, Chapter Notes, Description of the item, Foot-notes. Quantities given against each item is approximate and they may vary depending on requirements for the completion of the work.

In this Schedule, Lumpsum provision for items not included has also been kept. Any item of CPWD DSR can be operated under this provision.

For Non Standard Items, that are not available in CPWD Specifications, specifications as given in different IS Codes, other International Codes or Manufacturer's Specifications shall be followed. Details given in working drawings shall also be referred. Item description will prevail in case of any ambiguity in specifications.

Additional Technical Specifications for several non-standard items are provided below.

ITALIAN MARBLE FLOORING

The best quality Pre polished Italian marble stone from approved quarry shall be machine cut and machine polished as specified in respective items and shall be of specified thickness and of approved quality and size, free from cracks and flakes and shall be uniform colour, with straight edges. The sides of machine cut and machine polished stones shall have perfect right angles and surface smooth. The stone slabs shall be laid and finished on bedding of cement mortar 1:3 (1 cement: 3 coarse sand) 20 mm (average) thickness. The flooring work will be inclusive of skirting as per the drawings which flushed with the wall & with a groove above it. The Italian marble skirting is laid on min 20mm thick cement mortar of ratio 1:3 (1 cement: 3 coarse sand) and joined with white cement slurry mixed with matching colour pigment, to match the shade. The finished stone surface thus laid to the required degree as approved by the Architect / ~~Authority's engineer~~ AUTHORITY'S ENGINEER / PMC. Rate shall be inclusive of p.o.p protection, cleaning of the floor and disposal of debris from site, in all respects, up to final handover of the site. The tolerance of the stone slab should be followed as per the Granite stone item.

VINYL FLOORING

The Luxury Vinyl Tile Flooring of 1.5 mm thick of standard manufacturers from the approved make list of size 6" x 36" of the shade and design as approved by the architect. The LVT should be termite proof, scratch resistant, Chemical Resistant, Polyurethane Reinforcement (PUR) as well as Phthalate free.

GYPSUM BOARD FALSE CEILING

M/F Suspended Plain Ceiling includes Perimeter Channel {Material-GI(IS513),YS-260Mpa, Finish- Galvanized 150GSM(IS27)} is fixed along the perimeter of existing wall/ partition with the help of (6x40) impact anchor , at 600mm centers. Ceiling Angle {Material-GI(IS513), YS-260Mpa, Finish-Galvanized 150GSM(IS277)} is suspended by fixing it to the soffit cleat {GI(IS513) YS-260Mpa, Finish-Galvanized 150GSM(IS277) }. Soffit Cleat and Rawl Plug- Ø8x45mm {Material-IS 513 CR2 grade, Zinc coating (7 to 8 microns) pull out load- 6.8kN for M30 concrete grade} creating 1220mm x 1220mm grid. Intermediate channel {Material-GI(IS513),YS-260Mpa,Finish-Galvanised 150GSM(IS277) } is fixed to the G Ceiling Angle with M6 x 12mm Hex Bolt & Hex Nut arrangement {Material-As per EN 10083 Finish – Zinc Plating} or with 2 Nos of Ø4.2x13 metal to metal screw {Material-Carbon steel EN-ISO 7049/50 Finish- Zinc Coating Thickness- 4.14micron.} The Ceiling Section {Material-GI(IS513),YS-260Mpa,Finish-Galvanised 150GSM(IS277)} is then fixed to the

Intermediate Channel {Material-GI(IS513),YS-260Mpa,Finish-Galvanised 150GSM(IS277)} with the help of Connecting Clip {Material-High carbon spring steel wire(BS970Gr.En42)-46-48HRC,Finish- Zinc plating 4-6 micron} and in direction perpendicular to the Intermediate channel at 457mm c/c. Single layer of 12.5mm tapered edge Gypsum Boards (conforming to IS 2095-Part 1:2011, Certified board) is then screw fixed to ceiling section with 25mm drywall screws {Material-Carbon steel EN-ISO 7049/50,Finish-Case hardened Grey Phosphating} at 230mm centers on ceiling section & 150mm at periphery of ceiling. Finally, square and tapered edges of the boards are to be jointed and finished to have a flush look which includes filling and finishing with Pro-Fill Jointing compound (Conforms to ASTM C475), joint Paper tape. Serrated section has effective thickness of 2T (2xdepth), better load carrying capacity, enhanced screw retention, improved acoustic performance & fire resistance as compared to plain steel section. All the materials mentioned herewith should adhere to the list of approved makes or should be approved by the architect.

ALUMINIUM BAFFLE CEILING

Providing and fixing Luxalon® 50mm wide Baffle Ceiling System of approved make and approved colour consisting of Baffle 50 mm wide x 100mm height x 0.6mm thick square edged baffle having a length upto 4 mtrs, Coil Coated (chromatised for maximum bond between metal and paint, enamelled twice under high temperature, visible side with a full primer and finish coat, the inner side with a Primer coating and skin coat on a Continuous Paint line) corrosion resistant aluminium alloy for higher strength.

The Panel shall be clipped in a module of 100-150mm as per architect's specifications to a baked enamelled Aluminium Panel carrier of 32 mm wide x 39 mm deep x 0.95 mm thick in standard length of 5 mtrs made of double baked enamelled Aluminium alloy black with cutouts to hold the panels The L shaped galvanised angle is suspended by means of suspension angle and anchor fasteners at a centre to centre distance of 1200mm.

Mode of Measurements: Measurements shall be wall to wall without any deductions for lights, diffusers, columns etc.

LAY IN PLAIN METAL CEILING

Lay in Plain metal ceiling consisting of 600x600mm Lay in tiles in 0.7 mm thick Aluminum pre-coated to Global white color to be laid on the grid systems with 15mm

wide T - section flanges color white having rotary stitching on the Main Runner, 1200 mm & 600 mm Cross Tees. The tiles would have Fire Performance of Class A2-s1.d0 as per EN13501 standard in module size of 600 X 600mm, suitable for Green Building application, with Recycled content of 50%. The grid should be of approved make from the list of approved makes or as approved by the architect with 15mm wide T - section flanges color white having rotary stitching on all T sections i.e. the Main Runner with C3 coupling, 1200 mm & 600 mm Cross Tees with Hardened XL2 Clip having a web height of 38 mm and a load carrying capacity of 14 Kgs/M. The T Sections have a Galvanizing of 90 grams per M2 having pull out strength of 100 Kgs. The Tile & Grid system used together should carry a 10-year warrantee.

INSTALLATION: To comprise main runner spaced at 1200mm centers securely fixed to the structural soffit using Armstrong suspension system (specifications below) at 1200mm maximum Centre. The First/Last Armstrong suspension system at the end of each main runner should not be greater than 450mm from the adjacent wall. Flush fitting 1200mm long cross tees to be interlocked between main runners at 600mm Centre to form 1200 x 600 mm module. Cut cross tees longer than 600mm require independent support. 600 x 600mm module to be formed by fitting 600mm long flush fitting cross tees centrally between the 1200 mm cross tees. Perimeter trim to be of make approved from the list of approved makes / approved by the architect, wall angles of size 3000x19x19mm, secured to walls at 450 mm maximum centers.

SUSPENSION SYSTEM accessories consisting of M6 Anchor Fasteners with Vertical Hangers made of Galvanized steel of size 26 x 26 x 25 x 1.2mm with a Galvanized Thickness of 80gsm, A pre Straightened Hanger wire of dia – 2.65 mm of 1.8 m length., thickness of 80gsm and a tensile strength of 344-413 MPa, along with Adjustable hook clips of 0.8mm thick, galvanized spring steel for 2.68 mm. The adjustable clip also consists of a 3.5 mm aquiline wire to be used with the main runner. All the accessories should be from the list of approved makes or as approved by the architect

STRETCH FABRIC CEILING

The stretch fabric ceiling is de-mountable PVC stretch ceiling in monomeric quality welded with harpoon. The light reflection properties for white satin ceiling should be less than 10%. The light transmission properties for white satin ceiling should be approximately 75%. The thickness of the PVC stretch fabric ceiling should be 0.17mm and its weight should be approximately 220 gm / smt. It should be anti-bacterial, anti-fungal, antistatic and impermeable to water and steam. The average sound absorption should be 0.85 and NRC should be 0.83.

INTERIOR WORKS**General:**

1. For all items of work, the work shall be carried out strictly in accordance with description in General Specifications, particular specifications and drawings. The description, drawings and specifications shall be taken complementary to each other and shall form part of this contract.
2. In case items are not exhaustively described in parts described above, the general specifications of CPWD in respect of material & workmanship shall be followed for which nothing extra shall be paid.
3. The quoted rates shall be deemed to include all necessary hardware, tools & plants, props, material and labour, duties, taxes, insurance premium etc., all needed to make the individual item functional, to the complete satisfaction of the Engineer-in-charge, whether specifically mentioned in the individual item or not.
4. **Scope of Work**
The Scope of Work for buildings under this contract includes for full and final and entire completion of all works including all internal services in all respects described in General Specifications, particular specifications and as shown on drawings forming part of the contract.
5. Although all the details of construction have been by and large covered in these documents, any item or detail of construction not specifically covered but obviously implied and essential to consider Civil works and all internal services complete and functional, shall be deemed to have been covered in the item rate quoted. The tenderer may however, consider a minimum level of specifications conforming to IS Code or National Building Codes to cover these missing details.
6. **Approved Samples of Materials:** The contractor shall produce samples of all materials at least two weeks before incorporation in the work and shall obtain approval of these in writing from the architect and client's Engineer-in-charge, before he places bulk order for the materials. Materials to be incorporated in the work shall conform to latest relevant IS specifications, ISI marked goods where manufactured shall be used. (This will apply to the materials where specific brand, names of manufacturer not stipulated) where brand, names are given then the material should be out of the brands, names as specified.
7. **Bar Chart:** Contractor shall submit Bar Chart to the client, consultant and PMC and get it approved for the entire work in the contract
The bar chart shall be submitted by contractor within one week of acceptance of contract. Bar chart submitted by the contractor shall be scrutinized by the client and the consultant. Mutually agreed Bar chart shall be finalized within 07 days of submission by the contractor. The contractor shall carry out the changes as suggested by Architect and the client. The mutually agreed Bar chart shall be signed by contractor, Engineer-in-charge and the client. This shall be binding on contractor for progressing the work for completion by due date.
8. **Standard of Work:** To determine the acceptable standard of workmanship and also to decide if any variations are required in the layout of internal services or finishes, the

contractor shall execute on samples for areas as required. The contractor should take approval of the samples in writing from the Engineer-in-charge before placing the bulk order for the materials. Materials to be incorporated in the work shall conform to latest relevant IS codes and specifications, ISI marked goods where manufactured shall be used. (This will apply to the materials where specific brand, names of manufacturer not stipulated) where brand, names are given then the material should be out of the brands, names as specified.

9. The samples shall be put up for inspection and approval and specific dates put up in the bar chart mentioned above for each of the following.
10. All items of works, services and finishes such as paneling, door shutters, false ceiling, glazing, joinery including all fittings and hardware, sanitary fittings, electrification, entire wall finishes and painting etc. shall be completed in all respects before putting up for inspection and approval.
11. All materials fittings / fixtures to be incorporated in the sample rooms conforming to Specifications makes and brands as given in the Contract Agreement shall be got approved at least one week before they are required at site for incorporation. The order should be placed by the contractor in such a way that they can be procured in time and incorporated in the samples to be made. All samples shall be jointly approved by Architect and Engineer-in charge and record of approval stage wise duly signed and dated shall be kept by the Engineer-in charge.
12. The Engineer-in-charge, wherever mentioned shall be the Engineer-in- charge appointed by the client, who would be in charge of the project.
13. The contractor must clearly understand that this project involves coordination with different agencies working at a time, hence immaculate planning and co-ordination with the Engineer in charge and other agency shall be needed and the contractor must ensure that his team consists of qualified and compatible workers / interior designers / engineers. Certain decisions may be taken on the site and shall need to be documented and dealt with accordingly.

1. TIMBER / WOOD WORK

General: Specified variety of timber shall be used in the work. The timber shall be sawn in the direction of grains. The sawing shall be truly straight and square.

- Timber generally is to be the best of kind, well and properly seasoned, of matured growth, free from worm holes, large loose or dead knots or other defects and sawn i.e., squarely and will not suffer warping, splitting or other defects through improper handling.
- The hardwood is to be well seasoned Hollock, Kail, Mirandi or other approved similar locally obtainable hardwood weighing 610 Kg/cum.
- Teak wood would be of best quality from Burma, Dandeli, and Balarshah, free from soft heart, worn holes and weighting 640 Kg /cum.
- The moisture contents in wood shall be as per the CPWD Specification 1977. The testing of wood shall be carried out as per CPWD Specification 1977.

- All Steam Beach wood shall be free from worn holes, soft sap or knots. The wood shall be well seasoned as per IS: 287:1973 with a moisture content of 10%.
- Kailwood shall be of good quality, well-seasoned free from defects such as dead knots, cracks, sapwood etc. No individual hard and sound knot shall exceed 6 Sq.cm. in size and the aggregate area shall be more than 1% of the area of the pieces. These shall not be less than 2 growth rings per cm. width in cross-section.
- All dimensions given in the schedule of quantities and drawings are the required finished sizes.
- Timber shall be well seasoned and kiln dried with a moisture content of 12% nominal plus 2% for teak wood. The contractor should get the timber tested for moisture content of wood at his own cost.
- All timber shall be treated with preservatives and fire retardants.
- All timber shall be free from worm holes, loose or dead knots or other defects and shall not suffer from warping, splitting or other defects.
- All wood to be used shall be FSC certified.
- All timber shall be protected with an organic solvent water repellent wood preservative to give a highly efficient protection against termite, spider, worm, all insects, fungus and rot attack and shall, where exposed, enhance the appearance of the timber. Colour of the product shall be such as to bring out the natural colour of the respective timbers. Fire retardant paint to timber shall be applied as per the recommendations of manufacturer and shall comply with the requirement of ISI / B.S. code and local fire requirements.

2. COMMERCIAL PLYWOOD/ BOARD

- Commercial boards/plywood/particle board etc. as per IS 303 and as specified in the approved make list shall only be used.
- Only B.W.R. grade phenol formaldehyde bonded boards to be used.
- MR grade plywood to be used.

3. LAMINATES

- Thickness of the laminate to be used shall be 1.0 mm.
- Joints in laminates will not be permitted until and unless the same is unavoidable or is required as per the drawings.

4. FLUSH DOORS

- All Flush door shutters shall be as per the thickness mentioned in the design and drawings and of non-decorative industrial made conforming to IS – 2202 and ISI certified with block board core (confirming to the requirements as per IS-1659), for which the manufacturer shall produce the necessary evidence. The flush shutters shall be made with internal lipping of hardwood 25 mm thick and Adhesive used shall be phenol formaldehyde synthetic resin conforming to BWP types specified in IS 848-1974 solid core flush door shutters of approved make to be both side post formed laminated door finished of approved shed color. The door shall /shall not have 8.0mm thick glass view panel of size 300mm x 1200mm with itching pattern (as per the drawings) to be fixed with 18mm thick post formed moulding. The door is to be fixed in post formed laminate finished jambs made up of 18mm ply of size 50cm of matching shade. The cost of door shall include cost of door jamb, SS finish nickel plated 150mm door closer, door stopper handles, latch, aldrop, SS finish silencer etc. complete in all respect as per drawing and direction given by Engineer in charge.
- Contractor shall obtain the approval for the name of the manufacturer of the flush door shutters from the Engineer-in-charge before placing the supply order. While asking for the approval, copy of the “Bureau of Indian Standard” letter under which manufacturer has been authorized to mark the product with ISI marking should be attached. Engineer-in-charge, before giving the approval shall ensure that the validity date of license has not expired.
- **Testing of Flush Door Shutters**

On receipt of the shutters at site, the Engineer-in-charge shall be entitled to get the samples of door shutters tested in any approved laboratory. From each lot of shutters, one shutter shall be selected at random by the Engineer-in-charge. The cost of the door shutters selected as samples, their transportation to the laboratory and cost of testing by the laboratory shall be borne by the contractor, and shall be deemed to be included in the quoted rates.
- **Rebating**
 - The shutters shall be single leaf or doubled leafed as shown in the drawings and as directed by Engineer-in-charge. In case of double leafed shutters, the meeting of the stiles shall be rebated by one third the thickness of the shutter.
 - On all door shutters, laminate, 1.0 mm thk shall be pasted with adhesives as specified by the manufacturers. The laminate shall be of approved make list and as per approved shade & texture.
 - The bottom of shutters shall be 5mm above the finished floor level.
 - Vision panel, wherever needed shall be 8.0mm thk itching pattern glass of the size as mentioned in the drawings. The panel shall be fixed within the cut-out made from within the door shutter. The cut edges shall be fixed with TW lipping 35 x 8mm. The

lipping shall be flushed with the outer edges of the door and the glass fixed in the center of this lipping with quarter round beadings, 15x15 mm.

5. HARDWARE & METALS

- Tables side units back units consoles or other articles as per schedule of quantities shall be deemed to be inclusive of all the hardware required e.g. locks, sliding channels handles / knobs, bolts screws PVC buffers for the legs of sofas chairs tables etc. as per instructions of engineer in charge.
- Screws are to match the finish of the articles to be fixed and to be round or flat headed or counter sunk as required.
- The contractor should cover up and protect the brass and bronze surfaces with thick transparent grease or other suitable protective materials renew as necessary and subsequently clean off and clear away join completion.
- Aluminum and stainless steel shall be of approved manufacturer and suitable for its particular application. Generally, surface of aluminum shall have an iodized finish or powder coated finish and both shall comply with the samples approved by the ~~AUTHORITY'S ENGINEER~~AUTHORITY'S ENGINEER / PMC All stainless steel sheets shall be SS 304 or equivalent with gauge as specified but not thinner than 16 gauge. All exposed steel surfaces shall also have powder coated finish and shall complete with samples approved by ~~AUTHORITY'S ENGINEER~~AUTHORITY'S ENGINEER / PMC.
- All steel, brass, bronze, aluminum and stainless steel articles shall be subjected to a reasonable test for strength if so required by the ~~AUTHORITY'S ENGINEER~~AUTHORITY'S ENGINEER / PMC at the contractor's expense. All branching and welding are to be executed in a clean and smooth manner rubbed down and left in the flattest and tidiest way, particularly where exposed.
- Chromium plating shall be in accordance with IS standard or as per approved specification for normal outdoor conditions and shall be on a base material of copper brass or as specified.

6. ADHESIVES

- Adhesive shall be Phenol Formaldehyde Synthetic resin conforming to B.W.P. (Boiling Water Proof) type specified in IS: 848-1974. Only synthetic resin adhesive shall be used for bonding cores members to one another, including core frame, and for lipping, glazing frame, Venetian frame and other exposed parts where such binding is done.

7. NAILS, SPIKES, SCREWS AND BOLTS

- Nails, spikes and bolts shall be of the best quality mild steel or wrought and of length and weights approved by the Architect. Nails shall comply with IS: 1959-1960 or equivalent approved quality samples. Bolts with I.S. or equivalent approved quality samples. Brass headed nails are to comply with B.S. 1210. Wire staplers shall comply with B.S.1494 or equivalent.
- Rough Carpentry: Materials unless otherwise called for, all framing and other concealed wood members shall be of first class hard wood.
- Workmanship: All carpenter's work shall be done by skilled workmen using proper tools. All joints shall as far as possible, be mortised and tenoned and glued with best quality approved waterproof glue. Where mortise tenoned joints are not possible, the joints shall be securely nailed with the longest nails that may be used without splitting the wood. Wherever it is necessary or adequate joints cannot be formed by nailing, the members shall be lapped or jointed by GI straps or extra wood blocks. All joints shall be done with neatness and as approved and directed by the Architect.

8. GENERAL SPECIFICATIONS FOR "UPHOLSTERED" FURNITURE:**TIMBER:**

All timbers used are to be of top quality, free from knots, shakes, and worm holes, and with a moisture content of not more than 12% depending on the climatic conditions prevailing at the site. Timbers which are completely hidden, that are when covered by upholstery material, can be of local hardwood, except where this interfaces with the strength of the product, as in the case of a leg or arm which is part covered and part finished.

JOINTS:

All joints shall be standard, mortise and tenon, dowel, dovetail, and cross halved. Nailed or glued butt joints will not be permitted. Screws, nails, etc. will be of standard iron or wire unless stated otherwise on drawing. Where mortise and tenon joints are used, tenons should fit the mortise exactly. Where screws show on a finished surface, these will be sunk, and the hole plugged with a wood plug of the same wood and grain of the finished surfaces, unless otherwise. Nails on finished surface will be neatly punched and the hole filled with wood filler to match the colour.

UPHOLSTERY:

This will be of first class standard workmanship with webbing, no sag springs, coiled springs, padding and filling as specified on drawing. Covering fabrics will be sewn, tufted, and corded as shown on the drawing.

CUSHION VENTS :

Brass or Aluminium "cushion vents" should be installed at the back or under side of seat cushions (especially those covered in leather, vinyl plastic or very tightly woven fabric) to allow air to escape easily and to prevent torn seams.

MATERIALS :

Finished timber shall be of the type specified, furnishing fabrics, colour, pattern, substance to be as specified, no variation of this will be permitted unless with prior approval of the Designer & owner. Page 95 of 144

FINISH:

This will be as specified on the drawing and colour scheme chart where timber is finished in natural colour; care must be taken to "match" each separate piece of colour, before assembly. Where timber is stained, the stain or colour on each member must match. Only first class workmanship will be accepted. All legs to furniture will be fitted with nylon glides or castors as specified on the drawing. Full size drawings or prototype samples are to be submitted to the Designer for prior approval if requested.

FABRIC AND WALL COVERINGS:

The fabrics or wall coverings shall be supplied by the owner in conformity with the details shown on colour scheme charts. The wall paper or fabric shall be applied with an approved method or adhesive after necessary preparation of surfaces and in accordance with the manufacturer's recommendations and to the approval of the Architect / Consultant. The lengths of wall covering are to be hung with an overlap of at least 1" and cut flush as recommended by the manufacturer. A sample of the colour and style shall be produced for the Architect / Consultant's / owner approval.

NOTE: This specification is of the general type only and must be used in conjunction with the drawing of the particular item being made. Anything shown on the drawing and not in the specification must be compiled with, and vice versa.

9. GENERAL SPECIFICATION FOR CASE OF "CABINET" FURNITURE.

TIMBER:

All timbers used are to be of top quality free from knots, shakes, wormholes, and with a moisture content of not more than 12% depending on the climatic conditions prevailing at the site

JOINTS:

All joints will be standard, mortise and tennon, dovetail, duel, cross halved, mitred, tongued and grooved and rebated. Nailed and glued butt joints will not be accepted.

FASTENINGS:

Screws, nails, bolts, will generally be iron or wire, except in the following examples. "Outdoor Furniture" fastenings will be of brass or other non-corrosive metal. In hardware, they will match the finish of the hardware item Nails, in a finished surface shall be neatly punched and the hold filled with wood filler matching the finish.

Screws in a finished surface will be round head, raised or sunk beneath the surface, and the hole plugged with a wood plug with matching colour and grain of the wood surface, unless specially detailed.

PLYWOOD:

Used mainly for the body-work of this furniture, shall be Kit ply, Green ply, century, Archid Ply or multi ply suitable for veneering, painting or bonding plastic laminate. It shall be a resin bonded, specification, "marine", brand or equivalent. Exposed edges will be finished with a piece of solid wood, tongued, grooved and glued, or as detailed.

HARDWARE:

Hinges, locks, latches, door tracks, etc. shall be as specified, and as far as is possible of specified manufacture. In any variation of this the quality of the substitute shall be equal to or better than the originally specified, and the sample should be submitted to the designer \ owner for prior approval.

METAL:

Where metal lags, frames, sheets, etc. are used, these shall be welded, brazed, bolted or reverted as required and on finished surfaces welding, brazing and riveting shall be neatly smoothed so that no evidence of this is apparent on the final finish of the metal which will be as specified on drawing. On all legs wood or metal, nylon glides or heavy duty castors as indicated, are to be installed.

FINISH:

This will be as indicated on the drawing and colour scheme charts, and materials (timber, plastic, laminates, lacquer, paints, etc.) must be as specified. No variation will be accepted unless with the prior approval of the Designer & owner. "Backs" of cabinets, etc., where wall hung shall be treated with an approved brand or wood preservative. Full size drawings or prototypes are to be submitted for approval if requested.

NOTE-1: This specification is of a general type only and must be used in conjunction with the drawings of the particular item being made. Anything showing on the drawing, but not in the specification must be complied with and vice versa.

NOTE-2:-Where ever applicable only I, S.I. Approved first class materials are to be used. In other cases where I.S.I. specifications/certifications are not available the superior range quality materials are to be used and all the products got approved by the Architect / Consultant/Bank. The Architect / Consultant / Bank reserves the right to specify a particular brand name of a product, in his sole discretion, for use in the contract. No excuse from the contractor as regard variation in rates, in this context will be valid. All dimensions mentioned for all wooden sections (covered or exposed) are "OUT OF" dimensions. All site items procured by the contractor from the

manufactures, such as ply, veneer, laminates, wood, Italian marble, ceramic tiles etc., shall be within the allowable tolerances as specified by the manufacturer.

10. paneled AND GLAZED SHUTTER:

Solid wood panels for shutter shall be of pattern and size as specified. Generally each panel shall be in a single width piece. If unavoidable, the panels can be made from more than one piece with the prior approval of the Architect / Consultant. In such cases, the pieces shall be jointed with continuous tongue and groove joints and glued, together and reinforced with metal dowels. Jointed pieces of timber groove in paneled portion, for the panel to fit in tenons in rails shall pass through the styles. While assembling leaf, styles shall be left projecting as a horn. After the joinery work is assembled and approved by the Architect / Consultant the joints will be pressed and secured by about 6 mm. dia bamboo/wooden pins and the horns of styles sawn off. The grains of the solid panel shall run along with the longer dimensions of the panel. Panels shall be framed into grooves to the full depth of groove leaving an air-space of 1.6 mm. and the faces shall be closely fitted to the sides of the grooves. The styles and rails of glazed shutter shall be rebated of sizes as shown in drawing to receive glass.

11. GLAZED PARTITION

Deko FG Wide Line single glazed partition with 12mm Toughened Glass The panels are supported by Deko natural anodized aluminium ground and ceiling profiles (WD AGVP) of 103x30mm (H) attached to the floor and suspended false ceiling. On the vertical edges the glass panels are wrapped around with 103 x 30 mm vertical profiles (AGVP2/ AGVPA & AGVPT).Deko Certified proprietary factory finished 'I' Profile is used for glass to glass joints. The glass to glass joints at the corners to have 90°corner Deko Slim Profile and in the perpendicular glass junction (T-junction) Slim profile is to be used.

Door Frame: The Door opening shall be formed by custom FG40 aluminium door frames in natural anodized finished. It should have Deko door frame of size 40 x 110 mm.

Shutter: Providing of 40mm thick Stile Shutter. The width of Door Frame will be 70mm with provisions for inserting glass and the glass used in the system shall be 12mm toughened Glass with necessary acoustic gaskets. Hardware - Single Leaf: Butterfly Stile hinges, 30mm Back Set Narror Stile Mortise Lock handle, SLDE Arm Door Closer, Door Stopper, Drop Down Seal. Hardware - Double Leaf: Butterfly Stile hinges, 30mm Back Set Narror Stile Dead lock with 300mm C Type Offset handle, SLIDE Arm Door Closer, Door Stopper, Drop Down Seal.

Finishes of all aluminium frame components : Natural Anodized Finish

12. DUCO PAINTED PANELLING

Duco Painted Panelling constructed in saal wood frame made out of 50 x 38 and 12mm MR grade ply. 4mm MDF pasted on 9mm thick MR grade plywood of

approved make to be fixed to the framework and to be finished in Duco painting complete as per drawings.

13. VENEER PANELLING

Veneer Panelling constructed in saal wood frame made out of 50 x 38 and 12mm MR grade ply. 4mm Veneer pasted on 9mm thick MR grade plywood of approved make to be fixed to the framework to be finished in water based PU polish complete as per drawings.

14. LAMINATED PANELLING

Laminated panelling with approved laminate with 12mm thk grooves on it with vinyl graphic artwork 38 x 19mm thk tw moulding on panelling back painted laquered glass paneling.

15. MIRROR PANELLING

Mirror Panelling constructed in saal wood frame made out of 50 x 38 and 12mm MR grade ply. 6mm mirror , edge polished pasted on 12mm thick MR grade plywood of approved make with T.W. frame out of 25 x 50 , to be finished in water based PU polish to be fixed to the framework complete as per drawings.

16. LACQUERED GLASS

SGG Planilaque LACQUERED GLASS of 6 mm thick annealed of Saint-Gobains with PU lacquer (50 micron thick), opaque (if viewed against a support wall) conforming to EN 16477 standards for lacquered glass , of approved color by Architect/ Client fixed with compatible Neutral Alkoxy based Silicone having Shear Bond Strength (Dry, 24 hours), greater than 450 kpa and tack free time of 10 to 30 mins compatible for installation of mirror and lacquered glass / Tape - Foam based double sided adhesive tape for instantaneous adhesion, compatible with mirror and lacquered glass having Shear bond strength (Dry, 15 mins) of 250 to 350 kpa) on a perfectly leveled 12mm thick water proof marine plywood / MDF / Mineral fibre board which is mounted on the RCC wall/any other structure.

17. WOODEN MOULDING

Providing and fixing in proper line and level T.W. moulding of different thickness as per the drawings made out of teak wood and to be finished in water based PU polish complete.

18. LOOSE FURNITURE

Loose furniture should be as per the data provided in the items indicative and from the list of approved makes as approved by the architect / client / pmc.

BASIC RATE OF MATERIALS

SR.NO	DESCRIPTION	PER UNIT	BASIC RATE
1	Cement	M.T	Rs. 6,000.00
5	Fly ash Bricks	No	Rs. 7.00
6	AAC Block 600x200x100 mm	No	Rs. 49.00
7	Siporex Block 100x240x650 mm	No	Rs. 78.00
8	Siporex Block 200x240x650 mm	No	Rs. 158.00
9	Jointing Mortar	Kg	Rs. 18.00
10	Birla wall care putty	Kg	Rs. 50.00
11	Primer for plaster surface	Ltr	Rs. 180.00
12	Textured Synthetic paint	Ltr	Rs. 230.00
13	Cement paint	Kg	Rs. 62.00
14	Royale Luxury Emulsion Paint	Ltr	Rs. 410.00
15	Acrylic Emulsion Paint	Ltr	Rs. 210.00
16	Exterior Primer	Ltr	Rs. 123.00
17	Weather shield paint	Ltr	Rs. 205.00
18	Oil bound distemper	Kg	Rs. 105.00
19	Vitrified tiles Glossy Size 590 to 605 mm* 590 to 605 mm*8 to 10mm	Sq.m	Rs. 850.00
20	Vitrified matt finish - size 590 to 605 mm* 590 to 605 mm *8 to 10mm	Sq.m	Rs. 850.00
21	Vertified stone effect finish size 590 to 605mm* 590 to 605mm * 8 to 10mm	Sq.m	Rs. 850.00
22	Kota stone (Machine cut) upto 25-30mm thick one	Sq.m	Rs. 550.00
23	Kota stone for step polished) upto 25mm thick (1.2*0.3M)	Sq.m	Rs. 525.00
27	Telephone Black Granite	Sq.m	Rs. 3,750.00
28	White Cement	Kg	Rs. 22.00
29	Black Kadappa (one side polish) (Machine cut) 25 mm thick	Sq.m	Rs. 450.00
30	Both Sides Polished Kadappa stone 25mm thick	Sq.m	Rs. 550.00
31	Italian marble	Sq.m	Rs. 6,500.00

TECHNICAL SPECIFICATIONS FOR PLUMBING WORKS

1. SANITARY FIXTURE & FITTINGS:**• WATER CLOSETS, WASH BASIN, URINALS, SINKS**

Unless otherwise specified, the sanitary fixtures shall be of the following specifications:

• WATER CLOSETS :

(European type) shall be of vitreous china of approved pattern, quality & colour. The closet shall be fixed with C.P. brass screws in floor for floor mounted type & mounted on C.I. chair brackets with bolts for wall mounted type & shall be provided with solid plastic seat & cover with chrome plated pillar brass hangers as specified.

Indian Pattern shall be of similar quality as specified above. The pan shall be 675/575 mm in length with 'S' or 'P' trap of the same material of the pan. The W.C. with the trap shall be fitted & fixed in position & built round solid with brick & cement to required level after all connections are made. The finished floor of the water closet shall be of 25 mm below the level of the room or passage in front of it. Both type of closets should conform to the requirements of I.S. 771-1963 for glazed vitreous china sanitary appliances

The flushing cisterns/Dual flush valve shall conform to the requirements of I.S. 774-1971. High level cisterns shall be of cast iron unless otherwise specified. Low level cisterns shall be of the same material as the water closet. The cisterns shall be mosquito proof & shall fulfil the requirements of the local Authority

The flush pipe shall be 32 mm dia. PVC if concealed & if exposed brass C.P. as specified.

Where flush valves are specified, this shall be of the best approved quality procurable with C.P. control valve & C.P. flush pipe.

• WASH BASIN:

They shall be of vitreous china of approved pattern & shall conform to the requirements of Indian standard Specifications. The basin shall be provided with 32 mm heavy cast brass C.P. trap & waste shall be connected to the waste pipe with a C.P. extension & wall flange.

• URINALS:

Urinals shall be of glazed fire clay earthenware or Vitreous china as specified & shall conform the requirements of I.S. 771-1963. Bowl type urinals with a lipped basin & flushing main shall be fixed to wall by screws. A 40 mm trap shall be provided & outlet shall be connected to soil pipes.

One-gallon flushing cistern shall be provided unless otherwise specified. In case of such urinals in range one 3 gallons flushing cistern for 3 urinals shall be provided. All exposed pipe work shall be heavy brass C.P. with C.P. wall supports.

- **SINKS:**

They shall be of Vitreous china & shall strictly be in conformation with I.S. 771-1963 for white glazed earthenware sanitary appliances or in stainless steel where required of oriental Metal & pressing works or equivalent.

The sink shall be provided with 40 mm trap & shall be connected to the waste pipes.

Shower Set:

Shower set shall comprise of single lever shower mixer, C.P. Shower arm with wall flange and shower head of approved quality or as specified in the detailed engineering and system requirement or supplied by the project Manager.

Shower Mixer and shower arm shall be so fixed as to keep the wall flange clear off the finished wall. Wall flanges embedded in the finishing shall not be accepted. low flow fixture for GRIHA.

- **Toilet Paper Holder:**

Toilet paper holder shall be of CP brass, powder coated / S.S. heavy duty of approved make and colour or as specified in detailed engineering and system requirement.

- **Towel Rail:**

Towel rail shall be of C.P. brass with reinforced bends and circular flanges. The size of the rail shall be as specified. The brackets shall be fixed by means of CP brass screws to wooden cleats firmly embedded in the wall.

- **Hand Drier:**

The hand drier shall be no touch operating type with solid state time delay to allow user to keep hand in any position.

The hand drier shall be fully hygienic, rated for continuous repeat use (CRU).

The rating of hand drier shall be such that time required to dry a pair of hands up to wrists is approximately 30 seconds.

The hand drier shall be of wall mounting type suitable for 230V, single phase, 50 Hz, AC power supply.

- **Water cooler:**

Water cooler in all areas as per architects & clients requirement & as per drawing.

- **Shower Set:**

Shower set shall comprise of single lever shower mixer, C.P. Shower arm with wall flange and shower head of approved quality or as specified in the detailed engineering and system requirement or supplied by the project Manager.

Shower Mixer and shower arm shall be so fixed as to keep the wall flange clear off the finished wall. Wall flanges embedded in the finishing shall not be accepted. low flow fixture for GRIHA.

- **Electrical Water Heater:**

The Electric Water Heater shall be a complete package unit ready for plumbing and electrical service conditions. It shall be insulated with heavy duty 50 mm thick fiberglass blanket insulation and high gloss enamel finish outer shell. Electric Heating Coil rating and storage capacity shall be as shown on drawings.

Vertical pressure type electric water heaters shall be suitable for a minimum working head of 10 bars.

Construction: Inner containers shall be coated with glass, fused to steel at 870°C. This glass should provide corrosion resistance for steel.

Elements brazed to detachable brass heater plate, the whole being easily replaceable when required.

Heating elements constructed of a nickel chromium resistance wire, sheathed in a mineral filling, the whole being encased in a copper tube and subjected to a high voltage test of 1750 volts. Heater shall be supplied with adjustable setting thermostat including high temperature safety cut-out and over-pressure relief valve, drain point, electrical point, temperature indication, pilot indication, and necessary ancillaries.

Quality Assurance:

Manufacturers: Firms regularly engaged in the manufacturer of water heaters of the types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.

Comply with National Electrical Code, NFPA 70, relevant Indian Standards as applicable

to installation and connection of electric water heaters.

Provide water heaters and safety relief valves complying with ASME Code and stamped with appropriate code symbols.

Product Delivery, Storage and Handling:

Handle water heaters carefully to prevent external and internal component damage, breakage, denting and scoring enclosure finish. Do not install damaged water heaters; either replace damaged components or return water heater to factory for replacement.

Store water heaters in a clean dry place. Protect water heaters from weather, dirt, fumes, water construction debris and physical damage.

Installation:

Install water heaters where shown, in accordance with equipment manufacturer's written instruction, and with recognized industry practices, to ensure that water heaters comply with requirements and serve intended purposes. Comply with requirements of State and local codes and applicable NFPA and ASME Boiler and Pressure Vessel Codes and Standards.

Coordinate with other work (plumbing, piping) as necessary to interface installation of water heaters with other components of system.

Connect Pressure & Temperature relief valve line to drain at visible location. P&T relief valve shall be accessible for quick maintenance and inspection in accordance with BS regulations.

2. WATER SUPPLY:

- **Installation of Requirement**

The water meter shall be installed in any position. For Non-horizontal positions the flow shall be upwards.

The meter shall be full of water, while operating.

Prior to Installation of a meter, the pipe line shall be thoroughly fused.

Straight pipe section of the same diameter D as the meter, having length of 5D and 2D shall be installed upstream and downstream of the meter respectively.

- **Trenches**

The buried pipes and fittings shall be laid in trenches and shall be protected with fine sand 15 cms all round before filling in the trenches. The width and depth of the trenches for the different diameters of the pipes shall be as follows:

Dia of Pipe	Width of Trench	Depth of Trench
15 mm to 50 mm	30 cms	60 cms
65 mm to 100 mm	45 cms	75 cms

At joints the trench width shall be widened where necessary. The work of excavation and refilling shall be done true to line and gradient in accordance with

general specifications for earthwork in trenches. When excavation is done in rock, it shall be cut deep enough to permit the pipes to be laid on a cushion of sand minimum 7.5 cm deep.

- **Painting**

All metallic pipes above ground shall be painted with one coat of Red Lead and two coats of Synthetic Enamel paint of approved shade and quality. Pipes shall be painted to standard colour code specified by Engineer-in-Charge.

All metallic pipes in chases and below floor shall be provided Anti-corrosive treatment.

- **Pipe Protection**

Where specified in the detailed engineering, PDR and system requirement all metallic pipes below ground shall be protected against corrosion by wrapping 100mm wide and 4mm thick layer of PYPKOTE/MAKPOLYKOTE over the pipe. Protection shall be as per manufacturer recommendation.

- **Water Hammer Arrestor**

A suitable cylindrical water hammer arrestor as per approved sample will be provided in the pump room delivery side to absorb shock waves, abrupt surge waves and vibrations in the system.

- **Puddle Flange:**

Contractor shall provide all inlets, outlets, drains, vents, overflows, control valves and all such other piping connections including level indicator to water storage tanks as called for. All pipes crossing through RCC work shall have puddle flanges fabricated from MS/GI pipes of required size and length and welded to 6/8 mm thick MS plate. All puddle flanges must be fixed in true alignment and level to ensure further connection in proper order. Puddle flanges are fabricated item and have to be fabricated as per standard drawing provided in drawings or as directed by engineer in charge.

Puddle flanges will be fabricated from GI heavy grade pipes or MS heavy grade pipes with food grade epoxy coating over it.

- **Foot Rest:**

Foot rest will be of Orange colour safety foot rest of minimum 6 mm thick, plastic encapsulated as per I.S:10910 on 12 mm dia. steel bar conforming to I.S:1786 having minimum cross section as 23mm x 25mm and over all minimum length 263mm and width as 165mm with minimum 112mm space between protruded legs having 2mm tread on top surface by ribbing or chequering besides necessary

and adequate anchoring projections on tail length on 138mm as per standard drawing and suitable to withstand the bend test and chemical resistance test as per specifications and having manufacturer's permanent identification mark to be visible even after fixing, including fixing with 30x20x15cm cement concrete block 1:3:6 (1 cement: 3 coarse sand: 6 graded stone aggregate 20mm nominal size) complete as per standard design.

- **Valve Chambers:**

Contractor shall provide suitable brick masonry chambers in cement mortar 1:5 (1 cement: 5 coarse sand) on cement concrete foundations 150 mm thick 1:5:10 mix (1 cement: 5 fine sand: 10 graded stone aggregate 40 mm nominal size) 12 mm thick cement plaster inside and outside finished with a floating coat of neat cement inside with cast iron surface box as approved or as specified in detailed engineering, PDR and system requirement and in drawings including excavation, back filling complete.

- **Installation:**

Generally, all the valves up to 50mm dia. shall be of gunmetal/brass body with screwed ends and shall be provided with unions on both the sides for removal and repair, unless instructed otherwise.

Provide valves on all main branches of water supply as specified in the drawings or as per system requirements. Provide all valves, check valves, PRV, strainers of same size as the pipes in which they are installed, unless otherwise indicated.

All hand-controlled line valves are to be gate, ball or butterfly valves, except where throttling control or frequent operation is required, provide globe or angle valves, unless otherwise shown or specified. Install all globe valves to close against the pressure.

Position gate valves so that stems are in any suitable angle from horizontal to upright position. Install valves only in accessible locations. Do not install valves with stems pointing downwards unless specifically indicated.

Wherever possible, install valves accessible from floor level. Provide operating handles for all valves and cocks. Provide adequate clearance for easy operation.

Support line valves at the valve in addition to regularly spaced pipe supports shown and specified.

Provide discharge pipe from all relief and safety valves. Extend to over approved drain receptacle with air gap.

- **Testing**

All pipes, fittings and valves shall be tested by hydrostatic pressure of min. 1.5 times the maximum working pressure with the consent of Engineer-in-Charge.

Pressure shall be maintained for a period of at least twelve hours or as directed by engineer in charge, without appreciable drop in the pressure after fixing at site. (+10%). A test register shall be maintained and all entries shall be signed and dated by Contractor(s) and Engineer. In addition to the sectional testing carried out during the construction, Contractor shall test the entire installation after connections to the overhead tanks or pumping system or mains. He shall rectify all leakages, and shall replace all defective materials in the system. Any damage done due to carelessness, open or burst pipes or failure of fittings, to the building, furniture and Fixtures shall be made good during the defects liability period without any extra cost.

After completion of the water supply system, Contractor shall test each valve by closing and opening it a number of times to observe if it is working efficiently. Valves which do not effectively operate shall be replaced by new ones at no extra cost and the same shall be tested as above.

Test valve bonnets for tightness. Tests operate valves from closed-to-open-to-closed position while valve is under test pressure.

Test automatic valves including solenoid, motorized, pressure relief valves, safety valves and temperature and pressure relief valves for proper operation at settings indicated.

Ensure that valves are field checked for packing and lubricated.

Test all valves, air relief valves, safety relief valves, safety valves and temperature and pressure relief valves at least three times.

- **Disinfection**

On completion of the portable cold water supply services system, including any part of the

existing service, they shall be sterilized by the application of chlorine. After completion of the work Contractor shall flush clean the entire system with the filtered water after connection has been made. The minimum requirement for chlorination shall be to flush the pipe work thoroughly to remove dirt. Chlorine shall then be added to the storage tanks and water drawn from all draw off points until chlorine is detected at each outlet point.

After the first flushing, commercial bleaching powder is to be added to achieve a dosage of 2 to 3 mg/l of water in the system added and flushed. This operation should be performed twice to ensure that the system is fully disinfected and usable.

The mains are then to be allowed to stand for a period of 24 hours, after which the outlets are to be tested for chlorine. If chlorine is not found to be present, all the

above shall be repeated until residual chlorine is detected. After this, the systems to be completely flushed with clean water and precautions taken to avoid subsequent contamination of the installation.

- **Measurement**

General:

Rates for all items shall be inclusive of all work and items called for in the specifications given above and the detailed engineering, PDR and system requirement as applicable for the work under floors, in shafts or at ceiling level at all heights and depths.

All rates are inclusive of cutting holes and chase in RCC and masonry work and making

good the same.

All rates are inclusive of pre testing at site and final testing of the installations, materials and commissioning.

- **CPVC Pipes And Fittings:**

CPVC Water Distribution System shall be CPVC (Chlorinated Polyvinyl Chloride) Water Supply Piping System with pipe as per CTS SDR-11 at maximum working pressure of 400 psi (28.1 Kg/cm²) at 23oC and 100 psi (7.03 Kg/cm²) at 82oC (from ½" - 2"), using solvent welded CPVC fitting i.e. Tees, elbows, couplers, unions, reducers, bushing etc. including transition fitting (connection between CPVC and metal pipe / G.I.) i.e. Brass adapter (both male and female threaded) all conforming to ASTM D-2846 with only CPVC solvent cement conforming to ASTM F-493 - with only Clamps/ structural metal supports as required/directed at site including cutting chases and filling the same with cement concrete/cement mortar as required. All termination points for installation of faucets shall have brass termination fittings. Installation shall be to the satisfaction of consultant/manufacturers of flowguard pipes and fittings.

Table 2-3 : Outside Diameters and Wall Thicknesses for CPVC 4120, SDR 11 Plastic Pipes

Nominal Size		Outside Diameter, in. (mm)	Wall Thickness, in. (mm)
(in.)	Average	Tolerance	Minimum Tolerance
½	0.625 (15.9)	+ 0.003 (+ 0.08)	0.068 (1.73) + 0.020 (+ 0.51)

3/4	0.875 (22.2)	+ 0.003 (+0.080 (2.03) 0.08)	+ 0.020 (+ 0.51)
1	1.125 (28.6)	+ 0.003 (+0.102 (2.59) 0.08)	+ 0.020 (+ 0.51)
1-1/4	1.375 (34.9)	+ 0.003 (+0.125 (3.18) 0.08)	+ 0.020 (+ 0.51)
1-1/2	1.625 (41.3)	+ 0.004 (+0.148 (3.76) 0.10)	+ 0.020 (+ 0.51)
2	2.125 (54.0)	+ 0.004 (+0.193 (4.90) 0.10)	+ 0.023 (+ 0.58)

Table 2-4 : Pressure Ratings for CPVC, SDR 11 Plastic Pipes

Nominal Size		Pressure Rating, PSI (Kg/cm ²)			
(in.)	(mm)	73.4oF	(23oC)	180oF	(82oC)
1/2	15	400	(28.1)	80	(7.0)
3/4	20	400	(28.1)	100	(7.0)
1	25	400	(28.1)	100	(7.0)
1-1/4	32	400	(28.1)	100	(7.0)
1-1/2	40	400	(28.1)	100	(7.0)
2	50	400	(28.1)	100	(7.0)

Joining CPVC Pipes And Fittings:**Cutting :**

Pipe shall be cut with either with a wheel type plastic pipe cutter or hacksaw blade, and care

shall be taken to make a square cut, which provides optimal bonding area within a joint.

Deburring/Beveling :

Burrs and fillings should be removed from the outside and inside of pipe with a pocket knife or file otherwise burrs and fillings may prevent proper contact between pipe and fittings during assembly.

Fitting/Preparation :

A clear dry rag/cloth should be used to wipe dirt and moisture from the fitting sockets and tubing end. The tubing should make contact with the socket wall 1/3 or 2/3 of the way into the fitting socket.

Solvent Cement Application :

CPVC solvent cement conforming to ASTM - F493 should be used for joining pipe with fittings. An even coat of solvent cement should be applied on the pipe end and a thin coat inside the fitting socket, otherwise too much of cement solvent can cause clogged water ways.

Assembly :

After applying the solvent cement on both pipe and fitting socket, pipe should be inserted into the fitting socket within 30 seconds and rotating the pipe 1/4 to 1/2 turn while inserting so as to ensure even distribution of solvent cement with the joint. The assembled system should be holded for 10 seconds (approximately) in order to allow the joint to set up.

Set and Cure Times: remake the joint to avoid potential solvent cement set and cure times shall be strictly adhered to as per the below mentioned table.

Special care shall be exercised when assembling flow guard systems in extremely low temperature (below 4 C) or extremely high temperature (above 45 C) in extremely hot temperatures, make sure that both surfaces to be joined are still wet with cement solvent when putting them together.

Testing:

Once an installation is completed and cured or per above mentioned recommendations, the system should be hydrostatically pressure tested at 20 bar for 24 hour for all. During pressure testing, the system should be filled with water and if a leak is found, the joint should be cut out and replacing the same with new one by using couplers.

Transition of flow guard CPVC to Metals:

When making a transition connection to metal threads, special Brass (Male and female adapters) should be used.

Threaded Sealants:

Teflon tap shall be used to make threaded connections leak proof.

Solvent Cement:

CPVC solvent cement conforming to ASTM F 493 should be used for joining pipe with fittings and valves. CPVC cement solvent have a minimum shelf life of 1 year. Solvent have a minimum shelf life of 1 year. Aged cement solvent will often change colour or began to thicken and become gelatinous or jelly to like and when this happens, the cement should not be used. The cement solvent should be used within 30 days after opening the company's seal and tightly close the seal after using in order to avoid its freezing. The feezed cement solvent should be discarded immediately and fresh one should be used.

Hangers and Supports:

Most hangers designed for metal pipe are suitable for flow ground. Hangers should not have rough or sharp edges which come in contact with the tubing.

Supports should be as per the below mentioned table:

Horizontal and Vertical Support									
Spacing									
Size of pipe		21 deg. C (70oF)		49 deg. C (120oF)		71 deg. C (160oF)	82 deg. C (180oF)		
Inch	(mm)	Ft.	cm	Ft.	cm	Ft.	cm	Ft.	Cm
½"	(15)	5.5	(167.7)	4.5	(137.16)	3.0	(91.44)	2.5	(76.2)
¾"	(20)	5.5	(167.7)	5.0	(152.4)	3.0	(91.44)	2.5	(76.2)
1"	(25)	6.0	(182.88)	5.5	(167.7)	3.5	(106.68)		(91.44)
1 ¼"	(32)	6.5	(198.12)	6.0	(182.88)	3.5	(106.68)		(106.68)
1 ½"	(40)	7.0	(213.36)	6.0	(182.88)		(106.68)		(106.68)

2"	(50)	7.0	(213.36)	6.5	(198.12)		(121.92)		(106.68)
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- **BRASS FULL WAY VALVE**

Full way valve is a valve with suitable means of connection for insertion in pipeline for controlling or stopping the flow. The valve shall be of brass fitted with a cast iron wheel & shall be of gate valve type opening full way of the size as specified. Valve shall be of best quality as approved by the Engineer-in-charge & shall have the following approximate weight with a tolerance of 5%

Mm	Flanged ends Kg	Screwed ends Kg
15	1.021 (Provisional)	0.567(Provisional)
20	1.503 („)	0.680(„)
24	2.645 („)	1.077(„)
32	3.232 („)	1.559(„)
40	4.082 („)	2.268(„)
50	6.691 („)	3.232(„)
65	10.149 („)	6.804(„)
75	13.381 („)	8.845(„)

- **Butterfly Valves**

For all the pipe sizes above 50 mm Butterfly valves shall be used for hot and cold water supplies

PN20 rated Butterfly valve wafer type double eccentric disc with rubber gasket, flanges / unions, flange adaptors, nuts, bolts, washers, etc. shall be used for all the pipe sizes above 50 mm diameter. The disc shall be made of ductile iron with rilsan coated / SS 316.

Butterfly valves 65 mm dia. and above shall be butterfly valve to be used for isolation. The valves shall be bubble tight, resilient seated suitable for flow in either direction and seal in both direction with accompanying flanges and steel handle.

Butterfly valves shall be of best quality conforming to IS: 13095/API 609/BS 5155 of PN20 class (tested to 24 kg/cm²) or PN 20 class (tested to 30 kg/cm²) or as specified.

Provide wafer type slim seal double flanged butterfly valves of required sizes and of rating as mentioned in Detailed Engineering.

Material of Construction:

Body : Cast Steel to ASTM A 216 Gr WCB

Disc : ASTM A 351 Gr. CF8M (SS-316)

Disc Coating : No Coated

Body Liner (Seal) : Buna-N Integrally Moulded (Temp Range -57 Deg. C To 120 Deg. C)

Stem Material : SS-316

'O' Ring : Buna-N

Shaft Bushing : Glass Field Nylon

Shaft Disc Pin : SS-316

Operator : Hand Lever upto 150mm N.B. and Gear Operated 200mm and above.

Flange Connection : ASME B 16.5

Joints for double flanged butterfly valves shall be made with suitable tail/socket pieces on the pipeline and flanges joints made with appropriate number of bolts, nuts and washers with 3 mm thick insertion rubber gasket.

Provide the following butterfly valve accessories:

Valves 150 mm and smaller shall have nine position levers.

Valves 200 mm or larger shall have gear operator with crank handle or hand wheel.

Provide a position indicator on all butterfly valves.

For valves without full access provide enclosed extension stems to allow operation.

Provide a padlock for closed and open positions.

Where valves are located 2 m above floor level in equipment rooms provide chain wheel operators and chains.

All valves shall be approved by engineer in charge before they are used on works

- **Ball Valves**

Ball valves shall be full bore, heavy type, quarter turn, chrome/nickel plated brass body, screwed type, lever operated with Stainless Steel ball and Stainless Steel (AISI 410) stem with Teflon seating and gland packing including coupling and brass handle (to BS: 5351) with screwed female ends tested to minimum hydraulic pressure of 1.5 times the PN rating. All ball valves shall have locking handles to allow servicing and removal of equipment.

Provide lever handle with plastic sleeve on all ball valves unless otherwise noted.

Provide extension stem for all ball valves to be installed on insulated piping. Ball valves should be able to withstand minimum 150% of the operating working pressure.

Each valve should be tested for body integrity and seat tightness from manufacturers. The body test pressure shall be 1.5 x PN ratings. The seat test pressure for metal seated valves is

1.1 x PN ratings.

All valves shall be approved by engineer in charge before they are used on works and shall be of PN20 ratings as specified.

- **Check Valves**

Check valves of size 50mm or less shall be as per BS 5154/5352 and of size 50mm or more shall be as per API 594/BS 5153.

All check valves 50mm and smaller shall be of as per below specification and disc, threaded ends tested to minimum hydraulic pressure of 1.5 times the PN rating or as required by the piping system in which they are installed.

Material of Construction:

Body : ASTM A 351 Gr. CF8M (SS-316)

Plates: ASTM A 351 Gr. CF8M (SS-316)

Plate Coating: Integrally

Body Lining : Buna-N / Nitrile (Temp. Range -57 Deg. C to 120 Deg. C)Hinge/Stop Pin : AISI SS-316

Spring(s) : SS-316

Retainer : Carbon Steel

Body Bearing: AISI SS-316

Plate Bearing: AISI SS-316

Spring Bearing : AISI SS-316

End Connection : ASTM A 16.5

All non-return valves 65mm and larger shall be dual plate non return valve of stainless steel disc, stainless steel pin and hinges, nitrite/neoprene seal and shall be of flanged end as required by the piping system in which they are installed.

All check/non return valves shall be spring loaded. Check valves should be able to withstand minimum 150% of the operating working pressure. All valves shall be approved by engineer in charge before they are used on works PN20/20/30 ratings as specified.

- **Strainers**

Strainers shall be Y type strainers with gunmetal/bronze body up to 50mm dia. and CI body above 50mm dia. It shall have screwed female ends to BSPT, flanged ends to BS: 10, Table F and shall have perforated S/S (AISI-304) sheet with large screen area PN20 ratings as specified..

It shall be of compact shape and size as per approval and should be easy to install and repair.

- **Air Release Valves**

Air release valves shall be single acting type air valves with bronze/gunmetal parts. Each air release valve shall be provided with isolation valve before it.

- **Pressure Reducing Valves**

PRV in brass housing (DZR) with G ¼ "pressure gauge connection part, spring bonnet with adjustable opening having adjustable knob for pressure adjustments. The diaphragm shall be in fibre- reinforced NBR and seals in NBR. The adjustment spring shall not be in touch with water at any given time of PN20/20/30 ratings as specified.

WORKING:

The force of the diaphragm shall operate against the force of an adjustable spring. The inlet pressure shall have no influence in either the opening or closing the valve, hence, inlet Ratio is 3:1

ADJUSTMENT OF PRESSURE:

The knob fitted on top of the PRV shall be turned toward (-) or (f) sign to reduce/increase the outlet pressure as desired.

RANGE:

Inlet pressure	: Max 16 bar
Outlet pressure	: 1.5 to 6 bar adjustable
Operating temperature	: Max to Degree C
Maximum pressure drop	: 1 bar

- **Sluice Valves**

Sluice Valves (80 mm dia. and above) shall be double flanged sluice valves with rising stem. Each sluice valve shall be provided with wheel in exposed positions and cap top for underground valves. Contractor shall provide suitable operating keys for sluice valves with cap tops.

Sluice valves shall be of approved makes conforming to IS: 780 / IS: 14846/BS 5163 of PN20/20/30 ratings as specified.

Joints for double flanged sluice valves shall be made with suitable tail/socket pieces on the pipeline and flanges joints made with appropriate number of bolts, nuts and washers with 3 mm thick insertion rubber gasket.

Sluice valves shall generally be installed for isolating the main branches above 80mm dia. and as shown on the drawings.

Valves 200 mm or larger shall have gear operator with crank handle or hand wheel.

For valves without full access provide enclosed extension stems to allow operation. Provide a padlock (If specified).

Where valves are located 2 m above floor level in equipment rooms provide chain wheel operators and chains.

All valves shall be approved by engineer in charge before they are used on works.

- **Safety and Relief Valves**

All safety and pressure, air relief valves to be rated and installed in accordance with relevant standards and system requirements.

Use pressure reducing valves with strainer and bypass connections to limit the pressure in the high pressure areas as per the system requirements and as shown in the drawings and as directed by the engineer in charge.

- **Motorized Valve:**

Motorized valve to be installed in all the main inlet line of the terrace roof tanks with low and high level sensing probes, pressure switch, solenoid sensors, actuator with Control panels. Motorized valve shall be of proven quality and approved sample. Motorized valve shall be electrical operated. Motorized valve must ensure that the terrace roof tanks are always filled up and do not go dry. There will be a bypass circuit to the motorized valve in the inlet water line for emergency. Motorized valve will have a valve before and after it and a bypass to it with a valve. The motorized valve must keep the entire operations on automatic mode.

- **Pressure Reducing Valves**

PRV in brass housing (DZR) with G ¼ "pressure gauge connection part, spring bonnet with adjustable opening having adjustable knob for pressure adjustments. The diaphragm shall be in fibre- reinforced NBR and seals in NBR. The adjustment spring shall not be in touch with water at any given time of PN16/20/30 ratings as specified.

WORKING:

The force of the diaphragm shall operate against the force of an adjustable spring. The inlet pressure shall have no influence in either the opening or closing the valve, hence, inlet Ratio is 3:1

ADJUSTMENT OF PRESSURE:

The knob fitted on top of the PRV shall be turned toward (-) or (f) sign to reduce/increase the outlet pressure as desired.

RANGE:

Inlet pressure : Max 16 bar
Outlet pressure : 1.5 to 6 bar adjustable

Operating temperature : Max to Degree C

Maximum pressure drop : 1 bar

- **Puddle flange**

Contractor shall provide all inlets, outlets, drains, vents, overflows, control valves and all such other piping connections including level indicator to water storage tanks as called for. All pipes crossing through RCC work shall have puddle flanges fabricated from MS/GI pipes of required size and length and welded to 6/8 mm thick MS plate. All puddle flanges must be fixed in true alignment and level to ensure further connection in proper order. Puddle flanges are fabricated item and have to be fabricated as per standard drawing provided in drawings or as directed by engineer in charge.

Puddle flanges will be fabricated from GI heavy grade pipes or MS heavy grade pipes with food grade epoxy coating over it.

- **Cables**

Contractor shall provide control cables from supervisory valves and switches to the annunciation panels. Contractor to provide all electrical wires, cables, end connections, control cables from pump motors to the Motor Control panel.

All LV cables for normal power/control circuits within buildings shall be XLPE insulated and PVC sheathed Aluminum conductor and control cables shall be PVC insulated and PVC sheathed copper conductor respectively.

All cables shall have stranded conductors. The cables shall be in drums as far as possible and bear manufacturer name

All cable joints shall be made in an approved manner as per standard practice. (For details, refer Electrical specifications)

- **Cable Tray**

Cable tray shall be perforated type and construction with minimum 2.0 mm hot dipped galvanized mild steel for outdoor damp condition, and epoxy coated electro-galvanized mild steel for indoor installation. All cable trays shall be installed in a straight run parallel to walls where possible.

Cable trays shall be supported by electro-galvanized 'U' channel with galvanized threaded rod for indoor suspended tray and hot-dipped galvanized for area subject to weather.

All hangers shall be installed at 1 meter interval and shall be applied primer and painted to match with the surrounding building finish approved by the Engineer-in-charge.

The cable trays those are exposed to the weather, a hot-dip galvanized cover of 1.5mm gauge steel, flush fixing type with gasket, shall be installed on top of the tray. Depending on the size of cable trays spare space of 25% shall be maintained for future expansion. Copper earth link bar shall be fixed at every joint of the cable tray run.

All cables shall be routed in approved locations in coordination with all other services in a proper manner.

Cable Trays shall be galvanized/powder coated steel and hung from the ceiling by galvanized rods supported by appropriate size and type of expandable expansion fasteners drilled into the slabs and walls by an electric drill. (For details, refer Electrical specifications)

3. DRAINAGE PIPING

Cast Iron Hubless Pipe:

Hub-less CI pipes are to be used for all vertical and under slung soil, waste, anti siphonage and rain water lines. CI Hub-less pipes are normally available in 3 m length. Pipes shall be straight and smooth free from cracks and other manufacturing defects. Pipes, fittings and accessories shall be free from defects (superficial and other defects) which could be detrimental to their correct operation or long service life. Pipes and fittings shall be true to shape and smooth and cylindrical, their inner and outer surface being as nearly as practicable concentric. They shall be free from cracks, pinholes and other manufacturing defects. All pipes and fittings shall bear the manufacturer's name and standard to which it conforms. All pipes and fittings before dispatch to site at site shall be physically tested. All these

tests shall be carried out in the presence of the representative of the Project Manager. Also a test certificate from manufacturers be obtained before dispatch of material to site and proper site testing to be done during and after installation. The cast iron components shall be internally coated with epoxy coating/black bitumen and externally coated with acrylic /red oxide paint. Before applying the coatings, the surfaces shall be dry and free from rust or non-adhering products or foreign matter, e.g. oil, grease.

Hub-less pipes shall be centrifugally cast (spun) iron pipes conforming to ISO-6594/EN- 877/ DIN- 19522.

Pipes, fittings and accessories shall be manufactured

from:

Grey cast iron in accordance with ISO 185.

Stainless steel Couplings with EPDM rubber will comply to DIN 19543/EN 877 standards. When measured in accordance with EN 877/DIN 19543 standards, the length of all pipes shall be within a tolerance of + 20 mm.

The standard external diameters (DE) of pipes and fittings, as well as the tolerances applicable to these, shall comply with the values given in Table 1, when measured in accordance EN/DIN standards.

Pipes, fittings and accessories as well as the couplings or clamping components and the gaskets shall be legibly and indelibly marked and shall bear at least the following information:

- The manufacture's name or mark;
- The identification of the production site;
- The period of manufacture, coded or not;
- The reference to this standard;
- The DN/EN standards where applicable;
- The design angle of fittings;

In the case of pipes the above markings shall be applied at least once per meter length.

2.2.4 Fittings

Contractor shall use hub-less pipes and fittings of matching specifications. The fittings shall be of the same manufacture as the pipes used for soil and waste pipes. Fittings shall be of required degree of curvature with or without access door. The fixing shall be air and watertight.

Access door shall be made up with 3 mm thick insertion rubber washer and white Lead. The bolts shall be lubricated with grease or white Lead for easy removal later. The fixing shall be air and watertight.

Fittings are generally available in following angles as specified below with a design tolerance of + 2°:

- Bends

:

15°; 22°; 30°; 45°; 68°; 88°;

- Single/double branches :

45°; 68°; 88°.

2.2.5 Fixing And Jointing

All vertical pipes shall be fixed by M.S. clamps truly vertical. Branch pipes shall be connected to the stack at the same angle as that of the fittings. No collars shall be used on vertical stacks. Each stack shall be terminated at top with a Cowl. Horizontal pipes shall be laid to uniform slope and the clamps adjusted to the proper levels so that the pipes fully rest on them.

Contractor shall provide all sleeves, openings, hangers, inserts during the construction. He shall provide all necessary information to the building Civil Contractor for making such provisions in the structure as necessary. All damages shall be made good to restore the surface.

The joints are intrinsic components of the manufacturer's discharge systems. They shall permit correct connection between the ends of pipes and/or fittings and accessories in accordance with the standards.

Taking into account the different applications of cast iron pipe work systems, various joint designs are permitted provided that they satisfy the requirements of the standards. The joints shall incorporate one or more elastomeric gasket(s) to ensure leak tightness and prevent direct contact between the ends of pipe work components.

Stainless steel Couplings with EPDM rubber will comply to DIN 19543/EN 877 standards. Cast iron couplings or clamping components shall be coated, at least on the surfaces not covered by the gaskets.

The elastomeric gaskets shall: Conform to ISO 4633;

Satisfy the type test defined in EN/DIN standards.

All parts of the joints shall be free from defects that are likely to compromise their suitability for use. Sharp edges should be avoided.

Couplings and clamping components shall be designed so that they satisfy the water tightness requirements without any permanent changes (e.g. deformation, cracks and damaged threads) which could impair the performance of the joint. The manufacturer's instructions shall contain all information concerning the application and installation of the joints and if necessary, information on the torque for tightening the bolts.

Water tightness

When tested in accordance with EN /DIN standards on test apparatus preventing any excessive axial displacement and subjected to the test conditions and hydrostatic pressures, the joints shall exhibit no visible leakage.

Air tightness

In order to ensure a seal against odours, all joints shall be tight against positive internal air pressure of 0 mbar to 10 mbar when tested in accordance with standards. The contractor to furnish detailed specifications and jointing procedures

as per applicable standards and manufacturers catalogues to enable Project Manager to ensure QA/QC in installation.

2.2.6 Cast Iron Pipes For Drainage

Wherever specified, drainage lines passing under building, floors and roads, shall be C.I. LA pipes or as specified hereinafter. Position of such pipes shall be generally shown in the relevant drawings. Cast iron LA pipes shall be centrifugally spun iron pipes conforming to I.S: 1536-1976 and fittings shall be conforming to IS: 1538. Quality certificates shall be furnished. Wherever possible junction from branch pipes shall be made by a Y tee.

Clamps

M.S. clamps shall be of standard design and fabricated from M.S. flat 40x3mm thick. They shall be painted with two coats of black bitumen paint before fixing. Where M.S. clamps are to be fixed on RCC columns or slotted angles, walls or beam they shall be fixed with 40x3mm flat iron "U" type clamps with anchor fasteners of approved design or 6mm nuts and bolts.

Structural clamps shall be fabricated from M.S. Structural members e.g. rods, angles, channels flats as per detailed drawing or as directed. Contractor shall provide all nuts, bolts, welding material and paint the clamps with one coat of red oxide and two or more coats of black Enamel paint. Wooden saddles, where required shall be provided free of cost.

Slotted angle/channel supports on walls shall be provided wherever shown on drawings. Angles/channels shall be of sizes shown on drawings or specified in detailed engineering, and system requirement; angles/channels shall be fixed to brick walls with bolts embedded in cement concrete blocks and to RCC walls with suitable anchor fasteners. The spacing of support bolts horizontally shall not exceed 1 m. Wherever M.S. clamps are required to be anchored directly to brick walls, concrete slabs,

beams or columns, nothing extra shall be payable for clamping arrangement and making good with cement concrete 1:2:4 mix (1 cement: 2 coarse sand: 4 mm stone aggregate 20mm nominal size) as directed by the Engineer-in-Charge. All pipe supports clamps shall be load tested.

It should be fabricated and installed in a workman like manner.

2.2.7 Floor Traps, Fittings And Grating

Floor trap

Floor traps shall be deep seal CI P-trap with an effective minimum water seal of 70mm. In Sunken floor, trap and waste pipes shall be set in cement concrete blocks firmly supported on the structural floor. The blocks shall be in 1:2:4 mix (1 cement: 2 coarse sand: 4 stone aggregate 20 mm nominal size) and extended to 40 mm below finished floor level. Contractor shall provide all necessary shuttering and centering for the blocks. Size of the block shall be 30x30 cm of the required depth.

Inlet Fittings

The contractor shall provide a special type inlet hopper without or with one, two or three inlet sockets to receive the waste pipe from sanitary appliances as per layout. Hopper shall be connected to trap with inlet hoppers and the traps shall be set in cement concrete blocks as specified above. (Inlet fitting shall be paid for separately)

C.P./Stainless Steel Gratings

Floor Drain and Floor Traps shall be provided with 100-150 mm square or round C.P./Stainless steel grating with adjustable and removable strainers, with rim of approved design and shape by the Architects. Minimum thickness shall be 5-6 mm or as specified in the detailed engineering and system requirement.

2.2.8 Cleanout Plugs

Contractor shall provide cleanout plugs in floor or ceiling as required in the system during installation. Cleanout plugs shall be provided on head and turn of each soil/waste line and at locations indicated on plans or directed by Engineer-in-Charge or as required functionally to enable maintenance. Cleanout plugs shall be of size matching the full bore of the pipe. Plugs shall be fitted inside the pipe or fittings. The head of each straight line

shall be provided with plug with suitable key for opening as per manufacturer design. For straight long lengths of line, clean out plugs may additionally be also strategically provided at every approx. 10m intervals on top of line for enabling access inside the line for maintenance.

2.2.9 WC Pan Connector:

The WC connector shall be made of single body construction with integral fins, made from EVA (Ethyl Vinyle Acetate).

The Pan connector shall conform to BS 5627: 1984.

The Pan connector shall be supplied with one seal made of TPE (Thermoplastic Elastomeric).

The Pan connector must be supplied with factory fitted spring loaded seal guard fixed on the seal.

Fixing arrangement with CI soil pipe shall be as per manufacturer

recommendation/instructions.

4. GENERAL SPECIFICATIONS:

Unless specifically mentioned otherwise, all the applicable codes & standard published by the Indian standards institution and its subsequent revision & all other standards which may be published by them before construction work starts, shall apply in respect of design workmanship, quality and properties of materials & method of testing. Some of this available standard are listed below:	
IS: 27-1965	Pig Lead
IS: 651-1971	Specification for salt – glazed stoneware pipes & fittings
IS: 458-1971	Concrete pipes (with & without reinforcement)
IS: 778-1971	Specification for Gunmetal Gate, Globe & Check valves for water stem & oil only
IS: 779-1968	Water meter domestic type
IS: 14846-1969	Specification for sluice valves for various purpose.
IS: 782-1966	Specification for caulking lead.
IS: 783-1959	Code of practice for laying of concrete pipes.
IS: 1172-1971	Basic requirement water supply drainage & sanitation
IS: 1536-1967	Specification for centrifugally cast (spun) iron pressure pipes & for water, gas & sewage.
IS: 1537-1960	Specification for vertically cast iron pressure pipes for water, gas & sewage.
IS: 1538-1969	Specification for cast iron fittings for pressure pipes for water, gas & sewage.
IS: 1703-1968	Specification for ball valves (horizontal plunger type) including floats for water supply purpose.
IS: 1726-1974 Part 1, 2, 3, 4 & 5.	Specification for cast iron manhole covers & frames intended for use in drainage work.

IS: 1729-1964	Specification for cast iron spigot & socket soil, waste & ventilating pipe's fittings, & accessories.
IS: 1742-1972	Code of Practice for building drainage.
IS: 1795-1974	Specification for pillar taps.
IS: 2064-1973	Code of practice for selection, installation & maintenance of sanitary appliances.
IS: 2065-1972	Code of practice for water supply in buildings.
IS: 2373-1973	Specification for water meters (bulk type)
IS: 5455-1969	Heavy C.I. steps for manhole.
IS: 5961-1971	C.I. grating for drainage
IS: 7181-1971	C.I. flanged pipes.
IS: 4985	PVC pipes

Unless otherwise specified pipe connections will be as under:

MATERIAL OF PIPE	METHOD OF JOINTING
Lead to Lead	Wiped solder joint
Iron to Iron	2 ring's of hemp yarn & jointed with mineral Lead.
Stoneware to Stoneware	2 rings of hemp yarn & cement mortar 1:1 (1 cement = 1 sand)
Lead to Stoneware	Thimble of socket of brass with wiped solder joint to lead pipe & joint with stoneware pipe made with cement
Lead to cast iron	Brass thimble or socket as above but final joint in socket of iron pipe with yarn & molten lead properly caulked.
Iron to stoneware	Hemp yarn & cement. (Where stoneware socket is large enough)
Lead to a G.I. pipe	Brass plumber's union with wiped soldered joint on lead pipe & connected to a nipple on G.I. pipe screwed secured to later by socket & lock-out

5. PLUMBING WORK - MODE OF MEASUREMENT:**TOOLS, MATERIALS & STORAGE:**

The contractor at his own cost & charge shall provide all materials, tools tackle measure, scaffolding labour & water necessary for the completion of the whole work in all respects.

The contractor shall pay the fees for testing the material if directed by the architects & Local Authorities or other statutory authorities.

The Contractor will obtain, from time to time, various permission & the completion certificates as per rules of all local & statutory authorities.

The Counter shall arrange for the material & storage facility with the building contractor.

Any materials, brought at site, shall not be removed without the written authority of the Architect/Consulting Engineer/ Engineer-in-charge & when the Contractor shall have received payment in respect of any unfixed materials on the work has been taken into account, such materials, shall become the property of Employer/Corporation & the Contractor shall be liable for any loss or damage hereto.

The Contractor shall insure the work against damages, for such sum as the Architects/Consulting Engineers/Engineer-in -charge may from time to time direct. All insurance policies are to be taken out in the joint name of Employer/Corporation & the Contractor in an office selected by the Architect/Consulting Engineer/Engineer-in-charge & all policies & receipts shall be deposited with Architect/Consulting Engineers/Engineer-in-charge.

All the brackets & hangers for pipes shall be fixed to the wall or RCC slab using 'Dash' fasteners wherever necessary.

The amount shown against the provision item or / and contingencies in the schedule are provisional & for estimating purposes only the Contractor is neither concerned for its execution nor to change any commission on these items. The Owner reserves the right to get the work done for these items through a separate & independent Contractor.

Surplus material from the site shall be carted away by the Contractor without any cost to the Employer / Corporation & the Storage shall be handed over to Employer /Engineer-in-charge clean & ready for occupation.

SAFETY CODE:

1. There shall be maintained in a readily accessible place first aid appliance including adequate supply of sterilized dressing & cotton wool.

2. All injured persons shall be taken to a public hospital without loss of time, in case where the injury necessitates hospitalization.
3. Suitable & strong scaffolds should be provided for workman for all works that cannot safely be done from ground.
4. No portable single ladder shall be over 8 M in length. The width between the side rails shall be not less than 30cm. (clear) & the distance between two adjacent rungs shall not be more than 30cm. When a ladder is used or extra mazdoor shall be engaged for holding the ladder.
5. The excavated material shall not be placed within 1.5 M of the edge of the trench or half of the depth of trench whichever is more. All trenches & excavation shall be provided with necessary fencing & lighting.
6. Every opening in the floor of a building or in working platform be provided with suitable means to prevent the fall of person or materials by providing suitable fencing or railing whose minimum height shall be one meter.
7. No floor or other part of the structure shall be so overloaded with debris or materials as to render it unsafe.
8. Workers employed on mixing & handling material such as asphalt cement mortar or concrete & lime mortar shall be provided with protective footwear & rubber hand gloves.
9. Those engaged in welding works shall be provided with welder's protective eye-shields & gloves.
10.
 - a) No paint containing lead or products shall be used except in the form of paste or readymade paint.
 - b) Suitable face masks should be supplied for use by the workers when the paint is applied in the form of spray or surface having lead paint dry rubbed & scrapped.
11. Overalls shall be supplied by the Contractor to the painter & adequate facilities shall be provided to enable the working painters to wash during the periods of cessation of work.
12. Hoisting machines & tackle used in the works. including their attachments, anchorage & supports shall be perfect condition.
13. The rope used in hoisting or lowering material or as a means of suspension shall be of durable quality & adequate strength & free from defect.

TECHNICAL SPECIFICATIONS FOR ELECTRICAL WORKS

General

The electrical Installation work shall be carried out in accordance with Indian Standard Code of Practice. It shall also be in conformity with the current Indian Electricity rules and regulations and requirements of the Local Electricity Supply Authority and Fire Insurance regulations so far as these become applicable to the installation. Electrical work in general shall be carried out as per following Guidelines of CPWD, PWD MAHARASHTRA Specifications.

General Specifications for Electrical Works (Part-I) Internal Work-2013, CPWD Amended /PWD MAHARASHTRA & Latest revision

General Specifications for Electrical Works (Part-II) External – 1995 CPWD/PWD MAHARASHTRA & Latest revision

General Specifications for Electrical Works (Part-III) LIFTS & Escalators –2003 CPWD/PWD MAHARASHTRA & Latest revision.

General Specifications for Electrical Works (Part-IV) Substation – 2013 CPWD/PWD MAHARASHTRA & Latest revision.

General Specifications for Electrical Works (Part-VII) D.G. Sets – 2013 CPWD/PWD MAHARASHTRA & Latest revision

General Specifications for Electrical Works (Part-VIII) Gas Based Fire Extinguishing System- 2013 CPWD/PWD MAHARASHTRA & Latest Revision.

Indian Electricity Act 2003 amended up to date.

National Electrical Code. 2017 amended up to date.

Indian Electricity Rule 1956 amended up to date.

National Building Code 2016 as amended up to date

Relevant IS standards

Surge protection devices shall be provided as per requirement and as per Standards. If any item required to make the building/ scheme habitable and functional, is not specifically mentioned in the scope of services, the same is deemed to be included within the scope of this tender and nothing extra shall be paid on this account.

SCOPE OF WORK includes: -

Supplying, installation, testing and commissioning of all internal & external electrical works including: -

- a) Removing & Refixing or Supply Installation Testing & Comissiong of DB
- b) Point wiring
- c) Circuit wiring / Sub mains wiring
- d) LV cabling / wiring (Telephone / Data / TV cabling etc.)

Conduiting for other services of all types power plugs, TV socket, RJ 45 Socket, RJ 11 Socket, DBs etc.

All necessary cabling between Main Panel to DBs (If Required) etc.

Earthing for DBs (if Required)- Can be Tap from Nearest Tapping point in Electrical Shaft.

The work shall be generally carried out in accordance with tender conditions and the following specification and rules.

PWD/CPWD General Specification for electrical work 2013 as amended up to date

PWD/CPWD General Specification for electrical work 2013 as amended up to date

Indian Electricity Act 2003 amended up to date.

National Electrical Code - 2017 amended up to date.

Indian Electricity Rule 1956 amended up to date.

National Building Code 2016 as amended up to date

1.2 GENERAL

- 1.2.1 The surface/recess PVC / steel conduit, LED luminaires and lighting controls including daylight/ occupancy sensors, fans, modular switch, sockets, DBs, LT switchgear, raceways, cable trays, earthing, TV cable wiring in surface/ recess PVC / steel conduit and as required. If any item required to make the building / scheme habitable, is not specifically mentioned in the scope of services, the same is deemed to be included within the scope of this tender and nothing extra shall be paid on this account. scope of work covers Supply, installation, testing and commissioning of complete Internal and External Electrical Works which includes wiring in

1.3 LIGHTING

A. General**1.3.1.1 Inclusions**

- 1.3.1.1.1 Furnish and install lighting fittings of the types indicated at each location as per various drawings.
- 1.3.1.1.2 All materials, accessories, and any other equipment necessary for the complete and proper installation of all lighting fittings shall be furnished by the Contractor.
- 1.3.1.1.3 Conformance: Fittings shall be supplied in strict accordance with the Contract Drawings and Specifications.
- 1.3.1.1.4 Specifications and scale drawings are intended to convey the salient features, function and character of the fittings only, and do not undertake to illustrate or set forth every item or detail necessary for the work.
- 1.3.1.1.5 Minor details, not usually indicated on the drawings nor specified, but that are necessary for the proper execution and completion of the fittings, shall be included, the same as if they were herein specified or indicated on the drawings.

1.3.1.2 Omissions:

- 1.3.1.2.1 The Architect/Consultant shall not be held responsible for the omission or absence of any detail, construction feature, etc. which may be required in the production of the fittings. The responsibility of accurately fabricating the fittings to the fulfillment of this specification rests with Contractor.

1.3.1.3 Submittals

- 1.3.1.3.1 Shop Drawings shall clearly indicate the fitting details used as reference in the development of the shop drawings and the name of the Project, Department, Architect and the Project Management Consultant.
- 1.3.1.3.2 The Contractor shall coordinate all his lighting fitting drawings with details to the Architectural, Structural, Electrical, Mechanical, and other related trades to assure a correct and efficient installation.
- 1.3.1.3.3 No variation from the general arrangement and details indicated on the drawings shall be made on the shop drawings unless required to suit the actual conditions on the premises, and then only with the acceptance of the Engineer in Charge. All variations must be clearly marked as such on drawings submitted for approval.
- 1.3.1.3.4 LED life span and luminaire Photometric Data: As per IESNA LM79 & IESNA LM80.

B. Samples

- A) After shop drawing review, and prior to release for manufacturing, the Contractor

shall furnish one sample of each fitting of the fitting schedule and contract drawings for which sample requirement is noted.

- B) Shipping: The samples shall be complete with specified lamps and compatible control gear, ready for hanging, energizing, and examining, and shall be submitted by the Contractor to the Architect/ PMC. These samples are not returnable, nor included in quantities listed for a project. No cost shall be paid towards the samples.
- C) Samples must be actual working unit of materials to be supplied.

C. Reference Standards

- a) Materials and installation shall be in accordance with the latest r revision of the International Electrical Code and any other applicable International and local codes and regulations.
- b) All equipment and accessories shall be supplied and installed to comply with the relevant IEC Standards or demonstrated equal approved Standards. All the light fixtures shall be with LED lamps with Green Building norm compliances.

D. Products

- c) All fittings, including lamps, shall be as per the approved Technical Data Sheets.

E. All fittings shall be completely pre-wired at the factory.

- d) Mounting Frames and Rings: If ceiling/wall system requires, each recessed and semi-recessed fitting shall be furnished with a mounting Frame or ring compatible with the ceiling/wall in which they are to be installed. The frames and rings shall be one piece or constructed with electrically welded butt joints, and of sufficient size and strength to sustain the weight of the fitting.
- e) Light leakage between ceiling/wall trims of recessed lighting equipment and the ceilings/walls shall not be accepted.
- f) In areas there in no wind draft, mounting shall be with arrangement of a hanger and a high-tensile wire rope with a choice of fixing accessories attached to it. This hanger shall be with self-locking fastener mechanism that shall secure the wire rope and also allowing adjustment of the installation height. In other areas, stirrups, brackets, threaded rods etc. with supplementary supporting members needed to mount lighting fittings to carrier channels or other suitable ceiling members shall be furnished and installed by the Contractor.
- g) Hardware: For steel and aluminum fittings, all screws, bolts, nuts and other

fastening and latching hardware shall be cadmium or equivalent plated. For stainless steel fittings, all hardware shall be stainless steel. For bronze fittings, all hardware shall be stainless steel or bronze.

- h) Adjustable Angle Fittings: Each lighting fitting which has a beam angle adjustment shall have reliable angle locking devices.
- i) Oval Beam Fittings: Each lighting fitting which has a lamp with an oval shape beam pattern shall contain lamp orientation locking devices to ensure that beam orientation is not disturbed during fitting lamp replacement or cleaning.
- j) Spread Lens Fittings: Each light fitting which has a spread lens shall contain lens orientation locking devices to ensure that lens orientation is not disturbed during future lamp replacement or cleaning.
- k) Specifications for General light fixtures
 - l) All light fixtures shall be LED having LM79 and LM80 certification from NABL accredited laboratory and relevant approved IES files for Dialux. Before dispatch of approved light fixtures, third party test shall be carried out by NABL accredited lab, and the test reports shall be submitted.
 - m) The Service Life of the fixture including driver/control gear should be minimum 50,000 burning hours.
 - n) The CRI of the fixture should be minimum 80 unless otherwise mentioned for both indoor applications and outdoor applications.
 - o) All light fixtures (internal/external) and drivers shall be BIS certified.
 - p) The THD should be less than 10%.
 - q) The housing of the indoor fixtures should be extruded aluminium/CRCA.
 - r) For outdoor fixtures the housing shall be of high pressure die cast aluminium.
 - s) The IP category should be IP20 or higher for indoor applications, IP65 or higher for outdoor applications and in basements. For underwater/ submersible fittings they shall be suitable to the requirement.
 - t) Surge Protection shall be provided conforming to relevant IS standards
 - u) / IEC 61643-II Class-2 & EN 61643-II Type-2.
 - v) The manufacturer's name/logo should be engraved/embossed on the housing/body or Name/Logo on aluminum plate labels or Name/logo printed on housing/body.
 - w) The warranty period on complete luminaire including driver/control gear, LED,

all accessories should be 5 years from the actual date of completion of work.

- x) The Power factor should be 0.95 or higher.
- y) Before execution, the contractor should submit the Lighting Lux level calculations from the supplier after selection of fixtures.
- z) The fixtures shall be selected as required as per Reflected Ceiling Plan.

F.

G. Specifications for Specialized light fixtures

H. Apart from the above, the following shall also be satisfied.

I.

J. The CRI of the fixtures used in should be minimum 90.

K.

L. The UGR (Unified Glare Rating) shall be 19 or less

M.

N. All fixtures shall be with prismatic diffuser except batten & outdoor fixtures. The diffuser for battens & outdoor light as per decision of Engg- In-charge.

O.

P. The number of fittings shall be provided to maintain required lux level as well as to maintain good aesthetics.

Q.

R. Number of fittings shall be provided on the basis of average illumination range for different areas mentioned in NBC 2016 subject to maximum LPD specified in CPWD internal specification 2013 & ECBC 2017 (ECBC+ Building). However, the decision of the Engineer-in-charge on the quantity of light fittings shall be final and binding.

S.

T. Internal Lighting Levels: Lighting shall be based on the average lighting level considerations as provided in NBC 2016. Where any particular area has not been defined in NBC the decision of the Engineer-in- charge shall be final and binding on the Contractor.

U.

V. Fans:

W.

X. All fans, including ceiling, exhaust, wall mount, pedestal and fresh air, shall be of BLDC only

Y. BLDC type 5 star rated Ceiling fans with stepped type 2 module electronic regulator on the switch board shall be provided in each cabin /room/ work areas/rooms of residential quarters as per prescribed norms. Fan regulators shall be 2 module type.

Z.

Internal & External Lighting Fixture Details

Color temperature of the light fixtures shall be decided area wise at the time of execution. All fittings proposed should be available in 3000K/4000K/5600K/6000K/6500K for indoor fixtures depending on the functional usage of the space concerned. The preferred CCT shall be combination of 4000K & 6000K for indoor spaces.

For outdoor fixtures the CCT shall be 6000K/6500K.

Color Temperature of fixtures used for façade lighting and landscape lighting shall be approved by the Engineer-in-charge/ Architect/PMC.

All the light fixtures used for facade application should be available with DMX/Ethernet controllable driver option.

Different types of fittings are required in different areas. Specifications of different type of fittings have been mentioned below to provide reference to the bidding parties on the design intent and the energy efficiency. These fixtures are for reference only. Any other fixture with specification mentioned below or better out of the mentioned makes may be used subject to approval from Engineer-In-charge/architect/PMC.

CABLE TAGS

Cable tags shall be made out of 2mm thick aluminium sheets. Each tag shall be 2" in dia or 3" x 3" square with one hole of 2.5mm dia, 6 mm below the

periphery, or as approved by Consultant. Cable designations shall be punched with letters / number punches and the tags are to be tied to cables with piano wires of approved quality & size. Tags shall be tied inside the panels beyond the glanding as well as above the glands at cable entries. Along trays tags are to be tied at all bends. On straight lengths, tags shall be provided at every 5 meters.

Cables shall be secured to cable trays with 3mm thick x 25mm wide aluminium strips/suitable GI clamp, or as approved by Consultant, at 1000 mm intervals and screwed by means of rust proof screws, washers and bolts, of adequate but not excessive lengths. Cable trays for horizontal runs suspended from the ceiling will be supported with mild steel straps or brackets, at 1000 mm intervals and the overall tray arrangement shall be of a rigid construction. External cabling route marker with GI plate marked with "DANGER 1.1 KV CABLE" with 1 meter long GI angle iron grouting bracket including 1:3:6 ratio cement concrete base block of minimum size 200 x 200 x 350 mm to be provided or as approved by Elect. Supply Company.

CABLING FOR TV SYSTEM:

The Co-axial shall be of wide band type with operation capability upto 500 MHz.

The ageing resistance of the co-axial cable shall comply with DIN 47252. Part 2, i.e. max. 5% increase in attenuation at 200 MHz measured by artificial ageing (14 days at 80 deg.C).

Cables shall meet or exceed the following specifications.

		RG-6 MATV Type	RG-11 MATV Type
a.	Centre Conductor	18 AWG coated steel 18% conductivity	12AWG copper coated steel 18% conductivity.
b.	Dielectric	Foam polyethylene Nom.Dia. 0.180	Foam polyethylene Nom.Dia. 0.280
c.	Shield	Foil – 0.003 Al. Tape Braid –34 AWG 4 end Al. 60% coverage dia. 0.212	Foil – 0.003 Al. Tape Braid –34 AWG 6 end Al. 60% coverage dia. 0.314
d.	Jacket	Black PVC flame retardant dia. Over jacket 0.272 ±0.008 Min. spot 0.023	Black PVC flame retardant dia. Over jacket 0.405 ± 0.010 Min spot 0.032.

Electrical Properties

a.	Dielectric Strength	Conductor to shield 2000VDC	Conductor to shield 1500VDC
b.	Capacitance	16.2 PF/Ft. Nom.	16.2 PF/Ft. Nom.
c.	Impedance	75.0 ± 3.0 ohms	75.0 ± 3.0 ohms
d.	Attenuation	DB/100 ft.	DB/100 ft.
		0.65 DB at 5MHz	0.35 DB at 5 MHz
		0.76 DB at 10MHz	0.94 DB at 50MHz
		0.96 DB at 20 MHz	1.28 DB at 100 MHz
		1.98 DB at 100	1.78 DB at 200 MHz

		at	MHz	
		4.21 DB	450	2.20 DB at 300 MHz
		at	MHz	
		4.80 Db	550	2.75 Db at 450 MHz
		at	MHz	
		6.49 DB	1000	4.30 DB at 1000 MHz
		at	MHz	
e.	Velocity	82.0% Nom		92.0% Nom
f.	DCR	35.47 ohms/1000 ft.		14.29 ohms/1000 ft.
g.	SRL	30 DB (10 MHz to 300 MHz)		20 DB (5 to 450 MHz)

Directional Couplers

These shall be of Ultra-Wideband type and of hybrid circuit design.

These shall have a near flat frequency response over the entire operating range.

These shall have an aluminium cast housing for high frequency radiation resistance.

These shall have 'F' sockets for all input, output and branch ports.

The Tap offs shall be available in one way, two way and four way configurations.

The splitters shall be available in two way, three way and four way configurations.

The Tap offs shall be available in different tap values ranging from 11 dB, 15 dB, 20 dB, 25 dB and 30 dB.

These shall meet or exceed the following specifications:

Tap offs	Splitters		
a) Tap Loss	11-30 dB	----	
b) Through Loss	0.5-4 dB	4.0 – 8.0 dB	
c) Isolation		>22 dB	> 22 dB
d) Screening Factor	> 50 dB	> 50 Db	

FIRE ALARM & PA SYSTEM

GENERAL DESCRIPTION:

Scope of the Fire Alarm System & PA System shall be Removing & Refixing of Existing Smoke Detector, Speaker & Supply Installation Testing & Commissioning of as per Additional Requirement.

All Plant furnished shall be new and the latest state-of-the-art, products of a single Manufacturer engaged in the manufacturing of analog fire detection devices for at least 5 years & PA System.

DRAWINGS & TECHNICAL SUBMITTALS

CERTIFICATION:

Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of the installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

WARRANTY:

All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal bid

LIST OF APPROVED MAKES

LIST OF APPROVED MAKE FOR MATERIALS (CIVIL & INTERIOR WORKS)		
SR. NO.	MATERIAL	APPROVED MAKE
1	CEMENT	AMBUJA / BIRLA / ULTRATECH / ACC / JK
2	WHITE CEMENT	BIRLA CEMENT / JK WHITE / ULTRATECH
3	CONCRETE ADMIXTURE	SIKA / FOSROC / MAPAI / BASF / PIDILITE
4	NON SHRINK GROUT	SIKA / FOSROC / MAPAI / BASF / PIDILITE
5	BONDING AGENT	SIKA / FOSROC / MAPAI / BASF / PIDILITE
6	SECOND CLASS BURNT BRICKS	GOOD QUALITY LOCALLY AVAILABLE AS PER RELEVANT I.S. CODES
7	FLY ASH BRICKS	ANECO / SRI DURGA BHAVANI / APEX
8	AUCTOCLAVED BLOCKS (AAC BLOCKS)	SIPOREX / ULTRATECH / AEROCON
9	AAC BLOCKS ADHESIVE	ULTRATECH / MYK / MAGICRETE
10	DRY WALL SYSTEM	SAINT GOBAIN / USG BORAL / HIL
11	SAND	GUJARAT SAND OR EQUIVALENT AS APPROVED BY THE ARCHITECT / CLIENT / PMC
12	GYPSUM PLASTER	JK / GYPROC / ULTRATECH
13	POP	BEST QUALITY APPROVED BY ARCHITECT / CLIENT / PMC
14	WALL PUTTY	JK / BIRLA / SAINT GOBAIN
15	PLASTIC / ROYAL EMULSION PAINT	BERGER / NEROLAC / ASIAN / ICI
16	EXTERIOR PAINT	BERGER / NEROLAC / ASIAN / ICI
17	TEXTURED PAINT	SAN MARCO / OIKAS / JOTUN / SPECTRUM
18	EPOXY PAINT	NOBLE / NEROLAC / ASIAN / BERGER
19	PU PAINT	BERGER / NEROLAC / ASIAN / ICI
20	OIL PAINT	BERGER / NEROLAC / ASIAN / ICI
21	OBD	BERGER / NEROLAC / ASIAN / ICI
22	WATERPROOF CEMENT PAINT	SNOWCEM / ASIAN / BERGER
23	WOOD PRIMER	BERGER / NEROLAC / ASIAN / ICI

24	WOOD FINISH (MELAMINE & PU POLISH)	BERGER / NEROLAC / ASIAN / ICI
25	STEEL PRIMER	BERGER / NEROLAC / ASIAN / ICI
26	VITRIFIED TILES	SOMANY / KAJARIA / RAK / NITCO / SIMPOLO
27	CERAMIC TILES	SOMANY / KAJARIA / RAK / NITCO / SIMPOLO
28	GRANITE	BEST QUALITY APPROVED BY ARCHITECT / CLIENT
29	ITALIAN MARBLE	BEST QUALITY APPROVED BY ARCHITECT / CLIENT
30	CARPET FLOORING	TUNTEX / FLOTEX / INTERFACE / FORBO / GALEECHA
31	ARTIFICIAL / QUARTZ MARBLE	CMC / KALINGA / NITCO
32	NATURAL STONE	BEST QUALITY APPROVED BY ARCHITECT / CLIENT
33	VINLY FLOORING	TARKETT / FORBO / RESPONSIVE
34	TILES ADHESIVE	BAL ENDURA / PIDILITE / LATICRETE / MAPEI
35	STONE ADHESIVE	BAL ENDURA / PIDILITE / LATICRETE / MAPEI
36	STONE SEALER	BAL ENDURA / PIDILITE / LATICRETE / MAPEI
37	PU FLOORING	BASF / ARDEX / FOSROC / PIDILITE
38	GYPSUM CEILING	SAINT GOBAIN / ARMSTRONG / INDIA GYPSUM
39	ANTI BACTERIAL METAL CEILING	HUNTER DOUGLAS / DURLUM / ARMSTRONG
40	BAFFLE CEILING	HUNTER DOUGLAS / ARMSTRONG / DURLUM
41	PVC FALSE CEILING	VOX / KIYAN / PRINCE / PARE
42	STRETCH FABRIC CEILING	ORANGE / CLIPSO / SAINT GOBAIN
43	WATERPROOFING TREATMENT CHEMICALS	PIDILITE / FOSROC / ASIAN PAINTS / TIKIDAN
44	DOOR (BWP GRADE)	GREENLAM / CENTURY / DURO
45	FLUSH DOOR	GREENLAM / CENTURY / TUFWUD
46	DOOR HARDWARE/PATCH FITTING,FLOOR SPRING	DORMA / HAFFLE / GEZE / HETTICH
47	DOOR FRAME (BEST QUALITY)	BEST QUALITY TEAKWOOD AS APPROVED BY CONSULTANT
48	FIRE RATED WOODEN DOOR	TUFWUD / NAVAIR / ECOTONE / TRUDOOR

49	FIRE RATED METAL DOOR	SHAKTI HORMANN / NAVAIR / METAFLEX
50	CLEAR GLASS	SAINT GOBAIN / ASAHI / FG
51	FIRE RATED GLASS	SAINT GOBAIN / ASAHI / SCHOTT
52	MILD STEEL	JINDAL / JSW / TATA / SAIL
53	SS RAILING	Q-RAILING / D-LINE / JINDAL
54	STRUCTURAL GLAZING (GLASS)	SAINT GOBAIN / ASAHI / FG
55	SLLICON SEALANT	GE / DOW CORNING / PIDILITE / WACKER
56	MS SECTIONS (PIPE/BOXES)	TATA / SAIL / JSW
57	PVB LAMINATION	DUPONT / DURASAFE / EVERLAM
58	SGP LAMINATION	DUPONT / DURASAFE / EVERLAM
59	WEATHER SEALENT	DOWCORNING / PIDILITE / DR. FIXIT
60	ANCHOR FASTENERS	HILTI / FISCHER / BOSCH
61	ANCHOR CHANNELS	HILTI / HALFEN / BOSCH
62	POWDER COATING	JOTUN / ASIAN / BERGER / AKZONOBEL
63	PVDF COATING	VALSPAR / AKZONOBEL / JOTUN
64	SPACER TAPE	NORTON / BOW / 3M
65	SMOKE SEAL	HILTI / SIKA / 3M
66	ANTI-TERMITE TREATMENT	PCI / GODREJ / EXPRESS / BAYER
67	CORNER GUARD	WINDOWTECH / DECOREX / RS SALES
68	TOILET CUBICALs AND URINAL PARTITIONS	MERINO / GREENLAM / S CUBE / CUBICLES INDIA
69	GRAB BAR	GEZE / DORMA / HINDWARE
70	CORE CUTTING	HILTI / BOSCH / CANNON
71	SEASONED TEAKWOOD	BEST QUALITY APPROVED BY ARCHITECTS / CLIENT
72	PLYWOOD	GREENPLY / CENTURY PLY / MERINO / DURO / REGENCY
73	VENEER (GURJAN PLY BASE)	GREENPLY / CENTURY PLY / DURAIN / ARCHID
74	LAMINATE	GREENLAM / CENTURY MICA / EURO / ROYAL TOUCH
75	PLY BOARD	GREENLAM / CENTURY / DURO / ARCHID/REGENCY

76	WOOD ADHESIVE	FEVICOL / 3M / SIKA / THERMOSHIELD
77	NAILS, SCEWS, BOLTS	GKW / KUNDAN / PRIYA / ATUL / AXIL / BOUN
78	MDF BOARD	GREEN / ANCHOR / ARCHID / MERINO
79	FROSTED FILM	3M / LLUMAR / LG
80	MODULAR FURNITURE LAMINATE	CENTURY / MERINO / GREEN
81	LACQUERED GLASS	SAINT GOBAIN / ASAHI / PILKINGTON
82	WALL PAPER	MARSHALLS / MURASPEC / ELEMENTO
83	ACRYLIC SOLID SURFACE CORIAN	LG / DUPONT / HANEX
84	VINYL GRAPHICS	FORBO / TARKETT / DLW / RESPONSIVE / 3M
85	OFFICE CHAIRS	FEATHERLITE / GODREJ / HOF / DURIAN
86	LOOSE FURNITURE	STANLEY / TESSER / D FURN
87	RECLINER CHAIRS / OUTDOOR STADIUM CHAIRS	PENWORKERS
	NOTES:-	
1	The contractor should one of the approved makes as approved by the engineer- in-charge. If a make for any item is not provided than the contractor shall provide technical data sheets for those makes along with rate analysis for that item and get it approved from architect / client / pmc prior to use without any extra claim.	
2	In case of different quality/ pattern of make, the pattern/ quality shall be approved engineer-in- charge	
3	If any major equipment is using a small component of make other than that given as a standard component with the equipment, the same shall be accepted subject to approval of Architect / Engineer-in-charge	

LIST OF APPROVED MAKE FOR MATERIALS (MEP WORKS)		
SR. NO.	MATERIAL	APPROVED MAKE
PLUMBING WORKS		
1	C PVC PIPES AND FITTINGS	ASTRAL / SUPREME / ASHIRWAD / PRINCE
2	U PVC PIPES AND FITTINGS	ASTRAL / SUPREME / ASHIRWAD / PRINCE
3	CI HUBLESS PIPES AND FITTINGS	ELECTROSTEEL / NECO / KESORAM
4	VALVES (BALL, BUTTERFLY, AIR VENT VALVE)	ADVANCE / VTM UTAM / C & R / LEHRY
5	CP & SANITARY FITTINGS (PRESIDENT BOX)	KOHLER / TOTO / VITRA / ROKA
6	CP & SANITARY FITTINGS (CORPORATE BOXES & PRESS BOX)	JAQUAR / GROHE / CERA
7	CP & SANITARY FITTINGS (COMMON TOILETS)	JAQUAR / HINDWARE / CERA
ELECTRICAL WORKS		
	ELECTRICAL WORKS	
1	CABLES (L.T.) FRLSH	FINOLEX / POLYCAB / KEI / RR KABEL / HAVELLS
2	MCB / RCCB / MCCB IN DB / DISTRIBUTION BOARD.	LEGRAND / HAGER / SCHNEIDER / HAVELLS
3	FLANGE TYPE GLAND	DOWELS / HMI / COMET
4	PVC GLANDS	HENSEL OR EQUIVALENT
5	LED / LIGHTING FIXTURES & LAMPS	ABBY LIGHTING / PHILIPS / HAVELLS
6	CEILING FANS / WALL FAN / AIR CIRCULATOR / PEDASTAL FANS	CROMPTON (HIGH BREEZE) / BAJAJ (KASSELS 50 ISI) / BAJAJ(EXCEL) / HAVELLS / USHA / ORIENT / ATOMBERG
7	EXHAUST FANS	KIMCO / MICO / AIRFLOW / CROMPTION / HAVELLS / C.G.
8	INDUSTRIAL SOCKETS (METAL CLAD)/ ABS PLASTIC INDUSTRIAL SOCKETS/ 1 PHASE & 3 PHASE COMBINED	LEGRAND / SCHNEIDER / HENSEL / L&T
9	TELEPHONE CABLES	FINOLEX / DELTON / DLINK / POLYCAB / FINOLEX
10	TELEPHONE SOCKETS	LEGRAND / MK / HP / CISCO / SCHINDER
11	PVC CONDUIT & ACCESSORIES	PRECISION / DIAMOND / CIRCLE ARK

12	CASING CAPING	MODI / PRECISION / DIAMOND / CIRCLE ARK
13	WIRES (FRLSH ONLY) FOR WIRING	RR KABEL / POLYCAB / HAVELLS / KEI / AVOCAB
14	MODULAR SWITCH/PLATES/SOCKETS/BOX /CELLING ROSE/HOLDER & ACCESSORIES (Premium Series)	LEGRAND / WIPRO / L&T MK / SCHINDER / CRABTREE-HAVELLS / PRECISION /GM (TO BE MATCHED WITH EXISTING)
15	CABLE TRAY	ELCON / ASIAN ANCILIARY CORPORATION / LEGRAND / UNIVERSAL / PROFAB / AKG / SS INDUSTRIES PUNE
16	DATA CABLE/OUTLET SOCKET/ AND ACCESSERIES	D-LINK / AVAYA / LEGRAND / POLYCAB / FINOLEX (TO BE MATCHED WITH EXISTING)
	PUBLIC ADDRESS SYSTEM	
17	MIC	ATEIS / BOSCH / HONEYWELL / SIEMENS
18	SPEAKERS	ATEIS / BOSCH / HONEYWELL / SIEMENS (TO BE MATCH WITH EXISTING MAKE)
19	VOLUME CONTROLLERS	ATEIS/BOSCH/HONEYWELL/SIEMENS
	CABLE AND CONDUIT	
20	FRLSHZ ARMoured CABLE	POLYCAB / R.R. KABEL / KEI (TO BE MATCH WITH EXISTING)
21	PVC CONDUIT	PRECISION / MODI / DIAMOND
22	CABLE TRAY	PATNYSYS / RITE / SS INDUSTRIES / LEGRAND
	NETWORKING SYSTEM	
23	RG-6 / RG-11 CABLE	BELDON / COMSCOPE (TO BE MATCHED WITH EXISTING)
24	MS/ FRLS PVC CONDUIT	PRECISION / KEC OR EQUIVALENT
	FIRE ALARM SYSTEM	
25	SMOKE DETECTOR / MULTISENSOR DETECTOR / MULTICRITERIA DETECTOR	TO BE MATCHED WITH EXISTING SYSTEM
26	HEAT DETECTOR	TO BE MATCHED WITH EXISTING SYSTEM
27	STROBE CUM SOUNDER	TO BE MATCHED WITH EXISTING SYSTEM
28	MANUAL CALL POINTS	TO BE MATCHED WITH EXISTING SYSTEM
29	ADDRESSABLE MODULES	TO BE MATCHED WITH EXISTING SYSTEM
30	CONTROL MODULES	TO BE MATCHED WITH EXISTING SYSTEM
31	RESPONSE INDICATOR	TO BE MATCHED WITH EXISTING SYSTEM

32	FIRE CABLES FRLSHZ	TO BE MATCHED WITH EXISTING SYSTEM
	NOTES:-	
1	The contractor should one of the approved makes as approved by the engineer- in-charge. If a make for any item is not provided than the contractor shall provide technical data sheets for those makes along with rate analysis for that item and get it approved from architect / client / pmc prior to use without any extra claim.	
2	In case of different quality/ pattern of make, the pattern/ quality shall be approved engineer-in- charge	
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