

TECHNICAL SPECIFICATIONS

Codes and Standards to be followed

Entire Water supply, sanitary, rain water harvesting and drainage system has been designed as per NBC standards.

Following standard & guidelines is adopted while designing the PHE system:-

1. National Building Code of India (NBC) 2016
2. Uniform Plumbing Code of India
3. Prevailing Rules and Regulations of Kerala State Pollution Control Board
4. SP 35 - Handbook on water supply and Drainage.
5. Manual on Water supply and treatment.
6. Manual on sewerage and sewage treatment.
7. Relevant BIS, as detailed in the end of this document

I. GENERAL

The drawings, specification and bill of quantities, attached, are the essential parts of this tender and should be treated as complementary to each other. Any work or details shown in one and not mentioned in others, by over sight or by any other reasons, should be treated as the part of the Contract, as if it is occurring in all other complementary documents. The higher specifications seen only, in any of the above documents will over rule the specifications in other complementary documents. This clause is applicable for any related discrepancies in the General Conditions of Contract.

All the equipment, plant, machineries, materials and total work shall be to the approval of the Architect / Consultant and to the entire satisfaction of the Client / Engineer-In-Charge. The contractor has to submit all relevant details of equipment, plant, machineries and materials, required, in Prescribed Form / Format, supported by samples (as far as possible), catalogues / brochures, technical details, performance curves, test / confirmation certificates from the manufacturer(s), as soon as the work is awarded, and get it approved by the consultant and client, before procuring the equipment, machineries and materials.

The proposal for equipment, plant, machineries and materials shall be from the Listed Manufacturers / Brands, detailed / specified at the end of this section. At the same time, the system contractor has to adhere to the Tender / Technical Specifications rather than listed Manufacturers / Brands. Merely the name of a Manufacturer / Brand in the above list will not relieve the contractor from adhering with tender / technical specifications.

For an item only one Manufacturer / Brand will be approved for the project. Alternative proposal, if any, due to any reason, for any item, shall strictly to the approval of Client and Consultant Minimum 3 complete sets of material submittals are required for approval.

1.1 WORKING DRAWINGS

The Tender Drawings are only for guidance. The contractor has to prepare and submit detailed working drawings, necessary to carry out the work, as per latest IS Codes, latest amended rules in Part: 9, of NBC of India; 2016, other prevailing rules and regulations, and site conditions.

- With the location, levels and spacing of Sanitary Fixtures, Tap Fit Fittings, Water Transfer & Distribution Pumps / Sets, other Plant, Machineries, Equipment etc.
- Rising and Falling of Pipe Works, Routings, Levels and Gradient / Slope of above ground (concealed and exposed) & underground water supply and drainage pipe works and installation details for all above items.
- Head and Hydraulic Calculations and of all required Water and Waste Water Transfer / Distribution Pumps (Sets) and Sizing of Connected Pipe Work
- Maximum and Minimum Pressure Rating of In-Built Float / Control Valve for EWC Cistern and how it will be managed.
- Complete details thro. Plans, Schematic Drawings, Sections, Isometric View etc, as per requirement.

All the Working Drawings shall be submitted, for the approval of the Client, Architect and Engineer - In - Charge / Consultant, within two months, from the date of agreement for approval. The contractor will be permitted to start the work at site only after getting approval of the working drawings. The work shall be, as per approved working drawings, specifications, latest IS Codes, other Prevailing rules and regulations and site conditions. All the levels shall be as per requirement and site conditions. All the Plumbing Service Lines shall be drawn in approved Colors specified in, nationally / internationally accepted Color Codes (Eg. Treated Water: Green, Flushing Water: Purple etc.) All measurements and letters (writing) shall be in readable sizes.

1.2 AS-BUILT / FITTED DRAWINGS

The As- Built / Fitted / Installed Drawings to be prepared in details with finally installed / fitted / built and commissioned plant machineries equipment and materials etc. with all required details, as detailed in the section for As built drawings shall be submitted after completion of work for approval from Consultant/PMC. 3 Sets of Hard Copies Finally Approved as Built / Fitted Drawings in Color Prints along with Soft Copies in CD Rom to submitted.

II. TECHNICAL SPECIFICATIONS FOR PLANT, EQUIPMENT & MATERIALS

2.1 SANITARY FIXTURES AND TAP (CP) FITTINGS

Rates for each items under specification shall include, supply, fix at site in position, test and commission Concerned Sanitary Fixtures complete with necessary fixing accessories such as flush pipes, stainless steel/CP brass screws, rag bolts, expansion sleeves, nuts, washers, brackets and any other fixing arrangements required, as per manufacturer's instructions and consumables required . The rate shall also be inclusive of cutting holes, chases etc. and making good the walls, floors etc, wherever required. Core cutting in RCC structures shall be measured separately.

2.2 EUROPEAN WATER CLOSET

Wall mounting type water closet shall be white glazed vitreous china extended wall mounted type, as per IS: 2556, Water Closet with 3/6 LPF Dual, Prefer Rimless wall hung WC with PP Soft close seat cover, hinges, accessories set size:780x370x690 mm or as per approved model and shape, including cistern fittings, soft close seat cover, bolts, nuts, washers, expansion/ rawl sleeves, gasket etc. complete. The float (control) valve for flush tank cistern shall be capable of with stand 5.0 Bar working pressure. The contractor has to submit official confirmation letter for this working pressure from the manufacturer in their letter head. This confirmation is to be submitted along with material submission for flush tank set, for approval.

If any other modification or addition of any equipment is required to achieve the above working pressure; that shall be with prior approval from the Engineer - In - Charge and shall be without any cost variation.

2.3 TOILET FOR DISABLED

Disabled toilet shall be a complete set, including white glazed vitreous china Floor/Wall mounted water closet with 3/6 LPF dual white glazed vitreous flushing cistern, lid, soft close seat cover etc., Wash Basin, Faucet/Tap with spatula lever and with 1 set of hinged arm, 760mm. long, 4 set of Grab Rail, each of 600mm. long, and with all necessary accessories and fixed with Brackets Expansion Sleeves, Stainless Steel/ Brass Bolts/Screws, Nuts, Washers etc., including cutting and making good the walls and floors wherever required, including cutting and making good the walls and floors wherever required.

The float (control) valve for flush tank cistern shall be capable of with stand 5.0 bar working pressure. The contractor has to submit official confirmation letter for this working pressure from the manufacturer in their letter head. This confirmation is to be submitted along with material submission for EWC set, for approval.

If any other modification or addition of any equipment is required to achieve the above working pressure; that shall be with prior approval from the Engineer - In - Charge and shall be without any cost variation.

2.4 WASH BASIN

Wash basins shall be White Glazed Vitreous China Counter Top / Bottom, Wall Hung, Corner type, etc. as per the approved make of material list and final approval of the client, complete with C.P. Waste Couplings, and C.P. Brass chain with rubber plug etc.

2.5 URINAL

Urinals shall be white vitreous china battery based infrared sensor operated urinal of approx. size 610 x 390 x 370 mm having pre & post flushing with water (250 ml & 500 ml consumption), having water inlet from back side, including fixing to wall with suitable brackets all as per manufacturers specification and direction of Engineer-in-charge.

2.6 STAINLESS STEEL SINK

Kitchen Sink shall be Stainless steel A ISI 304 (18/8) Kitchen sink with CI brackets and stainless steel plug 40mm, waste coupling including painting of fittings and brackets.

2.7 BATH ROOM / TOILET ACCESSORIES

Bath Room/Toilet accessories such as Towel rail, Towel ring, Robe hook, Toilet paper holder, Soap dispenser, Hand drier etc. Tentative Schedule for Toilet accessories

- i. Towel Rail : In all Shower Rooms / Area.
- ii. Towel Ring : Nearby Wash Basins.
- iii. Robe Hook : In all Toilet Cubicles
- iv. Toilet Paper Holder : Nearby EWC
- v. Soap Dispenser : Nearby Wash Basins.
- vi. Mirror : Above Wash Basins.

The above Schedule is tentative only and shall change as per final architectural/interior design/ requirement. Final Quantities shall be measured in numbers of unit as per final requirement at site. Rates for each item under specification shall include fix at site in position and commission, concerned accessories complete with connected fittings, supplied by the client and the rate shall be inclusive of supply of fixing accessories such as Stainless Steel / CP brass screws, bolts, nuts, washers, brackets and any other fixing arrangements required, as per manufacturer's instructions and consumables required. The rate shall also be inclusive of cutting holes, chases etc. and making good the walls, floors etc, wherever required.

2.8 TAP (CP) FITTINGS AND ACCESSORIES.

All Tap fittings shall be chromium plated, with necessary fixing accessories.

- i. Pillar Tap for Wash Basins shall be 15mm. CP Pillar Tap (Strictly Quarter turn Type

- with Min 50mm Length Spatula Lever), Aerator for Cold & Hot Water Supply (overall dimensions: 115 x 120mm. or equal) including all other necessary accessories.
- ii. C.P. Brass concealed valve with exposed part for Cold Bath only shall be of Commercial Range from reputed manufacturers, complete with Concealed Valve & Exposed Control Unit complete set including all necessary accessories.
 - iii. C.P. Shower Set, for Cold and Hot Water Bath shall be of Commercial Range, complete with Concealed Bath Mixer Exposed Control, Unit Head Shower, Shower Arm etc, complete set, including all necessary accessories.
 - iv. Single Lever Surgical Purpose Elbow Action Sink Mixer with aerator Extended Operating Lever, Connecting legs & wall flanges, 15mm. nominal bore including all necessary accessories.
 - v. C.P. Long Body Tap with Aerator type, both Cold & Hot Water Supply shall be of 15mm. nominal bore, 177mm. long for Toilets, with wall flanges and all other necessary accessories, all as per manufacturer's instructions and to the approval of the Engineer-in-charge
 - vi. Health Faucet shall be of Durable and Long lasting with 15mm. CP Braided Hose, Hook and all other necessary accessories, all as per manufacturer's instructions and to the approval of the Engineer-in-charge. The offered rate for the unit shall be inclusive above braided flexible hose connectors.
 - vii. C.P. ABS Body P-Trap 32mm. for Wash Basins and 40mm. PP for Laboratory Kitchen Sink shall be with threaded union connections, wall flanges and all other necessary accessories.
 - viii. C.P. Brass Angle Valve shall be Durable and Long Lasting, approved quality conforming to IS: 8931 (a) 15 mm nominal bore.
 - ix. Heavy Duty Flexible Braided Connectors shall be of 15mm. nominal bore, 450mm. long with higher thermal stability up to 100°C for hot and cold water, for EWC Cistern, Wash basin, Health faucet, Geysers etc.,
 - x. All other Accessories such Waste Couplings etc. shall be of Chrome Plated. CP Items will be measured in numbers of unit.

All CP Fittings shall be of Standard Range in all respect and strictly to the approval of Client / Engineer-In-Charge. Rates for each items under specification shall include supply, fix at site in position, test and commission, Concerned Fittings complete inclusive of supply of Braided connectors, stainless steel/CP brass screws, bolts, nuts, washers, brackets and any other fixing arrangements required, as per manufacturer's instructions and consumables required. The rate shall also be inclusive of cutting holes, chases etc. and making good the walls, floors etc, wherever required.

III. DRAINAGE SYSTEMS

There shall be separate Piping System for Soil, Toilet / Bath Room & General Waste, Hospital Waste and Laundry Waste Drainage, as detailed in the tender drawings. All materials shall be new and of the best quality conforming to specifications. Contractor

should study the soil, waste and vent systems drawings and site plan drawings thoroughly, for getting a clear view of the proposed system. All Pipes shall be cut, cleaned and jointed (pipes together and pipes and fittings) in a neat manner, as per manufacturer's instructions and to the approval of consultants. All pipes shall be fixed in position, at site, as per details in the approved working drawings, with specified gradient and spacing. The spacing for pipe supports shall be as detailed in the drawings. Pipe work shall be fixed in a neat manner as to provide easy accessibility for repair and maintenance and shall not cause obstruction in shafts, passages etc. The vertical risers shall be parallel to walls and columns and shall be straight and plumb. The item 'Pipe Work' shall be inclusive of supply, fix at site (concealed in walls, RCC structure, ceiling voids etc. and exposed, horizontally and vertically, on walls, roof slabs, in ducts etc. and laying in underground, with appropriate pipe clamps, pipe supports, hanging supports, fasteners, concrete supports, thrust blocks etc), water / gravity testing, anti corrosive and weatherproof protective coatings and encasing/wrapping, as per requirements, and commissioning.

Rates for Pipe Work will be measured in unit rate per linear meters and inclusive of Wastage of Pipes, all Fittings, such as Elbows, Tees, Y-Joints, Reducers, Sockets, Flanges, Boss Connectors, as per requirement, Threaded End Caps, Solvent Welded End Caps (as per requirement), Pipe Supports, Clamps, Expansion Joints, Bolts, Washers, Nuts etc, as per requirement and site conditions.

The Prices shall also inclusive of providing higher sizes of Sleeves/Opening, on walls, roof slabs, Columns, in ducts etc, in advance, wherever required, and closing the gap between the pipes (after testing of the pipe work) and sleeves/openings with approved 2 Hr. Fire Rated Sealant or Foam, to the approval of the Client / Engineer-In-Charge.

The rate for concealed pipe work shall be inclusive of cutting, chasing drilling etc. through all types of walls /floors and finishing for all services crossings, including sealing, Fire proofing with approved fire resistant materials, providing sleeve, cover plates, making good structure and finishes to an approved standard etc. in a neat manner to the approval of Engineer - in - Charge.

Core cutting in RCC Structures, as per requirement shall be measured separately. Exposed pipe work shall be fixed on walls, roof slabs, columns etc. with approved G.I. Supporting Systems consisting of slotted rails, U-clamps, saddle clamps, fasteners, hanging rods, bolts washers, nuts etc, as per requirement, in a neat manner, to the approval of Consultant and PMC. The contractor shall be responsible for the selection and usage of above clamps, supports, brackets, fasteners etc. All Fittings shall be from the same Manufacturer for approved Pipes and of the required degree of curvature with or without access door as required in the approved drawings.

45 Degree Elbows and Y-Joints are only permitted to use in all Drainage Lines.

Clean Outs and Roding Points shall be provided at the beginning of a new junction, and as

per details in the approved working drawings. Since the Rates for Drainage Pipe Work shall be inclusive of all required Fittings, there shall no separate rate for Roding Points and Floor Clean Outs. However; Floor Clean Covers are measured separately. Anti syphonic pipes shall be provided to the soil stack fixed at the outer walls. Contractor shall provide all sleeves, openings, hangers, and inserts during the construction. He shall provide the necessary information to the building contractor for making such provisions in the structure necessary. All damages shall be made good to restore the surfaces. The AHU/FAHU/FCU drain pipes shall be taken to the nearest rainwater down corner.

All the drainage pipe work after installation shall be water/gravity tested, by filling with water, in parts or as a whole, for 24 hours, as instructed by the Engineer - in - Charge and System consultant and as when demanded by the client and consultant. All openings and connections shall be suitably closed/plugged before filling with water. The pipe work, as a whole, shall be once again being tested for a minimum period of 24 hours, before commissioning of the total Systems. All Cutting, chasing and drilled/cut holes in the floor slabs for fixing sanitary fixtures, accessories, floor traps, concealed traps and drainage connections for the same should be made thoroughly water tight, along with the floor slab and sunken area, by advanced and latest technology for water proofing.

3.1. PIPE WORK FOR SOIL AND WASTE

Soil, Waste, Rain Water (SWR) (except for Drainage Pipe Work inside the Hospital Building) and Vent Piping System shall be with uPVC Pipes and Fittings. All Concealed Pipe work for SWR, in RCC / Block Walls, shall be with uPVC Pipes 6Kg/Cm² (IS: 4985) and injection moulded PVC fittings (IS: 7834). All exposed Drainage Pipe Work (except for Drainage Pipe Work inside the Hospital Building), above 63mm. OD shall be with uPVC SWR, conforming to IS: 13592, Type-B, Solvent Welded Type Pipes and SWR Solvent Welded Type Fittings. Joining/fixing all above pipes and fittings shall be with heavy duty uPVC solvent cement/adhesive, from the same manufacturer for pipes and fittings. All jointing shall be strictly as per manufacturer's instructions. Curing time for adhesive joints shall be 24 hours and pipe work will be permitted to use only after 24 hours. Pipes for Drainage Vertical Stacks shall be of Ring Fit uPVC (SWR), with rubber gaskets over sockets, conforming to IS 13592: 1992, Type-B. Fittings shall be SWR Molded fittings, conforming to IS 14735: 1999, with ring seal adaptors over sockets, conforming to IS 5382. Approved lubricant is advisable for fixing/joining pipes and fittings.

3.2. DRAINAGE PIPE WORK FOR HIGHER TEMPERATURE WASTE WATER FROM EQUIPMENT

Pipe Work shall be with Cast Iron (Centrifugally Cast) Pipes and Fittings to IS: 3989 such as bends, tees, couplers, Y-junctions, reducers, adaptors, sockets, end plugs, Floor/P-traps etc. jointed with Drip Seal. The Pipe Work shall be fixed in position with clamps, fasteners, masonry supports etc, as per requirement, including cutting, chasing, drilling etc, in Block

Walls etc, wherever required and making good walls, floors, duct etc. Considering the ease of Installation, the system contractor can use Cast Iron Hubless Pipes and Fittings, as per IS: 15905 / ISO: 694, instead of Normal C I Pipe Work, as detailed above, with two conditions.

- i. The Pipes and Fittings, especially EPDM Gaskets for Fittings, shall be with Temperature Resistivity of minimum 120 Degree Centigrade. Official Confirmation in this regard is required from the Manufacturer.
- ii. No cost variation is entertained in this respect.

The Floor Traps required for above Pipe Work shall be Cast Iron P - Trap/Multi floor trap from the same manufacturer.

3.3. PIPES FOR VENT SYSTEM

The Internal Vent System, shown in the Tender Drawings and Quantities in the Tender Schedule are as per initial design. The system Contractor has to redesign the Internal Vent System, especially the number and locations of internal vent risers, as per final requirement and site conditions and get it approved from the Engineer-In-Charge before installation at site. The quantities shall be re measurable. Vent Pipes in continuation to Soil & Waste Drainage Stacks, in plumbing shafts, shall be of Ring Fit uPVC (SWR) Pipes, with rubber gaskets over sockets, conforming to IS 13592: 1992, Type-A. Fittings shall be SWR Moulded Fittings, conforming to IS 14735: 1999, with ring seal adaptors over sockets, conforming to IS 5382. Approved lubricant is advisable for fixing/joining pipes and fittings.

All other Vent Pipes concealed in Wall, Ceiling Voids and Plumbing Shafts shall be with uPVC SWR, conforming to IS: 13592, Type-A, Solvent Welded Type Pipes and SWR Solvent Welded Type Fittings. If IS: 13592, Type - A Pipes and Fittings are not readily available, the System Contractor can do the Vent System Pipe Work with uPVC Pipes 4Kg/Cm² (IS: 4985) and Injection moulded PVC fittings (IS: 7834). But, without any Cost variation from the quoted rates

3.4. PIPE WORK FOR SEWAGE, SULLAGE, HOSPITAL WASTE WATER & LAUNDRY EFFLUENT PUMPING LINES

Pipe work for Pumping / Transferring / Lifting Sewage, Sullage, Hospital Waste Water and Laundry Effluent shall be with High Pressure uPVC Pipes, Sch. 80 (ASTM D 1785) and Sch. 80 (ASTM D 2467) Fittings. The Solvent Cement shall be one step for pressure pipes and fittings from the same manufacturer. Only Long Radius Bends are permitted in Sewage, Sullage, Hospital Waste Water and Laundry Effluent Pumping Lines.

3.5. FLOOR TRAPS for uPVC Pipe Work.

Plain Floor Traps shall be of uPVC construction, **4" x 7" Height, Deep Seal Type**, with 75mm. outlet. Multi Floor Traps at ceiling suspended shall be of uPVC construction, **4" x 7" Height, Deep Seal Type** with 50/63mm. inlet and 75 mm. outlets. Multi Floor Traps at Sunken suspended shall be of uPVC construction, **4" x 4" Height**, with 50/63mm. inlet and 75 mm. outlets. The required Boss Connectors for urinal shall be measured as part of Drainage System Pipe Work. All Floor taps and drains shall be with Heavy Duty Stainless Steel Gratings and Cockroach Trap Gratings. All Concealed Floor Traps for Urinals shall be with removable type Heavy Duty Stainless Steel or Nickel Bronze Cover

3.6. FLOOR CLEAN OUTS

Floor clean outs shall be provided in toilet / toilet blocks & hospital areas, for Soil and Waste Drainage Systems, as detailed in the drawing, with uPVC pipe work and female threaded sockets. Clean out Covers shall be with Heavy Duty Stainless Steel / Nickel Bronze Covers having male threads and with suitable insertion keys for opening.

3.7. GULLY TRAPS

Gully Traps shall be of PVC construction, with **Deep Seal** and with 100mm. inlet and outlet. The Gully Traps shall be kept in masonry inspection chambers.

IV. RAIN WATER HARVESTING SYSTEM

4.1. General

The Design of Rain Water System and Down Comers from Roof shall be based on NBC of India for a Rain Fall Intensity of 50mm. / Hr.

The proposed Capacity of Rain Water harvesting Tank shall be 35 KL

The Rain Water Outlet (Gratings) proposed shall be Heavy Duty, CI Gratings complete with Gratings, suitable for 110mm. & 160mm. of down pipes.

Flow Rate for Rain Water Collected from roof.

Roof Area	:	679 m ²
Maximum hourly rainfall under consideration	:	0.05 Mtr. / Hour
Maximum Flow Rate under consideration	:	150 m ³ / Hour.

4.2. RAIN WATER FILTER (OPTIONAL)

The Rain Water Filter Unit proposed shall be with following details.

Filtration Method	:	Compact Bag Filtration System.
Material of Construction	:	Polypropylene Microfiber Filter Media, 1 to 5 Micron

Bag Size	:4” dia x 20” long.
Capacity / Flow Rate of Bag	: 7.5M ³ / Hr / Unit
No. of Bags	: As per the requirement.
Filter Tank / Chamber Size	: 1200mm.Dia. X 1200mm.Depth
Material of Chamber	: FRP
Wall Thickness	: 10 mm.
Connections Sizes	: Inlet:12”, Outlet: 12”

Depth Masonry Chamber / Manhole; Rate for the same shall be measured separately. The Filter Bags shall be imported by integrators. The Total Unit shall be from Reputed Specialized Agencies / Integrators

4.3. PIPES FOR RAIN WATER HARVEST SYSTEM

Rain Water Down Take (Vertical) Pipe Work shall be with Ring Fit uPVC (SWR), with rubber gaskets over sockets, conforming to IS 13592: 1992, Type-A. Fittings shall be SWR Moulded fittings, conforming to IS 14735: 1999, with ring seal adaptors over sockets, conforming to IS 5382. Approved lubricant is advisable for fixing/joining pipes and fittings.

Rain Water Pipe Work, concealed in ceiling void shall be with uPVC, conforming to IS 4985: 2000, with working pressure 4 kg/cm². Fittings shall be injection moulded fittings, conforming to IS 7834: 1987. Fixing shall be with heavy duty uPVC solvent cement/adhesive, from the same manufacturer, for pipes and fittings. Under Ground Pipe work shall be of uPVC, conforming to IS 4985: 2000, with working pressure 4 kg/cm². Fittings shall be injection moulded fittings, conforming to IS 7834: 1987. Fixing shall be with heavy duty uPVC solvent cement/adhesive, from the same manufacturer, for pipes and fittings.

All jointing shall be strictly as per manufacturer’s instructions. Curing time for adhesive joints shall be 24 hours and pipe work will be permitted to use only after 24 hours.

4.4. DRAIN PIPING FROM AHU / CSU AND OTHER HVAC UNITS.

The Drain piping from AH units, CSU etc shall be routed to the nearest plumbing shaft with adequate slope and connected to the Rain water down comer. There shall be provisions for inspection of such pipes.

V. WATER SUPPLY SYSTEM

5.1. General

This is inclusive of following.

- Domestic / Treated Water Requirement for total Premises.
- Total Flushing Water Requirement of the premises.

- Landscaping requirement for total premises.
- Treated Water requirement for AC Make up if necessary.

5.2. The Sources of Domestic Water

The Main Source of Domestic Water for the total premises shall be KWA Supply & Open well in the premises. Also; Rain Water Harvesting. The Rain Water Collected from Roof Top is directed to an Underground Storage Tank. Water from all above sources is collected in Underground Storage Tank.

5.3. The Sources of Flushing Water

STP Treated Water / Water from open well

The Treated Water Collected in the Underground Water Storage Tank will be lifted / transferred to the Overhead Water Tank, through treated Water Transfer Pump Set. From overhead water tank, domestic water will be supplied, by gravity flow, to Toilet Blocks, and for AC Make up, through pipe Work, including in Plumbing Shafts.

5.4. Hot Water Supply / Distribution System

The Hot Water Generators, proposed, shall be High Efficient / Star Rated Storage type Electric water Heaters. The capacity of each above Water Heater shall be as per requirement for each area / point.

5.5. Equipment and Materials required for Water Distribution Work.

All materials shall be new and of the best quality conforming to specifications. Contractor should study the water supply system drawings and site plan drawings thoroughly, for getting a clear view of the proposed system. All Pipes and Fittings shall be from same manufacturer only. All Pipes shall be cut, cleaned and jointed (pipes together and pipes and fittings) in a neat manner, as per manufacturer's instructions and to the approval of consultants. All pipes shall be fixed in position, at site, as per details in the approved working drawings, with specified route and spacing. The spacing for pipe supports shall be as detailed in the drawings. Pipe work shall be fixed in a neat manner, as detailed in the approved working drawings, as to provide easy accessibility for repair and maintenance and shall not cause obstruction in shafts, passages etc. The vertical risers shall be parallel to walls and columns and shall be straight and plumb. Isolating Valves and other appurtenances shall be installed at easily accessible locations with access doors/manhole covers etc. for emergency operation, repairs and maintenance.

Rates for Pipes will be measured in unit rate per linear meters and inclusive of Wastage for

Pipes, all fittings, such as Elbows, Tees, Reducers, Sockets, Flanges, Unions, Adaptors, Sockets, End Plugs etc, Pipe Supports, Fasteners, Clamps, Expansion Joints, Bolts, Washers, Nuts, Masonry Supports etc, as per requirement and site conditions. The item “Pipe Work” shall be inclusive of supply, fix at site (concealed in walls, RCC structure, ceiling voids etc. and exposed, horizontally and vertically, on walls, roof slabs, in ducts etc. and laying in underground, with appropriate pipe clamps, pipe supports, hanging supports, fasteners, concrete supports, thrust blocks etc), pressure testing, anti corrosive and weatherproof protective coatings and encasing/wrapping, as per requirements, and commissioning.

The rate for concealed pipe work shall be inclusive of cutting, chasing drilling etc. through all types of walls /floors and finishing for all services crossings, including sealing, fire proofing with approved fire resistant materials, providing sleeve, and cover plates, making good structure and finishes to an approved standard etc. in a neat manner to the approval of Engineer-In-Charge. Exposed pipe work shall be fixed on walls, roof slabs, columns etc. with approved G.I. Supporting. Systems consisting of slotted rails, U-clamps, saddle clamps, fasteners, hanging rods, bolt nuts etc, as per requirement, in a neat manner, to the approval of Engineer - in -charge. Contractor shall provide all sleeves, openings, hangers, and inserts during the construction. He shall provide the necessary information to the building contractor for making such provisions in the structure necessary. All damages shall be made good to restore the surfaces.

All the Internal Water Supply Pipe Work, Cold and Hot, PVC and CPVC Pipe Work, shall be Hydrostatically Pressure tested, in parts or as a whole, with Treated Water to 10.0 kg/cm², at least for 2 hours or to 8.0 kg/cm² for a period of 24 hours, from 2.00PM to 2.00PM next day, as instructed by the Engineer-in - Charge and as and when demanded by the Engineer - in - Charge / System Consultant. All the Pipe Work, as a whole, shall be once again pressure tested to 8.0 kg/cm² for a minimum period of 24 hours, before commissioning of the total Systems. The Total Systems including equipment and complete water distribution pipeline network shall be tested to the approval of Engineer - In - Charge and System Consultant. On completion, the entire water supply system to be disinfected before handing over. First all the water storage tanks, complete pipe work, sanitary fixtures, cisterns etc. shall be filled with clean water and thoroughly flushed out. After that all storage tanks shall fill with clean water and disinfecting chemicals such as fresh bleaching powder at the rate of 50mg/Ltr. Bleaching powder shall be added gradually, while the tanks are being filled to ensure thorough mixing. (For ordinary bleaching powder the above dosage shall goes up to 150mg/Ltr. and for other branded disinfecting. Agents dosage shall be as per manufacturers specifications) The powder shall made to creamy with water before adding to the water storage tanks. When the Storage tanks are full, the filling and mixing with chemicals can stop. Then gradually start the pumps, open valves, cisterns etc and allow the water to flow gradually through entire pipe net work and fixtures and flush out thoroughly. If required repeat the procedure once again with increasing the dosage of infecting agent. The total system should be thoroughly flushed out with clean water before

usage. The entire disinfections process shall be to the approval of the Engineer - In - Charge and System Consultant. The Rates for water supply pipe work shall be inclusive disinfection of water supply pipe work. Any extra claim in this respect shall not be entrained. All Cutting, chasing and drilled/cut holes in the floor slabs for fixing sanitary fixtures, accessories, floor traps, concealed traps and water supply connections for the same should be made thoroughly water tight, along with the floor slab and sunken area, by advanced and latest technology for water proofing.

5.6. PIPES FOR DOMESTIC WATER (COLD) WATER SUPPLY SYSTEM

All Internal Cold Water Supply Pipe Work shall be with High Pressure uPVC Pipes, Sch. 40 (ASTM D 1785) and Sch. 40 (ASTM D 2466) Fittings. The Solvent Cement shall be one step for pressure pipes and fittings from the same manufacturer. All the out let points, for concealed pipe work in Toilets, Kitchen and Pantries, for fixing angle valves, taps etc, shall be with 15mm. brass female threaded end fittings, from the same manufacturer.

Cold Water Supply Pipe Work for Treated Water Transfer / Pumping Line and Pipe Work at Terrace / Roof ring shall be with High Pressure uPVC Pipes, Sch. 80 (ASTM D 1785) and Sch. 80 (ASTM D 2467) Fittings. **The Solvent Cement shall for pressure pipes and fittings, Heavy Bodied for above 2” Pipe Sizes, from the same manufacturer.** All the Pipes and fittings shall be cut, jointed and fixed as per manufacturer’s instructions. Curing time for adhesive joints shall be 24 hours and pipe work will be permitted to use only after 24 hours.

5.7. PIPES FOR R.O. TREATED WATER (COLD) WATER SUPPLY SYSTEM:

The Distribution Pipe for RO Treated Water to Dialysis Unit and Pipe Work for Other Hospital Equipment shall be with CPVC PIPES, 4120, SDR 11, as per ASTM D 2846 and with Heavy Duty Solvent Welded CPVC Fittings. The Solvent Cement shall conform to the Standards of ASTM - 493 and suitable for Pipe Sizes.

5.8. PIPES FOR HOT WATER SUPPLY SYSTEM:

All Hot Water Supply Pipe Work shall be with CPVC PIPES, 4120, SDR 11, as per ASTM D 2846 and with Heavy Duty Solvent Welded CPVC Fittings. The Solvent Cement shall conform to the Standards of ASTM - 493. All the out let points, for concealed pipe work in Toilets, Kitchen and Pantries, for fixing angle valves, taps etc, shall be with 15mm. brass female threaded end fittings, from the same manufacturer.

All the Pipes and fittings shall be cut, jointed and fixed as per manufacturer’s instructions. Curing time for adhesive joints shall be 24 hours and pipe work will be permitted to use only after 24 hours.

5.9. WATER SUPPLY PUMPS AND ACCESSORIES.

The proposed head(s) for Domestic and Flush Water Transfer /Distribution pumps, as in the Tender Schedule shall be as per initial design and shall vary as per final total length of transfer / pumping lines and fittings. The contractor has to submit calculations for final head(s) required/arrived, for various pumps, for approval before ordering for the pumps. Cost Variation is allowed only if the pump has to upgrade to next higher level. The Engineer - in - Charge shall verify such changes / requirement with the selected /approved manufacturer. Then only cost variation in this respect.

Driving Electric Motors for all Water Transfer / Distribution Pumps shall be IE3 Rated Control Panels for all water transfer pumps shall be with necessary volt free contacts and other facilities, for interfacing with Level Control System and with IBMS, proposed for the project.

The Price for all Water Transfer / Distribution Pump Sets shall be inclusive of connected Power and Control Cabling / Wiring Work in / through Heavy Duty Screwed Steel Conduits / Powder Coated M.S. Tray and proper Earthing of Electric Motors & Control Panel, all as per prevailing Rules, Standards, Requirement and Site Conditions. The Material of Construction (MOC) of Various Parts of the Pumps is detailed, below, for each Pump Sets. There may be slight changes in MOC of different parts depends on Manufacturer. However; changes in MOCs, for various parts, shall be to the approval of Engineer - In - Charge. All pumps shall be fitted with suitable pressure gauges on the discharge side.

5.10. DOMESTIC/TREATED WATER TRANSFER PUMP

The Control Panel shall be capable operating the pumps automatically and manually. It shall be capable of 'not starting or stopping' the pumps when the water in the underground treated water tank goes below the pre-set minimum level in underground water tank. This is achieved by actuation of Level Sensor / Float Switch (for level sensing), inside the Treated Water Tank. Similarly, the Control panel shall switch the pump(s) off, when high level in the over head tank or destination tank is reached. This sensing shall be by means of Level sensors.

The Control Panel for Treated Water Transfer Pump Set should have the facility for such interfacing. The above requirement, including Level Sensor / Float Switches, in the Sump Treated Water Tank and OH Tank, and connected control cabling /wiring, including any logic control shall be part of the Pump Set.

All the Design and Technical Details to be submitted for approval

Level Sensors / Float Switches shall be from the same Manufacturer for Pumps or from reputed and approved Brand suggested by the Manufacturer. The Manufacturer has to take responsibility in this equipment. Level Sensors / Float Switches shall be with enough length of Cable, to interface with the Control Panel at Final Location, as per site conditions.

The System Contractor has to confirm the final head required for the pumps, supported with hydraulic calculations, as per the final requirement and site conditions, and get it approved, before Procurement of Pump Set.

- Class: F Insulation
- IP: 55 Protection
- Dynamically balanced rotating parts.
- Non overloading power characteristic for safety of motor.
- Replaceable wearing parts.

5.11. ELECTRICAL WATER HEATER FOR HOT WATER

The Storage type Electric Water Heaters proposed shall be High Efficient and minimum BEE 4/5 Star Rated, with following features.

- Rust proof body with polypropylene or equal.
- Stainless steel inner container.
- Multi-function safety valve for high pressure withstanding capacity.
- Heating element with high efficiency.
- Thermal cutout.
- Temperature regulator.

VI. VALVES AND ACCESSORIES:

6.1. ISOLATING VALVES:

a. Brass Forged Ball Valves for Cold Water Lines

Isolating Valves for Water Lines below 65mm. dia. shall be Ball Valves, Screwed Female Ends to IS: 554 / BS:21 / ISO: 7 and with following features.

- Pressure Rating : PN 25
- Body : Forged Brass, Nickel / Chrome Plated

Any Mild or Galvanized Steel Parts (including Nuts), will not be acceptable.

b. Ball Valves for R. O. Treated Water Lines

Stainless Steel Ball Valves, Single Piece, Grade: 316 (CF8M) to IS: 554 / BS:21 / ISO: 7, PN:16, with Screwed Female Ends and following features.

- Pressure Rating : PN:10
- Body : Stainless Steel: 316 (CF8M)
- Ball : Stainless Steel: 316 (CF8M)

- Stem : Stainless Steel: 316 (CF8M)
- Seats : PTFE/Acetal
- Handle : Stainless Steel: 316. (CF8M)

Stainless Steel Ball Valves shall be from reputed manufacturers only.

c. Gun Metal Gate Valves

65mm. Isolating valves for underground water supply lines, inside valve chambers, shall be CI/Gun Metal Gate Valve, conforming to IS: 778, with following features.

- Pressure Rating : PN 16
- Body : CI/Gun Metal
- Wheel : Cast Iron

d. Stainless Steel Butterfly Valves

Stainless Steel Butterfly Valves shall be Wafer Type, Gear or Lever Operated, as per manufacturer and Size of Valve, conforming to BS 5155 / IS 13095 / API 609 with following features.

- Pressure Rating : PN 16
- Body : Stainless Steel: 316 (CF8M)
- Disc : Stainless Steel: 316 (CF8M)
- Seat : PTFE / Teflon
- Shaft : Stainless Steel: 316 (CF8M)
- Bearing : PTFE
- Handle : Stainless Steel: 316 (CF8M).

e. Ductile/ Cast Iron Butterfly Valves

Butterfly valves shall be slim seal with integrally moulded seat to the body and conforming to BS 5155 / IS 13095 with following features.

- Pressure Rating : PN 10
- Body : Cast / Ductile Iron to BS 2789 or Equal.
- Handle : Standard Lever operated type for valves up to 200mm. and Gear Operated Type for 250mm. & above.
- End Connection : Wafer Sandwiched.

f. Sluice / Gate Valve.

Sluice valves for external fire lines shall be hydraulically engineered, tight shut off, self-acting, with non- rising Spindles, conforming to IS 14846 with following features.

- Pressure Rating : PN:16
- Body : Cast Iron / Ductile Iron

g. Non Return Valves.

Non Return Valves for Water Lines shall be hydraulically engineered, tight shut off, self acting, Brass Spring / Wafer swing type check valves, conforming to IS 13095 with following features.

- Pressure Rating : PN 16
- Body : Brass
- Disc : Brass / Gunmetal / Bronze
- Seat : Nitrile ‘O Ring’ / EPDM or equal
- End Facing : Plain

h. Y-Strainer.

Y-Strainer for Potable Water Lines shall be of CI Construction with following features.

- Pressure Rating : 15bar at 1500 d F
- Body, Cover, Plug : CI / Bronze
- End Connection : Female screwed connections to BSP or Flanged
- Screen : Stainless Steel, 304, Heavy gauge perforated, 1/8 to 3/64”, Opening - 0.125”
- Screen Size : 40 Mesh
- Bolts : S.S

Y-Strainer for RO Treated Water Lines shall be of Stainless;316 Construction with following features.

- Pressure Rating : 15 Bar
- Body, Cover, Plug : SS: 316
- End Connection : Female screwed connections to BSP or Flanged
- Screen : Stainless Steel, 316, Heavy gauge perforated, 1/8 to 3/64”, Opening - 0.125”
- Screen Size : 40 Mesh
- Bolts : S.S

i. Foot Valve

Foot Valve shall be Ball Type with following features:

- Pressure Rating : PN10
- Body : Cast Iron
- Seal Ring : Nitrile Reinforced Rubber
- Fastener : Carbon Steel
- Adaptor : Cast Iron
- End Details : Screwed/Flanged

j. Float Valve

Float Valve shall be Heavy Duty as per IS: 1703:2000, with following features.

- Working Pressure : 16 Bar.
- Stem / Lever : Brass/Stainless Steel
- Seal Ring : Nitrile Reinforced Rubber
- End Details : Screwed/Flanged

k. Air Release Valve

The body of air release valve shall be made of high strength composite materials and all operating parts should be made of specially selected corrosion resistant materials. The Air Release Valve shall be with following features.

- Pressure Rating : 3 - 250 psi.
- Orifice Area : 0.014 sq.in
- Working Temperature : 600 C
- Body, Base, Stem : Brass/NSF 61 Certified Reinforced Nylon
- Float : NSF 61 Certified Foamed Polypropylene
- O-Ring : NSF 61 Certified NBR 70
- Strainer : Nylon.

6.2. WATER METERS

Water Meter shall be Class: B, with ISI Marks. For up to 40mm. sizes, it shall be as per IS: 779 / ISO: 4064, with Screwed/Flanged Ends. For sizes 50mm and above, it shall be Bulk Enclosed Type with Removable Type Mechanism, as per IS: 2373 / ISO: 4064, with Flanged Ends. The Capacity of Water Meters shall be suitable for a Maximum Normal Flow Rate of 20m³/ Hr. Actual Flow Rate shall be as per final requirement and calculations. The Hydraulic Test Pressure shall be 16 Bar Minimum. All Water Meters shall be tested by Government / Approved Board / Agencies and to the approval of Kerala Water Authority,

complete with bolts, nuts, rubber insertions etc. and all necessary accessories etc. Flow Rates for Water Meters shall be as per final flow rates in concerned Water Lines. Testing of Water Meters and arranging the Test Results, from concerned authorities, shall be the scope of the System Contractor, including all related fee and expenses for this purpose. The rates, to be quoted, for Water Meters shall be inclusive of above fee and expenses.

VII. EXTERNAL AND CIVIL WORKS:

7.1. UNDER GROUND PIPE WORK

Before starting the excavation for trenches, for underground pipe work, permission shall be obtained from the Engineer-in-Charge and concerned authorities, if required. Rates separately measured for trenches for underground drainage pipe work shall be inclusive of excavation in all kinds of soil, to required depth, back filling in layers, compacting to required standards and disposal of surplus earth and waste materials out of the construction site. All underground uPVC pipe works shall be laid at a minimum depth of 1.0 Mtr. below ground level. In special cases, with approval from consultant and project engineer, minimum depth shall be reduced to 0.50m below ground level in non-traffic areas. All underground uPVC pipe work shall be laid in trenches on sand bed, free of stones and other objects, to a minimum bedding of 15cm. An overall covering with sand shall be provided such a way to have a minimum cover of 30cm. above the pipes.

Thrust blocks, of suitable dimensions shall be provided to underground uPVC pipes at bottom points of vertical stacks and at junctions, where ever change of direction required. Also concrete supports and anchors shall be fixed as per requirement and site conditions. Coloured Plastic foil warning grids/tapes shall be provided above all underground pipe work. For traffic areas, all underground pipe work shall be protected with higher dimension PVC sleeves, if required, and plain cement concrete encasement, 1:5:10 to a minimum covering of 10cm. all around the Pipe/Sleeve. Coloured Plastic foils warning grids also to be provided. Piping shall be kept free of earth, debris, dust other foreign matters, insects etc. and every pipe shall be cleaned after installation and subjected to inspection of the consultant at any time during construction.

No pipe shall be laid under unsuitable conditions.

7.2. DRAINAGE WORK:

Setting out for external services shall be done as per relevant rules, regulations and practices. Slopes and inverts shall be as per approved drawings and site conditions. Pipe work for Pumping / Transferring / Lifting Sewage, Sullage, Hospital Waste Water and Laundry Effluent shall be with High Pressure uPVC Pipes, Sch. 80 (ASTM D 1785) and Sch. 80 (ASTM D 2467) Fittings. The solvent cement shall be one step for pressure pipes and fittings from the same manufacturer. Only long radius bends are permitted in Sewage,

Sullage, Hospital Waste Water and Laundry Effluent pumping lines all underground drainage lines shall be laid in trenches, in position, at required depth with specified gradients and fixed with suitable concrete/masonry thrust blocks, anchors, supports etc. as detailed in above section. Including excavation wherever required for drainage pumping line.

As far as possible the crown levels of pipes shall be matching when different sizes of horizontal drainage pipes are jointed. This shall be applicable for connections in manholes also. Only straight pipe work, between manholes are permitted for all underground drainage line if any pipe fittings, due to any reasons, are required; then only 45 Degree Elbows or Long Radius Bends can be used with prior approval. Sewer lines shall be inclusive of earthwork, pipelines, manholes, drop connections and connections to the STP and soak pits.

Drop connections shall be given to sewage manhole when the drops exceed 60cm. and benching shall be done at the bottom. The Cost for Pipe Work for this drop connection shall count as part of drainage pipe work not as a part of Manhole Construction. Rainwater drainage shall be inclusive of earthwork, pipelines, manholes, catch basins and connections to the disposal trench or existing municipal storm water drain.

All the underground soil, waste and rain water pipe work shall be fully tested for water tightness by means of water pressure maintained for not less than 24 hours. The rates for underground pipe work shall be inclusive of supply, fix pipes and fittings and laying in underground, in position with proper slopes and fixing with concrete/masonry thrust blocks and supports wherever required, water testing, and commissioning.

Recommended width of trench shall be 55cms at the bottom and no additional payment is admissible for widths greater than this. Excavation of trenches of required width for pipes, include excavation for sockets, depth up to 1.5 m, including getting out the excavated materials, returning the soil as required in layers not exceeding 20 cm in depth, including consolidating each deposited layers by ramming, watering etc., stacking serviceable material for measurements and disposal of unserviceable material as directed, within a lead of 50 Mtr. Excavation for trenches shall be measured in Mtr. as per DSR: 16 for drainage line. Excavation of trenches with depth exceeding 1.5 Mtr. shall be measured separately.

Manholes shall of specified type, size and with specified invert levels, including for Drop manholes. The sizes given in the drawings are internal sizes of the chambers. Construction of M25 Grade RCC manhole shall be in cement mortar 1:4 (1 cement: 4 coarse sand), inside and outside cement plaster 12 mm thick with inside cement mortar 1:3 (1 B994 cement: 3 coarse sand) finished with a floating coat of neat cement, foundation concrete 1:3:6 mix (1 cement: 3 coarse sand: 6 graded stone aggregate 40 mm nominal size), and making necessary channel in cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size) finished with a floating coat of neat cement, all complete as per standard design.

Gully Trap chambers shall be with specified internal sizes and constructed with bed concrete, brickwork, plastering and with covers, as per specifications for manholes. The rates for manholes and gully trap chambers shall be inclusive of excavation, construction, curing, cover fixing, testing, back filling, compacting, removal of surplus earth and waste and commissioning. Septic Tanks, Soak Pits, Pump Room, etc. shall be constructed as per specification for Civil/Structural work for the project. Plastic encapsulated Steel steps shall be provided for Septic Tanks, Water Tanks, Manholes etc.

The Plumbing Contractor shall fix in position, with proper alignment, Heavy Duty uPVC Puddle Flanges, of required sizes, on the formwork during casting of the Septic Tanks, for making the inlets, and outlets. All the Septic tanks including its connections shall made leak proof by advanced and latest technology for waterproofing.

7.3. WATER SUPPLY WORK.

All Under Ground Cold Water Services Pipe Work shall be with High Pressure uPVC Pipes, Sch. 40 (ASTM D 1785) and high pressure fittings, Sch. 40 (ASTM D 2466) such as bend, tees, couplers, reducers, unions, flanges, male and female threaded couplings, adaptors, sockets, end plugs etc. The Solvent Cement shall be one step for pressure pipes and fittings, from the same manufacturer.

Only Long Radius Bends and 45 Degree Elbows are permitted in Cold Water Pumping Lines and for Underground Pipe Work for Treated and Raw Water Distribution.

All underground water supply lines shall be laid in trenches, in position, at required depth with a suitable slope to facilitate for complete draining during maintenance and fixed with suitable concrete/masonry thrust blocks, anchors, supports etc. as detailed in above section.

Recommended width of trench shall be 30cms at the bottom and no additional payment is admissible for widths greater than this. Rates for trenches for underground Cold water pipe work shall be inclusive of excavation in all kinds of soil, to required depth, back filling in layers, compacting to required standards and disposal of surplus earth and waste materials out of the construction site.

Water Supply lines includes earthwork, pipelines, valves, valve chambers and final connection to water pump, water tanks and other equipment and sources of water points, as detailed in the drawings. All the underground pipe work shall be pressure tested, as a whole, with water to 10.0 kg/cm² at least for 2 hours or to 8.0 Kg / cm² for a period of 24 hours, from 2.00PM to 2.00PM next day, as instructed by the Engineer-in - charge and as and when demanded by the Engineer - In - Charge/ System Consultant.

The rates for underground pipe work shall be inclusive of excavation, supply pipes and

fittings, fixing and laying in underground, in position with slopes and fixing with concrete/masonry thrust blocks and supports wherever required, pressure testing, back filling the earth and commissioning.

The Plumbing Contractor shall fix in position, with proper alignment, Heavy Duty uPVC Puddle Flanges, of required sizes, on the form work during casting of the underground and roof water tanks, for making the inlets, outlets and drain points. All the water tanks including its connections shall made leak proof by advanced and latest technology for waterproofing.

7.4. SUPPORTS AND HANGERS FOR PIPING

Horizontal pipes shall be supported independently. Supports shall be provided for fittings grouped together in horizontal runs, as appropriate. Piping shall be anchored at horizontal changes in direction, at clean outs and at start or horizontal lines. Floor clamps shall be provided at every floor and offset clamps below the branch take off joint in vertical risers.

SUPPORTS AND HANGERS FOR PLASTIC PIPING

Horizontal piping shall be supported as scheduled below:

Pipe Size	Maximum Spacing	Hanger Rod Dia
Up to 25 mm nom dia.	1.2 M	8mm(5/16")
32 to 50 mm nom dia.	1.5 M	10mm(3/8")
65 to 75 mm nom dia.	1.8 M	10mm(3/8")

16. LIST OF APPROVED MAKES

SI No	Description	Model No	Make of Material
1	EWC	Kerovit M odel No: KS123	JAQUAR / KOHLER / VITRA / KEROVIT
2	Concealed Cistern	GEBERIT Model: ALPHA DUOFIX	GEBERIT

3	Concealed Cistern - Push Plate	GEBERIT Model: ALPHA 35	GEBERIT
4	Urinal with sensor	Kerovit Model No: KB7008	JAQUAR / KOHLER / VITRA / KEROVIT
5	Urinal Division plate	Kerovit Model No: KS506	JAQUAR / KOHLER / VITRA / KEROVIT
6	Wash Basin - Wall Hung	Kerovit Model No: KENRICK - KS201	JAQUAR / KOHLER / VITRA / KEROVIT
7	Wash Basin - Counter Top	Kerovit Model No: AQUA - KO294W	JAQUAR / KOHLER / VITRA / KEROVIT
8	Wash Basin - Under Counter	Kerovit Model No: KAIA - KS207	JAQUAR / KOHLER / VITRA / KEROVIT
9	Wash Basin - Corner	Kerovit Model No: BEAM - KS244	JAQUAR / KOHLER / VITRA / KEROVIT
10	Angle Valve	Kerovit Model No: KB2711003	JAQUAR / KOHLER / VITRA / KEROVIT
11	Concealed Stop Cock Trims	Kerovit Model No: KB2711032	JAQUAR / KOHLER / VITRA / KEROVIT
12	Concealed Stop Cock Body	Kerovit Model No: KB111031	JAQUAR / KOHLER / VITRA / KEROVIT
13	Ablution Tap	Kerovit Model No: KA580007	JAQUAR / KOHLER / VITRA / KEROVIT
14	Diverter - 3 Way	Kerovit Model No: KB2711036	JAQUAR / KOHLER / VITRA / KEROVIT
15	Shower Head	Kerovit Model No: KA570002	JAQUAR / KOHLER / VITRA / KEROVIT
16	Soap Dish	Jaquar Model No: AKP-35731P	JAQUAR / KOHLER / VITRA / KEROVIT
17	Basin Mixer - Exposed Part Kit	Kerovit Model No: KB2711042	JAQUAR / KOHLER / VITRA / KEROVIT
18	Basin Mixer - Concealed Body	Kerovit Model No: KB1511041	JAQUAR / KOHLER / VITRA / KEROVIT
19	Pillar tap	Kerovit Model No: KB2711001	JAQUAR / KOHLER / VITRA / KEROVIT
20	Bib Tap	Kerovit Model No: KB2711004	JAQUAR / KOHLER / VITRA / KEROVIT
21	Towel Rail	Jaquar Model No: ACN-1181S	JAQUAR / KOHLER / VITRA / KEROVIT
22	Towel Ring	Jaquar Model No: ACN-1121N	JAQUAR / KOHLER / VITRA / KEROVIT

23	Toilet Paper Holder	Jaquar Model No: ACN-1151N	JAQUAR / KOHLER / VITRA / KEROVIT
24	Rob Hook	Jaquar Model No: AKP-35791P	JAQUAR / KOHLER / VITRA / KEROVIT
25	Sink Cock	Kerovit Model No: KB2711025	JAQUAR / KOHLER / VITRA / KEROVIT
26	Floor Drainer	Kerovit Model No: KA640002	KEROVIT / CHILLY / SANJAY CHILLY
27	PVC Pipes(IS 4985 & IS 13592)		ASTRAL / ASHIRVAD / AJAY / FINOLEX / SUPREME / PRINCE
28	uPVC Pipes ASTM SCH40/80		ASTRAL / ASHIRVAD / AJAY / FINOLEX / SUPREME / PRINCE
29	Cpvcpipes		ASTRAL / ASHIRVAD / AJAY / FINOLEX / SUPREME / PRINCE
30	Polypropylene Pipes (PP) & Fittings		HAKEN(GF) /VALSIR /WAVIN/ASTRAL
31	CP brass or SS Gratings, Cockroach free trap, Cover for Concealed trap and Clean Out		SANJAY CHILLY / ELIGNA / WEIMER / CHILLY
32	CI Humbless pipes and fittings		NECO / SAINT GOBAIN / HEPSCO(BINAY UDYOG) / RPMF
33	SS Kitchen sinks		NIRALI / HINDWARE / JOHNSON / FRANKE / DIAMOND
34	Valves / strainers		ZOLOTO / CASTLE / RB / ADVANCE / ITAP / LEADER
35	Grease & Soil Interceptor		ASHIRVAD / AQUAFIX
36	GI/SS Supports/Clamps, rails, Legs, Expansion bolts and accessories		HITECH / HILTI / CANON
37	Pumps		WILO / LUBI / GRUNDFOS / CRI / XYLEM / DECCAN KARVEL
38	Water Flow Meter		AQURA / ARISTO / ASTRA / KRANTI / ANAND
39	Geyser		A.O SMITH / RACOLD / JAQUAR