2018

PROPOSED HOTEL CLARKS- JAIPUR

TENDER DOCUMENTS FOR PLUMBING SYSTEM

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SUBHEAD : SANITARY PLUMBING INSTALLATION

TECHNICAL SPECIFICATIONS AND SCOPE OF WORK

1 SCOPE OF WORK

This part of the Contract shall generally include the following services:

i) Installation of sanitary fixtures, faucets and toilet requisites,

ii) Supply & Installation of internal hot and cold water supply distribution network,

iii) Supply & Installation of above ground drainage system,

iv) Supply & Installation of underground drainage system including construction of manholes and all other related appurtenances,

v) Supply & Installation of external water supply system.

vi) Supply & Installation of landscape irrigation system

vii) Installation of Pumping Machinery

vi) Fixing of inlet and outlet connections, over-flows and drain connections in the water storage tanks using puddle flanges,

The Contractor shall include for the supply, unless otherwise mentioned, delivery, installation, connection, commissioning and testing of all materials and equipment to provide a complete sewerage, drainage and water supply installation as described hereunder.
It is proposed that the Owner at his cost shall procure certain items of the works. The procurement of such equipment/material shall be done as per the advise of Architect / Consultant after necessary input from the Contractor as stated hereafter. The equipment/material shall be handed over to the Contractor at site. Thereafter it shall be Contractor's responsibility to takeover the possession of all such equipment, its insurance, safe custody etc. until installation, testing, commissioning and successful handing over the plant to the Owner for its beneficial use.

2 SPECIAL CONDITIONS

2.1 STATUTORY REGULATIONS AND APPROVALS

All Public Health Engineering works shall be carried out only by those Contractors who are licensed by the concerned local authorities to execute this type of work.

It shall be the responsibility of the Contractor to comply with the regulations as laid down by the local authorities. The Contractor shall also be responsible for obtaining all the statutory approvals/certificates for the work from the concerned Departments and these certificates shall be handed over to the Owner at the completion.

It shall also be the responsibility of the Contractor to get the sewerage, drainage & water supply connections from the concerned authorities. However, the Owner will bear all the statutory expenditures.

2.2 SITE CONDITIONS

It is assumed that before tendering the Contractor would have visited the site and familiarized himself with all the local conditions and means of transportation and communications. No claim of whatsoever nature would be entertained at a later date on account of the Contractor's ignorance of the local conditions.

2.3 STANDARD AND CODES OF PRACTICE

The work shall be carried out as per the enclosed Specifications of Work and the construction drawings to be issued from time to time. These specifications shall be read in conjunction with CPWD specifications 2002 (with up-to-date correction slips), National Building Code 2005, relevant Codes of Practice and Standards as issued by Bureau of Indian Standards (B.I.S. - all with the latest amendments) wherever applicable.

2.4 WORKMANSHIP

All the work shall be carried out in a workmanship like manner and as per the best practices of the trade.

2.5 DRAWINGS AND DOCUMENTS

(1) General

i) The Drawings provided with the Specification shall be treated as confidential documents and must not be copied or loaned to any other party without the express permission of the Project Manager / Architect.

ii) The Drawings are intended as a guide to the firms tendering and give approximate positions of pipes, conduits, cable runs and/or equipment only and in measuring from these drawings, the Tenderer must make due and proper allowance for all necessary diversions from the straight line, rises or falls as may be required for the proper execution of the works.

Detail drawings in all cases shall be worked to in preference to those of a more general nature and figured dimensions where indicated shall be followed in preference to scale.

Where necessary, the exact positions of plant and/or equipment will be decided by the issue of further drawings, but no claim for extra payment due to insufficient information on this scope will be entertained.

In any case of doubt as to the interpretation of either Drawings and/or Specification, the Contractor must refer the matter to the Project Manager / Architect prior to the submission of his Tender.

iii) It is to be clearly understood that this Tender is to be absolutely inclusive for the proper completion of the whole of the works specified to the true intent and meaning of the specification and/or Drawings and the description therein contained shall be read conjointly and together and no error, inconsistency, discrepancy in the Drawings and/or Specification will relieve the Contractor of his obligations to include for an hand-over the work in the true meaning and intent of the Specification and/or Drawings, complete in every respect.

Should any portion of the works which would reasonably and obviously be inferred as necessary for the installation as a whole not be expressly specified, the Contractor shall provide and execute such work as part of the Contract and shall not be entitled to any extra payment of that account.

iv) The Contract Drawings and such other drawings as may be furnished to the Contractor during the progress of the Works shall be considered as illustrating between the Drawings and the Specification, the Contractor shall execute the work in accordance with the decision of the Project Manager / Architect . If modifications are necessary, the Contractor shall submit modifications to the Project Manager / Architect for approval before such modifications are executed.

v) All Drawings and Specification are the property of the Project Manager / Architect .

vi) The Contractor will be required to give and obtain all necessary site and other particulars and to agree such details with the Project Manager / Architect. The Contractor must also obtain details of any other Contractor's work affected by his work and shall work in close co-operation with all such firms or persons concerned.

vii) The Contractor shall be responsible for any damage caused to buildings and contents and works by reason of, arising out of, or incidental to, or in connection with the execution of any work in the Contract Documents.

The Contractor shall permit nothing to be done which may injure the stability of the Works, or existing buildings and no cutting through floors or walls will be allowed other than where required by the Drawings, without the sanction of the Project Manager / Architect.

viii) The Contractor shall submit to the Project Manager / Architect for approval, before the work is commenced, a copy of all working details and installation drawings and shall also supply sufficient copies for the use of the Owner/Civil Work Contractor etc.

These drawings must be submitted by the Contractor as soon as possible after the order is placed to give ample time for all parties concerned to study and comment thereon.

ix) The work described on any working drawings submitted shall be carefully checked by the Contractor for all clearance, field conditions, maintenance of architectural conditions and proper co-ordination with all trades on the job. To this end, the Contractor, during the construction drawing stage, shall ensure that he co-ordinates drawings of all other trades that might interferes with the proper installation of his work. No payment shall be made for any variations or alterations on site due to lack of knowledge of other trades. Any unresolved conflict between various trades shall be referred to the Project Manager / Architect.

The equipment layout is to be detailed on the drawings, showing the exact method of installing and clearly illustrating components to be used in making all connections.

x) Pipework drawings must be fully detailed, showing all pipework in double line and indicating the precise size of fittings, valves and equipment, position of hanger supports with reference numbers must be indicated and a large scale detail must be given, showing the type and method of installation of each type of hanger. A schedule is to be included on each drawing, showing details of the type of hanger fixings and references number for each type.

All general layout drawings shall be drawn 1/50 scale, unless agreed otherwise with the Project Manager / Architect . Toilet piping layouts, details and hangers, cleanouts, methods of fixing of all fittings and fixtures including pipes, detailed cross sections of service ducts, etc., are to be drawn to 1/10 scale.

xi) The Contractor shall provide a detailed programme incorporating working drawing production which can be read in conjunction with the building construction programme.

xii) The Contractor shall prepare schedules and drawings showing precise details of holes in concrete, block works etc., base frames or support required and the like. The schedules shall show in detail the builder's work required to be performed by all other trades for the mechanical and electrical installations. These drawings and schedules, in an approved form, must be submitted to an properly approved by the Architect before any structural work requiring holes or other modifications is constructed.

xiii) The Contractor shall submit all drawings as prescribed hereunder. All drawings shall be supplied in the form of a second negative and signed by a principal of the Contractor. After approval, the negative will be signed by the Project Manager /

Architect and returned to the Contractor. The Project Manager / Architect will take as many prints from this negative as he requires for his own use.

Signed and approved drawings will not be departed from unless a signed variation or omission certificate is issued in writing by the Project Manager / Architect . Drawings returned to the Contractor for alteration or amendment shall be re-submitted to the Project Manager / Architect for approval.

Amended or altered drawings shall show the nature of the amendment or alteration in a revision block on the drawing, together with the revision number or letter and the date of the revision.

xiv) Should the Contractor prove unable to produce satisfactory "Working Drawings" or be unable to produce drawings to conform to the progress of the work, the Project Manager / Architect reserves the right to take whatever steps are necessary to have drawings undertaken by others and debit the Contractor's account.

Any decision taken by the Project Manager / Architect to have working drawings produced elsewhere will not relieve the Contractor of his contractual obligations and the Contractor must provide to the Project Manager / Architect all necessary details, physical dimensions, descriptive literature, etc., of all equipment to be incorporated on drawings within 10 days of a request from the Project Manager / Architect .

(2) Manufacturers' Data

i) Manufacturers' performance data, certified factory drawings of apparatus, giving full information as to capacity, dimensions, materials and all information pertinent to the adequacy of the submitted equipment shall be submitted for approval.

Manufacturer names, sizes, catalogue numbers and/or samples of all materials shall be submitted for approval.

Submittals and working drawings should, as far as possible be complementary so that drawings and submittals can be cross checked.

ii) Order of equipment submitted for approval must be accompanied by relevant drawings, technical data, catalogues and samples, Where data, certified drawings or other required information is not available until after orders have been placed, the Project Manager / Architect will give provisional approval until all requested drawings and information have been supplied to the Project Manager / Architect and approved by him. It is the Contractor's responsibility to ensure that all necessary information is supplied to the Project Manager / Architect in accordance with the progress of the work.

(3) Operating and Maintenance Manual/Test Certificate

i) The Contractor shall furnish six copies in bound form of an instruction manual and test certificates containing all information applicable to this section of the Works. This manual is to be similar in design and content to those to be provided under other services.

The manual shall contain a comprehensive written description of the Works, outlining the operation of the systems and maintenance procedures.

(4) "As Installed " Drawings

i) The Contractor shall arrange to keep on Site a full set of drawings showing the progress of the Works, which must be kept upto date.

The Contractor shall keep a record as the work proceeds of any work installed not in accordance with the drawings. On completion of the Works the Contractor shall supply three clear coloured prints of each applicable drawing, showing the exact position of all apparatus, pipe lines, services, control valves, switchgear, etc., together with diagrams, schedules, etc. to the Project Manager / Architect requirements and in addition one complete set of plastic negatives.

The word "AS INSTALLED DRAWINGS" shall be clearly indicated on all drawings adjacent to the title block.

2.6 WORK AND TIME SCHEDULE

The Contractor shall prepare a work and time schedule in a format as approved by the Owner/Consultant. The schedule shall be submitted to the Owner/Consultant within ten days of the award of the Contract. It shall indicate the expected date of commencement and completion of each item of work. The chart shall also indicate the Scheduling of samples, shop drawings and approvals. In addition to this, the Contractor shall also furnish to the Owner/Consultant fortnightly progress reports indicating percentage completion of each item of work.

2.7 RATES

The rates quoted for any particular item by the Contractor shall be inclusive of the cost of material, erection, connection, testing, labour, supervision, tools, plant, transportation, excise duties and taxes, contingencies, breakage, wastage and all other sundries.

The rate shall also be inclusive of cutting holes, making chases in RCC and making good the same. No claim for extra would be entertained on this account.

The quantities mentioned in the BOQ may vary (increase or decrease) to any extent without any change in rates.

2.8 PLUMBING DRAWINGS

The plumbing drawings issued from time to time to the Contractor are diagrammatic but shall be following as closely as actual construction work will permit. Any deviation from the drawings required to conform to the building construction shall be made by the Contractor at his own expenses. The architectural drawings shall take precedence over the services drawings as far as the Civil and other trades works are concerned.

2.9 DISCREPANCIES IN THE DRAWINGS

Should there be any discrepancy due to in-complete description, ambiguity or omission in the drawings and other documents relating to this Contract found by the Contractor either before starting the work or during execution or after completion, the same shall be immediately brought to the attention of the Architect/Consultant and his decision would be final and binding on the Contractor.

2.10 MATERIALS

All materials to be supplied by the Contractor shall be new. All packed items shall arrive at site in original packing only. Any items found defective or damaged shall be replaced by the Contractor at his own expenses. The Contractor shall get the `seal` of containers opened from Project Manager / Architect and maintain a record jointly signed by him and Project Manager / Architect. No empty containers shall be removed from the site till completion of work or without the written approval of Project in Charge.

2.11 STORAGE OF MATERIALS

All the materials brought at site shall be stored and stacked in a proper manner. The materials requiring protection from the Sun and rain shall be kept inside the temporary structures to be erected at site by the Contractor. The Contractor shall also follow the Manufacturers' instructions for storing and stacking the materials.

The storage facilities are to be created by the Contractor at his own expenses.

2.12 INSTRUMENTS FOR MEASUREMENT AND TESTING

The Contractor shall provide, free of cost, all equipments, instruments, labour and all other allied assistance required by the Architect/Consultant or their representatives for measurement and testing of the works.

2.13 CO-ORDINATION WITH OTHER TRADES

The Contractor shall be responsible for coordinating this work with works of other trades sufficiently ahead of time to avoid unnecessary hold ups. Hangers, sleeves, recesses etc. shall be left in time as the work proceeds.

2.14 SITE ORDER BOOK

The Contractor shall maintain a site order book, in which daily progress of the work and number of workers engaged shall be recorded. The site diary shall also be used by the Owner/Architect/Consultant for writing his comments/instructions.

2.15 UP-KEEP OF THE SITE

It shall be the responsibility of the Contractor to clear away, from time to time, all debris and excess material generated by the activities of his workers.

2.16 PROTECTION

All work shall be adequately protected, to the satisfaction of the Project Manager/ Architect , so that the whole work is free from the damage throughout the period of construction upto the time of handing over.

Special care must be taken to prevent damage and scratching of all fittings and fixtures. Tool marks on exposed fixtures shall not be accepted. Protective paper on fixtures shall be removed with hot water only at the final completion of the work.

Before handing over the work, the Contractor shall clean all elements of the complete installation, remove plasters, splashes, stickers, rust stains and all other foreign matter and leave every part in acceptable condition and ready for use to the satisfaction of the Owner/Architect/Consultant.

3 UNDER GROUND DRAINAGE

3.1 EXCAVATION

(1) Alignment and Grading

The sewers are to be laid to alignment and gradients shown on the drawings but subject to such modifications as shall be ordered by the Project Manager / Architect from time to time to meet the requirements of the works. No deviations from the lines, depths of cuttings or gradients of sewers shown on the plans and sections shall be permitted except by the express direction of the Project Manager / Architect.

(2) Excavation in Tunnels

The excavation for sewers and works shall be open cutting unless the permission of the Project Manager/ Architect for the ground to be tunneled is obtained. Where sewers have to be constructed along narrow passages, the Project Manager / Architect may order the excavation to be made partly in open cut and partly in tunnel and in such cases the excavated soil shall be removed at once so as not to block up the passage and shall be brought back later on for refilling of the trenches or tunnels.

(3) Opening out Trenches

In excavating trenches, etc. the soling, road metalling, pavement kerbing etc. and turf is to be placed on one side and preserved for reinstatement when the trench or other excavation shall be filled up.

Before any road metal is replaced, it shall be carefully shifted. The surface of all trenches and holes shall be restored and maintained to the satisfaction of the Project Manager / Architect and of the owners of the roads or other property traversed and the Contractor shall not cut or break down any live fence or trees in the line of the proposed works but shall tunnel under them, unless the Project Manager / Architect shall order to the contrary.

The Contractor shall grub up and clear the surface over the trenches and other excavation of all trees, stumps, roots and all other encumbrance affecting execution of the work and shall remove them from the site to the approval of the Project Manager / Architect.

(4) Obstruction of Roads

The Contractor shall not occupy or obstruct by his operation more than one half of the width of any road or street and if insufficient space shall then be left for public and private transit, he shall remove the materials excavated and bring them back again when the trench is required to be refilled. The Contractor shall obtain the consent of the Project Manager / Architect before closing any roads to vehicular traffic and the foot-walks must be kept clear at all times.

(5) Removal of Filth

All night soil, filth or any other offensive matter met with during the execution of the works, immediately after it is taken out of any trench, sewer or cess-pool, shall not be deposited upon the surface of any street or where it is likely to be nuisance or passed into any sewer or drain but shall be at once put into carts and removed to a suitable place to be provided by the Contractor.

(6) Excavation to be Taken to Proper Depths

The trenches shall be excavated to such a depth that the sewers shall rest on concrete as per specifications and drawings so that the inverts may be at levels given on the sections. In bad ground the Project Manager / Architect may order the Contractor to excavate to a greater depth than that shown on the drawings and to fill up the excavation to the level of the sewer with concrete, broken stone, gravel or other materials. Any such extra excavation, if ordered by the Project Manager / Architect, shall be extra as per provisions in the Contract conditions, but if the Contractor should excavate the trench to a greater depth than is required as per drawings without a specific order to than effect of the Project Manager / Architect,

the extra depth shall have to be filled up with concrete at the Contractor's own costs and charges to the requirements and satisfaction of the Project Manager/ Architect .

(7) Refilling

After the sewer or other work has been laid and proved to be watertight, the trench or other excavations shall be refilled. Utmost care shall be taken in doing this, so that no damage shall be caused to the sewer and other permanent work. The filling in the haunches and upto 75 cm above the crown of the sewer shall consist of the finest selected materials placed carefully in 15 cm layers and flooded and consolidated. After this has been laid, the trench and the other excavation shall be filled carefully in 150 mm layers with materials taken from the excavation, each layer being watered for proper consolidation unless the Project Manager / Architect shall otherwise direct.

(8) Contractor to Restore Settlements and Damages

The Contractor shall, at his own costs and charges, make good promptly during the whole period of the works are in hand, any settlement that may occur in the surfaces of roads, berms, footpaths, gardens, open spaces, etc. whether public or private, caused by his trenches or his other excavations and he shall be liable for any accidents caused thereby. He shall also, at his own expense and charges, repair and make good any damage done to buildings and other property. If in the opinion of the Project Manager, the Contractor fails to make good or pay or satisfy the expenses of making good such works / property, the Project Manager shall be at liberty to get the work done by other means and the expenses thereof shall be paid by the Contractor or deducted from any money that may be or become due to him or recovered from him in any other manner according to the conditions of the contract.

9) Disposal of Surplus Soil

The Contractor shall at his own costs and charges, provide places for disposal of all surplus materials not required to be used on the works. As each trench is refilled, the surplus soil shall be immediately removed, the surface properly restored and roadways and sides left clear.

(10) Timbering of Sewer & Trenches

The Contractor shall at all times support efficiently and effectively the sides of the sewer trenches and other excavations by suitable timbering, piling and sheeting and they shall be close timbered in loose or sandy strata and below the surface of the subsoil water level, without any extra cost.

All timbering, sheeting and piling with their wallings and supports shall be of adequate dimensions and strength and fully braced and strutted so that no risk of collapse or subsidence of the walls of the trench shall take place. The Contractor

shall be held responsible and accountable for the sufficiency of all timbering, bracing, sheeting and piling used for, all damage to persons and property resulting from the improper quality, strength, placing, maintaining or removing of the same.

(11) Shoring of Buildings

The Contractor shall shore up all buildings, walls and other structures, the stability of which is liable to be endangered by the execution of the work and shall be fully responsible for all damages to persons or property resulting from accident to any of such buildings.

(12) Removal of Water from sewer

The Contractor shall at all times, during the progress of work, keep the trenches and excavations free from water which shall be disposed of by him in a manner as will neither cause injury to the public nor to the public or private property nor to the work completed or in progress nor to the surface of any roads or streets, nor cause any interference with the use of the same by the public.

(13) Excess Excavation

If any excavation is carried out at any point or points to a greater width than the specified cross section of the sewer with its envelope, the same shall be filled with concrete by the Contractor at his own expenses and charge to the requirements of the Project Manager.

(14) Width of Trenches

Unless specified otherwise by the Project Manager, the width at bottom of trenches for pipes of different diameters laid at different depths shall be as given below :-

a) For all diameters, upto an average depth of 120 cm, width of trench in cm = diameter of pipe + 30 cm.

b) For all diameters or depths above 120 cm; width of trench in cm = diameter of pipe + 40 cm ; and

c) Notwithstanding (a) and (b), the total width of trench at the top should not be less than 75 cm for depths exceeding 90 cm.

3.2 SALT GLAZED STONEWARE PIPES

(1) Specifications

Wherever specified for drainage/sewer lines, salt glazed stoneware pipes shall be used. These pipes shall be of first quality, straight, free from any roughness inside or outside and conforming to IS: 651-1980.

(2) Laying

The pipes shall be laid on a bed of 15 cm thick cement concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate of 40 mm nominal size) mix or as specified, with sockets leading uphill and should rest on solid and even foundations for the full length of the barrel. Socket holes shall be formed in the foundation sufficiently deep to allow the pipes jointer room to work right round the pipes and as short as practicable to admit the socket and allow the joint to be made.

If the bottom of the trench of rock or very hard ground that cannot be easily excavated to a smooth surface, the pipes shall be laid on concrete cradles to ensure even bearing.

The pipes shall be surrounded with 15 cm thick cement concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate of 40 mm nominal size) mix all around.

(3) Jointing

Tarred gasket of hemp yarn soaked in thick cement slurry shall first be placed round the spigot of each pipe and the spigot then shall be slipped home well into the socket of the pipe previously laid. The pipe shall then be adjusted and fixed in the correct position and the gasket caulked home so as to fill not more than one fourth of the total depth of the socket.

The remaining depth of the socket shall then be filled with a stiff mixture of cement mortar 1:1 (1 cement: 1 fine sand). When the socket is thus filled, a fillet shall be formed round the joint with a trowel forming an angle of 45 with the barrel of the pipe.

3.3 UPVC PIPES FOR UNDERGROUND DRAINAGE

(1) Specifications

Wherever specified for underground drainage/sewer lines, UPVC pipes and fittings (orange brown in clour) shall be used. These pipes shall be conforming to IS:15328 or ISO:4435&ISO:3633

(2) Laying

The pipes shall be laid on a bed of 15 cm thick cement concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate of 40 mm nominal size) mix or as specified, If the bottom of the trench is rock or very hard ground that cannot be easily excavated to a smooth surface, the pipes shall be laid on concrete cradles to ensure even bearing. The pipes shall be surrounded with either a) pea gravel till 15 cm above the crown of the pipe or b) 15cm thick cement concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate of 40 mm nominal size) mix all around, as specified.

(3) Jointing

The pipes and fittings shall be jointing with water tight proprietary sealing rings

3.4 CAST IRON PIPES

(1) Specifications

Wherever specified, the cast iron pipes for drainage shall be centrifugally cast spun iron type conforming to IS: 1536 - 1976.

Generally, all drainage lines passing under buildings, floors, roads with heavy traffic and in exposed position above ground or like situations shall be in cast iron.

(2) Laying and Jointing

All excavation work for laying cast iron drainage pipes shall be done as described in Section AB3.1.

The spigot of the pipe shall be placed inside the socket and gasket caulked home. The interior of the socket and exterior of the spigots shall be thoroughly cleaned and dried. The spigot end shall be inserted into the socket right upto the back of the socket and carefully centered by two or three laps of treated spun yarn, twisted into ropes of uniform thickness, well caulked into the back of the socket to leave the depth for the required quantity of lead. Molten pig lead shall then be poured into the joint filling the same in one pouring. The lead shall be caulked by proper tools to make it even alround. The pig lead shall conform to IS:782-1978.

3.5 REINFORCEMENT CEMENT CONCRETE PIPES

(1) Specifications

Wherever specified for drainage/sewer lines, reinforcement cement concrete pipes shall be used. These pipes shall be suitable for semi fluid These pipes shall be of first quality, straight, free from any roughness inside or outside and conforming to IS: 458-1988.

(2) Laying

The pipes shall be laid on a bed of 15 cm thick cement concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate of 40 mm nominal size) mix or as specified, with sockets leading uphill and should rest on solid and even foundations for the full length of the barrel. Socket holes shall be formed in the foundation sufficiently deep to allow the pipes jointer room to work right round the pipes and as short as practicable to admit the socket and allow the joint to be made.

If the bottom of the trench of rock or very hard ground that cannot be easily excavated to a smooth surface, the pipes shall be laid on concrete cradles to ensure even bearing.

The pipes shall be surrounded with 15 cm thick cement concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate of 40 mm nominal size) mix all around.

(3) Jointing

The jointis composed of specially shaped spigot and socket ends on concrete pipes. A rubber ring shall be placed on the spigot which shall be forced into the socket of the pipe previously laid. This copresses the rubber rings as it rools in to the annular space formed between the two surfaces of spigot and the socket, stiff mixture of cement mortar 1:2 (1 cement : 2 fine sand) shall then be filled into the remaining annular space and rammed with a caulking tool. After day's work any extraneous materials shall be removed form the inside of the of the pipe and newly made joint shall be cured.

3.5 MANHOLES

(1) General

The Contractor shall construct all manholes, chambers, etc. in first class brick work to such levels, dimensions and specifications as shown in the drawings or as specified in the Bill of Quantities.

(2) Base Concrete, Benching and Channels

All manholes shall have a base of cement concrete 1:4:8 (1 cement : 4 coarse sand : 8 graded stone aggregate 40 mm nominal size) 200 mm thick or as shown on drawings. Channeling and benching shall be formed to the full depth of the diameter of the pipe with cement concrete 1:2:4 (1 cement : 2 sand : 4 graded stone aggregate 20 mm nominal size) finished with a floating coat of neat cement.

(3) Masonry Work

Masonry work shall be done with first class bricks in cement mortar 1:5 (1 cement : 5 fine sand). All manholes shall be plastered 12 mm thick inside with cement mortar 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement. Manholes shall be plastered outside with cement mortar 1:4 (1 cement : 4 coarse sand).

(4) Foot Rests

All manholes above 800 mm depth, shall have foot rests of specified type, spaced 300 mm vertically or as shown on drawings.

The foot rests may be set staggered in 2 vertical runs which may be 380 mm apart horizontally. The topmost step shall be 450 mm below the manhole cover and the lowest not more than 300 mm above the benching

The foot rests in general shall be of orange colour having minimum 6mm thick plastic encapsulating as per IS:10910 over 12mm dia steel bar conforming to IS:1786. The tread top surface shall be ribbed or chequered. The minimum dimensions shall be as follows: a)Crossection 23mmx25mm b) over all length 263mm c) width 165mm.

The foot rests shall with stand the bend test and chemical resistance test as per specifications and shall have manufacturer's permanent identification mark to be visible even after fixing

(5) R.C.C. Slab

C.I./S.F.R.C frames and covers of the specified size and weight shall be embedded in reinforced cement concrete slab 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size) 15 cm thick, reinforcement shall consist of 12 mm dia. M.S. bars of 15 cm centre to center (bothways). Additional bars shall be provided under the C.I. frame.

(6) Size of Manholes and Covers

Size of manholes and manhole covers shall be as follows unless otherwise specified in the Bill of Quantities:

	Size of Manhole (inside dimensions)	**Size and total weight of cover and frame**	
1.	Manhole not exceeding 0.45 m depth double	600 x 600 mm	600 x 450 mm (inside) sealed C.I. cover (light duty)
2.	Manhole not exceeding 0.90 m depth double	900 x 800 mm	600 x 450 mm (inside) sealed C.I. cover (light duty)
3.	Manhole not exceeding 1.67 m depth double	1200 x 900 mm	600 x 450 mm (inside) sealed C.I. cover (light duty)
4.	Manhole exceeding	900 mm	Medium Duty

	depth 0.9 m made of S.F.R.C.	circular	Dia-500 mm inside, Heavy Duty Dia-560 mm inside, made of S.F.R.C.
5.	Manhole exceeding depth 1.67 m inside, made of S.F.R.C. made of S.F.R.C	1200 mm	Medium Duty circular Dia - 500 mm Heavy Duty Dia - 560 mm inside,

(7) Drop Manholes

Where it is impracticable to arrange the connection within 60 cm height above the invert of the manhole, the connection shall be made by construction of a vertical shaft outside the manhole chamber as shown in the detailed drawings. If the difference in level between the incoming drain and the sewer does not exceed 60 cm and there is sufficient room in manhole the connecting pipe may be directly brought through the manhole wall and fall accommodated by constructing a ramp in the benching of the manhole.

All manhole covers shall fit properly and bed evenly without rocking in their frames. Covers shall be sealed with grease upon final completion and testing.

(8) Lifting Keys

A set of lifting keys for each type of manhole cover shall be supplied by the Contractor.

3.6 RAIN WATER COLLECTION CHAMBER

The chamber shall be of brick masonry as specified for manholes above and shall have a polycrete/ ferrocement grating with frame on top and C.I. grating with frame on side, both fixed in 15 cm thick cement concrete 1 : 2 : 4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size). The size of the chamber shall be taken as the clear internal dimensions of the polycrete/ ferrocement frame. The chamber shall have a connection pipe, the length of which in metre between the road gully chamber and the manhole of the drain shall not be less than one by forty (1/40) times the nominal diameter of pipe in mm (i.e. for 150 mm connection pipe, length shall not be less than 3.7 m and for 250 mm connection pipe length shall not be less than 6.25 m). The chamber shall be built at the location as shown on drawing or as fixed by the Project Manager considering the site conditions.

4 SOIL, WASTE AND VENT PIPEWORK

4.1 CAST IRON PIPES AND FITTINGS

(1) Specifications

Wherever specified, centrifugally cast (spun) iron pipes & fittings conforming to IS:3989-1984 shall be used for soil, waste and vent pipework unless specified otherwise. Pipes and fittings with irregular bore, blow holes and other manufacturing defects shall not be allowed to be used for work. All fittings shall be of the degree specified or as required at site.

All pipework shall be carried out in workmanship like manner following CPWD Specifications in general.

(2) Fixing

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 (Terminal Guard).

Horizontal pipes running along ceiling shall be fixed on structural adjustable clamps of special design shown on the drawings or as directed. 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 Contractor for making such provisions in the structure as necessary. All damages shall be made good to restore the surfaces if the above are not incorporated in time and provided afterwards by cutting walls and slabs..

(3) Cast Iron Floor Traps

Floor traps shall be cast iron deep seal type 'P' or 'S' traps with a minimum seal of 50 mm. They shall be with or without vent.

(4) Floor Trap Extension Piece

Wherever mentioned, flow trap shall be provided with G.I. extension piece. Length of the extension piece shall be as per the site conditions. On this extension piece, sockets of suitable diameters shall be welded at the required angle as per the drawing and site conditions. This extension piece shall be lead caulked into the collar of `P'/`S' trap.

(5) Installation of Cast Iron, Soil, Waste and Ventilation Pipe Work

i) Gradient

The gradient of a horizontal branch should not be flatter than 1 in 50 and not steeper than 1 in 10.

ii) Layout

The pipework in branch connections should always be arranged to allow free drainage of the system. Connections to main or branch pipes should be so arranged as to prevent cross flow from one appliance to another . Connections should be made with an easy sweep in the direction of flow.

iii) Jointing

All cast iron soil, waste & vent pipework shall have either lead joints of epoxy resin joints as specified in bill of quantities. Lead joints, if specified, shall be as specified in the latest CPWD specifications. Epoxy resin joint shall be done with specified proprietary products and shall be made as per the manufacturer`s directives.

All joints in pipe work and all pipe work to appliances should be made in such a manner as to be air-tight and water tight and to remain so during use.

iv) Bends

Bends should be of long radius where practicable. In the case of bends in the bottom most pipes, they should necessarily be of long radius and should be preferably be made of 135 degree (1/8) bends.

v) Access

Ample provision should be made for excess to all pipe work and embedding of joint in walls should be avoided as far as possible. All tee and cross pieces shall be with excess doors. Wherever instructed by the Consultant, the bends with

excess doors shall also be provided. The bottom most pipe of every soil and waste stack shall be provided with an excess piece at a height not more than 30 cm from the finished ground level.

vi) Soil pipes

Soil Pipes, whether inside or outside the building, shall not be connected with any rain water pipe and there shall not be any trap in such soil pipe or between it and any drain with which it is connected.

vii) Ventilating Pipe

a) Ventilating pipes should be so installed that water cannot be retained in them. They should be fixed vertically. Whenever possible, horizontal runs should be avoided. Ventilating pipe shall be carried to such a height and in such a position as to afford by means of the open end of such pipe or vent shift, a safe outlet of foul air with the least possible nuisance.

b) The upper end of the main ventilating pipe may be continued to the open air above roof level as separate pipe or it may joint the MSP and/or MWP above the floor level of the highest appliance. Its lower end may be carried down to join the drain at a point where air relief may always be maintained.

c) Branch ventilating pipes should be connected to the top of the BSP and BWP between 75 mm and 450 mm from the crown of the trap.

d) The ventilating pipe shall always be taken to a point 150 cm above the level of the leaves or flat roof or terrace parapet whichever is higher or the top of any window within a horizontal distance of 3 m. The least dimension shall be taken into account. The upper end of every ventilating pipe shall be protected by means of a cowl.

viii) Concrete Encasing

All soil and waste pipes horizontally laid in the sunken portion of the toilets (but not in open ducts or suspended with the ceiling) shall be covered with 75 mm thick cement concrete 1:2:4 all around. Encasement of such pipes shall be done after testing of the joints.

ix) Painting

All pipes in ducts and exposed position shall be painted with minimum two coats of enamel paint of approved shade and quality over a coat of primer. Pipes under floor or in chases need not be painted.

4.2 U.P.V.C. PIPES AND FITTINGS

12 (1) Specifications

Wherever specified, Internal above ground foul drainage pipework and fittings shall be of UPVC. Pipes of diameter 75 mm and above shall be confirming to **IS:13592 Type-B** and shall be of type commercially known as UPVC SWR system. Pipes of diameter 63mm and smaller shall be of pressure rating minimum 6 kg/sq.cm. Fittings in general shall be injection moulded and suitable for soil, waste and rain water drainage application. However, specials can be fabricated using pipes and fittings described above. All pipework fittings and accessories shall be installed strictly in accordance with the manufacturer's recommendations. The Contractor shall ensure that the UPVC pipes are of a sufficiently high temperature rating to withstand the environmental conditions

13 (2) U.P.V.C Pipework Installations

During the installation of internal drainage and waste system, the Contractor shall make due allowance for the expansion of UPVC and polypropylene pipework and fittings during normal working conditions. Further allowance shall be made for solvent weld jointing of the above materials with regard to temperature and humidity.

The bore of all pipework shall be smooth and free from all burrs or obstructions; bends wherever possible shall be of the long radius type.

All connections between soil drainage, vent, waste or fixtures shall be made with approved connectors. The termination at high level of all vent stacks shall be carried out with a vent guard.

All fixtures and fittings draining into the internal drainage installations shall be fitted with traps. In case of traps for sanitary fixtures e.g., hand wash basins, sinks etc., shall be of the deep seal type having a water seal of 50 mm.

Traps to sanitary fittings shall have deep seals of at least 50 mm depth of water and shall have inlet sizes as follows:

Wash Basins	-	32 mm
Sinks	-	40 mm
Bath Tubs	-	40 mm

Pipework shall be fixed accurately to approved falls, the gradient shall be consistent and pipework shall follow a true line. Allowance shall be made for the rodding of the whole installation in addition to which, at all changes of direction, a rodding eye shall be installed.

The pipework shall be fixed to the walls using standard PVC coated mild steel or PVC brackets of a screw-on type recommended by the manufacturers.

The maximum spacing between the supports shall be as follows:

Pipe Diameter	Horizontal	Vertical
32 mm	1.00 M	1.25 M
40 mm	1.00 M	1.25 M
50 mm	1.00 M	1.25 M
110 mm	1.25 M	2.00 M

The Contractor shall provide access or rodding eyes wherever required to provide full access to the system. The rodding eye shall also be provided at the foot of all vertical stacks at the point of connection to the underground drain pipe.

Access doors in suspended pipework within 0.5 M of the sofit shall not face upwards but be located on the side or underneath the pipe.

Where traps, access branches and access doors are located above false ceiling, removable panels shall be provided.

Soil and waste ventilation pipes passing through roofs shall be weather proofed to the satisfaction of the Project Manager.

The vent pipes shall be carried upto a minimum height from finished roof level of 500 mm to prevent any pressure fluctuations in the stack due to wind effect.

Connections to the outlets of the water closets shall be made by the use of proprietary UPVC WC connectors.

Generally vent and anti-syphonage pipes and fittings shall be installed above the flood level of the fitting wherever possible.

The whole of the installation shall be tested in accordance with the requirements of CPWD and Bureau of Indian Standards, specifications. All tests shall be to the full satisfaction of the Project Manager.

(3) U.P.V.C. Floor Traps

Floor traps shall be UPVC deep seal type 'P' traps with a minimum seal of 50 mm. They shall be with or without vent as required.

(4) U.P.V.C. Floor Trap Extension Piece

Wherever mentioned, floor trap shall be provided with UPVC extension piece. Length of the extension piece shall be as per the site conditions. Extension piece shall be formed out of boss pipe as per standard details and drawings.

14 4.3 GALVANISED IRON SOIL, WASTE AND VENT PIPEWORK

Wherever specified, small bore (upto 65 mm dia) galvanized iron soil, waste, vent and rain water pipework shall be executed as per the specifications given under section A5.1.1.1 G.I pipework

15 4.4 CLEAN OUTS

Clean outs shall be provided in the soil, waste and vent pipework as per the standard details wherever shown on the drawings and wherever required by the Consultant/Architect/Project Manager.

16 4.5 VENTILATION SYSTEM

i) Ventilating pipes shall project through walls or roofs to vent into the open air at the points shown on the drawings. The ventilation pipes shall be fitted with balloon at the top.

ii) No vent terminal shall be directly beneath any door, window or other ventilating openings of the building, nor shall any such vent terminal be within 3 M horizontally of such an opening unless it is 60 cm above the top of such an opening.

iii) All vent and branch vent pipes shall be so graded and connected as to drip back to the soil or waste pipe by gravity.

iv) Where vent pipes connect to horizontal soil or waste pipes, the vent pipes shall be taken off above the centre line of the pipe. The vent pipes shall rise vertically or at an angle note more than 45^{o} from the vertical to a point at least 150 mm above the floor level rim of the fixture it is venting before off-setting horizontally or before connecting to the branch vent.

v) A connection between a vent pipe and vent stack or stack vent shall made at least 150 mm above the flood level rim of the highest fixtures served by the vent. Horizontal vent pipes forming branch vents, relief vents or loop vents shall be at least 150 mm above the flood level rim of the highest fixture served.

17 4.6 RAIN WATER PIPES

Pipes for the conveyance of the rain water from the roof top, balcony etc. shall be installed, unless otherwise mentioned, as per the specifications for soil, waste and vent pipework as described above and of material as specified in bill of quantities.

The rain water inlet fittings shall be of type and material as specified in bill of quantities. Wherever, no special inlet fitting is specified in the bill of quantities, the cost of supplying and fixing of a normal grating of size matching with pipe size and of material as that of the pipes shall be deemed to be included in the cost of the rain water pipework.

The gaps between outlet and roof slab shall properly sealed.

18 4.7 PIPE SLEEVES

The Contractor shall install sleeves for all piping passing through slabs, beams, walls or any other building member. The sleeves shall be fixed in formwork before pouring of

concrete. In foundations and walls the sleeves shall be properly grouted and the gap between sleeve and building member shall be made water tight.

All sleeves shall be of PVC unless mentioned otherwise.

19 4.8 JOINTING OF NON-SIMILAR MATERIALS
UPVC & Cast Iron Pipes

Wherever cast iron pipes and UPVC pipes are to be jointed, the spigot end of UPVC pipe shall be jointed with socketed end of cast iron pipes. The length of spigot / plain end of UPVC pipe to be inserted in the socket of C.I. pipe shall be applied with PVC solvent cement and sprinklered with coarse sand end left for 24 hours. The joint shall be made with epoxy based **(like Drip-Seal)**

5 DOMESTIC WATER SERVICES

5.1.1 PIPE WORK

Wherever specified G.I. pipes for water supply inside and outside the building shall be genuine galvanised steel tubes conforming to IS:1239(Part-I)-1979 of specified grade with latest amendments.

All fittings shall be malleable iron galvanised fittings conforming to IS:1879(Part-1 to 10)-1975 with latest amendments. All fittings shall have manufacturer's trade mark stamped on it. Fittings in G.I.pipe lines shall include elbows, tees, bends, reducers, nipples, union, bushes, G.I. clamps of approved design, G.I. flanges with 3 mm rubber insertion, nuts, bolts, washers, etc. All fittings shall be tested at manufacturer's work. Contractors may be required to produce certificate to this effect from the manufacturers.

All pipework for water supply (both hot and cold) inside the building shall be carried out in a workmanship like manner following CPWD specifications in general. All materials shall be as specified in these specifications, bills of quantities and drawings. In case specifications of a material is not mentioned or not clear in the above, the reference shall be made to CPWD specifications and the relevant Indian Standards/codes.

5.1.2 CPVC PIPE WORK

Wherever specified, CPVC piping system for water supply system shall be SDR 11 rated and of approved makes. All pies and fittings shall be conforming to ASTM-D-2846 and IS: 15778:2007 (wherever there is a conflict, the material shall conform to stringent of the two parameters.

All fittings shall be injection moulded. CPVC to CPVC jointing shall be fusion bonding type(Solvent Cement Type) using proprietary CPVC fusion compound. Transition fittings (for making connections with valves, faucets, other appurtenances and non CPVC pipes) shall have brass insert having threads as per IS: 554. CPVC threaded fittings are not to be used.

All CPVC pipework for water supply (both hot and cold) inside the building shall be carried out in a workmanship like manner as per the manufacturer's recommendations. All materials shall be as specified in these specifications, bills of quantities and drawings. All the brass threaded adaptors and specials shall be jointed properly using Teflon tape. For storage, cutting, jointing, installing and testing of CPVC material, manufacturer`s instructions shall be strictly adhered to.

SolventCement : The jointing of pipes and plain fittings shall be by solvent cement of make and grade as specified and supplied by the manufacturer of CPVC piping system. It shall be ensured that the solvent supplied is not used beyond the expiry period as mentioned on the packaging of the material.

HORIZONTAL SUPPORTS SPACING:

DIA	**SPACING IN METRE AT WORKING TEMPERATURE**			
	23^0 C	**38^0 C**	**60^0 C**	**82^0 C**
½ "	1.22 M	1.07 M	1.07 M	0.92 M
¾"	1.53 M	1.37 M	1.22 M	0.92 M
1"	1.68 M	1.53 M	1.37 M	0.92 M
1 ¼"	1.83 M	1.68 M	1.53 M	1.22 M
1 ½"	1.98 M	1.83 M	1.68 M	1.22 M
2"	2.29 M	2.14 M	1.98 M	1.22 M

Curing Time: After the CPVC installation is completed, adequate time as per following schedule shall be provided for the curing of the of the joints before subjecting the system to pressure testing or putting it to use:

Ambient Temperature	**Pipe Sizes ½' – 1 ¼"**	**Pipe Sizes 1 ½"– 2"**
Above 16^0 C	½ hr.	1hr.
From 5^0 C – 16^0 C	1hr.	2hr.
Below 5^0 C	3hr.	6hr.

A5.1.3 GALVANISED IRON (G.I.) PIPE WORK (FOR EXTERNAL WORKS)

Specifications

Where specified G.I. pipes for water supply inside and outside the building shall be genuine galvanised steel tubes conforming to IS:1239(Part-I)-1979 of specified grade with latest amendments. Jointing of all G.I pipes shall be threaded

All fittings shall be malleable iron galvanised fittings conforming to IS:1879(Part-1 to 10)-1975 with latest amendments. All Threaded fittings shall have manufacturer's trade mark stamped on it. Threaded Fittings in G.I.pipe lines shall include elbows, tees, bends, reducers, nipples, union, bushes, G.I. clamps of approved design, G.I. flanges with 3 mm rubber insertion, nuts, bolts, washers, etc. All fittings shall be tested at manufacturer's work. Contractors may be required to produce certificate to this effect from the manufacturers.

Laying and Jointing

All excavation work for laying G.I. pipes shall be done as described in section A3.1 in general. However, the special care must be taken to ensure that the hard objects like stones, rock pieces, tree roots etc. are not present. Pipes shall be bedded in sand or soft soil free from rock and gravel. Backfill upto 15 cm above the pipe shall also be of fine sand (conforming to grading zone V) or soft soil. Pipes shall be protected by painting two coats of anti-corrosive bitumastic paint over a coat of primer. All the pipe surfaces shall be thoroughly cleared and dried before the application of the primer and shall be free of dirt, grease, oil, rust, scale or other foreign matter. The width of the trench shall be outside diameter of the pipe plus 30 cm. Pipes shall be laid atleast 90 cm. below the ground level (measured from surface of the ground to the top of pipe).

Screwed G.I. pipes shall be jointed with screwed socket joints, using screwed fittings. Care shall be taken to remove any burr from the end of the pipes after cutting. Thread lock cement with grummet of a few strands of fine hemp shall be applied while tightening. All piping shall be kept plugged at the end of day's work.

Protection of Underground Pipes:

The underground G.I pipes and Fittings shall be protected by Coaltar based polytmeric corrosion protection tape (minimum 4 mm thick) conforming to IS: 15337 - 2003,.

If specified in Bill of Quantities, the proprietary pipe protection system shall be provided as per the Manufacturers recommendation. The proprietary system shall be of approved make.

5.1.3 POLYBUTENE (PB) PIPE WORK (FOR EXTERNAL WORKS)

Specifications

Where specified PB.pipes for water supply inside and outside the building shall be conforming to ENISO 15876 of specified grade with latest amendments. Jointing of pipes shall be by polyfusion socket welding or electric socket welding

LAYING AND JOINTING

All excavation work for laying PB pipes shall be done as described above in general. However, the special care must be taken to ensure that the hard objects like stones, rock pieces, tree roots etc. are not present. Pipes shall be bedded in sand or soft soil free from rock and gravel. Backfill upto 15 cm above the pipe shall also be of fine sand or soft soil. Pipes shall not be painted. The width of the trench shall be outside diameter of the pipe plus 45 cm. Pipes shall be laid atleast 60 cm. below the ground level (measured from surface of the ground to the top of the pipe). The pipes shall be encased with 150 mm sand all-around

5.1.2 GALVANISED IRON (G.I.) PIPES FOR DOMESTIC WATER SUPPLY

Specifications

Where specified G.I. pipes for external water supply shall be genuine galvanised steel tubes conforming to IS:1239(Part-I)-1979 of specified grade with latest amendments.

All fittings shall be malleable iron galvanised fittings conforming to IS:1879(Part-1 to 10)-1975 with latest amendments. All fittings shall have manufacturer's trade mark stamped on it. Fittings in G.I.pipe lines shall include elbows, tees, bends, reducers, nipples, union, bushes, G.I. clamps of approved design, G.I. flanges with 3 mm rubber insertion, nuts, bolts, washers, etc. All fittings shall be tested at manufacturer's work. Contractors may be required to produce certificate to this effect from the manufacturers.

Laying and Jointing

All excavation work for laying G.I. pipes shall be done as described in section 3.1 in general. However, the special care must be taken to ensure that the hard objects like stones, rock pieces, tree roots etc. are not present. Pipes shall be bedded in sand or soft soil free from rock and gravel. Backfill upto 15 cm above the pipe shall also be of fine sand (conforming to grading zone V) or soft soil. Pipes shall be protected by painting two coats of anti-corrosive bitumastic paint over a coat of primer. All the pipe surfaces shall be thoroughly cleared and dried before the application of the primer and shall be free of dirt, grease, oil, rust, scale or other foreign matter. The width of the trench shall be outside diameter of the pipe plus 30 cm. Pipes shall be laid atleast 90 cm. below the ground level (measured from surface of the ground to the top of pipe).

Screwed G.I. pipes shall be jointed with screwed socket joints, using screwed fittings. Care shall be taken to remove any burr from the end of the pipes after cutting. White lead with grummet of a few strands of fine hemp shall be applied while tightening. Other pipe jointing compound may be permitted if approved by the Engineer-in-Charge before starting the work. All pipes shall be fixed with G.I. holder bat clamps clear off the wall. If pipes are fixed in chases they shall be fixed in position by iron hooks. All piping shall be kept plugged at the end of day's work.

Protection of Underground Pipes:

The underground steel pipes shall be protected by coating and wrapping. The coating and wrapping shall be done, in general, as per IS:10221 - 1982.

If specified in Bill of Quantities, the proprietary pipe protection system shall be provided as per the Manufacturers recommendation. The proprietary system shall be of approved make.

5.1.3 HDPE PIPEWORK

Wherever specified for external water supply including landscape irrigation, HDPE. Piping system shall be provided using specified materials and employing specially trained workmen.

HDPE PIPES

High Density Polyethylene (HDPE) pipes for potable water supply shall conform to IS : 4984-1978(Second Revision) (Material Grade PE-80) and be of appropriate pressure rating.

The pipes shall be reasonable round and shall be supplied in straight lengths or in coils as specified. The internal and external surfaces of the pipes shall be smooth and clean, free from grooving and other defects.

Pipes shall be manufactured using virgin material and shall be continuously and permanently marked with following information.

Manufacturer’s Name

Standards

Size and Pressure rating

HDPE FITTINGS

a) All Compression fittings shall be rated for 10 Kg/cm^2 suitable for HDPE pipes specified above.
b) All Butt welded fittings shall be of 10 Kg/cm^2 rating and shall be of same make as Pipes.

c) Wherever a branch or outlet of 50% or less dia is required, Clamp saddles shall be used instead of Tee. Saddles shall be Non metallic and shall be of same make as Compression fittings. Nuts and Bolts if used shall be SS 314.

d) Union wherever used shall be PVC as per DIN standards and shall be of 16 Kg/cm^2 rating. Unions shall be double union type and shall be threaded.

e) Flanges shall be selected to suit Valve flanges and shall be 10 Kg/cm^2(Min) depending on pipe line material. All bolts, nuts and washers shall be SS 314.

LAYING AND JOINTING

All excavation work for laying HDPE pipes shall be done as described above in general. However, the special care must be taken to ensure that the hard objects like stones, rock pieces, tree roots etc. are not present. Pipes shall be bedded in sand or soft soil free from rock and gravel. Backfill upto 15 cm above the pipe shall also be of fine sand or soft soil. Pipes shall not be painted. The width of the trench shall be outside diameter of the pipe plus 45 cm. Pipes shall be laid atleast 60 cm. below the ground level (measured from surface of the ground to the top of the pipe).

HDPE pipes shall be butt jointed by heat fusion method in accordance with the following procedures. HDPE pipes shall not be threaded. Jointing procedure shall be as follows and shall be strictly adhered to obtain optimum quality of joints. skillful application of qualified technique, welder and the use of proper construction equipment in good condition shall be made to achieve sound joints in HDPE piping.

Preparation

Any kinks or buckles in pipe near its ends shall be removed by cutting out as a cylinder. The face of the joints to be welded shall be flat. Correct position and holding of pipe is necessary when sawing pipe to achieve this. For pipes 160 mm. OD and above, shaping tool may be used.

Whether pipes have been sawn or not, joint faces shall be slightly scrapped with a knife, prior to welding, to remove exposed layers which may lead to unsatisfactory joint. Both the sections of pipe to be welded shall be positioned by using rollers and/or wooden supports.

Welding

Butt heat-fusion joint procedure shall require the use of jointing device (welding jack) that holds the heat element (mirror) square to the ends of pipes, can compress the heated ends together and holds the piping in proper alignment while the plastic hardens.

Temperature of joints should be 200^{o}C. Surface temperature, of the heating mirror, must, therefore, be 210^o C + 5^o C. The faces of pipes to be joined shall be on either sides of the heating mirror and maximum of 0.4 kg/cm^2 contact pressure shall be applied. Contact pressure should not exceed this, otherwise the molten mass from the joint faces will be squeezed out prior to welding. Even with the lowest pressure a rim of molten material shall be formed on the ends of pipes being joined. Care shall be taken in the heating

operation to prevent damage to the plastic material from over heating or having the material not sufficiently heated to ensure a sound joint. Direct application of heat, with a torch or other open flame is prohibited.

Approximate heating for series IV pipe may be taken as :-

32 mm OD pipe	:	1 minute
75 mm OD pipe	:	3 minutes
160 mm OD pipe	:	5 minutes

Heating time for pipes with lesser wall thickness may be according to experience and ambient temperature prevailing. Completion of heating is indicated by formation of a uniform rim of molten material at the edges of pipes.

Subsequent to heating, the pipes shall be removed from the heating mirror and shall be immediately joined by application of moderate pressure for 2-3 seconds, after which, pressure of approximately 0.6 Kg/cm^2 shall be applied for two minutes. After two minutes the pressure shall be increased to 1.2 kg/cm^2 and sustained for pipes upto 160 mm OD and 30 minutes for pipes 225 mm OD and larger.

Care shall be taken that the rim formed during welding is not too large. Pressure shall be maintained until the joint is hand-warm. After relieving pressure joint shall be allowed to cool completely before handling.

The electric heating mirror used shall be specially designed to meet the requirements of HDPE pipe welding. It should have a proper regulator to control and maintain its temperature during the welding procedure. It shall have P.T.F.E. cloth fitted on both sides to prevent adhesion of molten polyethylene on surface of the mirror.

Use of Crayons

The monochrome crayons (200^o C & 220^o C) shall be used to determine the temperature of mirror. At the correct temperature of 210^o C the colour of 200^o crayon mark shall change within 2 seconds. If the colour change takes longer time, the temperature is lower and if the colour change is immediate, the temperature is higher than necessary. As thin a layer as possible of crayon shall be used when checking. If the layer is too thick, the indications will be incorrect

5.1.4 UPVC PIPEWORK

Wherever specified for external water supply including landscape irrigation, UPVC Piping system shall be provided using specified materials and employing specially trained workmen.

UPVC PIPES

All pipes for laterals shall be un plasticised polyvinyl chloride (UPVC). UPVC pipes shall conform to IS:4985-1988 and shall be rated for 10 Kg/cm^2 working pressure.

Pipes shall be of uniform wall thickness, smooth finish inside and outside and shall show no evidence of interior scratches, extrusion marks, blisters, groves or any manufacturing or transit damage. Supplier shall provide test certificate of randomly selected pipes from supplied material. Sample shall be taken from site.

Pipes shall be supplied in lengths of six meters with integral socket end for solvent welding and each length shall bear following permanent marking at regular interval.

Manufacturer's Name

Standards

Size and Pressure rating

PVC Fittings

All PVC fittings shall have a minimum pressure rating of 16 kg/cm^2 working pressure, confirm to standards and shall be of same material as UPVC Pipes.

All fittings including the threaded ones to be of Injection Molded type. Fittings shall preferably be of same make as pipes.

Joint Cement and Primer

Solvent Cement and Primer for UPVC Pipes shall be as per Pipe manufacturer's recommendations.

5.1.5 LLDPE Tubing and fittings

Wherever specified for landscape irrigation, LLDPE tubing system shall be provided using specified materials and employing specially trained workmen.

Linear Low Density Polyethylene (LLDPE) Drip tubing shall have minimum out side diameter of 16 mm and minimum wall thickness of 1.2 mm and it shall be rated for 4 bar working pressure.

Drip lines shall have uniform wall thickness, and to be free from extrusion marks, grooves and blisters. The drip lines shall have the marking of manufacturer's name, size and pressure rating imprinted on it at regular intervals.

5.2 INSULATION OF HOT WATER PIPES

The insulation of the hot water pipework shall be done with closed cell chemically cross-linked polyethylene (XLPE) preformed pipe sleeves. The pipe shall be thoroughly cleaned and applied with proprietary glue and then the pre-slit insulation pipe section shall slipped on the pipe. The slits should be sealed properly with proprietary adhesive tapes as per the direction of the manufacturer.

All exposed hot water pipework in ducts, cavities, above false ceiling etc. should be insulated with pre laminated (with aluminum foil) pipe sleeves while those in chases shall be insulated with plain pipes sleeves.

5.3 VALVES, TAPS AND MIXERS

(1) General

Each valve body shall be marked with cast or stamped lettering giving the following informations :

a) The manufacturer's name or trade mark

b) The size of the valve

c) The guaranteed working pressure

Isolating valves on the water supply lines shall be full bore ball valve type for pipe diameters upto 50 mm. For 65 mm dia and 80 mm dia., these shall be gate valve type and diameters above 80 mm, these shall be sluice valve type.

(2) Float Valve

Float valves 50 mm and smaller shall be of brass, gun metal or other equally suitable corrosion resistant alloy in accordance with IS:1703-1977 or approved equal. The float valves shall have copper or plastic floats suitably reinforced to hold the threaded insert. The float valves fixed to the system shall be secured with backnuts.

(3) Fullway Gate Valve

The valves shall be of quality approved by the Consultant/Project Manager and shall generally conform to IS:778-1971.

(4) Full Way Ball Valve

The valves shall be of full bore type and of quality approved by the Consultant/Project Manager. The body and ball shall be of copper alloy and stem seat shall be of teflon. OR as specified in bill of quantities

(5) Non-Return Valves

Non-return valves are to be IS:778-1984 manufactured from gun-metal or dezincification resistant brass.

(6) Pressure Reducing Valve

The valve shall be suitable for water application and shall conform to relevant BIS standard. The valve should be installed in a vertical portion on horizontal line. In all cases, a stop valve should be installed in an easily accessible position on the inlet side of the pressure reducing valve. A safety valve and a pressure gauge must always be installed on the reduced pressure or outlet side of the pressure reducing valve. To avoid any dirt from entering the valve, it is advisable to fit a strainer on the

inlet or high pressure line. The pressure reducing valve and accessories should conform to relevant BIS standard and of approved make.

(7) Butterfly Valves

The valve shall be of cast iron conforming to relevant IS:13095. The valve shall be of quality approved by the consultant/Project Manager.

(8) Taps and Mixers

Bib or mixer taps shall be fixed to sinks, lavatory basins, bathtubs and showers and as shown on the drawings and/or specified under the Sanitaryware schedule.

The Contractor must ensure that the installed taps and mixers are not damaged or mishandled till the handing over of the installation.

6 SANITARY FIXTURES AND FITTINGS

6.1 WORKMANSHIP

All Sanitaryware shall be fixed in neat workmanship like manner, true to level and plumb. Manufacturer's instructions shall be followed closely regarding installation and commissioning.

6.2 SANITARYWARE

All fittings provided by the Contractor shall be of first quality, free from wraps, cracks and glazing defects. All sanitaryware, fittings and fixtures shall be fitted as shown in drawings and as described in details in Bill of Quantities.

6.3 FIXING

All sanitarywares shall be installed in accordance with manufacturers printed instructions for conditions indicated and as required to obtain a rigid installation. The location of each fixture and the fixing method of ceramic fixtures shall be as shown on the drawings or as directed by the Project Manager.

After all fittings have been mounted and are ready for use and before completion, all fittings furnished and mounted shall be thoroughly cleaned removing all plaster, stickers, rust, hair and other foreign matter or discolouration of fixtures, leaving each and every part in perfect condition and ready for use.

6.4 PROTECTION

The Contractor shall take adequate precautions to ensure that the sanitarywares are not damaged in any way before or after installation. Any piece of sanitaryware that is damaged shall be replaced at the Contractor's expense. The Contractor shall be responsible for checking sanitaryware on arrival at site. If any pieces of sanitarywares are found to be damaged on arrival at site, the Contractor shall inform the Project Manager

within two days. If the sanitarywares are delivered in damaged state, the Contractor shall refuse delivery of the damaged piece and shall request a replacement of the same.

6.5 TESTING

Just prior to handing over the building to the Owner, each piece of sanitaryware shall be tested. Each water closet shall be flushed twice and checked for leaks and any other defects by the Project Manager.

Each basin, bidet, bath and sink shall be filled to the overflow level and then after running the water through the overflow for a minimum of 30 seconds, the plug shall be removed or opened. Each of the above mentioned fixtures shall be inspected for leaks and defects by the Project Manager.

Any defects or leaks shall be repaired or in the case of the defect being chips or cracks or other visible damage, the fixture shall be replaced at the Contractor's expense. Any sanitaryware condemned by the Project Manager for any other reason shall be replaced at the Contractor's expense.

7 TESTING AND COMMISSIONING

7.1 GENERAL

The Contractor shall be responsible for testing and commissioning the entire services installation described in these specifications and will demonstrate the operation of the system of the entire Satisfaction of the Architect/Consultant and to the Owner approval.

7.2 GENERAL

The test on various services shall be carried out as described herein as described in relevant Indian Standards and British Standards and also as directed by the Project Manager. The carrying out and recording of tests shall be agreed with the Architect/Consultant

7.3 WATER FOR TESTING

Water for testing shall be obtained by the Contractor from an approved source. It shall be free from bacterial contamination silt, grit, sand etc. After testing, the Contractor shall satisfactorily dispose off all water, or it may be re used providing it is clean and is not contaminated.

7.4 TEST RECORDS

The Contractor shall be responsible for the keeping all records of tests and on completion shall provide records and reports of the tests in triplicate. All test records shall clearly identify the item of the test and must be signed by the Contractor’s authorised representative and Project Manager.

7.5 UNSATISFACTORY WORKS

If the tests reveal unsatisfactory materials, installation or adjustment, the Contractor shall, at his own expense, carry out such alternations or replacements as may be necessary to rectify the defective work. The Contractor shall then repeat the tests as necessary to establish the satisfactory nature of the alterations or replacements.

7.6 TESTING AT WORKS

All plants and equipments shall be tested at manufacturer's works before despatch and the test certificate in duplicate shall be forward to Architect/Consultant. The Contractor shall similarly provide a set of manufacturer's certified test curves for any pump installed under the Contract. All tests shall be in accordance with the appropriate Indian Standards and British Standards as applicable.

7.7 ON SITE TESTING

The Contractor shall provide on site all the necessary instruments, plant, equipment, materials, water, electricity and labour necessary for carrying out the specified tests. All tests shall be carried out as required to meet the construction programme and the Contractor shall include for all necessary isolation and other works as may be required for testing the whole or parts of the installation. The Contractor shall also be responsible for re-testing, if necessary, until satisfactory tests are achieved.

7.8 TEST PRESSURES

Pipe Line	Test Pressure	Period	Method
Water Mains, Fire Mains & Water Services.	5 kg/sq.cm. or maximum working pressure plus 50 percentwhich ever is greater.	24 Hours	Hydraulic Pressure Test
Underground Drainage	1.5 metres head of water at highest point	12 Hours	Hydraulic Test
Foul Drainage above ground	i) Not more than 4.5 M head in any section	2 Hours	Hydraulic Test
	ii) 75 mm water	3 min.	Air Test

gauge

7.9 TESTING OF VARIOUS SERVICES

(1) Water Services

Before the pipes for water supply are painted or covered they shall be tested to a hydraulic pressure of 5 kg/sq.cm or maximum working pressure plus 50 percent whichever is greater. Pressure shall be maintained for atleast 2 hours without appreciable drop in pressure. In addition to the sectional testing of water supply pipes, the Contractor shall test the entire installation on completion of the job to the entire satisfaction of the Project Manager. The Contractor shall rectify all leakages and restore damage done to the building and furniture at his own cost.

(2) Underground Drainage

The sewer and drain lines shall be tested for water tightness and straghtness as described below

i) Water Test:

Pipes and joints shall be subjected to a test pressure of atleast 1.5 m head of water at the highest point of the section under test. The test shall be carried out by suitably plugging the low end of the drain and filling the system with water. A knuckle bend shall be temporarily jointed in at the top end and a sufficient length of vertical pipe jointed to it so as to provide the required head. Or top end may be plugged with a connection to a hose ending in a funnel which could be raised or lowered till the required head is obtained and fixed suitably for observation.

ii) Test for Straightness and Observation.

Sewer lines shall be tested for straightness :

a) By inserting at the high end of the sewer or drain a smooth ball of diameter 13 mm less than the pipe bore. In the basence of obstruction, such as yam or mortar projecting through the joints, the ball should roll down the invert of the pipe and emerge at the lower end; and

b) By means of a mirror at one end of the line and lamp at the other. If the pipe line is straight, the full circle of light can be observed. If the pipeline is not straight, this will be apparent. The mirror will also indicate obstruction in the barrel.

(3) Above Ground Foul Drainage

All soil, waste and vent pipes shall be tested by filling up the whole or part of stack with water. All openings for connections, etc. shall be suitably plugged. The total head shall however not exceed 4.5 metres.

Contractor shall remove and replace all pipes having holes, cracks etc. All leaking joints and access doors shall be replaced or remade to the entire satisfaction of the consultant. Water shall be retained in stack for a minimum period of 2 hours. After all plumbing fixtures are installed. Contractors shall apply the smoke test to the entire stack to the satisfaction of the Consultant.

(4) Sanitary Fixtures & Fittings

When the installation has been complete to the satisfaction of the Consultant, it shall be tested in the following manner :

i) The entire system shall be slowly filled with water, allowing any trapped air to escape.

ii) When all outlets are closed, the system shall be checked for water tightness.

Each outlet shall then be checked for rate of flow and correct operation.

i) Waste outlets of wash basins and sinks shall be plugged and the basin and sink bowls shall be filled upto over flow level. Plug shall be removed and waste pipe and trap shall be checked for leakage and floor drain (if fixture waste is connected to floor drain) shall be checked for overflow.

(5) Testing Manholes

All open channel manholes shall be tested with water to a height of 1 metre above the channel invert or as otherwise directed. The water level shall be retained for a 2 hour period without appreciable loss. When the water is released the benching shall be inspected to ensure that there are no cracks**.**

7.10 FLUSHING OUT AND STERILISATION OF PIPEWORK AND TANKS

It is essential that all internal water services, external mains and tanks are thoroughly flushed out prior to being put into service and that drinking and domestic water services mains and tanks are sterilized in accordance with clause 13 of IS : 2065-1983 – Code of Practice for Water Supply in Buildings.

The Contractor shall be responsible for making any temporary pipe work connections required.

Following completion of sterilization of every part of the drinking and domestic water system, the Contractor is to ensure that satisfactory bacteriological samples are obtained and tested at an approved laboratory and the result approved by the Architect/Consultant prior to completion of the contract and handing over to the Owner.

8 LIST OF APPROVED MAKES/MANUFACTURES OF MATERIALS

NOTE : All Brand Names/Manufacturers are Indian unless specified otherwise.

S.NO.	*MATERIAL*	*BRANDNAME / MANUFACTURER*
A.	Sanitary Fixtures and Faucets The Owner's Supply	
B.	Pipes and Fittings (ISI Marked or Approved Quality)	
1.	Centrifugally Cast (Spun) Iron Soil, Waste & Vent Pipes	a) JayaswalNeco
		and Fittings (Nagpur)
.	UPVC Soil, Waste & Vent Pipes and Fittings	a) Supreme
		b) Astral
		c) Finolex.
3.	CPVC Pipes and Fittings	a) Astral
.		
4.	G.I. Pipes	a) Tata
		b) Jindal, Hissar
5.	G.I. Fittings	a) Unik Brand
		b) Zoloto-m
6.	R.C.C. Pipes	ISI marked of approved
		quality
		a) Pragati
		b) Laxmi
		c) Jain Spun Pipe (JSP)

S.NO.	*MATERIAL*	*BRANDNAME / MANUFACTURER*
7.	UPVC Underground Drainage Pipes& Fittings	a) Jain Irrigation (Orange brown in clour) b) Supreme
8.	HDPE Pipes and Butt Fittings	a) Jain Irrigation b) Hasti c) Dura-line
9.	HDPE Compression Fittings, Converters and Adapters	a) Plasson, Israel b) Palaplast, Greece c) Alprene, Italy d) MAIS, Saudi Arabia
C.	**Insulation**	
1.	Closed cell chemically cross-linked polyethylene (XLPE) Insulation	a) Supreme b) Thermaflex
D.	***Valves***	
1.	Ball Valves	a) R B, Italy b) Cim, Italy c) Arco, Spain d) Tiemme, Italy
2.	Gunmetal Gate Valves, Non-return Valves, Float Valves	a) Leader b) Zoloto c) Sant

S.NO.	MATERIAL	BRANDNAME / MANUFACTURER
E.	***Manhole Covers, Gratings etc.***	
1.	Steel Fibre Re-inforced Concrete Manhole Covers and Gratings	a) K.K. Manholes b) Pragati Concrete
2.	C.I. Manhole Covers	a) RIF b) Neco
F.	**Paint / Primer**	a) Shalimar b) Asian c) Nerolac
G.	**Miscellaneous Items**	
1.	Casted Gratings, Cleanouts, Funnel etc.	a) GMGR b) Neer c) Flowmax
2.	Shower/Floor Outlets	a) Viega, Germany (Marketed by /GMGR)
3.	Industrial Gully traps made of Stainless Steel	a) ACO, Spain (Marketed by GMGR)
4.	C.P Brass Angle Valve.	a) Arco, Spain (Marketed by Deepak Exim Company) b) Scheel (Marketed by GMGR)
5.	Stainless Steel Gratings.	a) ATGT, China (Marketed by Deepak

S.NO.	*MATERIAL*	*BRANDNAME / MANUFACTURER*
		Exim Company
		b) Chilly
6.	Stainless steel braided flexible connection pipe	a) ASR
		(Marketed by Deepak Exim Company)
7.	Quick Release Coupling	a) Rain Bird, USA
		b) Toro, USA
8.	PVC preassembled triple swing joint	a) Jain Pipes
		b) Ajay Industrial Corp
9.	HDPE Valve Box	a) MAIS, Saudi Arabia
		b) Rain Bird
10.	Expansion Bolts	a) Hilti
11.	G.I. Hangers for Pipes / Adjustable Hanger	a) Chilly
		b) Camry
12.	T/Y Strainer	a) Leader
		b) Zoloto
13.	Solenoid Valves	a) Danfoss
		b) Aira - Airmax
14.	Water Level Controller	a) Janus

S.NO.	MATERIAL	BRANDNAME / MANUFACTURER
		(Magnetic Float Type)
		b) Cirrus
		c) Elegant Control
15.	HDPE Tanks	a) Sintex
		b) Durawell
16.	Anti-vibration Pads/Footings	a) Resistoflex
17.	Vibrations Eliminators	a) Resistoflex
18.	Pressure Switches	a) System Sensor, U.S.A
		b) Danfoss
		c) Indfoss
19.	Pressure Gauges	a) H. Guru
		b) Fiebig
20.	Digital Water Quality Monitoring Equipment	a) Fluid Control stem, USA
		b) Impell
21.	Water Flow Meter Turbine Type	a) Kranti
		b) Kent

Note :

Note : Contractor to quote any make from recommended list only. In case of non-availability of any material . The Contractor must seek written approval from Consultant/Architect/Project Managers for use of alternate make. The cost differential from listed make to alternate make shall be reimbursed to the Client. The Contractor shall not be eligible for payment of non-approved make of material

9 PREAMBLE TO BILL OF QUANTITIES

9.1 The Bill of Quantities should be read with all the other sections of this tender. All the items of work mentioned in the Bill of Quantities covered by this contract shall be carried out as per the drawings, specifications and directions of the OWNERS/ROJECT MANAGER and shall include the cost of all labour, materials, tools and plants, Machinery / equipments, all form works, scaffoldings, pouring, vibrating, curing of concrete etc. and wastages etc. and testing of materials, if any, with CONTRACTOR's testing appliance, all octroi, duties, royalties, sales tax on works contract, toll tax, taxes and CONTRACTOR's profit and overheads etc…….

9.2 The TENDERERS shall be deemed to have studied the drawings, specifications and details of work to be done within the time schedule and to have acquainted himself of the conditions prevailing at site. The quoted rates shall be applicable for all works in any section / size / shape and Design etc.

9.3 The quantities shown against the various items are only approximate. Any increase or decrease in the quantities shall not form the basis for alteration of the rates quoted and accepted.

9.4 In case where the specifications given in the Description of the item of work given in Bill of Quantities are found wanting, the C.P.W.D. specifications – 2002 (with upto date corrections slips) shall be followed; where not specified the latest edition of relevant I.S. Specifications shall be applicable. In case of any ambiguity in interpretations, the OWNERS decision shall be final and binding.

9.5 The rates quoted for items of work shall include all costs for :-

a) Working in all conditions in all floors at all heights / depths including in / under water, liquid mud, foul conditions etc. and shall also include bailing or pumping out water from the foundations basements or any other place of construction collected from rain or any other source whatsoever at any time, till the completion of work including all suspension period and delays whatsoever.

b) Cutting chase / openings / holes etc. and making good in brick / R.C.C. walls and floors R.C.C. slabs etc. as necessary and restoring the cutouts to their original finish whether explicitly mentioned in the item or not ;

c) disposal of surplus earth and any dismantled R.C.C. / Cement concrete rubbish or malba etc. outside the site premises;

d) all form work for any size, section, thickness, and for all heights and all depths, curing of cement concrete / R.C.C. work and all works wherein cement is consumed.

e) Supplying, storing and safe handling of all fixtures and fittings.

f) Providing all necessary approved fittings and accessories. Accessories to be supplied to match the fixtures.

g) Effecting proper inlet, outlet, joints and slopes as required.

h) Testing, cleaning, of all sewer, soil , waste, vent, storm water drainage & water supply lines and dis-infection of water supply system etc. as called for in the specifications.

i) All lead caulk jointing for HCI pipe work including cost of the lead, cutting of pipe and clamps etc. complete in all respects.

j) Any item of work where steel reinforcement is used, shall be inclusive of cost of necessary supply & laying of steel reinforcement, shutterings& cement concrete of specified grades.

k) All necessary C.P. Brass / Galvanised M.S. screws / P.V.C,.expandable dash fasteners etc. including drilling holes in walls / R.C.C. / Masonry / Wood Work etc. for installation & fixing purposes, as required.

9.6 All the items of work shall be carried out as per description given in the Bill of Quantities and as shown in the drawings. All materials to be got approved from the OWNERS.

9.7 The OWNER reserves the right to with draw from the scope of work and/or to order to any other agency for any item or group of work, or to split the work between two or more SUB-CONTRACTOR's if necessary. Such a step shall not constitute a breach of the contract.

9.8 For all items of work the rates shall be comprehensive and all inclusive. The rates shall include for all materials and things necessary for satisfactory completion and maintenance of the work in proper working order and to the satisfaction of the Owner/Consultant, including testing, making samples etc., and all that have been indicated in the Specifications or other Tender Documents either directly or indirectly and cover for all obligations of the Contractor under the Contract. No claim for additional payment shall be allowed for any error or misunderstanding by the Contractor of the work involved.

9.9 Unless otherwise mentioned in the description of the item, this Bill of Quantities shall be applicable for work at any height/depth, position or condition, at all floors, in all shapes, sizes etc.

9.10 Unless otherwise stated, method of 'measurement' as described in the latest 'Specifications' of CPWD-2002 (with up-to-date correction slips) shall be followed. In case of any dispute in this regard, the Owner/Consultant's decision shall be final, binding and conclusive.

9.11 The following notations have been used throughout the Bill of Quantities and Rates :

m/M	Running Metre
Sqm	Square Metre
Cum	Cubic Metre
mm/MM	Millimetre
No.	Number/Numbers
Dia.	Diameter
Kg.	Kilogram/s
T.	Tonne
L.S.	Lump Sum
Pt.	Point
Rs.	Indian Rupees
ND	Nominal internal Diameter of pipe (mm)
%	Percent.

9.12 TRADE PREAMBLE

1. Manholes, masonry chambers for Valves, Hydrants and other Appurtenances.

MANHOLES AND OTHER CHAMBER

SHALL BE MEASURED IN NUMBER. THE RATES SHALL INCLUDE -

a) excavation in any kind of soil including quick sand but excluding rock which requires blasting :

b) protecting the excavation with all necessary shoring, strutting and keeping the excavation clear of water;

c) providing and laying foundation concrete as shown on drawing and as specified;

d) providing and constructing brick masonry walls in cement mortar as shown on drawing and as specified. The openings required to be left open for pipes and subsequent grouting shall also be included in the rates;

e) providing and casting R.C.C cover as shown in drawing and as specified;

f) providing, fitting and fixing C.I. surface box, manhole cover as shown in drawing and as specified and or directed at site by Owner's Representative, and;

g) providing cement plastering to the walls of chamber, internally as well as externally.

The depth of the manhole shall be reckoned from the top level of C.I. cover to the invert level of channel. The extra depth shall be measured and paid as extra over the specified depth.

2. Pipe work

R.C.C. , STONEWARE AND CAST IRON PIPEWORK FOR UNDERGROUND DRAINAGE

a) Pipework is to be measured in running meter nearest to a cm as laid or fixed from inside of one manhole to inside of the other manhole. The length shall be taken along the center line of the pipes over all fittings such as bends, junctions, etc. which shall not e measured separately.

SOIL, WASTE AND VENTILATION PIPEWORK

a) Pipework is to be measured in running meters nearest to a cm as fixed or laid. The length shall be taken along the center line of the pipes over all the fittings,

such as bends, tees, junctions, all with or without doors, door pieces, cowls, etc. which shall not be measured separately.

b) The rate shall be include the cost of materials and labour involved in supplying, fixing with holder bats & MS stays, laying underground, cutting holes, chases in walls, floors and painting with two or more coats of paint of approved quality and shade.

c) Floor Traps

Floor traps shall be measured by number. The rate shall be inclusive of supplying of trap and grating, setting, in concrete and connecting branch pipes to it.

G. I. PIPES FOR WATER SUPPLY (EXTERNAL)

a) Pipe work is to be measured in running meters nearest to a cm for the finished work, which shall include G.I. fittings such as bends, tees, elbows, reducers, crosses, plugs, sockets, nipples and nuts but shall exclude brass or ornamental taps, valves, etc.

b) The rate shall be inclusive of the cost of materials and labour, excavation and earth work and painting pipes with two coats of anti-corrosive bitumanistic paint and surrounding with Yamuna sand 150 mm all around

G. I. PIPES FOR WATER SUPPLY (INTERNAL).

a) As above.

b) The rate shall be inclusive of cost of materials and labour, cutting holes and chasing in walls and floors and making good the same, providing sleeves, applying anti-corrosive bitumanistic paint and 0.2mm thick PVC on buried and concealed pipe work and painting of exposed pipes.

c) The rate shall be inclusive of providing 'Identification and Labeling' of pipes with the colour coded bands.

d) Insulation of hot water pipes shall be paid separately.

3. Valves, cocks and other Appurtenances

Appurtenances like valves, water meter etc. shall be measured in number. Rates shall include -

a) testing and checking of appurtenances and fittings before taking delivery of the same.

b) delivering the appurtenances to the specified storage area at site;

c) lowering the same into specified support (including providing the support) jointing, fitting and fixing true to line and level

including repairing of protective coating, if necessary; and

d) providing all equipment labour and materials necessary to carry out the above works complete in all respect as specified and/or instructed.

e) Insulation of valves shall be paid separately.

4. Sanitary Fixtures & Faucets

All sanitary fixtures and faucets of specified trade mark or equivalent shall be paid by number. The rate shall include fixing components, brackets, screws and any other specials required, cutting holes in walls and making good the same.

The rate shall also be inclusive of painting R.S. or M.S. brackets for cisterns, wash basin, sinks etc. with one coat of red oxide and two coats of epoxy paint of approved shade and quality.

SUBHEAD : SANITARY PLUMBING INSTALLATION

SUMMARY

S.NO.	DESCRIPTION	AMOUNT	
1	SANITARY FIXTURES, FAUCETS & TOILET REQUISITES (FIXING RATE ONLY)	Rs.	
2	SOIL, WASTE & VENT AND RAIN WATER PIPES AND FITTINGS (ABOVE GROUND DRAINAGE)	Rs.	
3	WATER SUPPLY	Rs.	
4	SEWERAGE AND DRAINAGE	Rs.	
5	LANDSCAPE IRRIGATION SYSTEM	Rs.	
6	MISCELLANEOUS ITEMS	Rs.	
7	PUMPING MACHINERY (FIXING ONLY)	Rs.	
	TOTAL	Rs.	

In Words : Rupees .

Date **Signature and Seal of Tenderer**

SUBHEAD : SANITARY PLUMBING INSTALLATION

BILL OF QUANTITIES

S.NO.	DESCRIPTION	QTY	UNIT	RATE	AMOUNT
1.0	**SANITARY FIXTURES, FAUCETS & TOILET REQUISITES (FIXING RATE ONLY)**				
	NOTE :				
	FOR ITEMS UNDER THIS HEAD, THE FIXTURES, FAUCETES, FLUSHING UNITS ETC. SHALL BE PROVIDED BY THE OWNER AT SITE ON HIS OWN COST				
	THE OWNER SHALL SUPPLY THE FOLLOWING :				
	a) SANITARYWARES INCLUDING PROPRIETARY BRACKETS, SUPPORTS, CHAIRS, FASTNERS, EXPANSION BOLTS, PAN CONNECTORS, WASTE COUPLINGS, BOTTLE TRAPS, COPPER / FLEXIBLE CONNECTING PIPES ETC.				
	b) SINKS,				
	c) FAUCETS & FIXTURES				
	d) TOILET REQUISITES				
	e) AUTOMATIC FLUSHING MECHANISM				
	THE TENDERER MUST INCLUDE FOR IN HIS RATES THE FOLLOWING :				
	a) RECEIVING, STORING, UNPACKING ETC.				
	b) INSTALLATION, TESTING & COMMISSIONING				
	c) ANY CONSUMABLE LIKE CEMENT MORTAR, YARN, TEFLON TAPE, RAWL PLUGS, WOODEN CLEATS, SCREWS etc.				
1.1	**Fixing** vitreous **wall hung** china water closet **without cistern** complete with seat and cover, including making connection with soil pipe, cutting and making good the walls and floors wherever required.	32	No.		
1.2	Fixing **wall concealed W.C cistern**, making inlet and outlet connections with water supply and W.C. pan respectively, cutting and making good the walls wherever required.	32	No.		
1.3	Fixing **vitreous china Indian type water closet (Orissa Pan type W.C.)** with 'P'/'S' trap **with cistern**, with proper fixing arrangement including encasing the W. C. with cement concrete, cutting and making good the walls and floors wherever required.				
	Orissa pattern W.C. pan of size 580x440 mm with integral type foot rests	0	No.		

S.NO.	DESCRIPTION	QTY	UNIT	RATE	AMOUNT
1.4	**Fixing** vitreous **wall hung** china water closet **with cistern** complete with seat and cover including making connection with soil pipe, cutting and making good the walls and floors wherever required.	0	No.		
1.5	Fixing **vitreous china urinal basin** complete with waste outlet including making connection with water supply pipe and soil pipe, cutting and making good the walls and floors wherever required.	2	No.		
1.6	Fixing **vitreous china wash basin** complete with waste oulet including making connection with water supply pipe and waste pipe, cutting and making good the walls and floors wherever required.				
	a) Under Counter / Counter Top Fitting	32	No.		
	b) Flat back wall mounted fitting	0	No.		
1.7	Fixing of **Bath tub complete with supporting structure**, waste outlet , grip handles, overflow, including making connection with waste pipe, cutting and making good the walls and floors wherever required.				
	Approximate Size : 1650 mm x 750 mm x 400 mm	0	No.		
1.8	Fixing of **Kitchen sink with or without drainboard** complete with waste outlet including making connection with waste pipe, cutting and making good the walls wherever required.				
	Material : Stainless Steel	4	No.		
1.9	Installing, testing and commissioning **infra-red sensor controlled** electric / battery operated **automatic urinal flushing system,** including making connection with water supply and urinal basin, cutting and making good the walls wherever required	2	No.		
1.10	Fixing of **counter/ basin mounted single lever mixer set.**	32	No.		
1.11	Fixing of **wall-mounted Kitchen sink mixer** with swivel spout and wall flange.	4	No.		
1.12	Fixing of **4-way concealed diverter mixer** fitting including making connections with water supply, cutting and making good the walls wherever required.	30	No.		
1.13	Fixing of **wall mounted bath cum shower mixer fitting with diverter lever and bend for overhead shower connection** including making connections with water supply, cutting and making good the walls wherever required.	0	No.		

S.NO.	DESCRIPTION	QTY	UNIT	RATE	AMOUNT
1.14	Fixing **overhead shower rose/ rain shower/ hand shower complete with** arm/ flexible cord and wall flange.	30	No.		
1.15	Fixing **bath spout** with wall flange	30	No.		
1.16	Fixing of **bib cock** with wall flange	2	No.		
1.17	Fixing of **angle valve including flexible connection pipe** with wall flange.	128	No.		
1.18	Fixing of **hose bib-cock with ball valve arrangement**, butterfly handle and fitted with hose coupling, all complete.	1	No.		
1.19	Fixing **health faucet complete with flexible tube and** wall hook.	32	No.		
	TOTAL for "Sanitary Fixtures, Faucets, & Toilet Requisites" carried over to SUMMARY			**Rs.**	
2.0	**SOIL, WASTE & VENT AND RAIN WATER PIPES AND FITTINGS (ABOVE GROUND DRAINAGE)**				
2.1	**Providing, jointing and fixing UPVC Soil, Waste and Vent System**				
	The work shall be done as per technical specifications and in general shall include:				
	Material: UPVC pipes and fittings (moulded as well as fabricated) conforming to IS : 13592 - Type B				
	Fittings shall include all standard moulded as well as fabricated fittings like bends, tees, Y-tees, crosses, boss connections, access pieces, saddle pieces, cleanouts, adaptors for connections to other materials, plugs, reducers, cowls, offsets and other specials				
	Jointing: Pushfit rubber ring jointing technique in general. Solvent cement joints may be provided for fittings and specials which are not manufactured with pushfit rubber joints				
	Installation, Testing and Commissioning: The installation shall be complete in all respects including cutting chases / holes in walls, slabs, excavation, refilling and disposal of surplus earth where required and making good, etc				
	M.S Supports: All vertical and suspended horizontal pipework shall be fixed on MS brackets and hangers with U-clamps made from 10 mm dia galvanised steel rod complete with nuts and washers. Cost for MS structural work for supports shall be included in the rates				
	Conctere Encasing (In case of Sunken Floor/ burried pipes): The pipes and fittings shall be encased with 75 mm thick cement concrete (1:2:4) all around				

S.NO.	DESCRIPTION	QTY	UNIT	RATE	AMOUNT
	Making Good the Structure Crossings: For all horizontal and vertical crossings of building structure (slabs, walls, beams, column etc), the space between pipe and the structure shall be made good and water tight with concrete. The annular space between the pipe and the sleeves shall be sealed (upto a minimum depth 25 mm) with fire resistant acrylic based sealent of approved make and quality.				
	a) 32/40 mm OD	205	M		
	b) 50 mm OD	50	M		
	c) 63 mm OD	120	M		
	d) 75 mm OD	0	M		
	e) 110 mm OD	232	M		
	f) 160 mm OD	0	M		
2.2	**Providing, jointing and fixing Centrifugally Cast (Spun) Iron Soil, Waste and Vent System (Suspended Pipework in in common areas)**				
	The work shall be done as per technical specifications and in general shall include:				
	Material: Centrifugally Cast (Spun) Iron Pipes and Fittings conforming to IS:3989-1984				
	Fittings shall include all standard specials, i.e. bends, tees, crosses, access pieces, adaptors for connections to other materials, cleanouts, plugs, reducers, cowls, offsets, etc				
	Jointing: Epoxy based sealant-`Dripseal`,				
	Installation, Testing and Commissioning: The installation shall be complete in all respects including cutting chases / holes in walls, slabs, excavation, refilling and disposal of surplus earth where required and making good, etc				
	M.S Supports: All vertical and suspended horizontal pipework shall be fixed on MS brackets and hangers with U-clamps made from 10 mm dia galvanised steel rod complete with nuts and washers. Cost for MS structural work for supports shall be included in the rates				
	Conctere Encasing (In case of Sunken Floor/ burried pipes): The pipes and fittings shall be encased with 75 mm thick cement concrete (1:2:4) all around				
	Making Good the Structure Crossings: For all horizontal and vertical crossings of building structure (slabs, walls, beams, column etc), the space between pipe and the structure shall be made good and water tight with concrete. The annular space between the pipe and the sleeves shall be sealed (upto a minimum depth 25 mm) with fire resistant acrylic based sealent of approved make and quality.				

S.NO.	DESCRIPTION	QTY	UNIT	RATE	AMOUNT
	a) 100 mm dia	0	M		
	b) 150 mm dia	0	M		
	c) 200 mm dia	0	M		
2.3	Providing and fixing in position **CPVC pipes** with all necessary accessories complete, cutting and chasing walls, floors, etc. and making good the same.				
	a) 32 mm dia pipe - SDR-11	30	M		
	b) 40 mm dia pipe- SDR-11	20	M		
	c) 50 mm dia pipe- SC.- 40	0	M		
2.4	Providing and fixing in position the **medium class G.I. pipes (IS:1239)** with all fittings, specials & clamps effecting proper connections, cutting chases in walls and floors and making good, including painting with two coats of anti-corrosive paint on buried and concealed pipework and with two coats enamel paint of approved quality and shade over a coat of primer on exposed pipework. **(for sump pumps risers)**				
	a) 65 mm dia pipe	0	M		
2.5	Providing and fixing of **UPVC Floor Traps** formed out of bore 'P' trap with 50 mm water seal, setting in 1:2:4 mix cement concrete block or clamping to the wall or suspending with the ceiling including cutting and making good the walls and floors wherever required.				
	a) 110mm OD inlet and 110mm OD outlet	32	No.		
2.6	Providing and fixing of **floor traps** formed of Cast Iron 'P' traps, setting in concrete surround when installed in earth or sunken floor and steel suspender when installed under slung all complete including cost of cutting and making good the walls and floors wherever required. **(Floor trap grating will be paid seperately as per relevant item).**				
	a) 100 mm inlet and 100 mm outlet	0	No.		
2.7	Providing and fixing PVC floor trap EXTENTION PIECE formed out of 110 mm pipe with multiple side inlets formed with saddle pieces, suitable for 40, 50 and 63 mm dia side connections as per standard detail.	32			
2.8	Providing and fixing floor trap **Extension Piece** made out of 100 mm dia M.S pipe (medium grade) of required length (upto 450 mm) with 32 mm to 50 mm dia threaded maleable iron sockets (maximum 4 nos.) welded as side inlets, neatly finished, inside and outside epoxy painted, including the cost of jointing with floor trap with dripseal joint.	0	No.		

S.NO.	DESCRIPTION	QTY	UNIT	RATE	AMOUNT
2.9	Providing and fixing of **UPVC Nahani Traps**, setting in 1:2:4 mix cement concrete block or clamping to the wall or suspending with the ceiling including cutting and making good the walls and floors wherever required.				
	a) 75 mm OD inlet and 63mm OD outlet	32	No.		
2.10	Providing and fixing **floor drain points** formed out of 100 X 50 mm dia reducing elbow with suitable extension piece including cost of cutting and making good the walls and floors wherever required. **(Floor drain grating will be paid seperately as per relevant item).**	32	No.		
2.11	Providing and fixing screwed down type **nickel bronze alloy cast floor cleanout** with opening arrangements for soil / waste pipe and other necessary fittings inlcuding jointing, all complete as per standard detail.				
	a) for 100 mm dia pipe	12	No.		
	b) for 150 mm dia pipe	0	No.		
2.12	Providing and fixing **cleanout with opening arrangements** by providing 300 mm long G.I. nipple welded to 6 mm thick flange sealed with 6 mm thick blank flange including nuts and bolts, rubber insertions etc. all complete as per standard detail.				
	a) for 150 mm dia pipe	0	No.		
	b) for 100 mm dia pipe	4	No.		
2.13	Providing and fixing 120 mm dia round **stainless steel rotate lock type grating with frame and ABS Plastic cockroach trap**, embedded in floor, all complete of following make or equal approved				
	Make : ATGT, China				
	Model: DD 3128	64	No.		
2.14	Providing and fixing 300 X 300 **mm square stainless steel grating with cockroach trap** fixed in floor, and suitable for industrial kitchen, all complete of following make or equal approved				
	Make : Chiily	6	No.		
2.15	**Providing and fixing** of **Industrial Gully traps made of Stainless Steel with frame and grating** complete, including cost of cutting and making good the walls and floors wherever required, all complete of following make or equal approved				
	Make : ACO (Marketed by GMGR)				
	Model: 403821	8	No.		

S.NO.	DESCRIPTION	QTY	UNIT	RATE	AMOUNT
2.16	**Providing, jointing and fixing UPVC Rain Water System.**				
	The work shall be done as per technical specifications and in general shall include:				
	Material: UPVC pipes and fittings (moulded as well as fabricated) conforming to IS : 13592 - Type B				
	Fittings shall include all standard moulded as well as fabricated fittings like bends, tees, Y-tees, crosses, boss connections, access pieces, saddle pieces, cleanouts, adaptors for connections to other materials, plugs, reducers, cowls, offsets and other specials				
	Jointing: Pushfit rubber ring jointing technique in general. Solvent cement joints may be provided for fittings and specials which are not manufactured with pushfit rubber joints				
	Installation, Testing and Commissioning: The installation shall be complete in all respects including cutting chases / holes in walls, slabs, excavation, refilling and disposal of surplus earth where required and making good, etc				
	M.S Supports: All vertical and suspended horizontal pipework shall be fixed on MS brackets and hangers with U-clamps made from 10 mm dia galvanised steel rod complete with nuts and washers. Cost for MS structural work for supports shall be included in the rates				
2.16 contd.	**Conctere Encasing (In case of Sunken Floor/ burried pipes):** The pipes and fittings shall be encased with 75 mm thick cement concrete (1:2:4) all around				
	Making Good the Structure Crossings: For all horizontal and vertical crossings of building structure (slabs, walls, beams, column etc), the space between pipe and the structure shall be made good and water tight with concrete. The annular space between the pipe and the sleeves shall be sealed (upto a minimum depth 25 mm) with fire resistant acrylic based sealent of approved make and quality.				
	a) 75 mm dia	10	M		
	b) 110 mm dia	48	M		
	c) 160 mm dia	70	M		
2.17	Providing and fixing screwed down type cast iron body with aluminium ring and aluminium dome grating with ss screw for rain water pipe and other necessary fittings inlcuding jointing, all complete.(for rain water pipes at terrace), of following make or equal approved.				
	a) For 150 mm dia pipe				
	Make : Neer				
	Model : NDG 3004	0	No.		

S.NO.	DESCRIPTION	QTY	UNIT	RATE	AMOUNT
	b) For 100 mm dia pipe				
	Make : Neer				
	Model : NDG 3003	4	No.		
	TOTAL FOR "Soil, Waste & Vent and Rain Water Pipework" carried over to SUMMARY			**Rs.**	
3.0	**WATER SUPPLY**				
3.1	**Providing, jointing and fixing CPVC Cold and Hot Water Supply System.**				
	The work shall be done as per technical specifications and in general shall include:				
	Material: Upto 2 inch dia — CPVC pipes and fittings conforming to IS: 15778:2007 of SDR 11 Grade. Basic Raw Material of Pipe work - FlowGuard of Lubrizol Inc. USA.				
	Fittings shall include all standard moulded fittings elbows, tees, couplers, reducers, unions, plugs, adaptors with brass threaded insertions and specials.				
	Jointing: Solvent cement jointing. The Solvent Cement shall be of make and grade as specified by the manufacturer of CPVC piping system				
	Installation, Testing and Commissioning: The installation shall be complete in all respects including cutting chases / holes in walls, slabs and making good, etc The entire CPVC piping system shall be installed, tested and commissioned following the recommendation of the manufacturer including provision of **expansion loops**				
	M.S Supports: All pipework in shafts, ceiling voids and terrace shall be fixed on MS brackets and hangers with U-clamps made from 10 mm dia galvanised steel rod complete with nuts and washers. Cost for MS structural work for supports shall be included in the rates				
	Making Good the Structure Crossings: For all horizontal and vertical crossings of building structure (slabs, walls, beams, column etc), the space between pipe and the structure shall be made good and water tight with concrete. The annular space between the pipe and the sleeves shall be sealed (upto a minimum depth 25 mm) with fire resistant acrylic based sealent of approved make and quality.				
	a) 1/2" N.D.	650	M		
	b) 3/4" N.D.	150	M		
	c) 1" N.D.	120	M		
	d) 1 1/4" N.D.	240	M		
	e) 1 1/2" N.D.	45	M		
	f) 2" N.D.	15	M		

S.NO.	DESCRIPTION	QTY	UNIT	RATE	AMOUNT
3.2	**Providing, jointing and fixing CPVC Cold and Hot Water Supply System.**				
	The work shall be done as per technical specifications and in general shall include:				
	Material: Above 2 inch dia — CPVC pipes and fittings of Schedule 40. Basic Raw Material of Pipe work - CORZAN of Lubrizol Inc. USA.				
	Fittings shall include all standard moulded fittings elbows, tees, couplers, reducers, unions, plugs, adaptors with brass threaded insertions and specials.				
	Jointing: Solvent cement jointing. The Solvent Cement shall be of make and grade as specified by the manufacturer of CPVC piping system				
	Installation, Testing and Commissioning: The installation shall be complete in all respects including cutting chases / holes in walls, slabs and making good, etc The entire CPVC piping system shall be installed, tested and commissioned following the recommendation of the manufacturer including provision of **expansion loops**				
	M.S Supports: All pipework in shafts, ceiling voids and terrace shall be fixed on MS brackets and hangers with U-clamps made from 10 mm dia galvanised steel rod complete with nuts and washers. Cost for MS structural work for supports shall be included in the rates				
	Making Good the Structure Crossings: For all horizontal and vertical crossings of building structure (slabs, walls, beams, column etc), the space between pipe and the structure shall be made good and water tight with concrete. The annular space between the pipe and the sleeves shall be sealed (upto a minimum depth 25 mm) with fire resistant acrylic based sealent of approved make and quality.				
	a) 2 1/2" N.D.	0	M		
	b) 3" N.D.	0	M		
	c) 4" N.D.	0	M		
	d) 6" N.D.	0	M		
	FOR EXTERNAL WORK WITH EXCAVATION, REFILLING AND NECESSARY PROTECTION.				
	e) 2 " N.D.	15	M		
	f) 3" N.D.	0	M		

S.NO.	DESCRIPTION	QTY	UNIT	RATE	AMOUNT
3.3	Providing and fixing in position the **medium class (Class B) G.I. pipes (IS:1239)** with threaded fittings, specials & clamps effecting proper connections, mount on wall / burried in earth, including thrust blocks in cement concrete 1:2:4 on all bends, tees and junctions etc. as required, protection of pipe with a coat of primer and with polymeric corrosion protection tape (minimum 4 mm thick) conforming to IS: 10221, coating and wrapping as per manufacturer`s recommendations (Pypkote or approved equivalent) , including earthwork in excavation in all kinds of soil and refilling, complete in all respects. Jointing of all G.I pipes shall be threaded. (External works)				
	a) 65 mm dia	0	M		
	b) 80 mm dia	0	M		
3.4	Providing and fixing insulation to hot water piping with closed cell chemically cross-linked polyethylene **(XLPE)** preformed pipe sleeves of specified wall thickness using propriety adhesive and self adhesive tapes, all as per the manufacturer's specifications.				
	a) 15 mm dia - 9 mm thickness	390	M		
	b) 20 mm dia - 9 mm thickness	100	M		
	c) 25 mm dia - 13 mm thickness	80	M		
	d) 32 mm dia - 13 mm thickness	160	M		
	e) 40 mm dia - 13 mm thickness	30	M		
	f) 50 mm dia - 20 mm thickness	0	M		
	g) 65 mm dia - 20 mm thickness (with aluminium foil laminated)	0	M		
	h) 80 mm dia - 20 mm thickness (with aluminium foil laminated)	0	M		
	i) 100 mm dia - 20 mm thickness (with aluminium foil laminated)	0	M		
3.5	Extra for providing and wrapping with 5 mile glass cloth on hot water lines insulation and applying of coat of hardner paint of approved shade, all complete in a workmanship like manner				
	a) 15 mm dia pipe plus insulation	390	M		
	b) 20 mm dia pipe plus insulation	100	M		
	c) 25 mm dia pipe plus insulation	80	M		
	d) 32 mm dia pipe plus insulation	160	M		
	e) 40 mm dia pipe plus insulation	30	M		
	f) 50 mm dia pipe plus insulation	0	M		
	g) 65 mm dia pipe plus insulation	0	M		
	h) 80 mm dia pipe plus insulation	0	M		
	i) 100 mm dia pipe plus insulation	0	M		
3.6	Providing, fixing, testing and commissioningof **Full Bore Ball Valves** of approved makes.				
	MOC:				
	Body : Nickel plated brass				
	Ball : Chrome plated brass				

S.NO.	DESCRIPTION	QTY	UNIT	RATE	AMOUNT
	Washers : PTFE				
	Operating Handle : Aluminium Painted				
	Pressure Rating : Minimum 20 Bar				
	Temerature Withstanding : 90^0 C Min.				
	a) 15 mm dia	32	No.		
	b) 20 mm dia	96	No.		
	c) 25 mm dia	0	No.		
	d) 32 mm dia	10	No.		
	e) 40 mm dia	8	No.		
	f) 50 mm dia	4	No.		
3.7	Providing and fixing **Cast Iron butterfly valve of approved make and as per following specification:**				
	MOC:				
	Body - Cast Iron				
	Shaft - Carbon Steel / Stainless Steel				
	Body Liner - EPDM/ nitrile rubber				
	Disc - Epoxy coated C.I./ D.I.				
	a) 65 mm dia	0	No.		
	b) 80 mm dia	0	No.		
	c) 100 mm dia	0	No.		
	d) 150 mm dia	0	No.		
3.8	Insulating isolating valve with 25mm thick nitrile rubber sheet. Insulation shall be covered 500 g polythene sheet and 24 gauge aluminium sheet cladding tested to 15 kg/sqcm pressure				
	a) 15 mm dia	0	No.		
	b) 20 mm dia	64	No.		
	c) 25 mm dia	0	No.		
	d) 32 mm dia	0	No.		
	e) 40 mm dia	6	No.		
	f) 50 mm dia	0	No.		
	g) 65 mm dia	0	No.		
	h) 80 mm dia	0	No.		
	i) 100 mm dia	0	No.		
3.9	Providing, fixing and testing forged brass 25 mm dia screwed inlet single acting air release valve with 25 mm dia ball valve on inlet side and pressure gauge with isolating cock.	8	No.		
3.10	Making water supply connections to kitchen equipment / water treatment plant as per the direction of the Engineer-in-charge (pipes and valves & other appurtenances shall be paid as per relevant items in Section 3 - Water Supply)				
	a) 15 mm dia	2	No.		
	b) 20 mm dia	2	No.		
	c) 25 mm dia	2	No.		

S.NO.	DESCRIPTION	QTY	UNIT	RATE	AMOUNT
3.11	**Making connection with municipal water supply line** including all fittings, specials & clamps effecting proper connections, mount on wall / burried in earth, including thrust blocks in cement concrete 1:2:4 on all bends, tees and junctions etc. as required, protection of pipe with a coat of primer and with polymeric corrosion protection tape (minimum 4 mm thick) conforming to IS: 10221, coating and wrapping as per manufacturer`s recommendations (Pypkote or approved equivalent) , including earthwork in excavation in all kinds of soil and refilling, complete in all respects.	1	Job		
3.12	Providing and fixing inline turbine type water flow meter with removable mechanism and having digital register complete with specials as required, bolts, nuts, rubber insertions etc. of approved make.				
	a) 40 mm dia nominal bore	1	No.		
3.13	Providing and fixing flanged end Wafer type check valve **(non return valve)** of Class PN 10, having stainless steel body and disc, trim and spring of approved make, including a set of MS flanges, required nos. of nut & bolts all complete.(for submersible pumps)				
	a) 50 mm dia	0	No.		
3.14	Providing and fixing of flanged end `Y' type strainer in cast iron body with stainless steel perforated sheet screen basket, complete with drain plug.				
	a) 65mm dia	0	No.		
3.14	Providing and fixing screwed end **Wafer type check valve (non return valve) of Class PN 10,** having stainless steel body and disc, trim and spring of approved make. all complete.				
	a) 50 mm dia	0	No.		
3.15	Providing and fixing heavy duty resilient rubber neoprene lined single arch vibration eliminators suitable for raw water up to 70 deg.C temperature, pressure upto 15 Bar and vacuum rating upto 700 mm Hg.				
	a) 50 mm dia	0	No		
	b) 65 mm dia	0	No		
3.16	Supplying, installation, setting, testing and commissioning of differential type **pressure switches** for operation of pumps.	2	No		

S.NO.	DESCRIPTION	QTY	UNIT	RATE	AMOUNT
3.17	Supplying, installation, setting, testing and commissioning of **pressure gauge** with isolation cock, **all complete**	2	No		
	TOTAL of "Water Supply " carried over to SUMMARY			**Rs.**	
4.0	**SEWERAGE AND DRAINAGE**				
4.1	**Providing, Laying, Jointing and Testing of Under Ground Sewerage Pipes**				
	The work shall be done as per specifications and in general shall include:				
	a) Providing UPVC drain pipes (orange in clour) conforming to IS:15328 and of class SN 4				
	b) Excavation of trenches in all kinds of soil				
	c) Dressing and compacting of trench bottom.				
	d) Providing and laying in position cement concrete 1:5:10 (1cement : 5 finesand : 10 graded stone aggregate 40 mm nominal size) bed 150 mm thick.				
	e) Laying in position pipes in trenches.				
	f) Jointing with water tight sealing rings				
	g) Encasing the laid pipe with pea gravel (size 20mm), 150 mm all around.				
	h) Refilling the trenches with selected earthfill, complete in all respects				
	a) 200 mm dia	54	M		
4.2	Providing and laying light duty non pressure NP2 class RCC pipes with sockets & spigots, jointed with rubbering followed by stiff mixture of cement mortar in the proportion of 1 : 2 (1 cement : 2 fine sand) including testing of joints etc. complete.				
	a) 200 mm dia	0	M		
	b) 250 mm dia	0	M		
	c) 300 mm dia	0	M		
	d) 400 mm dia	0	M		
4.3	Providing and laying cement concrete 1:5:10 (1 cement : 5 coarse sand : 10 graded stone aggregate 40 mm nominal size) **upto haunches** of RCC. Pipes including bed concrete as per standard design : **(Only for stretches as instructed at site)**				
	a) 200 mm dia	0	M		
	b) 250 mm dia	0	M		
	c) 300 mm dia	0	M		
	d) 400 mm dia	0	M		

S.NO.	DESCRIPTION	QTY	UNIT	RATE	AMOUNT
4.4	Providing and laying in position cement concrete 1:5:10 (1cement : 5 finesand : 10 graded stone aggregate 40 mm nominal size) **bed 150 mm thick** as per standard design : **(for RCC pipes)**				
	a) 200 mm diameter R.C.C pipe	0	M		
	b) 250 mm diameter R.C.C pipe	0	M		
	c) 300 mm diameter R.C.C pipe	0	M		
	d) 400 mm diameter R.C.C pipe	0	M		
4.5	Constructing brick masonry Rain Water Collection Chamber 50x45x60 cm with 75 class designnation F.P.S. brick work in cement mortar 1:5 (1 cement : 5 coarse sand) including 500x450 mm S.F.R.C. (Steel Fibre Reinforced Concrete) horizontal grating with frame complete as per standard design/ drawing.	6	No.		
4.6	Constructing brick masonry **circular manhole 0.91 m internal dia** at bottom and 0.56 m dia at top with 75 class designnation F.P.S. bricks in cement mortar 1 : 4 (1 cement : 4 coarse sand) **inside and outside cement plaster 12 mm thick** with cement mortar 1 : 3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement foundation concrete 1 : 3 : 6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size), and making necessary channels 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, **including earthwork in excavation** in all kinds of soil, backfilling around manhole all complete as per standard design :				
	0.91 m deep with S.F.R.C. cover and frame (heavy duty, HD-20 grade designation) 560 mm internal diameter conforming to IS 12592, including centering shuttering all complete.	6	No.		
4.7	**Extra** depth for circuler type manhole 0.91 m internal dia (at bottom) with F.P.S.bricks				
	Beyond 0.91 m to 1.67 m	0	M		
4.8	Providing, installing, testing and commissioning of Grease Separator having grease storage capacity of 100 litre and total iquid holding capacity of 320 litre , all as per standard design and including making connections with scullery sink Make : ACO (Marketed by GMGR) Model: 3551.64.41	0	No.		

S.NO.	DESCRIPTION	QTY	UNIT	RATE	AMOUNT
4.9	Constructing brick masonry water tight grease trap (with three chambers , each of 0.6 M X 0.6 M in plan) with 75 class designation bricks in cement mortar 1 : 5 (1 cement : 5 fine sand) earth work, excavation in all kinds of soil, foundation concrete 1 : 4 : 8 mix (1 cement : 4 coarse sand : 8 graded stone aggregate 40 mm nominal size) **inside and outside plastering 12 mm thick** with cement mortar 1 : 3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement including constructing baffle wall, stainless steel angles on corners, stainless steel perforated plates with stainless steel lifting handles in each chamber, inlet and outlet fittings in UPVC, double seal C.I. covers complete as per standard design .				
	a) Inside size 1.8 m x 0.6 m and 1.2 m deep including three nos. 60x60 cm. C.I. Cover and frame (double seal weight of cover and frame not less than 75 kg)	1	No.		
4.10	**Excavating trenches** of required width for pipes, cables, etc. including excavation for sockets and dressing of sides, ramming of bottoms, depth upto 1.5 m including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth including consolidating each deposited layer by ramming, watering etc. and disposal of surplus excavated soil as directed within a lead of 50 M **(In all kinds of soil).**				
	a) Exceeding 80 mm dia. but not exceeding 300 mm dia.	52	M		
	b) Exceeding 300 mm dia. but not exceeding 600 mm dia.	0	M		
4.11	Making connection of drain or sewer line with existing manhole including breaking into and making and making good the walls, floors with cement concrete 1 : 2 : 4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size), cement plastered on both sides with cement mortar 1 : 3 (1 cement : 3 coarse sand), finished with a floating coat of neat cement and making necessary channels for the drain etc., complete.				
	a) Pipe size not more than 200 mm dia	1	Job		
	TOTAL of "SEWERAGE AND DRAINAGE " carried over to SUMMARY			**Rs.**	
5.0	**LANDSCAPE IRRIGATION SYSTEM**				
5.1	**Providing, Laying, Jointing and Testing of HDPE Pipes and Fittings.**				
	The work shall be done as per specifications and in general shall include:				

S.NO.	DESCRIPTION	QTY	UNIT	RATE	AMOUNT
	a) Providing HDPE pipes (of PE 80 grade as per IS 4984-1995). The pipes shall have a working pressure of PN 10.				
	b) Providing fabricated and moulded fittings of same or higher grade and upto 63 mm OD shall be rated PN 16 and 75 mm OD and above shall be rated for PN 10.				
	Providing, laying and fixing HDPE compression type fittings (as required, adaptor fittings, saddles, etc. including jointing, testing etc. all complete. The compression fittings upto 63 mm OD shall be rated PN 16 and 75 mm OD and above shall be rated for PN 10.				
	c) Excavation of trenches and refilling including thrust blocks				
	d) Laying in position in excavated trenches.				
	e) Jointing by heat fusion technique.				
	f) Encasing the laid pipe with river sand of grading zone V or coarser, 150 mm all around.				
	f) Providing and laying LDPE/PVC warning tape (in florescent colour) of size 25 mm wide and 50 micron thick. The warning tape shall be laid 150 mm above the pipe crown.				
	a) 75 mm dia. (PN 10)	0	M		
	b) 40 mm dia. (PN 10)	52	M		
	c) 32 mm dia. (PN 10)	0	M		
5.2	Providing and fixing **Cast Iron butterfly valve of approved make and as per following specification:**				
	MOC:				
	Body - Cast Iron				
	Shaft - Carbon Steel / Stainless Steel				
	Body Liner - EPDM/ nitrile rubber				
	Disc - Epoxy coated C.I./ D.I.				
	a) 65 mm dia (with lever)	0	No.		
5.3	Providing, fixing, testing and commissioningof **Full Bore Ball Valves** of approved makes.				
	MOC:				
	Body : Nickel plated brass				
	Ball : Chrome plated brass				
	Washers : PTFE				
	Operating Handle : Aluminium Painted				
	Pressure Rating : Minimum 20 Bar				
	Temerature Withstanding : 90^0 C Min.				
	a) 32 mm dia.	0	No.		
5.4	Providing, installing and commissioning 20 mm dia brass quick release coupling valves, complete with lid, **preassembled triple swing joint in PVC**, GI support rod with SS hose clamps all complete as per standard detail including making connections with main supply line.	2	No		

S.NO.	DESCRIPTION	QTY	UNIT	RATE	AMOUNT
5.5	**Supply of Quick Coupling Keys complete with Swivel elbow** complete	2	No		
5.6	Providing and installing HDPE Valve Boxes with screw down type covers, of following sizes and shape, including excavation and filling of pea gravel in 100 mm deep layer at bottoms, all as per standared detail (for QRCV, Ball Valves, Butterfly Valves, Flush points etc.)				
	a) 150 mm dia- Circular	2	Nos.		
	b) 375X300 mm - Rectanguler	0	Nos.		
5.7	Constructing masonry chamber 90 x 90 x 100 cm inside with 1st class brickwork in cement mortar 1 : 5 (1 cement : 5 fine sand) for branch line, with 60 x 60cm fabricated hinged MS cover with locking arrangement, RCC top slab 1 : 2 : 4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size) necessary excavation foundation concrete 1 : 5 : 10 (1 cement : 5 fine sand : 10 graded stone aggregate 40 mm nominal size) and inside plaster with cement mortar 1 : 3 (1 cement : 3 coarse sand) 12 mm thick finished with a floating coat of neat cement complete as per standard design and drawings.				
	With F.P.S. bricks	0	Nos.		
5.8	Providing, laying and,jointing non pressure NP3 class RCC pipes with sockets with stiff mixture of cement mortar in the proportion of 1 : 2 (1 cement : 2 fine sand), including, excavations of trenches and refilling, testing of joints complete in all respects. (for Pipe Ducts)				
	a) 300 mm dia	0	M		
	TOTAL of "Landscape Irrigation System" carried over to SUMMARY			**Rs.**	
6.0	**MISCELLANEOUS ITEMS**				
6.1	Providing and fixing G.I. vent pipe with antimosquito grating of the following sizes (for under ground/over head water tanks only) :				
	a) 100 mm dia	8	No.		
6.2	Providing and fixing level indicator assembly for water tanks comprising 2 nos. 15 mm dia gunmetal level guage isolation cocks with screwed ends, heavy guage transparent polythelyne tube of upto 6.0 m length, 100 mm wide x 20 mm thick teak wood indicating board painted with level indications in cms and litres, as required.	1	Sets		

S.NO.	DESCRIPTION	QTY	UNIT	RATE	AMOUNT
6.3	Providing and fixing in position following sizes **pipe inserts with puddle flanges**, fabricated with M.S. pipe pieces conforming to IS: 1239 (Heavy) and puddle flange made of 6 mm thick MS plate welded to the pipe piece, **entire piece hot dipped galvanized**, all complete as per Standard Detail, including fixing at desired position in the form work for RCC walls / slabs before pouring of concrete.				
	a) 25 mm dia	4	No.		
	d) 50 mm dia	3	No.		
	f) 80 mm dia	0	No.		
	g) 100 mm dia	1	No.		
	h) 150 mm dia	0	No.		
	i) 250 mm dia	0	No.		
6.4	BOREWELL CUM DUGWELL : Construting a borewell cum dugwell ground water recharge structure generally as per enclosed standard detail and having following construction specifications :	0	Job		
	Peripherical brick masonry in cement mortar 1:4 (1 cement:4 coarse sand) with necessary 15 mm thick cement plaster 1:3 neat finish.				
	Foundation concrete 1:5:10 (300mm thick)				
	300 mm thick dry stone aggregate bed (40 to 65 mm nominal grade)				
	200 mm thick R.C.C (1:2:4) slab to cover the well at top including necessary centring, shuttring and reinforcement with required opening/cutouts etc. supplying & fixing 600 mm X 600 mm S.F.R.C Manhole cover / frame(total weight 208 Kg.) heavy duty type, all complete as per drawings.				
	160 mm dia PVC perforated pipe lowered vertically upto first granular saturated sandy formation including necessary drilling / boring in ground in all kinds of soil.				
	Supplying & fixing P.V.C foot rests.				
	Making all inlets & outlets in brick masonry walls including cutting holes & making good the same.				
	10-12 mm thick cement plaster 1:3 mixed with water profing compound on top of R.C.C slabs & in ceiling of slab, finished smooth.				
	Note: Dimensions may vary as per the site conditions.				

S.NO.	DESCRIPTION	QTY	UNIT	RATE	AMOUNT
6.5	Providing and fixing M.S. structural work fabricated from standard sections i.e. rounds, solid angles, slotted angles, tees, flats, channels including cutting to size, drilling, welding to insert plates in RCC structural members, painting with two coats of enamel paint of approved quality and shade over a coat of steel primer as directed by Engineer-in-charge including cutting and making good the walls and floors (for ladders and lockable covers for water storage tanks, etc.).	500	Kg		
	TOTAL for "Miscellaneous items" carried over to SUMMARY			**Rs.**	
7.0	**PUMPING MACHINERY (FIXING ONLY)**				
7.1	Installing, testing and commissioning of **raw water transfer pumps** as per following details:				
	The pump unit shall be complete with :				
	a) Pumps: Vertical monoblock booster pumpset	2	No.		
7.2	Installation, testing and commissioning of **electric pump control panel** metal clad cubicle type for above pumps	1	Set		
7.3	Installing, testing and commissioning of clear water **packaged hydropneumatic pumping system for general water supply** as per following details:	1	Set		
	The packaged unit shall be complete with :				
	a) Pumps: Vertical monoblock booster pumpset with mechanical seal and VFD- **3 nos.** (2 working+1 standby)				
	b) Pressure Tank: FRP vessel — 1 **Nos.**				
	c) Interconnecting Pipe work, Valves and Vibration Eliminators : Common suction & delivery headers in Hot Dipped Galvanised Iron, Isolating valves, non return valves and vibration eliminators on suction & delivery sode of pumps.				
	d) Common fabricated base frame, duly painted.				
	e) Power and control cabling between panel and pumps.				
	f) Accessories like presure guages, pressure switches etc.				
	g) Electric control panel mounted on the skid				
7.4	Installing, testing and commissioning **drainage pumping system in the sumps of plant room** comprising of the following:	1	Set		
	a) 2 Nos.Vertical fully floodable type **submersible drainage cutter pumps** in close coupled design single stage				
	b) Electric control panel				
	c) Power cabling between panel and pumps.				

S.NO.	DESCRIPTION	QTY	UNIT	RATE	AMOUNT
	d) Pump suspension systemwith Stainless Steel Sling wire with `U` clamp.				
7.5	**MAIN PANEL - WATER PUMPING SYSTEM**				
	Installation, testing and commissioning of **electric distribution board,** metal clad cubicle type suitable for 415V AC single phase 50Hz supply system. The panel shall be completely compartmentalised and complete with Copper Bus Bars, designation labels as per requirement, continuous earth bar, panel separators, protective screens, cable clamping support system, top/bottom cable gland plates for incoming and out going cable entries as per details given below:	1	Job		
	TOTAL for "Pumping Machinery (for fixing only)" carried over to SUMMARY			**Rs.**	