

PUBLIC HEALTH ENGINEERING_TENDER SPECIFICATION

LIBRARY, JAGADIYA

Contents

A. Part-1 General Specification	4
1. Scope of Work	4
2. Technical Information	4
3. Contractor's Rates	5
4. Drawings	6
5. Execution of Work	7
6. Material and Workmanship	9
7. Inspection and Testing of Materials	10
8. Mock Up	11
9. Materials Supplying by Client	11
10. Reference Points	12
11. Reference Drawings	12
12. Shop Drawings	12
13. Site Clearance and Cleanup	13
14. Testing	13
15. License and Permits	14
16. Handing Over Documents	14
17. Applicable Codes and Standards	15
B. Technical Specification	19
1. General	19
2. CPVC Pipes and Fittings	22
3. Ball Valve	26
4. Non-Return Valve	28
5. Pressure Gauge	29
6. Strainer	30
7. Float valve	31
8. Water Meter	32
9. Air release valve	33
10. SWR PVC Pipe	35
11. uPVC Trap	38
12. Constructing Brick Masonry Manhole	39
13. Gully Trap	42

14.	RCC PIPE.....	42
15.	Septic Tank & Soak Pit	44
16.	Connection To RCC Tanks/ Reservoirs.....	46
17.	Pump and Motors.....	47

A. Part-1 General Specification

1. Scope of Work

Work under this contract shall consist of furnishing all labour, materials, equipment and appliances necessary and required to completely furnish all the plumbing and other specialized services as described hereinafter and as specified in the schedule of quantities and/or shown on the plumbing drawings.

Scope of Work generally shall include the area shown in the drawings attached.

Over & above Clause 1.1, the plumbing installation may include but not limited to the following:

- Sanitary & CP Fixtures with all accessories.
- Water Treatment Plant.
- Internal & External Water supply & Distribution.
- Internal & External Sewage Collection & Disposal system.
- Electro-mechanical equipment/accessories required for Plumbing Installation.
- All hardware, supports, hangers required for complete installation.
- Civil work related to Plumbing Installation.
- Instruments, meters, gauges, required for the installation.
- External sewerage network.
- Sewage Treatment Plant
- The scope of work also includes all minor details of construction which are obviously and fairly intended and which may not have been referred to in these documents but are essential for the entire completion in accordance with standard Engineering practice.

2. Technical Information

The detailed specifications given hereinafter are for the items of works described in the schedule of quantities attached herein, and shall be guidance for proper execution of work to the required standards. It may also be noted that the specifications are of generalized nature and these shall be read in conjunction with the description of item in schedule of quantities and drawings.

Work under this contract shall be carried out strictly in accordance with specifications attached with the tender.

Item not covered under these specifications due to any ambiguity or misprints, or additional works, the work shall be carried out as per specifications of the latest applicable standards with latest amendments as applicable in the contract or as directed by Engineer in Charge.

Works not covered under Para 2 and 3 above shall be carried out as per relevant Indian standards specifications or codes of practice.

Unless specifically otherwise mentioned, all the applicable codes and standards published by the Indian Standard Institution and all other standards which may be published by them before the date of receipt of tenders, shall govern in all respects of design, workmanship, quality and properties of materials and methods of testing, method of measurements etc.

Wherever any reference to any Indian Standard Specification occurs in the documents relating to this contract, the same shall be inclusive of all amendments issued there to or revisions thereof, if any, up to the date of receipt of tenders. In case there is no IS specification for the particular work; such work shall be carried out in accordance with the instructions in all respects and requirements of the Engineer-in-Charge.

For the items not covered under any of the specifications stated above, the work shall be executed as per manufacturers specifications / General good engineering practice/ or as per direction of Engineer in charge and shall be carried out in a manner complying in all respects with the requirement of relevant byelaws of municipal corporation/ Development Authority etc. under the jurisdiction of which the work is to be carried out.

In case of any difference or discrepancy between specifications & the description of Schedule of Quantities, the Schedule of Quantities shall take precedence. In case of any difference or discrepancy between specification and drawings, the drawings shall take precedence. In case any difference or discrepancy between the specifications for civil works and specification for Public Health Engineering works, specifications for civil works shall take precedence.

All electrical installation shall comply with the requirements of relevant Indian Standards, Indian Electricity rules & Indian Electricity Act amended up to date & local bye laws.

3. Contractor's Rates

Rates quoted are for all heights and depths required for this work.

All rates quoted must be for complete items inclusive of all such accessories, fixtures and fixing arrangements, nuts, bolts, hangers as are a standard part of the particular item except where specially mentioned otherwise.

All rates quoted are inclusive of cutting holes and chases in walls and floors and making good the same with cement mortar/ concrete of appropriate mix and strength as directed by consultant/client/ Engineer in Charge.

Rates quoted shall be inclusive of cost incurred in testing, commissioning of works and materials.

Rates quoted shall be inclusive of any rework to be carried in the system installation due to the instructions given by Statutory / Approval authority.

For all the items/ equipment supplied free of cost by the Client, the contractor's rate shall take care of transportation to the site, lifting and shifting at required height for installation, storage at site, installation, testing & commissioning of those items/equipment's.

All rates quoted by the contractor under this contract shall including bailing or pumping out of all the water and drainage at approved location by engineer in-charge, which may accumulate during the progress of work either through seepage, springs, rain or any other cause without any additional cost.

All rates quoted by the contractor shall include all miscellaneous civil work related to Plumbing work like excavation, refilling, timbering, bedding, encasing, etc. required as per actual site condition.

The contractor must get acquainted with the proposed site for the works and study specifications and site conditions carefully before bidding.

All water and electricity charges for testing and commissioning of the system shall be borne by the contractor.

In case of discrepancy / calculation error between rate & amount quoted by the contractor, the quoted rate shall be considered as final to derive the amount.

4. Drawings

Plumbing drawings are diagrammatic but shall be followed as closely as actual construction permits. Any deviations made shall be in conformity with the Client / consultant and other services drawings.

Contractor shall verify all dimensions/service coordination at site and bring to the notice of the PMC / Engineer in Charge all discrepancies or deviations noticed. PMC / Engineer in Charge decision shall be final. In case of commencing the work with discrepancies, contractor will have to rectify the same without additional cost.

Civil related details like tanks, basement channel, and plant room, sump, etc. to be read in conjunction with structure drawings. In case of any discrepancies, Contractor shall co-ordinate with other agencies & execute as per the best practices.

Large size details and manufacturers dimensions for materials to be incorporated shall take precedence over small-scale drawings.

Any drawings supplied with the tender shall be returned in good conditions along with the tender.

Any drawings issued by the Client / consultant / Engineer in Charge for the works are the property of the Client / consultant / Engineer in Charge and shall not be lent, reproduced or used on any works other than intended without the written permission of the Client / consultant / Engineer in Charge.

5. Execution of Work

The contractor must get acquainted with the proposed site for the works and study specifications and conditions carefully before execution.

The work shall be carried out in conformity with the plumbing drawings and within the requirements of Client / consultant, HVAC, Electrical, Structural and other specialized services drawings.

The work shall be executed as per program approved by the Client / consultant / Engineer in Charge. If part of site is not available for any reason or there is some unavoidable delay in supply of materials stipulated by the Client / or due to any other issue not pertaining to the contractor, the contractor shall draw attention to the Client & as per the mutual agreement, the program of construction shall be modified accordingly and the contractor shall have no claim for any extras or compensation on this account. Here Client means the authorized person / agency representing Client / Client.

The contractor shall cooperate with all trades and agencies working on the site. The contractor shall ensure that all inserts, pipe lines embedded in structural members, sleeves, cutouts, etc. are placed

in position in coordination with civil work as and when required. All holes, sleeves, cutouts shall be filled with best quality sealant to make leak proof joint.

The contractor shall take instructions from the Engineer In charge regarding collection and stacking of material in any place with lockable arrangement. For damage / theft of any material, Contractor shall be held responsible. No Excavated earth or Building material shall be stacked on areas where other buildings, roads, services, compound walls, etc. are to be constructed.

The contractor shall maintain in perfect condition all works executed till the completion of the entire work allotted to him. Where Phased delivery is contemplated, this provision shall apply to each phase.

While carrying out pipeline work, in case the contractor encounters any Interference with other services, such as cable, conduits, etc. he shall take sufficient precautions in order to prevent any damage to them. If any damage occurs it shall be rectified to its original condition at his own cost to the satisfaction of Engineer-In-Charge.

The contractor carrying out the construction work shall take effective measures to carefully open out all existing channels, culverts, bridges, pipelines, conduits, water courses, sewer, drains, electrical cables, transmission lines and their supports and all works buried or otherwise where such services have to be interfered with the purpose of the construction of the works. He shall provide and arrange all necessary temporary supports and diversions, if necessary, across / under / even through along sides of the trenches and all other parts of construction work for all such channels, culverts, bridges, pipe lines, and conduit.

The contractor shall arrange to carry out all works with least interference practicable with public footpath and vehicular traffic and with existing waste water or storm water drainage arrangements and provide all necessary road barriers, fences, notices, lights, gangways, access crossings, diversions for traffic, temporary drains, dewatering channels, chutes pumping or water lifting arrangements and all other facilities for the proper execution of the works to the approval and satisfaction in all respects of the Engineer-in-Charge. Any work carried out by the contractor in this connection shall be deemed as temporary works incidental to the construction work.

For any free issue items by Client, the contractor shall maintain the same properly & install as per good engineering practice.

No structural member shall be chased or cut without the written permission of the Client/consultant/ Engineer in Charge/ Engineer in charge.

The work shall be executed in a manner complying in all respects with requirements of relevant bye-laws of the municipal corporation / Development Authority / NBC 2016 / Applicable Statutory Authority, the jurisdiction of which the work is to be executed or as directed by the Engineer-In-Charge.

All plumbing services shall be handed over to Engineer-In-Charge complete in all respects. Incomplete work will not be taken over. Any loss or damage to these services due to any reasons by anybody whatsoever before handing over will be at contractor's risk and cost. Any damage to any structural, finishing work done during the testing or rectification shall be made good by the contractor at his own cost and risk.

6. Material and Workmanship

All materials used in the works shall conform to the list of approved vendors provided in the tender. The approved samples shall be maintained at site till the completion of work.

As far as possible, materials bearing IS certification marks shall be used with the approval of the Client / consultant / Engineer in Charge.

Unless otherwise specified and explicitly approved in writing by the Client / consultant / Engineer in Charge, materials of makes and specifications mentioned with tender shall be used. In case of any items, list of approved vendors is not given; the contractor shall submit his recommendation to Engineer in charge with proper technical back up justifying the selection.

Workmanship and general finish shall be of first-class quality and in accordance with best workshop practice. All similar items of the Plant and their component parts shall be completely interchangeable.

Spare parts shall be manufactured from the same materials as the originals and shall fit all similar items.

Machining fits on renewable parts shall be accurate and to specified tolerances so that replacements made to may be readily installed.

All equipment shall operate without excessive vibration and with minimum noise.

All revolving parts shall be truly balanced both statically and dynamically so that when running at normal speeds at any load up to the maximum there shall be no vibration due to lack of balance.

All parts which can be worn or damaged by dust shall be totally enclosed in dust proof housings.

All materials selected in the work shall be most suitable for duty concerned, free from imperfections, selected for long life and minimum maintenance.

All necessary accessories required for satisfactory and safe operation of the Plant shall be supplied by the Contractor unless it is specifically excluded from his scope.

All valves shall be closing on clockwise rotation of the hand wheel. The effort required to close / open under all operating conditions shall be limited to 7 kg. The direction of opening/ closing shall be cast on the hand wheel.

All flanges shall be drilled in accordance with requirements of IS: 1538. All flanges shall be full or spot faces on the back side. The flange thickness shall be uniform throughout. Flange outside periphery shall be concentric with the bore. Flanges shall be finished smooth on periphery also Castings and fabricated materials shall be finished smooth all over.

7. Inspection and Testing of Materials

Contractor shall be required, if requested, to produce manufacturers test certificate for the particular batch of materials supplied to him. The tests carried out shall be as per the relevant Indian standards.

Testing charges including incidental charge and cost of sample for testing shall be borne by the contractors for all mandatory tests.

Testing charges for optional tests shall be paid by the Dept. However, the incidental charges and cost of sample for testing shall be borne by the contractor.

In case of non-IS materials, it shall be the responsibility of the contractor to establish the conformity of material with relevant IS specification by carrying out necessary tests. Testing charges including incidental charge and cost of sample for testing shall be borne by the contractors for such tests.

The materials should pass all tests and tolerance in dimensional, chemical, physical properties should be within the limit as stipulated in relevant I.S. for acceptance. Such materials will be accepted as standard.

Payments shall be restricted to standard unit mass, or as specified in the schedule, without making any cost adjustment towards mass or any other properties provided the material pass all the tests and tolerance are within the specified limit.

For examination and testing of materials and works at the site, contractor shall provide all testing and gauging equipment necessary but not limited to the followings:

- Theodolite
- Dumpy level
- Steel tapes
- Weighing machine
- Plumb bobs, spirit levels, Hammers
- Micrometers
- Thermometers, Stoves
- Hydraulic test machine
- Smoke test machine.

All such equipment shall be tested for calibration at any approved laboratory, if required by the Client / consultant / Engineer in Charge.

All testing equipment shall be preferably located in special room meant for the purpose.

8. Mock Up

The contractor shall install all pipes, fixtures, clamps and accessories and fixing devices in mock-up shaft and room so constructed as directed by Client / consultant / Engineer in Charge without any cost. The materials used in the mock-up may be reused in the works if found undamaged.

Any tiles or finished surfaces or floors damaged by the contractor while doing his work shall be made good with new tiles or other finishing material. No payment shall be admissible for such repairs. The Client/consultant / Engineer in Charge may, at his discretion get the damaged work repairs to the contractor.

9. Materials Supplying by Client

The contractor shall verify that all materials supplied by the Client conform to the specifications of the relevant item in the tender. Any discrepancy found shall be brought to the notice of the Client / consultant / Engineer in charge.

If any materials issued to the contractor, free of cost, are damaged or pilfered, the cost of the same shall be recovered from the contractor on the basis of actual cost to Client which shall include all freight and transportation, excise duty, sales tax, octroi, import duty etc.

10. Reference Points

Contractor shall provide permanent bench marks, flag tops and other reference points for the proper execution of work and these shall be preserved till the end of the work.

All such reference points shall be in relation to the levels and locations given as per the Client / consultant / Engineer in Charge and in plumbing drawings.

11. Reference Drawings

The contractor shall maintain one set of all construction drawings issued to him as reference drawings. These shall not be used on site.

All corrections, deviations and changes made on the site shall be shown on these reference drawings for final incorporation in the completion (as built) drawings. All changes to be made shall be initialed by the Engineer in charge.

One complete set of construction drawings shall be made available to the execution engineer & shall be maintained in good condition throughout the execution activities.

12. Shop Drawings

The contractor shall submit to the Client / consultant / Engineer in Charge four copies of the shop drawings.

Shop drawings shall be submitted under following conditions:

- Showing any changes in layout in the plumbing drawings.

- Foundation details, Nozzle Orientation, Equipment layout and piping, electrical, wiring diagram.
- Manufacturer's or contractor's fabrication drawings for any materials or equipment supplied by him.

The contractor shall submit four copies catalogues, manufacturers drawings, technical data sheet, equipment characteristic data or performance charts as required by the Client / consultant / Engineer in Charge.

13. Site Clearance and Cleanup

The contractor shall, from time to time clear away all debris and excess materials accumulated at the site.

After the fixtures, equipment and appliances have been installed and commissioned, contractor shall clean-up the same and remove all plaster, paints stains, stickers and other foreign matter of discoloration leaving the same in a ready to use condition.

On completion of all works, contractor shall demolish all stores, remove all surplus materials and leave the site in a broom clean condition, failing which the same shall be done at contractor's risk and cost.

14. Testing

Piping and drainage works shall be tested as specified under the relevant clauses of the specifications.

Tests shall be performed in the presence of the Engineer in Charge. The engineer in charge shall issue a certificate for approved testing of all systems duly signed & stamped.

All materials and equipment found defective shall be replaced and whole work tested to meet the requirements of the specifications.

Contractor shall perform all such tests as may be necessary and required by the local authorities to meet Municipal or other bye-laws in force.

Contractor shall provide all labour, equipment and materials for the performance of the test.

After completion of work and during the maintenance liability period of contract, the work shall be subjected to "Post construction and testing". In case, if the materials incorporated in the work are found to be inferior, though the sample collected from the materials might have been passed at the

time of execution, it shall be the responsibility of the contractor to replace the same without any cost to the Client failing which the Client may rectify the same at the risk and cost of the contractor or the Client may accept the same as substandard, and cost be adjusted from the outstanding security deposit as per the terms and condition of the contract for the work.

15. License and Permits

Contractor must hold a valid plumbing license issued by the Municipal authority (if applicable) or other competent authority under whose jurisdiction the work falls.

Contractor must keep constant liaison with the Municipal authority and obtain approval of all drainage and water supply works carried out by him.

Contractor shall obtain, from the municipal authority, completion certificate with respect to his work as required for occupation of the building.

All inspection fees or submission fees paid by the contractor shall be reimbursed by the Client on production of valid official receipts.

16. Handing Over Documents

On completion of work, contractor shall submit one complete set of as built drawings in editable soft copy and two hard prints of 'as built' drawings to the Engineer in Charge. These drawings shall have the following information:

- Run of all piping & diameters on all floors, terrace and vertical stacks.
- Ground and invert levels of all drainage pipes together with location of all manhole and connections up to outfall.
- Run of all water supply lines with diameters, locations, of control valves, access panels inside the utilities.
- Location of all mechanical equipment with layout and piping connections & location of electrical panel for the same.
- Location & capacity of Underground / Overhead tanks.
- Equipment general arrangement drawings, as built drawings, P&ID diagram.
- Warranty/ guarantee certificate from OEM.
- Inventory datasheet.
- Sanitary item guarantee bond.

Contractor shall provide four sets of catalogues, performance data and list of spare parts together with the name and address of the manufacturer for all electrical and mechanical equipment provided by him.

All 'warranty cards' given by the manufacturers shall be handed over to the Client / consultant / Engineer in Charge.

Contractor shall provide Operation and Maintenance manual of all major Electro-mechanical equipment's.

All test certificates of materials & testing at manufacturer works shall be submitted in one set of hard copy.

All site performance test certificates approved by Engineer in charge shall be submitted in one set of hard copy.

17. Applicable Codes and Standards

Plumbing system design shall conform to plumbing design codes like National Building code – 2016, Part 9, Section 1, CPHEEO Manual, Handbook on Water supply & Drainage – SP 35, Public Health Engineering Handbook, Uniform Plumbing Code for India.

All equipment, supply, erection, testing and commissioning shall comply with the requirements of Indian Standards and code of practice given below as amended up to the date of submission of Tender. All equipment and material being supplied shall meet the requirements of BIS and other relevant standard and codes.

LIST OF INDIAN STANDARDS FOR PLUMBING

The following IS codes shall be referred in execution of Public Health Engineering works.

IS CODE	SUBJECT
456- 2000	Code of practice for Plain & Reinforced concrete.
458- 2003	Specifications for Concrete Pipes.
554- 1999	Dimensions for pipe thread where pressure tight joints are required.
651- 1992	Specifications for Salt glazed stoneware pipes & fittings.
778- 1984	Specifications for copper alloy gate & Globe check valves for water works

779- 1994	Water meters (domestic type)
782- 1978	Specification for Caulking lead.
783- 1985	Code of practice for laying concrete pipes.
784- 2001	Pre-stressed concrete pipes.
1172- 1993	Code of basic requirements for water supply, drainage and sanitation
1200-1979 (Pt. 16)	Method of measurements for Laying of water and sewer lines including appurtenant items.
1200-1981 (Pt. 19)	Method of measurements for Water supply, plumbing and drains.
1230	Specifications for CI Rain Water pipes
1703- 2000	Ball valve (horizontal plunger type) including floats for water supply.
1726- 1991	Cast iron manhole covers and Frames.
1729- 2002	Cast /ductile iron drainage pipes & fittings for over ground NP pipeline S/S series.
1742- 1983	Code of practice for building drainage
2065- 1983	Code of practice for water supply in buildings.
2097 - 1983	Specification for foam making branch pipe.
2104- 1981	Water meter boxes (domestic type)
2267- 1995	Polystyrene molding and extension materials – specification
2373	Specification for Water Meter (Bulk type)
2379- 1990	Color code for identification of pipe lines.
2401- 1973	Code of practice for selection, installation & maintenance of domestic water meters
2527- 1984	Code of practice for fixing rain water gutters and down pipes for roof drainage.
2692- 1989	Specification for Ferrules for water services.
2800- 1991 (Pt. I)	Construction of tube well
2800- 1979 (Pt. II)	Testing of tube well
2951- 1965 (Pt. I)	Head loss in straight pipes due to frictional resistance

2951- 1965 (Pt. II)	Head loss in valves & fittings.
3076- 1985	Low density polyethylene pipes for potable water supply
3597- 1998	Method of test for concrete pipes.
4038- 1986	Foot valves for water works purposes.
4111 (Pt. I to V)	Code of practice for ancillary structures in sewage system.
4111- 1986 (Pt. I)	Manholes
4111- 1985 (Pt. II)	Flushing tanks
4111- 1985 (Pt. III)	Inverted siphon
4111- 1968 (Pt. IV)	Pumping stations & pumping mains (rising mains)
4111- 1993 (Pt. V)	Tidal out-falls
4350- 1967	Specification for concrete porous pipes for under drainage.
4733- 1972	Methods of sampling & test for sewage effluents
4854 (Pt. I to III)	Glossary terms for valves and their parts
4854- 1969 (Pt. I)	Screw down stop, check & gate valves & their parts
4854- 1974 (Pt. III)	Butterfly valves
4985- 2000	Specifications for un plasticized PVC pipes for potable water supplies
5312 (Pt. I)	Swing check type reflux (non-return) valves
5312- 1984 (Pt. I)	Reflux (non-return) valves – single door pattern
5329- 1983	Code of Practice for sanitary pipe work above ground for building
5382- 1985	Specifications for rubber sealing rings for water, gas & sewer mains
5455- 1969	Cast iron steps for manholes
5600- 2002	Specifications for Sewage and drainage pumps
5961- 1970	Specifications for CI grating for drainage purposes
6279- 1971	Equipment for grit removal

6280- 1971	Sewage screens
6494- 1988	COP for water proofing of underground water tanks & swimming pools
7634 (Pt. I to III)	Code of Practice for Plastic pipe work for potable water supplies
7634- 2003 (Pt. III)	Laying & jointing un plasticized PVC pipes
7740- 1985	Code of Practice for road gullies
7834 (Pt. I to VIII)	Injection molded PVC socket fittings with solvent cement joints for water supplies
8329- 2000	Centrifugally cast (spun) ductile iron pressure pipes & fittings for water, gas & sewage
8835- 1978	Guideline for planning and design of surface drains.
9739- 1981	Specifications for Pressure reducing valves for Domestic water supply system.
9762- 1994	Specifications for polyethylene floats for float valves
10500- 1991	Specification of Drinking water
11189- 1985	Method of tube well development
11632 - 1986	Rehabilitation of Tube well
12183- 1987 (Pt. I)	Code of practice for Plumbing in multi-storied buildings (for water supply)
12231 - 1987	UPVC pipes for suction & delivery lines of agricultural pumps–Specification.
12235 - 1986	Method of test for UPVC pipe for potable water supply
12469 - 1988	Specifications for pumps
12592- 2002	Precast concrete frame & cover (SFRC frame & cover)
12701-1996	Specifications for rotational molded polyethylene water storage tanks
12818 - 1992	Specification for UPVC ribbed screen casing & plain casing pipes for bore / tube well
13095 - 1991	Butterfly valves for general purposes
13114 - 1991	Specification for forged brass gate, globe & check valves for water works purposes
14333-1996	Specification for HDPE pipes for sewerage system.

B. Technical Specification

1. General

Any damage caused to the building, or to electric, sanitary water supply or other installations etc. therein either due to negligence on the part of the contractor, or due to actual requirements of the work, shall be made good and the building or the installations shall be restored to its original condition by the contractor. Nothing extra shall be paid for it, except where otherwise specified.

All plumbing installation work shall be carried out through licensed plumbers.

It is most important to ensure that wholesome water supply provided for drinking and culinary purposes, is in no way liable to contamination from any less satisfactory water. There shall, therefore, be no cross connection whatsoever between a pipe or fitting for conveying or containing wholesome water and a pipe or fitting for conveying or containing impure water or water liable to contamination or of uncertain quality of water which has been used for any purpose. The provision of reflux or non-return valves or closed and sealed valves shall not be construed a permissible substitute for complete absence of cross-connection.

Where a supply of wholesome water is required as an alternative or standby to supply of less satisfactory water or is required to be mixed with the latter, it shall be delivered only into a cistern, and by a pipe or fitting discharging into the air gap at a height above the top edge of the cistern equal to twice its nominal bore, and in no case less than 15 cm.

No piping shall be laid or fixed so as to pass into, through or adjoining any sewer, scour outlet or drain or any manhole connected therewith nor through any ash pit or manure-pit or any material of such nature that can cause undue deterioration of the pipe.

Where the laying of any pipe through fouled soil or previous material is unavoidable, the piping shall be properly protected from contact with such soil or material by being carried through an exterior cast iron tube or by some other suitable means. Any piping or fitting laid or fixed which does not comply with the above requirements, shall be removed and re-laid in conformity with the above requirements.

No piping shall be laid or fixed so as to pass into, through or adjoining any sewer, scour outlet or drain or any manhole connected therewith nor through any ash pit or manure-pit or any material of such nature that can cause undue deterioration of the pipe.

Where the laying of any pipe through fouled soil or previous material is unavoidable, the piping shall be properly protected from contact with such soil or material by being carried through an exterior cast iron tube or by some other suitable means. Any piping or fitting laid or fixed which does not comply with the above requirements, shall be removed and re-laid in conformity with the above requirements.

The design of the pipe work shall be such that there is no possibility of backflow towards the source of supply from any cistern or appliance whether by siphonage or otherwise, and reflux or non-return valves shall not be relied upon to prevent such back flow.

All pipe work shall be so designed, laid or fixed, and maintained so that it remains completely watertight, thereby avoiding wastage of water, damage to property and the risk of contamination of the water conveyed.

In designing and planning the layout of the pipe work, due attention shall be given to the maximum rate of discharge, required economy in labour and materials, protection against damage and corrosion, protection from frost, if required, and to avoidance of airlocks, noise transmission and unsightly arrangement.

To reduce frictional losses, piping shall be as smooth as possible inside. Methods of jointing shall be such as to avoid internal roughness and projection at the joints, whether of the jointing materials or otherwise.

Change in diameter and in direction shall preferably be gradual rather than abrupt to avoid undue loss of head. No bend or curve in piping shall be made so as to materially reduce or alter the cross-section.

Underground piping shall be laid at such a depth that it is unlikely to be damaged by frost or traffic loads and vibrations. It shall not be laid in ground liable to subsidence, but where such ground cannot be avoided; special precautions shall be taken to avoid damage to the piping. Where piping has to be laid across recently disturbed ground, the ground shall be thoroughly consolidated so as to provide a continuous and even support.

Where the service pipe is of diameter less than 50 mm the stop valves shall be of the screw-down type and shall have loose washer plates to act as non-return valves. Other stop valves in the service line may be of the gate type.

Water for drinking or for culinary purposes as far as possible shall be on branch pipes connected directly to the service pipe.

Pumps shall not be allowed on the service pipe as they cause a drop of pressure on the suction side thereby affecting the supply to the adjoining properties. In cases where pumping is required, a properly protected storage tank of adequate capacity shall be provided to feed the pump.

Service pipes shall be so designed and constructed as to avoid air-locks, so that all piping and fittings above ground can be completely emptied of water to facilitate repairs. There shall be draining taps or draw-off taps (not underground) at the lowest points, from which the piping shall rise continuously to draw-off taps, ball valves, cisterns, or vents (where provided at the high points).

Service pipes shall be designed so as to reduce the production and transmission of noise as much as possible. Appliances which create noise shall be installed as far distant as possible from the living rooms of the house. High velocity of water in piping and fittings shall be avoided. Piping shall be confined, as far as possible, to rooms where appliances are fixed, it shall have easy bends, and where quietness is particularly desired, holder bats or clamps shall be insulated from the piping by suitable pads.

The rising pipe to the storage cistern, if any, or to any feed cistern shall be taken as directly as possible to the cistern and shall be fixed away from windows or ventilators.

All pipe work shall be planned so that the piping is accessible for inspection, replacement and repair. To avoid its being unsightly, it is usually possible to arrange it in or adjacent to cupboards, recesses, etc. provided there is sufficient space to work on the piping with the usual tools. Piping shall not be buried in walls or solid floors. Where unavoidable, piping may be buried for short distances provided that adequate protection is given against damage and that no joints are buried. If piping is laid in ducts or chases, these shall be roomy enough to facilitate repairs and shall be so constructed as to prevent the entry of vermin. To facilitate removal of pipe casing, floor boards covering piping shall be fixed with screws or bolts.

When it is necessary for a pipe to pass through a wall or floor, a sleeve shall be fixed therein for insertion of the pipe and to allow freedom for expansion, contraction and other movement. Piping laid in wood floors shall, where possible, be parallel with the joists.

Where storage tanks are provided to meet overall requirements of water connection of service pipe with any distributing pipe shall not be permitted except one direct connection for culinary or drinking requirements.

No service pipe shall be connected to any water closet or urinal. All such supplies shall be from flushing cisterns which shall have supply from storage tank.

No service or supply pipe shall be connected directly to any hot-water system or to any apparatus used for heating other than through a feed cistern thereof.

In designing a drainage system for building(s), the aim shall be to provide a self-cleansing conduit for the conveyance of soil, waste, surface or sub-surface waters and for the removal of such wastes speedily and efficiently to a sewer or other outlet, without risk of nuisance and hazard to health.

The discharge of water through a domestic drain is intermittent and limited in quantity and therefore, small accumulations of solid matter are liable to form in the drains between the building and the public sewer. There is usually a gradual shifting of these deposits as discharges take place. Gradients shall be sufficient to prevent these temporary accumulations building up and blocking the drains.

In cases, where it is practically not possible to conform to the minimum gradients, a flatter gradient may be used but the minimum velocity in such cases shall on no account be less than 0.62 meters per second.

On the other hand, it is undesirable to employ gradients giving velocity of flow greater than 2.40 meters per second.

All materials shall be new of the best quality confirming to specifications and subject to the approved make list and as approved by Design Consultant / Engineer in charge.

2. CPVC Pipes and Fittings

Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold-water supply including all CPVC plain & brass threaded fittings This includes jointing of pipes &

fittings with one step CPVC solvent cement, trenching, refilling & testing of joints complete as per direction of Engineer in Charge.

a. Scope

This specification covers the requirements for manufacture, supplying, lowering, laying, jointing, testing and commissioning of CPVC solvent welded pipe with fittings for the conveyance & distribution system.

b. Material

The pipes and fittings chemically known as Chlorinated Poly Vinyl Chloride [CPVC] shall be produced in Copper Tube Size [CTS] from ½" to 2" with two different standard dimensional ratios – SDR 11 and 13.5 and from 2.5" to 10" as per SCH 40 and 80.

All the CPVC pipes and fittings shall be made from the identical CPVC compound having the same physical properties.

Pipes and fitting shall be produced as per SDR 11 & shall meet the requirement of ASTM D 2846 whereas the pipes produced with SDR 13.5 shall meet the requirement derived from ASTM F 442, specific to CPVC in Iron Pipe Size [IPS] dimension, which also shall be applied to CPVC pipes in Copper Tube Size [CTS] dimension.

Pipes and fitting shall be produced as per SCH 40 & 80 shall meet the requirement of ASTM F 441.

Fittings shall be of the same make as that of pipes. It shall be injection molded type.

CPVC pipes and fittings shall be visually inspected before laying & shall be free from cracks, flaws and defects and shall be able to withstand a pressure as mentioned in the schedule of quantities. Cracked & damaged pipe shall be removed from the site by the contractor at his own cost. All the pipes and fittings shall be thoroughly cleaned with brush and washed if necessary to remove any accumulated stone, soil or dirt inside and outside surfaces.

The pipe shall be provided with bends, junctions, inspection doors, offsets, cowl, access pieces/ plugs etc. jointing with Solvent cement (lubricant) including cutting holes in walls and making good the same. The Access door shall be secured air and water tight with 3mm thick insertion

rubber washer and white lead. The bolts shall be lubricated with grease or white lead for easy removal.

Lubricant/ solvent cement: It is available in 100 Gms, 250 Gms & 500 Gms packing. It is specially formulated for compatibility with rubber seal as well as PVC. It does not support the growth of bacteria or fungi. Solvent joints shall be used as per manufacturer's recommendations.

c. Cutting, Jointing, & Fixing

In order to make a proper and neat joint, the pipe length shall be measured accurately and make a small mark. Ensure that the pipe and fittings are size compatible. It shall be easily cut with a wheel type plastic pipe cutter or hacksaw blade. Cutting tubing as squarely as possible shall provide optimal bonding area within a joint.

- **Deburring/ Beveling**

Burrs and filings shall prevent proper contact between tube and fitting during assembly and should be removed from the outside and inside of the pipe. A pocket knife or file shall be used for this purpose. A slight bevel on the end of the tubing shall ease the entry of the tubing into the fitting socket.

- **Fitting Preparation**

Using a clean, dry rag, wipe dirt and moisture from the fitting sockets and tubing end. The tubing should make contact with the socket wall 1/3 to 2/3 of the way into the fitting socket.

- **Solvent Cements Application**

Use only CPVC cement or an all – purpose cement conforming to ASTM -493 or joint failure may result. When making a joint, apply a heavy, even coat of cement to the pipe end. Use the same applicator without additional cement to apply a thin coat inside the fitting socket. Too much cement can cause clogged water ways.

- **Assembly**

Immediately insert the tubing into the fitting socket, rotate the tube ¼ to ½ turn while inserting. This motion will ensure an even distribution of cement within the joint. Properly

align the fittings. Hold the assembly for approximately 10 seconds, allowing the joint to set-up.

- **Set and Cure Times**

Solvent cement set and cure times are a function of pipe size, temperature and relative humidity. Curing time is shorter for drier environments, smaller sizes and higher temperatures. It requires 10 to 20 minutes for perfect joint.

- **Cementing**

Verify the cement is the same as the pipes and fittings being used. Check the temperature where the cementing will take place. Cement takes longer time to set up in cold weather. Be sure to allow extra time for curing. Do not try to speed up the cure by artificial means – this could cause porosity and blisters in the cement film.

Solvents evaporate faster in warm weather. Work quickly to avoid the cement setting up before the joint is assembled. Keep the cement as cool as possible. Try to stay out of direct sunlight. Keep the lid on cements, cleaner and primers when not in use. Evaporation of the solvent will affect the cement. Stir or shake cement before using.

Use $\frac{3}{4}$ " dauber on small diameter pipes, 1 $\frac{1}{2}$ " dauber up through 3" pipe, and a natural bristle brush, swab or roller $\frac{1}{2}$ the pipe diameter on pipes 4" and up.

Do not mix cleaner or primer with cement. Do not use thickened or lumpy cement. It should be like the consistency of syrup or honey. Do not handle joints immediately after assembly. Do not allow dauber to dry out.

Maximum temperature allowable for CPVC pipe is 180 °F. All colored cements, primers and cleaners will have a permanent stain. There is no known cleaning agent. Use according to the step outline in ASTM D – 2846, joining of pipe and fittings.

d. Testing

After laying and jointing, the pipes and fittings shall be inspected under working condition of pressure and flow. Any joint found leaking shall be redone and all leaking pipes removed and replaced without extra cost. Use of any compound or stop leak compound will not permit.

The pipes and fittings after they are laid shall be tested to hydraulic pressure of 1.5 times the working pressure or 7.5 Kg/Sq.cm whichever is more. The pipes shall be slowly and carefully charged with water allowing all air to escape and avoiding all shock or water hammer. The draw of taps and stop cocks shall then be closed and specified hydraulic pressure shall be applied gradually. Pressure gauge must be accurate and preferably should have been recalibrated before the test. The test pump having been stopped, the test pressure should be maintained without loss for at least two hours. The pipes and fittings shall be tested in sections as the work of laying proceeds, having the joints exposed for inspection during the testing.

e. Rates

- CPVC pipes and fittings of specified diameter & pressure class.
- Laying and cutting the pipe wherever necessary and wastage.
- Over ground installation with supports/ clamps, accessories required, Concealed installation with required civil work.
- Pipe & Fitting with insulation for hot water application if specified in schedule of quantities.
- Making the solution joint, painting the pipe line if mentioned in schedule of quantities.
- Making all damage good to original condition after completion of installation work.
- Testing the entire system and rectification of defects if any.
- All necessary materials, labor and use of tools.

f. Mode of Measurement

The measurement shall be for unit running meter length of pipe line laid of fixed. The measurement shall be taken along the center line of pipe. No measurement shall be recorded separately for fittings, making joint, supports, clamps, civil work, painting if mentioned in schedule of quantities. It shall also include insulation for hot water application if mentioned in schedule of quantities.

g. Mode of Payment

Mode of payment shall be Unit length of pipe line laid or fixed. No extra payment shall be made for fittings, making joint, supports, clamps, civil work, painting if mentioned in schedule of quantities. It shall also include insulation for hot water application if mentioned in schedule of quantities.

3. Ball Valve

a. Material

The ball wall shall be brass as specified conforming to IS: 9890 and of the size as specified. This shall be fixed in the pipe using suitable Teflon tape wrapping on the pitched pipe ends to remove any type of leakage.

b. Fixing

The valves shall be fixed in position in the pipeline as shown in the drawing or as directed with necessary socket or union, nuts, flanges, hardware, gaskets, tail piece, etc. During installation, flow direction on the valve shall be checked.

Valves shall be preferably installed in horizontal position.

Screwed valves after few turns shall be applied with Teflon tape over the threaded ends to obtain complete water tightness. Flanged joint shall be fixed with non-corrosive bolts & nuts with suitable thickness asbestos fiber gasket conforming to IS 638 for water tightness.

c. Testing

The valves shall be body & seat tested at manufacturer's works as per the relevant standard & duly stamped. Test certificate shall be submitted for material & hydraulic testing.

After fixing in the pipelines, the system shall be hydraulically tested for 1.5 times working pressure or 10 kg/cm² whichever is higher for minimum 4 hrs. without any pressure drop. In case of leakage, contractor shall rectify / replace valves at his own cost

Valves shall also be tested for its hand wheel/ lever function by frequent on-off operation.

d. Rates

- Fixing & jointing material.
- Painting.
- Making all damage good to original condition after completion of installation work.
- Testing.
- All necessary materials, labor and use of tools.

e. Mode of Measurement

The measurement shall be for each unit valve of specified diameter fixed.

f. Mode of Payment

The contract rate shall be for each unit of valve of specified diameter fixed. No extra payment shall be made for G.I. fittings used in fixing of the valve.

4. Non-Return Valve

Providing, installation, testing and commissioning of non-return valve of following sizes confirming to IS: 5312 complete with rubber gasket, GI bolts, nuts, washers etc.as required.

a. General

Non return valve shall be either lift single/ multi door type or spring-operated check valves. For sizing more than 50 mm, generally NRV shall be of Cast Iron body, CI / CS door.

Single door Non return valve shall conform to IS 5312 up to 600 mm. Size above 600 mm shall have multi door design. Spring operated shall conform to API 594/598 standard having spring for non-slam action.

Material of Valves for hot water application shall withstand the temperature up to 80 deg. C. Generally, all internal valves (within the building) shall be of Gun Metal unless otherwise specified. All external installation on pipe line, plant rooms, etc. shall be of cast iron unless otherwise specified.

All valves up to 50 mm shall have screwed ends while all valves beyond 50 mm size shall have flanged ends. Flange dimensions shall conform to IS: 1538 Table IV & VI or IS: 6392 PN 1.6.

b. Fixing

The valves shall be fixed in position in the pipeline as shown in the drawing or as directed with necessary socket or union, nuts, flanges, hardware, gaskets, tail piece, etc. During installation, flow direction on the valve shall be checked.

Valves shall be preferably installed in horizontal position, except butterfly valves which can be fixed in the vertical position.

Screwed valves after few turns shall be applied with Teflon tape over the threaded ends to obtain complete water tightness. Flanged joint shall be fixed with non-corrosive bolts & nuts with suitable thickness asbestos fiber gasket conforming to IS 638 for water tightness.

c. Testing

The valves shall be body & seat tested at manufacturer's works as per the relevant standard & duly stamped. Test certificate shall be submitted for material & hydraulic testing.

After fixing in the pipelines, the system shall be hydraulically tested for 1.5 times working pressure or 10 kg/cm² whichever is higher for minimum 4 hrs. without any pressure drop. In case of leakage, contractor shall rectify/replace valves at his own cost.

Valves shall also be tested for its hand wheel/ lever function by frequent on-off operation.

d. Rates Included

- Valve of required type, size & pressure rating.
- Fixing & jointing material.
- Painting.
- Making all damage good to original condition after completion of installation work.
- Testing.
- All necessary materials, labor and use of tools.

e. Mode of Measurement

The measurement shall be for each unit valve of specified diameter fixed.

f. Mode of Payment

The contract rate shall be for each unit of valve of specified diameter fixed. No extra payment shall be made for G.I. fittings used in fixing of the valve.

5. Pressure Gauge

SITC of glycerine filled Pressure gauge of following ranges with isolation valve and tap off pipe complete in all respect as per technical specification and as per direction of Engineer.

a. Scope

The item includes provision of Pressure Gauge of specified range as mentioned in the schedule with siphon tubing & SS isolation cock.

b. Material

The pressure gauge shall be constructed of die cast aluminum and stove enameled.

It shall be weather proof with an IP 55 enclosure.

It shall be a stainless-steel Bourdon tube type pressure gauge with a scale range from 0 to 16 Kg/cm² and shall be constructed as per IS: 3524.

Each pressure gauge shall have a siphon tube connection. The shut off arrangement shall be by SS Ball Valve.

c. Fixing

It shall be fixed vertically in position on pipe line by means of screwed nipple, spool piece or as required or as directed by the Engineer-in-charge.

d. Test

Calibration certificate shall be obtained and submitted for each pressure gauge.

e. Rates

- Pressure Gauge with isolation valve & siphon tubing.
- Making connection with piping with all accessories.
- Making all damage good to original condition after completion of installation work.
- Testing the entire system and rectification of defects if any.
- All necessary materials, labor and use of tools.

f. Mode Of Measurement

The measurement shall be for each unit of Pressure Gauge of specified range fixed.

g. Mode Of Payment

The contract rate shall be for each unit Pressure Gauge of specified range fixed.

6. Strainer

Providing, installation, testing and commissioning of stainless-steel Y-strainer fabricated out of 1.6 mm thick stainless steel, Grade 304, sheet with 3 mm Dia holes with stainless steel flange.

a. Scope

The item includes the 'Y' type or POT type strainers of size as specified in schedule of quantities including fixing, testing & commissioning.

b. Material & Fixing

Body material shall be cast iron, Gun metal or Stainless steel.

Screen material shall be either bronze or stainless steel. Screen shall be removable type. Size of the perforations shall be 1/8" if not specified.

Strainers shall have either screwed or flanged ends.

Strainers shall be provided with equal size of butterfly valve for ease of cleaning.

It shall be such designed that, removal/ replacement of screen can be possible without disconnection of main pipe.

c. Testing

It shall be hydraulically tested at least for 1.5 times working pressure.

d. Rates

- Strainer.
- Fixing material, specials & hardware.
- Fixing, testing & commissioning.
- Painting.
- Making all damage good to original condition after completion of installation work.
- All necessary labor, material and use of tools.

e. Mode Of Measurement

The measurement shall be for one strainer.

f. Mode Of Payment

The contract rate shall be for one strainer.

7. Float valve

Supply, installation, testing and commissioning of Horizontal plunger type Forged Brass / Bronze Float Valve, Screwed End, HDPE Ball / Float, PN 10 rating.

a. Scope

The valve shall be of copper or as specified in schedule of quantities. Size of float valve shall be as specified in schedule of quantities. Connecting rod to ball float shall be of brass & shall withstand high pressure encountered on it. It shall be brazed or soldered to render it leak proof.

b. Rates

- Ball float valve.
- Making all damage good to original condition after completion of installation work.
- Testing the entire system and rectification of defects if any.
- All necessary materials, labor and use of tools.

c. Mode Of Measurement

The measurement shall be for each unit of Ball float valve fixed.

d. Mode Of Payment

The contract rate shall be for each unit of Ball float valve fixed.

8. Water Meter

Providing and fixing enclosed type water meter (bulk type) conforming to IS: 2373 and tested by Municipal Board complete with bolts, nuts, rubber insertions etc. (The tail pieces if required will be paid separately)

e. Scope

The item includes the bulk type water meter of size as specified in schedule of quantities including fixing, testing & commissioning.

Water meters shall be selected according to flow to be measured and not necessarily to suit a certain size of main. The following points shall govern the selection of meters:

- The maximum flow shall not exceed the nominal capacity of the meter.
- The continuous flow shall be not greater than the continuous running capacity rating.
- The minimum flow to be measured shall be within minimum starting flows.

f. Material & Fixing

Water meters and their parts, especially parts coming in continuous contact with water shall be made of materials resistant to corrosion and shall be non-toxic and non-training. Use of dissimilar metals in contact under water shall be avoided as far as possible in order to minimize electrolytic corrosion.

The body of water meters shall be made from bronze, brass or any other corrosion resistant material e.g. grey iron castings, blackheart malleable iron, spheroidal graphite iron casting.

Registration box of water meters shall be made from bronze, brass, aluminum alloy or suitable plastics. The registration box of dry dial water meters shall be provided with one or two escape holes for minimizing the accumulation of condensed water.

Cap of water meters shall be made from brass, bronze, aluminum alloy or suitable plastics. The cap shall be so designed and fixed to the registration box as to avoid entry of water and dirt. The transparent window which covers the dial shall be inserted from the inside into the cap. The protective lid shall be secured by a robust hinge or other suitable method of robust construction.

Provision shall also be made to lock the lid. The provision shall be such that the lock is conveniently operated from the top. Where the provision is designed for use in conjunction with padlocks, the hole provided for padlocks shall be of a diameter not less than 4 mm.

Where so required for dry-type water meters the transparent window covering the dial shall be provided with a wiper on the inner side for wiping off condensed water.

Water meters shall be provided with strainers. Strainers shall be of a material which is not susceptible to electrolytic corrosion. They shall be of plastics or other corrosion-resistant materials for both Type A and Type B meters. They shall be rigid, easy to remove and clean, and shall be fitted on the inlet side of the water meter. It shall be possible to remove and clean the strainer in such a way as not to permit disturbing the registration box or tampering with it. The strainer shall have a total area of holes not less than twice the area of the nominal inlet bore of the pipe to which the meter is connected however, in the case of meters provided with internal strainer involving opening of the registration box for cleaning, an additional external strainer shall be fitted on the inlet side satisfying the above requirements.

9. Air release valve

a. Scope

The item includes supplying of single, double action or kinetic air Valve of specified diameter as mentioned in the schedule including fixing.

b. Material

Single air valve shall have single small or large orifice for releasing air during pipe filling and ventilating the pipe during emptying. Air valves up to 50 mm diameter directly shall be screwed on the main.

Double air valve shall have two ball chambers, on outlet of large capacity shall be provided for admission and release of bulk volume of air during emptying and filling of the main, another of small outlet type for the escape of smaller quantities of air accumulating under pressure. They shall be of flanged type.

Air valve body, bonnet , glands, caps, joints support rings shall be best gray iron of selected grade, 200 of IS-210-1978 specification for gray iron castings.

Ball guides of small orifice units and outlet bushes of large orifice valves shall be of gunmetal.

Nipples, spindles shall be machined from rolled, extruded or forged high tensile brass or aluminum bronze.

The balls shall be of rubber covered and vulcanite covered. The rubber shall have a smooth and hard surface. It shall be as per I.S. 638-1965 specification for rubber and insertion jointing.

Air valve shall be provided with isolation valve with IS certification mark and isolation valve.

c. Fixing

The Air Valve shall be fixed in position as indicated in the drawing or as directed. They shall be fitted by means of flange joints or screwed joint to the pipe line.

d. Testing

The Air Valve and the joints shall be tested hydraulically to a minimum pressure of 10 kg/cm² or 1.5 times working pressure whichever is greater for minimum 4hrs without any leakage.

e. Rates

- Supplying and fixing Air Valve of specified diameter and type with isolation valve.
- Fixing & Jointing material & specials.

- Painting.
- Making all damage good to original condition after completion of installation work.
- Testing & commissioning
- All necessary materials, labor and use of tools.

f. Mode Of Measurement

The measurement shall be for each unit of Air Valve fixed.

g. Mode Of Payment

The contract rate shall be for each unit of air valve fixed

10. SWR PVC Pipe

Providing & fixing of 6 Kg/ sq. cm SWR TYPE A / TYPE B PVC Pipe ISI marked brand as per IS 13592 self-fit type complete. The work including solvent jointing hydraulic testing the joints & pipes as mentioned in the specification etc. making holes including fixing on the wall with clamps and fasteners at 1.00 meter distance or as mentioned in the specifications, making holes in brick or RCC wall as per requirement ,clearing the debris, grouting of concealed pipes, making good the chase as mentioned, making good the wall and floors, making connection with down take to satisfaction of Engr / arch with proper care, protecting fittings & pipes till the final handing over etc as directed by E-I-C complete as per specifications & drawing provided for all places, all heights & all levels (Exposed work on wall- Rain Water)

a. Scope

The item includes supplying of UPVC soil, waste and rain water (SWR) and ventilation pipes with fittings of specified diameter including laying, fixing, cutting, joining, painting if required etc.

b. Material

The pipes shall conforming to IS 13592, UPVC - SWR (Type 'A' or 'B' as specified) and fittings conforming to IS 13591 shall be free from cracks, flaws and defects and shall be U.V. stabilized and able to withstand a pressure as mentioned in the schedule of work. Rubber sealing rings

conforming to IS: 5382 with lubricant for sliding socket joints as mentioned in the schedule of work.

EXAMINING

Before laying the pipe line, it shall be first examined for damages and cracks, No cracked or damaged pipe and fittings shall be used in the work and they shall be removed from the site by the contractor at his own cost and charge.

CLEANING

All the pipes and fittings shall be thoroughly cleaned with brush and washed if necessary to remove any accumulated stone, soil or dirt inside and outside surfaces.

c. Laying, Fixing & Jointing

The pipes shall be carefully laid straight to the correct alignment in gradients as indicated in the drawing. The entire pipe shall be used in standard length as far as possible. Cut length may be used only where it is necessary to make up exact length. The entire length of pipe shall be evenly supported on bed of the trench throughout. Care shall be taken to prevent any sand, earth or other materials from entering into the pipes during laying. At the end of day's work, the open end shall be suitably plugged.

The pipe line shall be fixed in position as shown in the drawing or as directed by the Engineer-in-charge. The pipe shall be fixed with G.I. clamps not less than 2.0 mm thick or with suitable UPVC clamps/ clips, the clamps/ clips shall be fixed into the wall with G.I. nails not less than 40 mm long and wooden gutties keeping the pipe about 15 mm clear of the wall.

The jointing of pipes and fittings generally shall be done with approved make cement solvent including making surface rough or rubber sealing rings with lubricant for sliding socket joints. The pipe shall be cut to desired length. Care shall be taken that that profile or cut surfaces shall not be changed and the fibrous material shall be removed with scraper or knife.

d. Detachable Joint

Detachable joints shall be made where pipes of different materials have to be jointed or as specified in the schedule. The flanges are first pushed over the pipe ends and jointing shall be made by cement solvent.

e. Painting

In case of underground piping, the pipe line shall be painted with two coats of approved oil paint of matching color over a coat of primer.

f. Dewatering & Civil Work

In case of underground pipes, the contract rate shall include bailing or pumping out all the water till completion or work if accumulated during the progress of work either from seepage, springs, rain or any other cause. The rate shall also include for excavation, refilling, etc. civil work required if specified in schedule of quantities. Pipe shall be laid with suitable bedding, encasing as per actual site condition. For concealed piping, chasing, drilling holes in wall, etc. shall be covered under the rate.

g. Testing

The joints shall be tested by either smoke test for vertical stacks or 2.5 m head of water at the highest point of the section under test for horizontal drainage pipes. Smoke shall be pumped into the pipes at the lowest end from a smoke machine which consists of a bowl and burner. The material usually burnt is greasy cotton waste which gives out a clear pungent smoke which is easily detectable by sight as well as by smell, if there is leak at any point of the drain. The water head test shall be carried out by suitably plugging the lower end of the drain and the ends of the connection if any and filling the system with water. A knuckle bend shall be temporarily jointed to it so as to provide required test head, or the top 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 suitable for observation. The leaky joints shall be remade and section re-tested at no extra cost.

h. Rates

- Supplying of UPVC-SWR pipes and fittings of specified diameter.
- Laying and cutting the pipe wherever necessary and wastage.
- Fixing the pipe line with G.I. clamps not less than 2mm thick and G.I. / M.S. nails length not less than 40mm or with UPVC clamps, screws, wooden gutties etc.
- Making the solution joint and painting if mentioned in schedule of work the pipe line.
- All civil work required for concealed piping.

- In case of underground pipes, dewatering, if necessary, till completion of work, excavation, refilling, etc. civil work if specified in schedule of quantities.
- Testing of pipes.
- Making all damage good to original condition after completion of installation work.
- All necessary materials, labor and use of tools.

i. Mode Of Measurement

The measurement shall be for unit running meter length of pipe line laid or fixed. The measurement shall be taken along the center line of pipe. No measurement shall be recorded separately for fittings, making joint, painting, civil work if mentioned in schedule of work and testing.

j. Mode Of Payment

The contract rate shall be for unit running meter length of pipe line laid or fixed.

11. uPVC Trap

Providing and fixing UPVC Trap conforming to IS 14735, including cost of cutting and making good of wall and floors to the satisfaction of Engineer-In-Charge.

a. Material & Fixing

The trap shall be of cast iron or PVC or SS as specified in schedule of quantities.

The trap shall be provided with SS/ CP brass/ PVC grating of size 100/ 150 mm size as specified in schedule of quantities.

The trap shall have generally water seal not less than 50 mm.

The trap shall have 150/ 100 mm inlet & 40/ 50/ 75/ 100 mm multiple outlets.

The trap & waste pipe shall be fixed in PCC 1:2:4, 100 mm around up to finished floor with water tight finishing & shall be firmly supported on structural floor.

b. Rates

- Multi floor trap with grating cover.

- Jointing & fixing material.
- Making all damage good to original condition after completion of installation work.
- Testing the entire system and rectification of defects if any.
- All necessary materials, labor and use of tools.

c. Mode Of Measurement

The measurement shall be for each unit of Multi floor trap with grating fixed.

d. Mode Of Payment

The contract rate shall be for each unit of Multi floor trap with grating fixed.

12. Constructing Brick Masonry Manhole

Constructing brick masonry manhole in cement mortar 1:4 (1 cement : 4 coarse sand) with R.C.C. top slab with 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size), foundation concrete 1:4:8 mix (1 cement : 4 coarse sand : 8 graded stone aggregate 40mm nominal size) inside plastering 12mm thick with cement mortar 1:3 (1 cement : 3 coarse sand) finished with floating coat of neat cement and making channels in cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size) finished with a floating coat of neat cement complete as per standard design :

Inside size 90x80 cm and 60 cm deep including C.I. cover with frame (light duty) 455x610 mm internal dimensions total weight of cover and frame to be not less than 38 kg (weight of cover 23 kg and weight of frame 15 kg) with common burnt clay of class designation 5

Inside size 120x90 cm and 90 cm deep including C.I. cover with frame (Medium duty) 500 mm Dia internal dimensions total weight of cover and frame to be not less than 38 kg (weight of cover 23 kg and weight of frame 15 kg) with common burnt clay of class designation 5

a. Material

Concreting, Brick work, plastering etc., shall be as per specification as given in general specification under section II.

b. Construction

Internal dimensions and initial depth shall be as specified in the schedule or as shown in the drawing. If not specified, size of manholes shall be constructed as follows.

Foundation of 1:2:4 concrete shall be 150 mm thick and shall have 150 mm offset.

The concrete 1:2:4 shall be laid to necessary shapes to form the channel for the pipe being received in the channel. It shall be of appropriate diameter and shall be half round. The sides shall be kept sloping towards the channel.

Brick masonry shall be 230 mm thick in cement mortar 1:5 or as specified in the schedule of work, making brick tapering for longitudinal wall 450 mm from top of cover of the chamber.

Brick masonry shall be rendered with 20 mm thick plaster in cement mortar 1:1 or as specified in the schedule of work inside and outside surfaces in two courses and inside surface finished smooth with neat cement punning.

II manholes with depths greater than 1 meter shall be provided with 20 mm square or 25 mm round rods the steps shall be fixed in brick masonry wall with 1:2:4 cement concrete with 75mm cement concrete cover at all around the step. Cast iron step shall be painted with two coats of approved black bitumastic anti corrosive paint over a coat of primer. Or foot rests shall be PVC coated.

All manholes shall be provided with Cast Iron/ pre cast RCC cover & frames & embedded in reinforced cement concrete slab. Weight of cover & frame & thickness of the slab shall be as specified in schedule of quantities.

c. Dewatering

The contract rate shall include bailing or pumping out all the water if accumulated during the progress of the work either from rain, seepage, springs or any other cause.

d. Rates Included

- Concreting in foundation, forming the channels, constructing brick masonry and plastering over the brick work, and finishing smooth in side surfaces.
- Cover & Frame (if called in schedule of quantities).
- Foot rests (if called in schedule of quantities).
- Dewatering the pit if found necessary till completion of work.

- Making all damage good to original condition after completion of construction work.
- All necessary labor, materials and use of tools.

e. Mode Of Measurement

The measurement shall be for an Inspection chamber of specified finished internal size and initial depth measured vertically from top of the frame and cover to the invert of chamber. Extra for additional depth or rebate for lesser depth shall be measured in RMT.

f. Mode Of Payment

The contract rate shall be for unit Inspection chamber of specified internal size and initial depth Extra/Rebate for additional/lesser depth respectively shall be paid in RM.

Rate shall be for per number of CI cover installed.

Extra depth beyond mentioned depth for above items

Inside size 90x80 cm

Inside size 120x90 cm

a. Scope

The item includes provision for extra depth of Inspection Chamber and manholes of brick masonry.

b. Material

Concreting, Brick work, plastering etc. Shall be as per specification given above

c. Construction

Extra depth for inspection chamber and manhole shall be constructed as per Inspection Chamber & Circular Manhole.

d. Dewatering

The contract rate shall include bailing or pumping out all the water if accumulated during the progress of the work either from rain, seepage, springs or any other cause.

e. Rates

- Constructing brick masonry and plastering over the brick work.
- Dewatering the pit if found necessary till completion of work.
- All necessary labor, materials and use of tools.

f. Mode Of Measurement

The measurement shall be for unit meter depth or part thereof for inspection/ manhole chamber manhole constructed. Depth of manhole or chamber shall be measured from top of the frame and cover to the invert level of manhole deducting the initial depth of at manhole/ chamber. Extra for additional depth or rebate for lesser depth shall be measured in R.M.

g. Mode Of Payment

The contract rate shall be for unit meter depth of inspection chamber/ circular manhole constructed.

13. Gully Trap

Constructing brick masonry road gully chamber 30x30x60 cm with bricks in cement mortar 1:4 (1 cement: 4 coarse sand) including 500x450 mm pre-cast R.C.C. horizontal grating with frame complete as per standard design: with common burnt clay FPS (non modular) bricks of class designation 7.5

Relevant specifications shall be followed as per serial no. 3.06 except inside and outside dimension.

14. RCC PIPE

Providing and laying non-pressure NP3 class R.C.C. pipes with collars jointed with stiff mixture of cement mortar in the proportion of 1:2 (1 cement: 2 fine sand) including testing of joints etc. complete: (For Rain Water & Sewer underground network)

a. General

The item includes supplying of RCC piping of specified diameter including laying, fixing, joining, painting etc. for external sewage disposal

b. Material

The pipe shall be new & of first class quality RCC & free from rough texture, inside & outside straight with uniform bore throughout.

All pipes shall be centrifugally spun NP3 class unless otherwise specified.

Pipe shall be tested at manufacturer's works prior to dispatch at site. A certificate shall be produce for the same.

Pipe shall be with or without reinforcement as required & of the class as specified. It shall conform to IS: 458.

c. Laying

RCC spun pipes shall be laid on cement concrete bed or cradles as specified. Cradles shall be pre cast & sufficiently cured to prevent cracks & breakage in handling.

The invert of cradle shall be left 12 mm below the invert level of the pipe & properly placed on the soil to prevent any disturbance.

The pipe shall then be placed on cradles & set for the line & gradient by means of sight rails, bonding rods, etc. Cradles or concrete bed may be omitted if directed by engineer in charge.

d. Jointing

After setting out the pipes, the collars shall be centered over the joint & filled in with tarred gaskin, so that sufficient space is left on either side of the collar to receive mortar.

The space then shall be filled with cement mortar 1:2 & caulked by means of proper tools.

All joints shall be finished at an angle of 45 degree to the longitudinal axis of the pipe on both sides of the collars neatly.

e. Testing

All pipes shall be tested to a hydraulic test of 2.5 m head for at least 50 minutes at the highest point in the section under test.

Smoke test is too carried out by the contractor, if directed by engineer in charge.

f. Rate included

- RCC pipes of specified diameter.

- Laying the pipe wherever necessary and wastage.
- Underground installation with trenching, bedding, and encasing, dewatering, etc. civil work as specified in schedule of quantities.
- Making joint, painting the pipe line if mentioned in schedule of quantities.
- Making all damage good to original condition after completion of installation work.
- Testing the entire system and rectification of defects if any.
- All necessary materials, labor and use of tools.

g. Mode of Measurement

The measurement shall be for unit running meter length of pipe line laid or fixed. The measurement shall be taken along the center line of pipe. No measurement shall be recorded separately for fittings, making joint, painting, it shall also include required civil work for underground installation if mentioned in schedule of quantities.

h. Mode of Payment

Mode of payment shall be Unit length of pipe line laid or fixed. No extra payment shall be made for fittings, making joint, painting. It shall also include required civil work for underground installation if mentioned in schedule of quantities.

15. Septic Tank & Soak Pit

a. SCOPE

The item includes the Septic tank & soak pit with all connections & civil work including construction, testing & commissioning.

b. Construction

Septic tank shall consist of tank with inlet & outlets with all earthwork & backfilling. The details of the septic tank shall be as shown in the drawing. The item shall also include ventilating pipe of at least 100 mm diameter whose top shall be provided with a suitable mosquito proof wire mesh & a cowl. Ventilating pipe shall be extended to a height of about 2 meters from ground when septic tank is at least 15 meters from the nearest building and shall be 2 meter above the building when it is located closer than 15 meter.

Effluent from the septic tank shall be disposed to drain/ water body if approved by concerned authority or to be discharged into a soak pit for absorption in soil or shall be allowed to be absorbed by soil through open jointed SW pipes laid in a trench filled with broken bricks.

Soak pit shall be as per drawing. Diameter & depth of soak pit shall be as indicated in schedule of quantities. The pit shall be lined with stone, brick or concrete blocks set in cement mortar (1:6) &

filled with brick bats.

In case of open joined SW pipe/dispersion trenches, minimum diameter of pipe shall be 150 mm. The trench for laying the pipes shall be minimum 600x600 mm. The joints of the pipe shall be left unsealed. The entire length of the pipe within the trench shall be buried in a 250 mm layer gravel or crushed stone of uniform size. On the top of gravel/crushed stone layer 150 mm bed of well graded coarse aggregate shall be laid. Ordinary soil will be used for filling the top trench.

c. Commissioning Of Septic Tank

After the septic tank has been proved water tight & the sewage system is checked the tank shall be filled with water to its outlet level before sewage is let into the tank. It shall be seeded with well-designed sludge obtained from septic tank or sludge digestion tank. In the absence of digested sludge, a small quantity of decaying organic matter such as digested cow-dung may be introduced.

d. Testing Of Septic Tank

The septic tank shall be tested for water tightness. It shall be filled up with water & allowed to soak for 24 hrs. Then it shall be topped up & allowed to stand again for 24 hrs. & loss of level is to be recorded. The fall shall not be more than 15 mm.

e. RATES

Septic tank

- All material & civil work for septic tank like excavation, backfilling, dewatering, & required brick work/ lining work/ RCC work/Plaster work, etc. complete.
- All pipe connections, jointing, vent, etc.
- Manhole cover & frame, rungs.
- Testing & commissioning.
- Making all damage good to original condition after completion of work.
- All necessary labor, material and use of tools.

Soak well

- All material & civil work for soak pit like excavation, backfilling, dewatering, & required brick work/ lining work/ RCC work/Plaster work, etc. complete.
- All pipe connections, jointing, vent, etc.
- Manhole cover & frame.
- Testing & commissioning.
- Making all damage good to original condition after completion of work.
- All necessary labor, material and use of tools.

16. Connection To RCC Tanks/ Reservoirs

Inlets, outlets, interconnection sleeves & drain outlets for the reservoir shall be made through mild steel bath galvanized puddle sleeves obtained from reputed manufacturers & to be inserted at suitable levels as indicated on the drawings. The contractor shall be responsible for placing the inserts at required level well in advance & before making the final shuttering layout for casting the walls. All puddle sleeves must be fixed in true alignment & level to ensure further connection in proper order all the overhead water tank terraces shall be provided with efficient rain water disposal system. The necessary sleeve in the tank wall shall be provided for running the level controller wires/ probes.

The plate used for fabricating the shall MS 6 mm thick with fillet welding. The length of the puddle sleeve shall be 600 mm minimum unless otherwise specified. Puddle sleeve shall have flanged ends for all sizes. Puddle sleeves shall be hot dip galvanized after fabrication.

The tanks shall be provided with vent pipes of minimum 100 mm diameter with mosquito proof mesh.

The overflow pipe shall be so placed to allow the discharge of water being readily seen. A stop valve shall be provided in the inlet water connection to tank. The outlet pipes shall be fixed approximately 75 mm above the bottom of tank towards which the floor of tank is slopping to enable tank to be emptied for cleaning.

Full way gate valves shall be provided as near the tank as practicable on every outlet pipe from storage tank except overflow pipe.

The floor & walls of the tank shall be tiled with glazed tiles (by other agency) up to overflow level. Alternatively, food grade epoxy paint to be applied.

a. Manhole Covers

Manhole cover shall be medium/ light duty type (cast iron) with double seal, locking arrangement & lifting hooks manufactures as per IS: 1726. The shape of the cover shall be as shown in the drawing.

b. Aluminum Ladder

For effective maintenance of the tank, portable aluminum step ladder to suit the depth of the tank shall be provided with necessary hooks & fixing accessories.

17. Pump and Motors

This specification covers the supply, installation; testing & commissioning of Centrifugal type (Monoset)/ Open well monoset submersible pumps. The scope also includes motor, delivery piping up to Discharge Header with necessary pipe, fittings, electric panel, pressure gauges, etc. Each pump shall have isolation gate/ ball valve & NRV at delivery side & on header.

c. Codes And Standards

The design and manufacture of the pump shall comply with all currently applicable statutes, regulations and safety codes in the locality where the equipment will be installed.

d. Design Features:

- The pump shall be capable of developing required total head at rated capacity.
- Impeller shall be enclosed type and shall be dynamically balanced.
- The pump shall have non overloading characteristics.
- The pump shall be submerged in tank/ reservoir.

e. Constructional Features

- The casing shall be of rigid construction and shall have central delivery pipe.
- The casing shall be of Cast Iron.
- The pump shall have very small length suction and delivery pipe connections which will result in minimum friction loss in case of moonset pumps.
- Impeller shall be of one piece and shall be of SS CF 8 M.
- The shaft shall be of S.S. and its surface shall be properly finished.
- Shaft sleeves shall be provided to protect shaft from any damage.
- Bearing shall be ball or roller type.
- Mechanical seal shall be provided to avoid any leakage.
- Each pump shall be driven by directly coupled squirrel cage induction motor having 1500/ 2900 RPM, TEFC enclosure & IP 55 protection.

f. Inspection And Testing

- The pump shall be offered for visual inspection before dispatch.
- Material test certificates for the various pump components shall be furnished for purchaser's approval.
- Hydrostatic test shall be carried out at 1.5 times the maximum discharge pressure.
- For electrical accessories, necessary tests shall be performed or factory test certificate shall be furnished.

g. Rates:

- Pump-Motor sets.
- Base plate, foundation bolts, anti-vibration pads.
- Pump delivery pipe & delivery manifolds.
- Foot valves in case of negative suction.
- Pump delivery & delivery manifold isolation valve & NRV & delivery flexible bellows.
- Pressure gauges & level indicator to be interlocked with pump operation.
- Starter panel with all electrical components, protections, interlocks, cable from starter to pump.
- All material like flanges, hardware, gaskets, etc. required for installation.
- Installation, testing & commissioning.
- Making all damage good to original condition after completion of work.
- All necessary labor, material and use of tools.

h. Mode Of Measurement

The measurement shall be for one set including working & stand by units

i. Mode Of Payment

The contract rate shall be for one set including working & stand by units.