

## SECTION-2

**Specifications for Plumbing Works****2.1 Thermal Insulation:**

- (a) Hot Water Piping Insulation: The Hot Water Supply pipe Exposed or in shaft shall be provided with Aeroflex / foam rubber / Polystyrene / Polyurethane (AS PER BOQ) insulation or any other insulation as per CONSULTANT approval, 2 Inches thickness of 24kg/m<sup>3</sup> density in preformed sections, as manufactured by **ISLAMUDDIN & SONS** or **APPROVED EQUAL**. Insulation thickness shall be as Given below:

- (i) For embedded pipes in floors and wall - 15mm thick
- (ii) For pipes in shafts and exposed installation - 25mm thick

Where the insulation sleeves are longitudinally cut, the insulation shall be wrapped with PVC tape with 20% overlap along its entire length. At circumferential joints PVC tape shall be wrapped upto 150mm on either side of the joint.

- (b) Installation of Pipe Insulation: No insulation shall be applied to any system of piping until all foreign matter has been removed from the surface to be insulated, and until the piping has been tested, cleaned out and made tight. All insulation shall be applied in a manner consistent with good practice & methods. All longitudinal joints of pipe shall be top and bottom. Insulation shall be continuous through walls, floors, ceiling and partitions etc.
- (c) Valves and Fittings: and other specialities shall be insulated with preformed adjoining insulation, cut to suitable shapes and sections, to closely fit around valves and fittings. Insulation thickness shall not be less than the adjoining straight pipe insulation thickness. The adjoining insulation near these fittings shall be metered and trimmed into suitable sections to fit closely around the valves, flanges and fittings. All trimmed sections shall be secured by wrapping of approved type of self-adhesive tape. Insulation at valves, unions, flanges and any other pipe line mounted component shall be done in such a way that if the insulation of the component is required to be removed the adjoining pipe line insulation shall not be damaged. A clear line of demarcation shall be inherent between the pipeline insulation and pipeline mounted components.

## 2.2 Water Supply Piping and Specialities:

### 2.2.1 Scope of Work:

The Contractor shall furnish all labour, materials, tools, and equipment to complete the plumbing work and plumbing services as shown on drawings and as herein described, ready for service to the satisfaction of the Consultants.

The work includes, in general, the following:

- (i) Cold Water Piping Systems.
- (ii) All valves, strainers, etc., shown on drawings specified or needed.
- (iii) Services and connections to utilities.
- (iv) Other items as may be specified or shown on the drawings.

### 2.2.2 Piping Material:

Cold water and Hot Water Piping shall be **Polypropylene Random Rigid Unplasticized PN-20(COLD WATER) & PN-20(HOT WATER)** normal impact type of weight as indicated on the pipe material schedule. The pipe shall be furnished in straight length marked to makers name. Pipe shall be shipped and stored in a manner, which will prevent distortion of material. Pipe shall be of **DADEX**(polydex), **VESBO**, **AGM** All piping and fittings shall be in perfect condition, without any pitting, corrosion, dents and flattening.

**Gas Pipes** be galvanized steel (medium weight) as manufactured by Karachi pipes IIL (FOR INTERNAL) polyethylene AS APPROVED BY **SSGC** (FOR EXTERNAL) and the fittings shall be imported conforming to BSS 1387 ASA B16.5 suitable for 150 psi SWP.

### 2.2.3 Valves and Strainers:

- (a) Gate Valves upto 50mm shall be with threaded ends, bronze body, with union bonnet, non-rising stem and wedge disc. Hand wheel nut, disc and body shall be of bronze. Hand wheel shall be of malleable iron.

Packing shall be Graphited asbestos. Stem shall be manganese bronze.

Gate valves 65mm and above shall be cast iron body bronze mounted, with flanged ends.

These shall be of the solid wedge disc type, with outside screw and yoke. Body and bonnet shall be of cast iron. Wedge shall be of cast iron with bronze discs. Seat rings shall be bronze. Packing shall be graphited asbestos. Packing gland shall be cast iron. Yoke shall be of cast iron and yoke nuts shall be of bronze. Hand wheel shall be of cast iron.

All valves for water supply services shall be rated for 150 Psi. SWP and 120 C. Valves shall be as manufactured by **KITZAVA JAPAN OR APPROVED EQUAL..**

- (b) Installation: All valves having stem over 7 feet (2m) height shall be provided with galvanized chain operators. Valves in horizontal lines shall be installed with stem horizontal or above. Isolation gate valves shall be installed on each side of each piece of equipment as pumps, and other similar items; at the mid point of all looped mains; and at any other points indicated or as required for draining, isolation or sectionalizing purpose.

Strainers shall be installed wherever necessary to protect equipment and control valves, where proper functioning would be affected by dirt on the seat or scoring of the seat. Strainers shall be arranged not to clog piping and allow easy disconnection for change. All strainers 2 inches (50mm) and above shall be provided with 3/4 inch (20mm) dia ball valves for blow-off. Strainers shall allow removal of accumulated dirt and screen replacement without disconnecting main piping.

#### 2.2.4 Installation of Piping, Valves and Fittings:

- (a) General: Pipes shall be cut accurately to measurements established at the job site and worked into place without springing or forcing, properly clearing all windows, doors and other openings. Excessive cutting or other weakening of the building structure to facilitate piping insulation will not be permitted without written approval. Polypropylene pipes should be assembled as per manufacturer recommendation.

Shop drawings by Contractor shall show locations of all supports, the load imposed on each fastening or anchor, typical details for special anchorage's, and details for special anchorage's for supports attached to metal roof decking, for suspended piping, valves, tank, pumps, converters, and other mechanical equipment. Supports shall be attached to metal decking. Where supports are required between structural framing members, suitable intermediate metal framing shall be provided and detailed. Pipe shall have burrs removed by reaming and shall be installed to permit free expansion and contraction without damage to joints and hangers. Changes in direction shall be made with fittings, except that bending of pipe 4 inches (100mm) and smaller will be permitted provided a pipe bender is used and wide-sweep bends are formed. The centre line radius of bends shall not be less than 6 diameters of the pipe. Bent pipe showing kinks, wrinkles, flattening or other malformations will not be accepted. All piping shall be installed with sufficient pitch to ensure adequate drainage and venting. Piping connections to equipment shall be provided with unions or flanges. Open ends of pipelines or equipment shall be properly capped or plugged during installation to keep dirt and other foreign matters out of the system.

- (b) Screwed joints shall be used on pipes of diameter 2 inches (50mm) and below. Screwed joints shall be made with tampered threads properly cut. Joints shall be made tight with polytetrafluoroethylene (TEFLON) Tape, or other approved thread joint compound applied to the male thread only. Not more than three threads shall show after the joint is made up.

For galvanized pipe threaded flanges shall be used for 100mm dia pipe and above.

- (c) Flanges and Unions shall be faced true. Flanges shall be provided with 1/16 inch (1.6mm) asbestos gasket, and made square and tight. Except where copper tubing is used, union or flange joints shall be provided in each line immediately preceding the connection to each piece of equipment or such as coils, pumps, control valves & other similar items.
- (d) The run and arrangement of all pipes shall be approximately as shown on the drawings and as directed during installation and shall be as straight and direct as possible, forming right angles or parallel lines with building walls and other pipes, and shall be neatly spaced. Offsets will be permitted only where required to permit the pipes to follow wall, standard fittings shall be used for offsets. All risers shall be erected plumb and true, and shall be parallel with walls and other pipes and shall be neatly spaced. This Contractor shall at all times work in conjunction with other contractors in order to avoid interference of pipes and unnecessary cutting of floors and walls. All pipes running underground or concealed in floors or wall construction shall be installed before the construction is closed up.
- (e) All horizontal runs of piping, except where concealed in partitions, shall be kept as high up as possible and close to walls. Consult with other trades so that grouped lines will not interfere with each other. Where plans call for offsets, same shall be kept close to underside of beams and slabs, and run along side of beams, girders of partition.
- (f) The arrangement, positions and connections of pipes, fixtures, drains, valves, etc., as shown on the drawings shall be taken as a close approximation and while they shall be followed as closely as possible the right is reserved by the Architect/Consultants to change the location etc., to accommodate any conditions which may arise during the progress of work prior to installation without additional compensation to this Contractor for such change. The responsibility for accurately laying out the work and coordinating his installation with other contractors rests with this Contractor. Should it be found that any of his work is laid out so that interference will occur, he shall so report that to the Architect/Consultants.
- (g) All of the pipes shall be concealed in walls, slabs unless otherwise shown on drawings or directed by the Architect/ Consultants.

- (h) Special precaution shall be taken in the installation of piping concealed underground or in the building construction, to see that the piping is properly installed. Should it be necessary to correct piping so installed, this Contractor shall be held liable for any injury caused to other work in the correction of his piping.
- (i) All screwed pipe throughout the job shall be reamed smooth before being installed. Pipe shall not be split, bent, flattened nor otherwise injured either before or during the installation.
- (j) Fixture connections, shown to be installed concealed in building construction, shall in general, be carried concealed to points above floor (near fixtures) where they shall break-out and rise exposed to fixtures, all as required or approved.
- (k) Reducing fittings, unless otherwise approved in special cases, shall be used in making reduction in size of pipe. Bushings will not be allowed unless specifically approved.
- (l) Exterior piping shall not be laid in water or when trench or weather conditions are unsuitable for the work, except by permission of the Architect/Consultants.
- (m) Fittings at bends or tees in buried water pipe lines shall be wedged against concrete thrust block poured between the vertical face of the trench and the fittings, to prevent the fittings from being blown off the lines when under pressure. The size of the blocks shall be based on the working pressure plus 3 bars, the pipe size and the bearing capacity of the soil, all as recommended in the Journal of the American Water Works Association.
- (n) Where chrome plated piping is installed, this Contractor shall cut and thread his pipe so that no unplated pipe threads are visible when the work is complete.
- (o) Friction type wrenches and vices shall be used on all copper tubing and brass piping. Any pipe showing tool marks will be ordered to be removed and replaced with new materials, without additional cost.
- (p) Unions and flanges shall be provided at suitable intervals to enable easy assembly and disassembly of the pipes. All piping installation shall allow means of easy disassembly for cleaning and maintenance.

**2.2.5 Pipe Supports:**

- (a) General: Pipe hangers, brackets, saddles, inserts, clamps and pipe rolls including rods, bolts, turn buckles, bases and protection shields shall conform to standard recommended engineering practice. Design generally accepted as exemplifying good engineering practice, using stock or production parts, shall be utilized wherever possible. Chain, wire, strap or other make shift devices will not be permitted as hangers or supports. Pipe hangers shall be capable of supporting the pipe in all conditions of operations. Hangers shall be supported with from beams, clamps, concrete inserts Phillips concrete fasteners, and powder actuated drive pins. Concrete inserts when used shall be installed in the exact location prior to the pouring of the concrete.
- (b) Suspended Horizontal Piping shall be supported by adjustable hangers or supports, which shall provide a means of vertical adjustment after erection. Unless otherwise indicated on drawings maximum spacing between pipe supports for straight runs of pipe shall be in accordance with recommended spacing shown in accordance with recommended spacing shown in the table given below:

Nominal Pipe Size Inches (mm)	0.5 (13)	0.75 (20)	1 (25)	1.5 (40)	2 (50)	2.5 (65)	3 (75)	4 (100)	5 (125)	6 (150)	8 (200)	10 (250)
Maximum Span Feet (Meters)	5 (1.5)	6 (1.8)	7 (2.1)	9 (2.7)	10 (3.0)	11 (3.3)	12 (3.6)	14 (4.2)	16 (4.8)	17 (5.1)	19 (5.2)	22 (6.7)
Rod Size dia mm	10	10	10	10	10	13	13	16	16	19	22	22

Pipe hangers and supports shall be spaced not over 5 feet (1.5m) apart at heavy fittings and valves. A hanger shall be installed not over 1 foot (0.3m) from each change in direction of piping.

- (c) Vertical Piping shall be guided or supported in the centre of each riser but not over 15 ft. (4.5m) on centres and shall be supported at the base of the riser on a base elbow or tee with a pipe stand only where required.
- (d) Piping in Trenches: Pipes shall rest on suitable wall or floor supports with rollers.
- (e) Pipe Sleeves: Pipes passing through concrete or masonry walls or concrete floors or roofs shall be provided with pipe sleeves fitted into place at the time of construction or afterwards if necessary. Each sleeve shall extend through its respective wall, floor or roof and shall be cut flush with each surface. Sleeves shall be of such size as to provide a minimum of ¼ inch (6mm) all around clearance between bare pipe and sleeve, or between jacket over insulation and sleeve. Sleeves in non-bearing walls shall be steel or cast iron pipe. Sleeves in non-bearing walls, floors, or ceilings may be steel pipe, cast iron pipe or G.I. sheet metal 14 gauge 0.08 inch (2.03mm) with lock type longitudinal seam. Sleeves in bearing walls shall be steel or cast iron pipe. Sleeves in exterior walls and pits shall be of steel and shall have anchor flanges with the space between the pipe and the sleeve caulked watertight.

### 2.2.6 Underground Piping:

Piping specified to be laid directly underground or below floors, shall be laid in an excavated trench with a minimum of 450mm of soil cover. The trench bottom shall be smooth and of uniform grade with either undisturbed ground, or a layer of selected and compacted backfill so that no settlement shall be expected. Pipe must bear on this material through its entire length. Where rock is encountered in trench, it shall be removed to a point at least 75mm below the grade line of the trench and the trench shall be backfilled to grade with sand tamped in place. If soft material of poor bearing qualities are found at the bottom of the trench, stabilization shall be achieved by over excavating at least two pipe diameters and bringing upto grade with fine grade or crushed stone or a concrete foundation. Such concrete foundation shall be bedded with sand tampered in place so as to provide a uniform bearing for the pipe between joints.

Care shall be exercised in backfilling trenches. Loose earth free of rocks, broken concrete, broken chips and other rubble shall be placed in the trench in 150mm layers and tamped in place. Care shall be taken to thoroughly compact the backfill under and beside the pipe to be sure that the pipe is properly supported. Proper alignment shall be maintained.

### 2.2.7 Cutting and Patching:

Cutting will be done under specifications of other trades. This Contractor is called upon to set sleeves for pipes accurately before the concrete slabs or beams are poured or masonry wall put-up, or may set boxes on the forms so as to leave openings in the floors in which the required sleeves can be subsequently located, in which case he is called upon to fill in the concrete voids around the sleeves.

All patching will be done under specifications of other trades. Should this Contractor neglect to perform his preliminary work and should cutting be required in order to install his piping or requirement, then the expense of the cutting and restoring of surfaces to their original condition shall be borne by this Contractor.

### 2.2.8 Protective Painting shall be carried out on pipes as specified hereinafter under Clause 2.7 "Painting, Coating & Stencilling".

### 2.2.9 Testing

- (a) Hydraulic testing to following pressures shall be carried out on the complete cold & hot water piping:

For Cold & Hot Water Piping - 210 Psi or as per manufacturer recommendation.

No loss of pressure shall be indicated for 4 hours. Tests shall be conducted in the presence of the Consultant/Owner's Representative.

- (b) Defects disclosed by the tests shall be repaired or if required by the Consultants defective work shall be replaced with new work without any extra charge to the Owner. Test shall be repeated as directed, until all work is proven satisfactory.
- (c) This Contractor shall furnish & pay for all devices, materials, supplies, labour and power required in connection with all tests. All tests shall be made in the presence of and to the satisfaction of the Consultant and other Inspectors of the City and Public Utility Inspectors having jurisdiction.
- (d) This Contractor shall also be responsible for the work of other trades that may be damaged or disturbed by the tests, or the repair or replacement of his own work, and he shall without extra charge to the Owner, restore to its original condition, work of the trades so damaged and disturbed, engaging the original Contractors to do the work of restoration.

#### 2.2.10 Payment:

Payment shall be made as per the accepted rates per running foot of the pipe, which cost shall include the supply and installation of pipes including the cost of all tees, elbows, reducers, unions, nipples and other pipe fittings, the cost of all hangers, supports, sleeves and fittings, cutting and patching, protective painting, anti-corrosion treatment, stencilling and tagging, excavation and backfilling for underground pipes, testing, etc., complete in all respects.

### 2.3 Soil and Waste Water Piping and Specialities:

#### 2.3.1 Scope of Work:

The work includes in general the following:

- (a) External Soil and Waste Water Piping
- (b) Internal Soil, Waste Water, and Vent Piping
- (c) All specials shown fixtures and accessories, specified or needed
- (d) Services and Connection to Utilities
- (e) Other items specified, or shown on drawings.

#### 2.3.2 Piping Material

- (a) Internal Soil and Waste Water line and to a maximum of 3m outside the building, unless otherwise shown on plans, shall be **uPVC Polyvinylchloride** pressure pipe soil pipes conforming to Bs.3505, **CLASS "B" Solvent Joint**. Each pipe shall be tested as per manufacturer's recommendation or 150 Psi, and shall show no leakage, sweating or other defects. Pipes supplied shall be accompanied by a test certificate and each pipe shall be so stamped. Pipes shall be (150 Psi) as manufactured by **Dadex, AGM, VESBO**



- (b) External Soil & Waste Lines, unless otherwise shown on plans, shall be **uPVC Class - B unplasticized polyvinylchloride suitable for solvent joint of DADEX, AGM, VESBO or** as shown on drawings conforming to ASTM C14. R.C.C Pipe as manufactured by Pakistan Pipes & Construction Company Ltd. Joints shall be with plain collar. Consultant has the right to approve any pipe listed.

### 2.3.3 Installation:

- (a) Each pipe shall be examined on arrival, defective pipes shall not be used. Drain shall be laid in straight lines and to even gradients between the levels shown, with pipes and fittings, of the type and diameter as shown on the drawings. Great care shall be exercised in setting out and determining pipe levels and the Contractor shall provide suitable instruments and set up and maintain and sight rails, and bench marks etc., necessary for the purpose. Cut pipe shall have smooth regular ends at right angles to arise of pipes. Cast iron pipe to be cut with an approved cutter. All drain shall be kept free from earth debris, superfluous cement and other obstructions during laying and until the completion of the contract when they shall be handed over in a clean condition. Pipes shall be laid with the sockets leading uphill and shall rest on solid and even concrete foundations for the full length of the barrel as shown on drawings.

No pipes shall be laid on their collar or on blocks, tiles or other temporary supports.

For uPVC pipes solvent joint should be executed as per manufacturer recommendations and should not violate the plumbing code.

- (b) Drainage line shall be accurately laid and shall be perfectly true to line and gradient from point to point in both vertical and horizontal planes. Every main shall be straight from manhole and any change in direction shall take place inside the manhole by the use of the curved main channels, similar changes in internal diameter in drain shall be made in manhole by the use of tapers or bends.
- (c) Easily accessible cleanouts, flush with the floor finish should be provided at each bend and bottom of stacks and at all points shown on drawings. The cleanouts should be made of "WYE" of full size, the minimum size should be 75mm dia.
- (d) Special fittings required in the installation not generally cast by manufacturers shall be got specially cast by Contractor matching with the shell thickness specified.
- (e) Branch connection shall be made with "WYE" and long "TEE-WYE" fittings. Short 1/4 bends, common offsets and double hubs will not be permitted. Short "Tee-Wye" fittings are to be used in vertical piping only. All fittings shall conform to Code requirements.

- (f) Joints between cast iron to cast iron soil pipe (C.I.) shall be caulked joints made with firmly caulked tarred yarn and then tightly caulked with molten lead. After the lead has cooled, the joints shall be thoroughly caulked, made tight and smoothly faced. All lead for joints in cast iron piping shall be pure and soft and of best quality, and shall be sufficiently heated to run joint full at one pouring without hardening. Dross shall not be allowed to accumulate in the melting pot.
- (g) Approximate weight of lead for C.I. pipe joints shall be as specified hereunder:

Pipe Size Dia (mm)	Caulking Space (mm)	Depth of Lead (mm)	Weight of Lead (Kgs)
50	10	45	1.5
75	10	45	2.0
100	10	45	2.5

- (h) Joints between cast iron and galvanized steel shall be made with a ferule having internal threads which shall be caulked with lead.
- (i) Joint of PVC pipes to cast iron socket shall be made by means of purpose made cast iron sleeves jointed as indicated at sub-clause (f) of this clause.
- (j) All sewerage pipes laid underground shall be on a concrete bed as shown on drawing. All sewer pipe crossing roads shall be completely encased in concrete as shown on drawings.
- (k) All soil and waste lines hung from the ceiling shall be supported at not more than 2m centres for horizontal pipe and 3m for vertical pipes. Provide supports at all special fittings. Supports shall generally conform to specifications given at Clause 2.5.6 hereinbefore.

#### 2.3.4 Testing and Inspection:

- (a) The entire drainage and vent system and building sewer shall be subjected to testing after installation to ensure a leak-proof installation under operation conditions.

All the openings in the piping system shall be tightly closed by inserting test plug so that heavy rubber gasket fits snugly all around the opening. The highest point will be left open to supply water and may be raised if necessary by temporary jointing to develop a minimum head of five (5) meters of water at each section of the system.

Water is filled to the point of overflow and any drop in the level of water will indicate a leak that will be found by inspection. The water level will be checked for no drop for at least 15 to 30 minutes. No section will be tested at a pressure more than 6m of water. Height stacks will be tested in sections, starting from the top section and then connecting top section to next lower section.

- (b) A final test of the completed drainage and vent system will be conducted by smoke to ensure that connection for water closets are absolutely gas and water tight and that fixture traps are sound.

All the traps will be filled with water and a thick smoke produced by burning oil, waste, tar paper or similar material in the combustion chamber of a smoke test machine, will be introduced into the entire system. When smoke appears at highest point it will be closed and pressure equivalent to 25mm of water column will be built and maintained.

The drainage pipe and building sewer will also be inspected for slopes which must conform to the slopes specified. The slopes will be checked with precision angle measuring equivalent like universal protector, plumb and level. Any portion found not laid according to the given slope will be rectified at the Contractor's expenses. The Contractor shall be required to inform the Consultants before any laid pipes are backfilled and approval obtained.

After the pipe is laid, the joints completed between manholes, and the trench practically backfilled leaving the joints exposed for examination, the newly laid piping shall be checked for alignment by flashing a light between manholes. If illuminated interior of the pipe line shows poor alignment, the displaced pipe, or any other defects, shall also be checked for the given slopes, and if found unsatisfactory, shall be repaired at the Contractor's expense.

- (c) This Contractor shall furnish & pay for all devices, materials, supplies, labour and power required in connection with all tests. All tests shall be made in the presence of and to the satisfaction of the Engineer Incharge, Plumbing Inspector of the City and Public Utility Inspectors having jurisdiction.
- (d) This Contractor shall also be responsible for the work of other trades that may be damaged or disturbed by the tests, or the repair or replacement of his work and he shall, without extra charge to the Owner, restore to its original condition, work of the trades so damaged and disturbed, engaging the original contractors to do the work of restoration.
- (e) Defects disclosed by the tests shall be repaired, or if required by the Engineer Incharge. Defective work shall be replaced with new work without extra charge to the Owner. Test shall be repeated as directed, until all work is proven satisfactory.
- (f) This Contractor shall notify the Engineer Incharge, Plumbing Inspector and others having jurisdiction at least ten days in advance of making the required tests, so that arrangements may be made for their presence to witness the tests.

### 2.3.5 Payment:

All payment for R.C.C., C.I. uPVC & Polypropylene pipes shall be made per running foot of the installed length of the pipes, which shall include all fittings such as elbow, wye, tee, collars, junction box, cowl, etc. No additional payments shall be made for supports, excavation and backfilling, testing and any other work required for the C.C. Pipes, and the rates per foot submitted by the Contractor for this item of the Bill of Quantities shall be deemed to include all such ancillary requirements.

## 2.4 Sewerage Line Specialties:

### 2.4.1 Manhole:

Manholes shall be constructed of 200mm thick masonry walls or R.C.C as per BOQ. Bottom of manholes shall be a 150 mm thick 1:2:4 RCC pad with nominal reinforcement. Top slab of the manhole shall be a 150mm thick 1:2:4 RCC slab. The depth of the manhole shall be upto the invert level shown on the drawings. The civil construction conforms to the specifications of the Civil Works. The internal surface of the manhole shall be provided with a 15 mm thick Puddlo plaster.

Manhole shall be constructed with cast iron frames and covers as shown on the drawings. The invert channels shall be smooth and accurately shaped to a semicircular bottom conforming to the adjacent sewer section. Inverts shall be formed directly in the concrete of the manhole base. Steep Slopes outside the invert channels shall be avoided. Changes in size and grade shall be made gradually and evenly. Changes in direction of the sewer and entering branches shall have true curves of a radius as large as the size of the manhole will permit. Manhole shall be provided with built-in steps of M.S. iron. The rungs shall be not less than 250 mm in width and spaced at intervals of approximately 300 mm, and alternative rungs shall be staggered or off-set 150mm. Bars or rods when used for steps shall not be less than 20 mm in diameter.

The manhole frame shall be carefully embedded in the top slab of the manhole as neatly as possible.

### 2.4.2 Intercepting Manhole:

Intercepting Manholes shall conform to specifications given above, except that it shall be provided with an RCC intercepting trap of the same diameter on the main pipeline.

### 2.4.3 Sewer Connections:

The Contractor shall be responsible for obtaining necessary permits, licenses, etc., from the concerned authorities for the sewerage connections. He shall give notice to local authorities of intention to connect to the public sewer.

The work of breaking into the existing public sewer and forming a connection should be carried out by permission from and under the supervision of the authorised representative of the relevant authorities.

Breaking into the sewer should be effected by the cautious enlargement of a small hole, and every precaution should be taken to prevent foreign material from entering the sewer. The express consent of the local authority must be obtained before any temporary obstruction is made to the flow of the public sewer.

#### 2.4.4 Cleanouts:

Cleanouts shall be locally manufactured, but shall be similar to those marketed by ZURN INDUSTRIES INC. of U.S.A, REHAU or ALPINE. whose model Nos. are noted below. The tenderer may refer the catalogue available in the Consultant's office. A sample cleanout shall be submitted for approval to the Consultants.

Cleanout for Finished Floor Areas shall be similar to ZURN Model No. Z-1323. These shall be of the cast iron, designed to provide an airtight seal with the uPVC CLASS-D. The cleanout shall be provided with a threaded brass plug that shall fit into the hub and provide an airtight seal. A key to un-screw the plug shall be provided. A brass ferrule shall be provided, that shall screw into the hub with the capacity of level adjustment. The ferrule shall be provided with a round scoriated brass top, and a long brass screw threaded into the plug below, shall hold down the top cover.

#### 2.4.5 Floor Drains:

Floor Drains shall be of MASTER or approved equal with 4" (125 mm) dia opening. The drain shall be provided with a P-Trap(DADEX OR APPROVED EQUAL) having a minimum water seal of 50 mm. The drain grating shall be of stainless steel.

#### 2.4.6 Vent Cowls:

All vent-lines terminating above the building shall be provided with best quality uPVC cowls.

#### 2.4.7 Manhole Frame and Covers:

Manhole Frame and Covers shall be of water tight quality manufactured from good quality cast iron. Weight of frame and cover shall be as follows:

Size - mm.	Weight - Kg.
300 x 300	12
450 x 450	50
600 x 600	50

#### 2.4.8 Gully Trap Chamber shall be constructed of 1:2:4 R.C.C., and shall be provided with a deep-seal "P" Trap with cast iron frame and cover of 12" x 12" (300 mm x 300 mm) size,

weighing 26 Lbs. (12 Kgs.). Gully Trap Chamber shall be made as instructed and approved by the Engineer Incharge, prior to its construction.

Payment shall be made for complete construction of the Gully Trap, as per the unit price quoted in the B.O.Q. and shall include all works necessary for construction and installation, complete in all respects, including the cost of excavation, backfilling, structural works, frame and cover, etc.

- 2.4.9 Valve Chambers shall be constructed in accordance with the clearance for valves and the operations, as instructed by the Engineer Incharge. It shall include C.I. manhole frame and cover. Chambers shall be constructed of 1:2:3 R.C.C. convenient for operation and maintenance of the valves, installed in the valve chamber. 1.5" (40 mm) thick cement plaster shall be provided at the internal and external surfaces of the valve chamber. Bituminous paint shall be provided in two coats outside the valve chamber. G.I. pipe sleeves shall be provided for pipe connections.

## 2.5 Plumbing Fixtures and Accessories:

### 2.5.1 General:

- (a) All fixtures shall be free from imperfections, true as to line, angles, curves and colours, smooth water tight and complete in every respect.
- (b) All fixtures specified to be of vitreous ware, shall be fired vitreous china ware of the best quality, non-absorbent and burned so that the whole mass is thoroughly fused and vitrified producing a material white or colored, which when manufactured will show a homogeneous mass, close grained and free from pores. The glazing and vitreous china fixtures shall be of a colour approved by the Consultant/Architect, thoroughly fused, and united to the body, without discoloration, chips, or flaws and shall be free from craze. Wrapped or other imperfect fixtures will not be accepted.
- (c) All plumbing fixtures proposed to be supplied shall be indicated at the time of tendering, and all fixtures should be approved by the Architect/Consultant, prior to installation.
- (d) All fixtures shall be furnished by one manufacturer unless otherwise specified.
- (e) All fittings, cast brass set screws, escutcheons faucets, traps exposed piping etc., shall be of brass chrome plated over nickel plate with polish finished. Any hanger nuts visible shall likewise be chrome plate over nickel plate. Generally all fittings shall be **PRIME QUALITY** from **MASTER** TYPE OF ALL FITTINGS WOULD BE APPROVED BY ARCHITECT / CONSULTANT AND CLIENT AND RESERVES THE RIGHT TO REJECT ANY FITTING AND CONTRACTOR NEED TO COMPLY BY SUBMITTING ALTERNATE FOR APPROVAL PRIOR TO INSTALLATION.
- (f) After installation of plumbing accessories, the Contractor shall ensure their protection against damage, misuse and general deterioration. Fixture outlets shall

be plugged with suitable material to prevent entry of external debris All chrome plated and other metallic fittings shall be provided with a coat of grease to prevent their deterioration. All items prior to handling over must be in perfect condition in the visual and operational sense.

- (g) All fixtures and accessories shall be first quality, locally manufactured, unless otherwise indicated.

### 2.5.2 **Plumbing Fixtures:**

- (a) Counter Top type Wash Basin shall be 494mm x 612mm of approved colour as manufactured by **PORTA,DYNASTY, SHABBIR or APP.EQUAL**. Model OVAL VANITY BASIN, with MASTER mixer fitting, tee stop cock with flexible connections, wall flanges, 32 mm P.V.C. bottle trap with P.V.C. waste pipe. Hand Wash Basin will be complete in all respects as approved by the Architect/Consultants.
- (b) Eastern Type Water Closet shall be locally made, vitreous China, as manufactured by PORTA,DYNASTY,SHABBIR OR APPROVED EQUAL of approved colour. It shall include 'S' or 'P' trap with vitreous china 2½ IMPORTED FLUSH VALVE including the cost of tee stop cock as Manufactured by MASTER, 1½" dia C.P. brass supply pipe, etc., complete in all respects as per approval of the Consultants.
- (c) Western Type Water Closet shall be locally made, vitreous China, as manufactured by PORTA,DYNASTY,SHABBIR OR APPROVED EQUAL of approved colour. It shall include 'S' or 'P' trap with vitreous china IMPORTED FLUSH VALVE including the cost of tee stop cock as Manufactured by MASTER, 1½" dia C.P. brass supply pipe, , etc., complete in all respects as per approval of the Consultants.
- (d) Muslim Shower shall be local make best quality OF MASTER C.P. brass "T" Stop Cock at height of 18" from finished floor level, complete with 3/8" flexible stainless steel hose 30" long and nozzle C.P. brass hose hook including the cost of all cutting, binding and making good, complete in all respects.
- (e) Urinal shall be of vitreous china, best quality, as manufactured by PORTA,DYNASTY,SHABBIR., of approved colour, wall mounted type, complete with P.V.C. bottle trap and waste outlet pipe, tee stop cock with CP flexible connection to urinal.
- (f) Shower Set: shall be of local make as manufactured by 'MASTER' complete with all accessories (for cold & hot water) such as 2 Nos. concealed stop cocks with wall fittings, regulating valves, swivel shower rose, 2 Nos. bib cocks with wall flanges. All exposed fittings will be chromium plated and complete in all respects as approved by the Architect/ Consultants.

- (g) Scrub Sink Should of s/s304 with bolted at wall with heavy stainless steel bolts selected as per dimension and weight of the sink with 1 ½ inches dia waste chrome plated with washer and chain and plug , uPVC drain terminated in floor drain.

#### 2.5.4 **Plumbing Accessories:**

- (a) Soap Holders shall be of chromium finish of MASTER or approved equivalent.
- (b) Towel Rails shall be of chromium finish brass rails of 25 mm dia, 600 mm long with brackets of MASTER or approved equivalent.
- (c) Paper Holder shall be of chromium finish of MASTER or approved equivalent.
- (d) Coat Hooks shall be of chromium finish of MASTER or approved equivalent.
- (e) Bib Cock shall be 15mm dia of CP brass, best quality, local make MASTER, or approved equivalent.
- (f) Bottle Trap shall be chrome plated of with 1 ½” dia minimum, locally make of MASTER or approved equivalent.

**NOTE: ALL FITTING SHOULD BE CHROME PLATED THE TYPE AND SHAPE TO BE APPROVED BY ARCHITECT AND CLIENT**

#### 2.6 **Hot Water Geyser:**

Storage type gas Fired water Geyser of capacities as indicated on drawing shall be supplied and installed the location as per drawing.

The storage water heater shall be as manufactured by SHAN CONTROL, I.M.E. OR AS APPROVED BY the consultant. The storage tank shall be of ½” thick mild steel plate, with the water side galvanized or otherwise suitable lined to prevent corrosion. In addition to this two magnesium anodes shall be installed to inhibit corrosion of the tank, and these shall be easily removable and replaceable from top. The storage heater shall be provided with two inch thick fibre glass insulation protected with a jacket of mild steel and provided with two coats of enamel paint over primer.

The storage Geyser shall be provided with two pipe insertion thermometers on the supply and discharge line and snap acting thermostat to maintain water temperature at 140°F on the peak demand. Thermometers, thermostats, relief valve (safety valve) and such other accessories shall be provided with the heater with the cost quoted in the BOQ.

All the Geyser after installation would be subjected to performance test to determine the efficient working of recovery side, thermostat etc to the satisfaction of Consultant.