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Construction & Services Division

SPECIFICATIONS FOR PUBLIC HEALTH ENGINEERING WORKS

(INTERNAL, EXTERNAL PH ENGINEERING WORKS. & FIRE FIGHTING SYSTEM)

DEPARTMENT OF ATOMIC ENERGY

RAJA RAMANNA CENTRE FOR ADVANCED TECHNOLOGY

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1. GENERAL INSTRUCTIONS

1.1 : GENERAL INSTRUCTIONS: 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 generalised nature and these shall be read in conjunction with the description of item in schedule of quantities and drawings.** The 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.

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 their to or revisions thereof, if any, upto the date of receipt of tenders. In case there is no I.S.I. 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. The work shall be carried out in a manner complying in all respects with the requirements of relevant bye-laws of the Municipal Committee/Municipal Corporation/Development Authority/Improvement Trust etc. under the jurisdiction of which the work is to be executed or as directed by the Engineer-in-Charge and, unless otherwise mentioned, nothing extra shall be paid on this account.

Samples of various materials, fittings etc. proposed to be incorporated in the work shall be submitted by the contractor for approval of the Engineer-in-charge before order for bulk supply is placed.

The contractor shall take instructions from the Engineer-in-Charge regarding collection and stacking of materials in any place. No excavated earth or building materials 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.

The contractor shall give a performance test of the entire installation(s) as per standard specifications before the work is finally accepted and nothing extra whatsoever shall be payable to the contractor for the test.

The contractor shall clear the site thoroughly of all debris, surplus excavated materials and rubbish etc. left out of his work and dress the site around the building to the satisfaction of the Engineer-in-Charge before the work is considered as complete.

The Chief Engineer, RRCAT, shall be the sole deciding authority as to the meaning, interpretations and implications for various provisions of the specifications and his decision in writing shall be final and binding on all concerned.

In case any difference or discrepancy between the specifications and the description in the schedule of quantities, the schedule of quantities shall take precedence. In case of any difference or discrepancy between specifications and drawing, the specifications shall take precedence. In case any difference or discrepancy between the specifications for Civil works and specification for Public Health Engg. works, specifications for Civil works shall take precedence.

1.1.01 APPROVAL The materials for P.H. Engineering works which are to be supplied by the contractor shall conform to the relevant IS specifications and the latest approved list of RRCAT if any, and shall be approved by the Engineer-in-Charge prior to installation of fixture and the approved samples shall be maintained at site till the completion of work. The approved makes of main items are, however specified in the list of approved makes of materials herein before.

1.1.02 PRECAUTIONS While carrying out pipe line work in case the contractor encounter any interference with other services such as cables, 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 the officers concerned with such services.

The contractor shall ensure that all inserts, pipe lines embedded in structural members or sleeves are placed in position in co-ordination with civil work.

All public health engineering services shall be handed over to Engineer-in-charge complete in all respects on completion of the work. 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.

1.1.03 COST TO BE COVERED : The rates quoted by the tenderer under this contract shall cover the cost of all the following elements.

1.1.04 MISCELLANEOUS WORK : 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 works for all such channels, culverts, bridges, pipe lines, conduits.

1.1.05 CLEARANCE FOR ROADS AND FOOT PATHS : 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.

1.1.06 LOCATION : The rates quoted by the tenderer under this contract shall be applicable for the work at all floor and locations.

1.1.07 DEWATERING : The rates quoted by the tenderer under this contract shall include bailing or pumping out all the water which may accumulate during the progress of the work either through seepage, springs, rain or any other cause.

1.1.08 : WATER SUPPLY MAIN : The cost includes for transport charges and testing charges prescribed by the Public Health Department, Indore. Water mains thus laid shall be tested to a pressure as specified in the schedule and specifications. Contractor has to get the pipe line laid hydraulically tested. Contractor has to bear the testing charges.

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1.2 LIST OF INDIAN STANDARDS

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

Indian Standard	Reaffirmation	Subject
27 - 1992	**Reaffirmed 2002**	Specifications for Pig Lead
269- 1989	**Reaffirmed 2004**	Specifications for 33 grade Ordinary Portland Cement
407- 1981	**Reaffirmed 2001**	Brass tubes for General purposes
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.
636- 1988	**Reaffirmed 2003**	Fire fighting hose, rubber lined or fabric reinforced rubber lined woven –jacketed
638- 1979	**Reaffirmed 2003**	Sheet rubber jointing & rubber insertion jointing
651- 1992	**Reaffirmed 2003**	Specifications for Salt glazed stoneware pipes & fittings.
771 (Pt. I &VII)		**Glazed Fire Clay Sanitary Appliances.**
771- 1979 (Pt. I)	**Reaffirmed 2003**	General requirements
771- 1985 (Pt. II)	**Reaffirmed 2003**	Specific requirements of kitchen & laboratory sinks
771- 1979 (Pt. III/ Sec 1)	**Reaffirmed 2003**	Specific requirements of urinals (section 1- Slab urinals)
771- 1985 (Pt. III/ Sec2)	**Reaffirmed 2000**	Specific requirements of urinals (section 2- Stall urinals)
771- 1979 (Pt. IV)	**Reaffirmed 2003**	Specific requirements of postmortem slabs.
771- 1979 (Pt. V)	**Reaffirmed 2003**	Specific requirements of shower trays
771- 1979 (Pt. VI)	**Reaffirmed 2003**	Specific requirements of bed pan sinks
771- 1981 (Pt. VII)	**Reaffirmed 2003**	Specific requirements of slop sinks
774- 1984	**Reaffirmed 2000**	Flushing cistern for water closet and urinals.
775- 1970	**Reaffirmed 2000**	Cast iron brackets and supports for wash basin and sink.
778- 1984	**Reaffirmed 2000**	**Specifications for copper alloy gate & Globe check valves for water works**
779- 1994	**Reaffirmed 2004**	Water meters (domestic type)
781- 1984	**Reaffirmed 2001**	Specifications for cast copper alloy screw down bib taps & stop cocks for water services
782- 1978	**Reaffirmed 2003**	Specification for Caulking lead.
783- 1985	**Reaffirmed 2001**	Code of practice for laying concrete pipes.
784- 2001	**Reaffirmed 2002**	Pre-stressed concrete pipes.
884- 1985	**Reaffirmed 2000**	Fire aid hose reel for fire fighting (for fixed installation)
901 - 1988	**Reaffirmed 2003**	Specification for couplings, double males & double female, instantaneous pattern for Fire Fighting
902 - 1992	**--**	Specification for suction hose couplings for Fire Fighting purposes.
903 - 1993	**Reaffirmed 2003**	Couplings for fire hose delivery, branch pipe, nozzles specification
904 - 1983	**Reaffirmed 2000**	Specification for 2 way and 3 way suction collecting heads for Fire Fighting purposes.
905 - 1980	**Reaffirmed 2002**	Specification for delivery breechings, dividing and collecting instan-taneous pattern for Fire Fighting
906 - 1988	**Reaffirmed 2000**	Specification for revolving branch pipe for Fire Fighting
907 - 1984	**Reaffirmed 2000**	Specification for suction strainer, cyclindrical type for Fire Fighting purposes.
908- 1975	**Reaffirmed 2000**	Fire Hydrants, Stand post type
909- 1992	**Reaffirmed 2002**	Specifications for underground fire hydrants, sluice valve type
940 - 1989	**--**	Portable Fire Extinguisher, water Type (Gas Cartridge) - Specification
941- 1985	**Reaffirmed 2000**	Specification for Blower and Exhauster for Fire Fighting.
1172- 1993	**Reaffirmed 2002**	Code of basic requirements for water supply, drainage and sanitation
1200-1979 (Pt. 16)	**Reaffirmed 2002**	Method of measurements for Laying of water and sewer lines including appurtenant items.

Indian Standard	Reaffirmation	Subject
1200-1981 (Pt. 19)	**Reaffirmed 2002**	Method of measurements for Water supply, plumbing and drains.
1230		Specifications for CI Rain Water pipes
1239- 2004 (Pt I)		Specifications for Mild steel tubes
1239- 1992 (Pt. II)	**Reaffirmed 2002**	Specifications for Mild steel Tubular & other wrought steel pipe fittings
1300- 1994	**Reaffirmed 2000**	Phenolic moulding material specification
1536- 2001	--	Specifications for Centrifugally cast iron (spun) pressure pipes for water, gas and sewage
1537- 1976	**Reaffirmed 2000**	Specifications for Vertically cast iron pressure pipes for water, gas and sewage
1538- 1993	**Reaffirmed 1999**	Cast iron fittings for pressure pipes for water, gas and sewage
1700- 1973	**Reaffirmed 2003**	Drinking fountains
1701- 1960	**Reaffirmed 2003**	Combination valve , mixing valves
1703- 2000		Ball valve (horizontal plunger type) including floats for water supply.
1711- 1984	**Reaffirmed 2000**	Self closing taps.
1726- 1991	**Reaffirmed 2003**	Cast iron manhole covers and Frames.
1729- 2002	--	Cast /ductile iron drainage pipes & fittings for over ground NP pipeline S/S series.
1742- 1983	**Reaffirmed 2002**	Code of practice for building drainage
1795- 1982	**Reaffirmed 2000**	Pillar taps for water supply purposes
1879		Malleable Cast Iron Pipe Fittings
1978- 1982	**Reaffirmed 2002**	Specification for line pipe (M S Seamless)
1979- 1985	**Reaffirmed 2002**	Specification for high test line pipe
2065- 1983	**Reaffirmed 2001**	Code of practice for water supply in buildings.
2097 - 1983	**Reaffirmed 2000**	Specification for foam making branch pipe.
2104- 1981	**Reaffirmed 2003**	Water meter boxes (domestic type)
2171 – 1999	**--**	Specification for portable fire extinguisher, dry powder (Cartridge Type)
2190- 1992	**Reaffirmed 2002**	Code of practice for selection ,installation & maintenance of portable first-aid fire extinguishers
2267- 1995	**Reaffirmed 2000**	Polystyrene moulding and extension materials – specification
2326- 1987	**Reaffirmed 2003**	Automatic flushing cistern for urinals
2373		Specification for Water Meter (Bulk type)
2379- 1990	**Reaffirmed 2000**	Colour code for identification of pipe lines.
2401- 1973	**Reaffirmed 2003**	Code of practice for selection, installation & maintenance of domestic water meters
2470 (Pt. I to II)	**--**	**Code of practice for installation of septic tanks**
2470- 1985 (Pt. I)	**Reaffirmed 2001**	Design criteria & construction
2470- 1985 (Pt. II)	**Reaffirmed 2001**	Secondary Treatment & disposal of septic tank effluent
2527- 1984	**Reaffirmed 2000**	Code of practice for fixing rain water gutters and down pipes for roof drainage.
2546 - 1974	**Reaffirmed 2000**	Specification for galvanized Mild Steel Fire bucket.
2548- 1996(Pt. I)	**Reaffirmed 2002**	Plastic water closet seats and covers.
2548- 1996(Pt. II)	**Reaffirmed 2002**	Plastic water closet seats and covers.
2556 (Pt. 1 to XV)	**--**	**Specification for Vitreous (Vitreous China) sanitary appliances.**
2556- 1994 (Pt.1)	**Reaffirmed 2004**	General requirements
2556- 1994 (Pt.2)	**Reaffirmed 1999**	Specific requirements of wash down water-closets
2556- 2004 (Pt.3)	--	Specific requirements of squatting pans
2556- 2004 (Pt. 4)	--	Specific requirements of wash basins
2556- 1994 (Pt.5)	**Reaffirmed 2004**	Specific requirements of laboratory sinks
2556- 1995(Pt.6)	**Reaffirmed 2003**	Specific requirements of urinals & partition plate
2556- 1995 (Pt.7)	**Reaffirmed 2003**	Specific requirements of accessories for sanitary appliances
2556- 1995 (Pt.8)	**Reaffirmed 1998**	Specific requirements of pedestal close coupled & wash down and siphonic water closets
2556- 2004 (Pt.9)	--	Specific requirements of pedestal type bidets
2643 -1999	**--**	Type Threads where pressure tight joints are not mase on the threads – dimension, tolerances and designation

Indian Standard	Reaffirmation	Subject
2692- 1989	**Reaffirmed 2003**	Specification for Ferrules for water services.
2800- 1991 (Pt. I)		Construction of tube well
2800- 1979 (Pt. II)		Testing of tube well
2871- 1983	**Reaffirmed 2000**	Specification for Branch pipe, universal, for fire fighting purposes
2878 - 2004	--	Fire Extinguisher, Carbon Dioxide Type (Portable and Trolley Mounted) – Specification.
2951 (Pt. I to II)	**--**	**Recommendation for estimate of flow of liquids in closed conduits.**
2951- 1965 (Pt. I)	**Reaffirmed 2003**	Head loss in straight pipes due to frictional resistance
2951- 1965 (Pt. II)	**Reaffirmed 2003**	Head loss in valves & fittings.
3006- 1979	**Reaffirmed 2003**	Specification for Chemically resistant glazed S.W. pipes and Fitting
3076- 1985	**Reaffirmed 2003**	Low density polyethylene pipes for potable water supply
3114- 1994	**Reaffirmed 2004**	Code of practice for laying of Cast Iron pipes.
3311- 1979	**Reaffirmed 2003**	Waste plug & its accessories for sinks & wash basins.
3328- 1993	**Reaffirmed 2003**	Quality tolerances for water for swimming pools
3389- 1994	**Reaffirmed 2000**	Urea formaldehyde moulding materials
3486- 1966	**Reaffirmed 2000**	Specification for Cast iron spigot and socket drain pipes
3489- 1985	**Reaffirmed 2000**	Specifications for enameled steel bath tubs
3589- 2001	--	Specifications for steel pipes for water & sewage (168.3 to 2540 mm outside dia.)
3597- 1998	--	Method of test for concrete pipes.
3844- 1989	**Reaffirmed 2000**	Code of practice for installation and maintenance of internal fire hydrants Hose Reels in premises.
3950- 1979	**Reaffirmed 2003**	Specification for Surface boxes for sluice valve.
3989- 1984	**Reaffirmed 2000**	Centrifugally cast (spun) iron spigot and socket soil, waste and ventilating pipes, fittings & accessories.
4038- 1986	**Reaffirmed 2000**	Foot valves for water works purposes.
4111 (Pt. I to V)		**Code of practice for ancillary structures in sewage system.**
4111- 1986 (Pt. I)	**Reaffirmed 2001**	Manholes
4111- 1985 (Pt. II)	**Reaffirmed 2001**	Flushing tanks
4111- 1985 (Pt. III)	**Reaffirmed 2001**	Inverted syphon
4111- 1968 (Pt. IV)	**Reaffirmed 2001**	Pumping stations & pumping mains (rising mains)
4111- 1993 (Pt. V)	**Reaffirmed 2004**	Tidal out-falls
4120- 1967	**Reaffirmed 2000**	Tubs and baths.
4127- 1983	**Reaffirmed 2001**	Code of practice of laying of glazed stone ware pipes.
4308 - 2003	**--**	Dry Chemical Powder for Fighting B & C class Fires– Specification.
4350- 1967	**Reaffirmed 2001**	Specification for concrete porous pipes for under drainage.
4733- 1972	**Reaffirmed 1992**	Methods of sampling & test for sewage effluents
4736- 1986	**Reaffirmed 2001**	Specification for hot –dip zinc coating on mild stele tubes.
4854 (Pt. I to III)		**Glossary terms for valves and their parts**
4854- 1969 (Pt. I)	**Reaffirmed 1999**	Screw down stop, check & gate valves & their parts
4854- 1968 (Pt. II)	**Reaffirmed 1999**	Plug valves & cocks & their parts
4854- 1974 (Pt. III)	**Reaffirmed 1999**	Butterfly valves
4927- 1992	**Reaffirmed 2002**	Unlined flax canvass hose for fire fighting
4947 - 1985	**Reaffirmed 2000**	Specification for gas cartridge for use in Fire extinguishers.
4984- 1995	**Reaffirmed 2002**	Specifications for HDPE pipes for water supply
4985- 2000	--	Specifications for unplasticised PVC pipes for potable water supplies
5290- 1993	**Reaffirmed 2003**	Specifications for Landing valves.
5312 (Pt. I)		**Swing check type reflux (non return) valves**
5312- 1984 (Pt. I)	**Reaffirmed 2000**	Reflux (non return) valves – single door pattern
5329- 1983	**Reaffirmed 2001**	Code of Practice for sanitary pipe work above ground for building
5330- 1984	**Reaffirmed 2000**	Criteria for design for anchor blocks for pen-stocks with expansions joints.

Indian Standard	Reaffirmation	Subject
5382- 1985	**Reaffirmed 2003**	Specifications for rubber sealing rings for water, gas & sewer mains
5455- 1969	**Reaffirmed 2003**	Cast iron steps for manholes
5600- 2002	--	Specifications for Sewage and drainage pumps
5611- 1987	**Reaffirmed 2002**	Code of Practice for waste stabilization ponds (Facultative type)
5714- 1981	**Reaffirmed 2002**	Specifications for Hydrant stand-pipe for fire fighting
5822- 1994	**Reaffirmed 2004**	Code of Practice for laying of welded steel pipes for water supply
5961- 1970	**Reaffirmed 2003**	Specifications for Cast Iron grating for drainage purposes
6234 - 2003	**--**	Portable fire Extinguisher water Type (Stored Pressure) – Specification.
6279- 1971	**Reaffirmed 2001**	Equipment for grit removal
6280- 1971	**Reaffirmed 2001**	Sewage screens
6295- 1986	**Reaffirmed 2001**	COP for water supply & drainage in high altitude & / or sub-zero region
6392- 1971	**Reaffirmed 1998**	Steel pipe flanges
6411- 1985	**Reaffirmed 2000**	**Specifications for gel coated glass fiber reinforced polyester resin bath tubs**
6418- 1971	**Reaffirmed 2000**	Cast Iron & malleable flanges for general engg. Purpose
6494- 1988	**Reaffirmed 2000**	COP for water proofing of under ground water tanks & swimming pools
6587- 1987	**Reaffirmed 2003**	Specifications for Spun hemp yarn
7181- 1986	**Reaffirmed 2000**	Horizontally Cast Iron Double Flanged pipe for water, gas & sewage.
7231- 1994	**Reaffirmed 2004**	Specifications for Plastic Flushing Cisterns for w.c. & urinals
7558- 1974	**Reaffirmed 2001**	Code of Practice for domestic hot water installations
7634 (Pt. I to III)		**Code of Practice for Plastic pipe work for potable water supplies**
7634- 1975 (Pt. I)	**Reaffirmed 2002**	Choice of materials & general recommendations
7634- 1975 (Pt. II)	**Reaffirmed 2002**	Laying & jointing polyethylene (PE) pipes
7634- 2003 (Pt. III)	--	Laying & jointing unplasticised PVC pipes
7740- 1985	**Reaffirmed 2001**	Code of Practice for road gullies
7834 (Pt. I to VIII)		Injection moulded PVC socket fittings with solvent cement joints for water supplies
7834 - 1987(Pt.I)	**Reaffirmed 2003**	General requirements
7834- 1987 (Pt.II)	**Reaffirmed 2003**	Specific requirements for 45 ^{0} elbows
7834- 1987 (Pt. III)	**Reaffirmed 2003**	Specific requirements for 90 ^{0} elbows
7834- 1987 (Pt. IV)	**Reaffirmed 2003**	Specific requirements for 90 ^{0} tees
7834- 1987(Pt.V)	**Reaffirmed 2003**	Specific requirements for 45 ^{0} tees
7834- 1987 (Pt. VI)	**Reaffirmed 2003**	Specific requirements for sockets
7834- 1987(Pt. VII)	**Reaffirmed 2003**	Specific requirements for unions
7834- 1987 (Pt. VIII)	**Reaffirmed 2003**	Specific requirements for caps
8008 (Pt. I to VII)		**Injection moulded HDPE fittings for potable water supplies**
8008- 2003 (Pt. I)	--	General requirements for fittings
8008- 1976 (Pt. II)	**Reaffirmed 1997**	Specific requirements for 90 ^{0} bends
8008- 2003 (Pt. III)	--	Specific requirements for 90 ^{0} tees
8008- 2003 (Pt. IV)	--	Specific requirements for reducers
8008- 2003 (Pt. V)	--	Specific requirements for ferrule reducers
8008- 2003 (Pt. VI)	--	Specific requirements for pipe ends
8008- 2003 (Pt. VII)	--	Specific requirements for sandwich flanges
8090- 1976	**Reaffirmed 2000**	Coupling, branch pipe, nozzle used in hose reel tubing for fire fighting
8329- 2000	--	Centrifugally cast (spun) ductile iron pressure pipes & fittings for water, gas & sewage
8413 (Pt. I)		Requirements for biological treatment equipment
8413- 1977 (Pt. I)	**Reaffirmed 2001**	Trickling Filter
8718- 1978	**Reaffirmed 2000**	Specifications for vitreous enameled steel kitchen sinks
8727- 1978	**Reaffirmed 2000**	Specifications for vitreous enameled steel wash basin
8835- 1978	**Reaffirmed 1999**	Guideline for planning and design of surface drains.
8931- 1993	**Reaffirmed 2003**	Specifications for copper alloys Fancy single taps, combination tap assembly & stop valves for water services

Indian Standard	Reaffirmation	Subject
9140- 1996	**Reaffirmed 2002**	Method of sampling of vitreous & fire clay sanitary appliances
9293- 1991	**Reaffirmed 1996**	Specifications for flax canvas
9338- 1984	**Reaffirmed 2000**	Specifications for Cast Iron screw down stop valves and stop & check valves for water works purposes
9668- 1990	**Reaffirmed 2000**	Code of practice for provision & maintenance of water supplies for Fire Fighting
9739- 1981	**Reaffirmed 2003**	Specifications for Pressure reducing valves for Domestic water supply system.
9758- 1981	**Reaffirmed 2003**	Flush valves and Fittings for water closets and urinals
9762- 1994	**Reaffirmed 2004**	Specifications for polyethylene floats for float valves
9763- 2000	--	Specifications for Plastic Bib taps, pillar taps, angle valves and stop valves for hot & cold water service.
9972 - 2002	**--**	Specification for Automatic sprinkler Heads for Fire Protection Service.
10221- 1982	**Reaffirmed 1997**	Code of practice for coating and wrapping of underground M.S. steel pipeline,
10500- 1991	**Reaffirmed 2003**	Specification of Drinking water
11108 - 1984	**Reaffirmed 2000**	Specification for portable fire Extinguisher Halon 1211 Type.
11189- 1985		Method of tube well development
11606 - 1986	**Reaffirmed 2000**	Method for sampling of cast iron pipes and fittings.
11632 - 1986		Rehabilitation of Tube well
12183- 1987 (Pt. I)	**Reaffirmed 2004**	**Code of practice for Plumbing in multi-storied buildings (for water supply)**
12231 - 1987	**Reaffirmed 2003**	UPVC pipes for section & delivery lines of agricultural pumps–Specification.
12235 - 1986	**Reaffirmed 1998**	Method of test for UPVC pipe for potable water supply
12288 - 1987	**Reaffirmed 2002**	Code of practice for use and laying of Ductile Iron pipes.
12469 - 1988	**Reaffirmed 2002**	Specifications for pumps
12592- 2002	--	Precast concrete frame & cover (SFRC frame & cover)
12701-1996	**Reaffirmed 2002**	Specifications for rotational moulded polyethylene water storage tanks
12709 - 1994	**Reaffirmed 2004**	Glassfiber reinforce plastic(GRP) pipes, joints & fittings for use for potable water supply – Specification.
12818 - 1992	**Reaffirmed 2002**	Spn. for UPVC ribbed screen casing & plain casing pipes for bore / tube well
12820 - 1989	**Reaffirmed 1999**	Dimensional Requirements of Rubber Gaskets for Mechanical Joints & push in joints for use with Cast Iron Pipes & fittings for carrying water, Gas & sewarge.
13095 - 1991	**Reaffirmed 2003**	Butterfly valves for general purposes
13114 - 1991	**Reaffirmed 2003**	Spn. for forged brass gate, globe & check valves for water works purposes
13382-2004	**-**	Cast Iron specials for mechanical & push-on flexible joints for pressure pipelines for water, gas & sewage
13592- 1992	**Reaffirmed 2002**	Specifications for PVC soil, waste & rain water (SWR) including ventilation pipes
13593 - 1992	**Reaffirmed 2002**	UPVC pipes fittings for use with section and delivery lines for Agricultural pumps – Specification.
13916 – 1994	**Reaffirmed 2004**	Code of practice for installation of GRP piping system.
13983-1994	**Reaffirmed 2004**	Specifications for stainless steel kitchen sinks & drain boards for domestic purpose
14333-1996	**Reaffirmed 2001**	Specification for HDPE pipes for sewerage system.
14402-1996	**Reaffirmed 2001**	GRP pipes, joints & fittings – Specification.
14735-1999	**Reaffirmed 2004**	UPVC injection moulded fittings for UPVC – SWR pipes – Specifications.
14845- 2000	**Reaffirmed 2004**	Resilient seated cast iron air relief valves for water works purposes – Spn
14846- 2000	--	Specifications for sluice valve for water works purposes (50 to 1200 mm size)
15265 – 2003	--	Specifications for flexible PVC pipes or polymer reinforcement thermo plastic hoses for suction and delivery lines for Agricultural pumps.
15328 – 2003	--	UPVC non pressure pipes for use in underground drainage and sewerage system – Specifications.
15450- 2004	--	Polyethylene/Aluminium/Polyethylene composite pressure pipes for hot and cold water supplies – Specifications.

1.3 MINIMUM WEIGHT OF MOST COMMONLY USED SANITARY APPLIANCES & WATER FITTINGS:

The minimum unit weight of each fitting shall not be less than as given in the following table and tolerance for weight shall be as per relevant IS code.

S.N.	Description of items	Nominal size/ thickness	IS code	Minimum Unit Weight
1	Brass non-fancy type Bib Tap Please see Table under relevant item for other sizes.	15mm	781- 1984	400 Grams
2	C.P. brass fancy type Bib Tap	15mm	8931- 1993	550 Grams
3a	Brass non-fancy types Stop cock – Internally threaded	15mm	781- 1984	330 Grams
3b	Brass non-fancy types Stop cock – Externally threaded	15mm	781- 1984	400 Grams
4	C.P. brass fancy types Stop cock	15mm	8931- 1993	550 Grams
5	C.P. brass concealed typed Stop cock	15mm	8931- 1993	750 Grams
6	C.P. brass fancy Pillar Tap	15mm	1795- 1982	650 Grams
7	C.P. brass waste coupling	32mm	3311- 1979	200 Grams
8	C.P. brass waste coupling	40mm	3311- 1979	250 Grams
9 a	C.I. Nahani Trap 165mm inlet dia.	75mm(outlet)	1729-2002/ 3989- 1984	6.50 Kg.
9 b	C.I. Floor Trap 100 mm inlet dia.	75mm(outlet)	1729-2002/ 3989- 1984	4.80 Kg.
9 c	C.I. Nahani Trap with 20 mm water seal	65mm(outlet)	non ISI	4.50 Kg.
15	Cast Iron surface box for sluice valve	(rectangular shape)	3950-1979	33 kg.

The minimum unit weight of each fitting shall not be less than as given in the following table which are used in General practice.

S.N.	Description of items	Nominal size/ thickness	Minimum Unit Weight
1	C.P. brass fancy Shower rose	15mm	125 Grams
2	C.P. brass bottle trap	32mm.	500 Grams
.3	C.P. brass bottle trap	40mm	550 Grams
4	C.P. brass Liquid soap dispenser		250 Grams
5	C.P. brass coat and hat hook		150 Grams
6	C.P. brass Towel rod bracket [pair]		100 Grams
7	C.P. brass Towel rod [600 mm long]	20mm	150 Grams
8	G.I. Clamps thickness for GI piping	2 MM	
9	MS Clamps thickness for CI piping	3 MM	
10	Rain water lead sheet flashing		38.00 kg/sqm
11	C.I. frame and cover for Gully Trap		7.50 kg.
12	S.S. grating for Nahani Trap		50 Grams
13	C.P. brass grating for Nahani Trap		190 Grams
14	C.P. Brass Dome shape grating		275 Grams
15	Cast Iron surface box for sluice valve (circular shape)		14 kg.

1.4 MANDATORY TESTS / OPTIONAL TESTS :-

1. The following mandatory tests shall be carried out when the qty. of materials to be incorporated in the work exceeds the minimum qty. specified in col.5 of the table below irrespective of whether the materials are with I.S. mark, or otherwise.
2. Optional tests specified or any other tests shall be carried out in case of specialized work/ important structure at Department's discretion.
3. Testing charges including incidental charge and cost of sample for testing shall be borne by the contractors for all mandatory tests.
4. 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.
5. In case of non-I.S. materials, it shall be the responsibility of the contractor to establish the conformity of material with relevant I.S. 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.

1.4.1 Mandatory tests for P.H.E. works :

Material	Test	Field/lab test	Test Procedure	Minimum quantity of material / work for carrying out the test 5	Frequency of sampling	Remarks
1	2	3	4	5	6	7
G.I. pipes	**Physical** Dimensional Nominal unit wt. Tensile, Elongation **Chemical** Mass of zinc coating Sulpher, Phosphorus	 Field/lab Field/lab Lab Lab Lab Lab	 IS 4736 IS 228 IS 228	 >20tubes >20tubes >1000/ 500 up to 25 mm bore >25 mm bore respectively. Up to bore 25mm 1 tube / 1000 or part thereof >25mm bore 1 tube/ 500 tube	 Sampling & criteria for conformity as per 4711	
C.I. pipes Water Quality "LA/A/B" Class	Dimensional Unit weight Hammer test Hydrostatic test Hardness & grade	Field/lab Field/lab Field/lab Field/lab -------		> 20 copies > 20 copies --------	Sampling & Conformity as per IS 1536/2001 IS1500	Hardness & grade shall be optional
C.I. pipe Soil quality	Dimensional Unit weight Hammer test Hydrostatic test Hardness & grade	Field/lab Field/lab Field/lab Field/lab -------		> 20 pipes ➢ 20 pipes ---------	Sampling & Conformity as per IS 3981, IS1729 IS 1500	Hardness & grade shall be optional
Pig lead	Chemical Analysis	Lab	IS 1817	Lot > 1000 kg, if less Mfr. test report to be furnished	Each lot > 1000 kg.	
Stone ware pipes	Hydraulic Test, Absorption Test, Test for Acid Resistance , Test for Alkali Resistance, Crushing strength Test	Lab	IS 651	3no for lot of 150 5 no. for 151 to 1200 8 no. for 1201 to 10000		
Cement,Bricks	**As per Civil specification**					
Pre Cast Concrete man hole frame & covers/ Gratings	Dimension Load test	Lab	IS 12592 (Part I)	> 20 frame & covers/ gratings	Sampling as per IS 12592(partI)	

Material	Test	Field/lab test	Test Procedure	Minimum quantity of material / work for carrying out the test 5	Frequency of sampling	Remarks
1	2	3	4	5	6	7
CI man hole frame & covers	Dimension Load test	Lab	IS 1726	>50 frame & covers/ gratings	Sampling as per IS 1726	
Hume pipe NP class	Dimension Hydrostatic test Three-edge bearing Absorption test	Lab/field Lab Lab Lab	IS 458 IS 3597 IS 3597 IS 3597	>50 pipes	As per IS 458	
Sanitary fittings	Manufacturer's Test certificate To be produced IS mark materials.					
CP brass fittings Bib taps/ stop cocks	Manufacturer's Test certificate To be produced IS mark materials.					

1.4.2 Testing, tolerances, Acceptance and mode of payment

a) 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.

b) 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.

c) In case of non-standard materials, materials not covered under any I.S specification, such as aluminium sections, the payment shall be made based on the actual unit weight as determined by testing at random sampling.

Post construction Inspection and testing : 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 department failing which the department may rectify the same at the risk and cost of the contractor or the department may accept the same as sub standard, and cost be adjusted from the outstanding security deposit as per the terms and condition of the contract for the work.

2.0 GENERAL SPECIFICATIONS :

2.1. EARTH WORK AND BACKFILL

2.1.1 SCOPE OF WORK :

The scope of work covered under this specifications pertains to excavation of foundations, trenches, pits and over areas, in all sorts of soils, soft and hard rock, correct to dimensions given in the drawing including shoring, protections of existing underground utilities if any, such as water lines, electric cables etc., dewatering and shoring if necessary, stacking the useful materials as directed within the lead specified, refilling around the foundation and into the plinth with selected useful excavated earth and disposing off the surplus earth/materials within specified lead and finishing the surface to proper levels, slopes and camber etc. all complete.

2.1.2 SITE CLEARANCE :

Before the earth work is started the area coming under cutting and filling shall be cleared of all obstructions, loose stones, shrubs, rank vegetation, grass, brush-wood, trees and saplings of girth upto 30 cm. measured at a height of one metre above ground and rubbish removed upto a distance of 150 metres outside the periphery of the area under clearance. The roots of trees shall be removed to a minimum depth of 60 cm. below ground level, or a minimum of 30 cm. below formation level whichever is lower, and the hollows filled up with earth, levelled and rammed. This work is deemed to be included in the earth work items and no separate payment will be admissible for the work.

The trees of girth above 30 cm. measured at a height of one meter above ground, shall only be cut after permission of the Engineer-in-charge is obtained in writing. The roots shall also be removed as described in the preceding sub-para. Payment for cutting and removing roots of such trees shall be made separately. Any material obtained from the site will be the property of the Department and the useful materials as decided by the Engineer-in-charge will be conveyed and properly stacked as directed within the lead specified.

2.1.3 SETTING OUT AND MAKING PROFILES :

Masonry or concrete pillars will be erected at suitable points in the area to serve as bench marks for the execution of the work. These bench marks shall be connected with G. T. S. or any other permanent bench mark approved by the Engineer-in-charge. Necessary profiles with pegs, bamboos and strings or Burjis shall be made to show the correct formation levels before the work is started. The contractor shall supply labour and materials for setting out and making profiles and Burjis for the work at his own cost and the same shall be maintained during the excavation work. The Department will show grid Co-ordinate or other reference points. It shall be the responsibility of the contractor to set out centre lines correctly with reference to the drawings and install substantial reference marks. Checking of such alignment by the Department will not absolve the contractor from his responsibility to execute the work strictly in accordance with the drawings.

2.1.4 EARTHWORK :

The contractor shall notify the Engineer-in-charge before starting excavation and before the ground is disturbed, to enable him to take existing levels for the purpose of measurements. The ground levels shall be taken at 5 to 15 metres intervals in uniformly sloping ground and at closer distance where local mounts, pits or undulations are met with, as directed by the Engineer-in-charge. The ground levels shall be recorded in field books and plotted on plans, which shall be signed by the Contractor and the Engineer-in-charge, before the earth work is actually started. The labour required for taking levels, shall be supplied by the Contractor at his own cost. The Contractor shall perform excavation in all types of soils, murrum, soft and hard rock, boulders etc. in foundation, over areas and in trenches to widths, lines, levels, grades and curves as shown in the drawing or lesser widths, lines and levels as directed by the Engineer-in-charge and as per items in the schedule of quantities.

2.1.4.1 The item in the schedule of quantities shall specify the excavation in trenches

For this purpose, the excavation in trenches for foundations and for pipes, cables etc. not exceeding 1.5 m. in width and for chambers, manhole, shafts, wells, cesspits and the like not exceeding 10 sqm. on plan and to any depth shall be described as Excavation in trenches for foundation, drains, pipes and cables and returning the excavated material to fill the trenches after pipes, cables etc, are laid and their joints tested and passed and disposal of surplus excavated material upto 50 m lead.

2.1.4.2 Excavation exceeding 1.5 m. in width as well as 10 sqm. on plan (excluding trenches for pipes, cables etc.) and exceeding 30 cm in depth shall be described as Excavation over areas.

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2.1.5 CLASSIFICATION OF EARTH WORK:

The earth work shall be classified under the following main categories and measured separately for each category.

a) All types of soils, murrum, boulders.

b) Soft rock.

c) Hard rock.

2.1.5.1 a) ALL TYPES OF SOILS, MURRUM, BOULD : This includes earth, murrum, top deposits of agricultural soil, reclaimed soil, clay, sand or any combination thereof and soft and hard murrum, shingle etc. which is loose enough to be removed with spades, shovel and pick axes. Boulders not more than 0.03 cum. in volume found during the course of excavation shall also fall under this classification.

b) EXCAVATION IN SOFT ROCK : This shall include all materials which are rock or hard conglomerate, all decomposed weathered rock, highly fissured rock, old masonry, boulders bigger than 0.03 cum. in volume but not bigger than 0.5 cum. and other varieties of soft rock which can be removed only with pick axes, crow bars, wedges and hammers with some difficulty. The mere fact that the contractor resorts to blasting and/or wedging and chiselling for reasons of his own, shall not mean the rock is classificable as hard rock.

c) EXCAVATION IN HARD ROCK : This includes all rock other than soft rock mentioned in para 2.1.5.1 b viz. soft rock, occurring in masses, boulders having approximate volume more than 0.5 cum. plain or reinforced cement concrete, which can best be removed by blasting or chiselling and wedging where blasting cannot be permitted owing to any restriction at site.

i) EXCAVATION IN HARD ROCK BY BLASTING : Where blasting is permitted the excavation in rock shall be done by means of blasting. No heavy blasting will be permitted and only controlled/muffled blasting will be permitted at the discretion of the Engineer-in-Charge. The Contractor shall be governed by the relevant statutory laws, rules and regulations on explosives, pertaining to the acquisition, transport, storage, handling and use of explosive which shall be rigidly followed and shall obtain himself all necessary materials and equipment for blasting. Blasting shall be executed through a licensed blaster with prior permission from police authorities. Prior to blasting sufficient notice shall be given to concerned parties to avoid danger to people, materials and nearby structures. All the damages caused by careless blasting if any shall be made good by the contractor at his own expenses.

ii) EXCAVATION IN HARD ROCK BY CHISELLING AND WEDGING : Where blasting is not permitted and if the Engineer-in-Charge so desires, the excavation shall be done by chiselling and wedging or any other agreed method.

NOTE : All the excavated hard rock obtained shall be stacked properly and neatly within the specified lead by the contractor as directed by the Engineer-in-Charge.

2.1.6 EXCAVATION : The excavation under all classifications in areas in trenches or in pits shall be carried out systematically. Cutting shall be done from top to bottom and no under-pining or undercutting will be allowed. The bottom and sides of excavation shall be dressed to proper level, slopes, steps, camber etc. by removing high spots, and ramming thoroughly as directed by the Engineer-in-charge.

All the excavation shall be carried out strictly to the dimensions given in the drawing. The width shall generally be of the width of mudmat concrete and depth as shown in drawing or as directed by the Engineer-in-Charge, according to availability of the desired bearing capacity of soil below. Any excavation if taken below the specified depths and levels, the contractor shall at his own cost fill up such overcut to the specified level with cement concrete 1:4:8 in case of excavation in all types of soils and with cement concrete 1:2:4 in case of excavation in soft and hard rock.

After the excavation is completed, the contractor shall notify the Engineer-in-Charge to that effect and no further work shall be taken up until the Engineer-in-Charge has approved the depth and dimensions and also the nature of foundation materials. Levels and measurements shall also be recorded prior to taking up any further work.

2.1.6.1 SIZES OF TRENCH FOR EXCAVATION FOR PIPE LINE :

Where the width of trench is not specified the following shall apply.

a) Upto 1.0 metre deep shall be arrived at by adding 25 cm to the external diameter of pipe (not socket/collar) cable, conduit etc where a pipe is laid on concrete bed/cushioning layer, the authorised width shall be the external diameter of the pipe (not socket/collar) plus 25 cm or the width of concrete bed/cushioning layer whichever is more.

b) For depths exceeding one metre, an allowance of 5 cm per metre of depth for each side of the trench shall be added to the authorised width (that is external diameter of pipe plus 25 cm) for excavation. This allowance shall apply to the entire depth of the trench. In firm soils upto a depth of 2 metres from the bottom. For depths greater than 2 metres, the excavation profiles shall be widened by allowing steps of 50 cm on either side after every two metres from bottom.

c) Where more than one pipe, cable, conduit etc. are laid, the diameter shall be reckoned as the horizontal distance from outside to outside of the outermost pipes, cable, conduit etc.

d) Where the soil is soft, loose or slushy, width of trench shall be suitably increased or side sloped or the soil shored-up as directed by the Engineer-In-Charge. It shall be the responsibility of the contractor to take complete instructions in writing from the Engineer-In-charge regarding increase in the width of trench, sloping or shoring to be done for excavation in soft, loose or slushy soils.

2.1.6.1 SIZES OF TRENCH FOR EXCAVATION FOR CHAMBERS, MANHOLES, SHAFTS, WELLS, CESSPITS:

Authorised working space shall be special in each case. Where authorised working space is not so specified the following shall apply :

600 mm measured from the external face of substructure/walls (including protective measures like water proof plaster, tile cladding etc. if any) at lowest level, where extra working space is required.

2.1.7 SHORING :

Unless separately provided for in the schedule of quantities, the quoted rate for excavation shall include excavation of slopes to prevent falling in soil by providing and/or fixing, maintaining and removing of shoring, bracing etc. The contractor would be responsible for the design of shoring for proper retaining of sides of trenches, pits etc. with due consideration to the traffic, superimposed loads etc. Shoring shall be of sufficient strength to resist the pressure and ensure safety from slips and to prevent damage to work and property and injury to persons. It shall be removed as directed after items for which it is required are completed. Should the slips occur, the slipped material shall be removed and slope dressed to a modified stable slope. Removal of the slipped earth will not be measured for payment.

2.1.8 DEWATERING :

Unless specifically provided for as a separate item in the schedule of quantities, rate shall also include bailing or pumping out all water which may accumulate in the excavation during the progress of further works such as mud mat concrete, R.C. footings, shuttering etc. either due to seepage, springs, rain or any other cause and diverting surface flow by bunds or other means. Care shall be taken to ensure that the water discharged sufficiently away from the foundations to keep it free from nuisance to other works in the neighbourhood.

2.1.9 DISPOSAL OF EXCAVATED MATERIALS :

a) ANTIQUITES : Any finds of archaeological interest such as relics of antiquity, coins, fossils or other articles of value shall be delivered to the Engineer-in-Charge and shall be the property of the Government.

b) USEFUL MATERIALS : Any material obtained from the excavation which in the opinion of the Engineer-in-Charge is useful, shall be stacked separately in regular stacks as directed by the Engineer-in-Charge and shall be the property of the Government.

No material excavated from foundation trenches of whatever kind they may be are to be placed even temporarily nearer than about 3 m. from the outer edge of excavation. Discretion of the Engineer-in-Charge in such cases is final. All materials excavated will remain the property of the Department. Rate for excavation includes sorting out of the useful materials and stacking them separately as directed within the specific lead.

Materials suitable and useful for refilling or other use shall be stacked in convenient place but not in such a way as to obstruct free movement of materials, workers and vehicles or encroach on the area required for constructional purposes. It shall be used to the extent required to completely backfill the structure to original ground level or other elevation shown on the plan or as directed by the Engineer-in-Charge. Materials not useful in anyway shall be disposed off, leveled and compacted as directed by the Engineer-in-charge within a specified lead. The site shall be left clean of all debris and leveled on completion.

2.1.10 REFILLING IN SIDES OF CHAMBERS, DRAINS ETC. :

The back filling shall be done after the concrete or masonry has fully set and shall be done in such a way as not to cause under-thrust on any part of the structure. Where suitable excavated material is to be used for back filling, it shall be brought from the place where it was temporarily deposited and shall be used in refilling. The scope of work for back filling/filling in sides of chambers and other areas shall include filling for all the excavation covered under the contract. Surplus earth available from the excavation, if required, shall be used for refilling/filling for filling the trenches for pipes cables buildings also within the specified lead mentioned in the item.

All timber shoring and form work left in the trenches, pits, floors etc. shall be removed after their necessity ceases and trash of any sort shall be cleared out from the excavation. All the space between foundation masonry or concrete and the sides of excavation shall be refilled to the original surface with approved materials in layers not exceeding 200 mm. in thickness, watered and well consolidated by means of rammers to atleast 90% of the consolidation obtainable at optimum moisture content (Proctor density). Flooding with water for consolidation will not be allowed. Areas inaccessible to mechanical equipment such as areas adjacent to walls and columns etc. shall be tamped by hand rammer or by hand held power rammers to the required density. The backfill shall be uniform in character and free from large lumps, stones, shingle or boulder not larger than 80 mm. in any direction, salt, clods, organic or other foreign materials which might rot. The refilling in plinth and under floors shall be done in similar way in layers not exceeding 200 mm. thick and shall be well consolidated by means of mechanical or hand operated rammers as specified to achieve the required density.

Test to establish proper consolidation as required will be carried out by the Department at rates specified. Two tests per 50 sqm. will be taken to ascertain the proper consolidation. The cost of tests carried out will be recovered from the contractors bill.

2.1.11 REFILLING IN TRENCHES FOR PIPES, CABLES ETC.

Filling in trenches shall be commenced soon after the joints of pipes, cables, conduits etc. have been tested and passed. The space alround the pipes, cables, conduits etc. shall be cleared of all debris, brick bats etc. Where the trenches are excavated in hard/soft soil, the filling shall be done with earth on the sides and top of pipes in layers not exceeding 20 cm in depth. Each layer shall be watered, rammed and consolidated. All clods and lumps of earth exceeding 8 cm in any direction shall be watered, rammed and consolidated. All clods and lumps of earth exceeding 8 cm in any direction shall be broken or removed before the excavated earth is used for filling. In case of excavation of trenches in ordinary/hard rock, the filling upto a depth of 30 cm above the crown of pipe, cable, conduits etc. shall be done with fine material like earth, murrum or pulverised/decomposed rock according to the availability at site. The remaining filling shall be done with boulders of size not exceeding 15 cm mixed with fine material like decomposed rock, murrum or earth as available to fill up the voids, watered, rammed and consolidated in layers not exceeding 30 cm. Excavated material containing deleterious material, salt peter earth etc. shall not be used for filling. Ramming shall be done with iron rammers where feasible and with blunt ends of crow bars where rammers cannot be used, Special care shall be taken to ensure that no damage is caused to the pipes, cables, conduits etc. laid in the trenches.

2.1.12 LEAD & LIFT

LEAD : The lead for disposal/deposition of excavated materials shall be as specified in the respective item of work. For the purpose of measurements of lead, the area to be excavated or filled or area on which excavated material is to be deposited/ disposed off shall be divided in suitable blocks and for each of the block, the distance between centre lines shall be taken as the lead which shall be measured by the shortest straight line route on the plan and not the actual route adopted.

LIFT : Lift shall be measured from ground level. Excavation up to 1.5 m depth below ground level and depositing excavated material on the ground shall be included in the item of earthwork for various kinds of soil. Extra lift shall be measured in unit of 1.5 m or part thereof. Obvious lift shall only be measured; that is lifts inherent in the lead due to ground slope shall not be measured except for lead upto 250 m. All excavation shall be measured in successive stages of 1.5 m stating the commencing level. This shall not apply to cases where no lift is involved as in hill side cutting.

2.1.13 MODE OF MEASUREMENTS:

2.1.13.1 All excavation in areas having depth more than 30 cm. pits, trenches etc. shall be measured net. The dimensions for the purpose of payment shall be reckoned on the horizontal area of the excavation at the base for foundations of the walls, columns, footings, rafts or other foundations, multiplied by the mean depth from the surface of ground determined by levels. Excavation for side slopes will not be paid for. Excavation in areas having depths less than 30 cms. shall be measured as surface excavation on square metre basis, mentioning the average depth of excavation.

Reasonable working space beyond concrete dimension required for waterproofing and shuttering where considered necessary in the opinion of Engineer-in Charge will be allowed in execution and considered for payment for underground water tank, sump, septic tank etc.

2.1.13.2 Wherever direct measurements of rock excavation are not possible, volume of rock be calculated on the basis of length, breadth and depth of stacks made at site. The net volume shall be worked out by reducing it by 50%, taking the voids into consideration as 50%. Similarly to arrive at net quantity to be paid in the case of soil, reduction @ 20% of corresponding stack/truck measurements shall be made.

2.1.13.3 The rate for excavation shall include carting and disposing and levelling the excavated materials within the specified lead. The rate shall also be inclusive of cost of all tools, plants, explosives, shoring, dewatering at various stages, labour, materials etc. to complete all the operations specified.

2.1.13.4 The backfilling and consolidation in sides of foundation and in plinth with excavated material will not be paid for separately. The rate quoted for excavation shall be deemed to have been included the cost of stacking of excavated materials, conveying within the specified lead, picking of selected stacked materials, conveying it to the place of final backfill, compaction to the required proctor density etc.

2.1.13.5 Payment for filling and consolidation inside the trenches, sides of foundations, plinth etc. with selected materials brought by the contractor other than the excavated material, shall be paid for separately as per the rates in schedule of quantities which includes cost of such materials/excavation, royalty, its conveyance within the specified lead, watering, consolidating, dressing etc. Actual quantity of consolidated filling shall be measured and paid in cubic metres upto two places of decimal.

2.1.13.6 The rate quoted in cum. for items of excavation is deemed to include the necessary additional quantity of excavation involved beyond the plan dimensions of the work which may be necessary to be carried out for carrying out the work in an engineering manner, decided upon by the contractor. Therefore no extra payment will be made for any excavation done other than the required quantity as per the plan dimension indicated in the drawings.

2.1.13.7 Measurements for excavation over areas shall be determined by levels or by "Dead men" or both at the discretion of the Engineer-in-Charge. If however the Engineer-in-Charge decides on measurement by levels, levels of site shall be jointly taken and recorded by the Engineer-in-Charge or his representatives and the contractor, before commencement of the work and after completion of the work and the quantity of work done shall be computed based on these levels. The volume of earth work shall be computed based on "Simpson's formula" or any other approved method at the discretion of the Engineer-in-Charge.

2.1.14 MODE OF PAYMENT : The contract rate shall be for unit cubic meter of earth work.

2.2.00 PLAIN CEMENT CONCRETE :

2.2.01 GENERAL : The specification covers the requirement of ordinary Cement Concrete of the specified proportion to be used for various concrete items.

2.2.02 MATERIAL : The material requirement for particular item shall be as per IS 456

2.2.03 CEMENT : Cement shall be OPC/PPC cement conforming to IS 269 & IS 1489 respectively. Cement shall be stored in dry godowns or sheds use of PPC slag cement as approved by the Engineer In-charge, out of construction with damp ground on a 0.6M height platform. Cement shall not be stored in the open. All cement shall be kept well stacked and no cement other than intended to use in the work, shall be used. The cement shall be stored as received and shall be consumed in the order in which consignments are received and shall not be stored for long periods. No clogged cement caused by dampness shall be used. Blended cement for finishing work shall be used with the prior approval of the Engineer In-charge.

2.2.04 FINE AGGREGATE : The sand shall be clean, well graded, hard, strong, durable and gritty particles of size 0.15 mm to 5 mm fee from mica, dust, clay, kankar, soft or flaky particles and other deleterious materials. If the fine aggregate contain more than 4 percent of clay, dust or silt it shall be washed. Sea sand should not be used. The fineness modulus may range between 2.6 to 3.6.

2.2.05 COARSE AGGREGATE : All stone aggregate to be used for cement concrete shall be from approved sources. The aggregate shall be clean hard, strong and durable. It shall not contain soft, flaky thin or elongated pieces, alkali organic matter or other notorious matter. The specific gravity of the aggregate shall be between 2.5 to 2.7.

2.2.06 STORAGE, SCREENING AND WASHING : It shall be stored at the work site in such a manner as to prevent contamination. All aggregate shall be stored to convenient height on hard and dry platform. The contractor shall install screens, one for coarse aggregate and one for sand and shall thoroughly wash all aggregate if directed by Engineer-in-charge.

2.2.07 WATER : The water shall be confirming to IS 3025. The water shall be clean and free from deleterious matters such as acids, oils, alkalies, sugar and vegetable matter. Every attempt shall be made to use water that is fit for drinking and whenever possible, water shall be used direct from the supply mains. PH value of water shall not be less than 6.

2.2.08 PROPORTIONING OF MIX : In ordinary concrete although proportion of cement to fine and course aggregate is specified by volume, the quantity of cement shall be determined by weight assuming one bag of cement weighing 50 kg. net to be equivalent to 35 Ltrs. fine and course aggregate shall be measured by dry volume in suitable measuring boxes. The allowance shall be made for bulking in the fine aggregate due to moisture if any at the time of mixing. Water cement ratio will be such as will give concrete just sufficient workable to place and compact with out difficulty.

2.2.09 MIXING : In all the cases concrete shall be mixed in a mechanical mixer at the site of work, mixer and other accessories should be in first class condition and well maintained through out the construction. Mixing shall be continued till the homogeneous mixture is obtained but in no case mixing shall be done for less than 1.5. minutes.

When hand mixing is permitted by Engineer-in-charge in any special condition, it shall be done on a smooth, hard and water tight, platform large enough to allow sufficient turning over of the ingredients of concrete after adding the water. The material shall be mixed in dry state and turned over until they are thoroughly and fully mixed homogeneously. In hand mixing, the quantity of cement shall be increased by 10 percent with out any extra cost. Retampering or remixing of partially hardened concrete shall not be permitted.

2.2.10 PLACING : The concrete shall be transported in such a manner that there shall be no tendency for the segregation of the different ingredients and it shall not be dropped into position from the height greater than 1.00 meter and shall be placed within 30 minutes after mixing. It shall not be interfered when once it has become to set. When new concrete is to be placed on the already set concrete, the surface of the old concrete shall be thoroughly roughened & wetted before the new concrete is laid. Cement sand slurry (1:2) being laid over the surface of the old concrete which is roughened, washed and wetted. The stripped surface of concrete shall be smooth & sharp. Any honey combing, air holes,board marks etc, shall be finished smooth.

2.2.11 COMPACTION : The concrete shall be thoroughly compacted during depositing to get dense concrete. The concrete shall not be disturbed once it is set. For important works, the use of mechanical vibrator is essential. The vibrator shall not be less than 4000 to 5000 impulse per minute and shall be worked at an interval about 600 mm. Over vibration shall be avoided.

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

2.2.13 FORM WORK : The forms shall generally comply with IS 456 & IS 14687. The shuttering shall be of wood or metal. Before placing the concrete the inside of the forms which comes into contact with concrete shall be coated with mineral oil. The forms shall be erected in position firmly so that it should not be dislocated during concreting. The forms shall be removed without damaging the concrete structure after development of sufficient strength and taking consent of the Engineer-In-Charge.

2.2.14 DEFECTIVE CONCRETE : The defective concrete surface shall be made good as per the direction of Engineer-In-Charge at the contractor's own cost and charges.

2.2.15 WATERING AND CURING : All the concrete work shall be kept wet continuously for a period of a least 14 days to prevent excessive evaporation. In hot and dry weather matting or gunny bags may be hung on out side of the concrete surface to keep moist.

2.2.16 THE RATE INCLUDES FOR :

1. Installation and removal of scaffolding and shuttering.
2. Cost includes transporting, placing, compacting, curing and finishing cement concrete,
3. Necessary sampling and tests for materials and concrete.
4. Dewatering the pit or trench if found necessary till completion of work.
5. All labour, materials, use of equipment, tools and plants.

2.2.17 MODE OF MEASUREMENT : The measurement shall be for unit cubic meter of concrete or as specified in schedule of work. The concrete shall be measure for its length, breadth and depth. Deduction for pipe shall be made as per the actual outer dimension of the pipe.

2.2.18 MODE OF PAYMENT : The contract rate shall be for unit cubic meter of concrete or as specified in the schedule of work.

2.3.0 BRICK MASONARY :

2.3.01 GENERAL : This specification covers requirement of the Brick Work in specified proportion of cement mortar.

2.3.02 BRICK : Brick shall generally confirmed to IS 1077. All the bricks to be used in the work shall be well bunt clay brick of class 35, red colour, homogeneous in texture, free from flaws, cracks and crevices. They shall have a frog of 10 mm. depth on one side of their flat faces. No brick after twenty four hours immersion in water shall absorb more than 25% of its own weight and strength should not be less than 3.5 MPa (35 kg/Sq.cm). The test report of the bricks shall be submitted to the Engineer-in-charge at the contractor's own cost, if required Brick shall be uniformly burnt throughout but not over burnt, shall give the clear metallic ringing sound when struck.

2.3.03 BRICK WORK : All bricks shall be thoroughly soaked in water before use till the bubbles ceases to come up. No half or quarter brick shall be used except as closures. The course shall be horizontal and the wall shall be raised to plumb. Joints in brick wall shall not exceed to 10mm thick. Brick work shall be uniformly raised around to heights as per drawings. All joints shall thoroughly flushed with mortar at every courses. Care shall be taken to see that the bricks are properly bedded and joint completely filled to full depth. No bat or cut bricks shall be used in the work unless absolutely required to give proper shape. Brick work shall be built in cement and sand mortar as specified in the schedule or as per drawing. The joints shall be raked for a depth of 10 mm to receive cement plaster.

2.3.04 DEWATERING : The item rate shall include bailing or pumping out all water which may accumulate during the progress of the work either from seepage, springs, rain or any other cause.

2.3.05 WATERING AND CURING : All the brick work shall be kept damp continuously for a period of 14 days to prevent excessive evaporation In hot and dry weather matting or gunny bags may hung on the out side of brick work & kept moist.

2.3.06 THE RATE INCLUDES FOR :

1. Erecting, dismantling and removing the scaffolding. and curing brick work for at least 14 days.
2. Dewatering the pit or trench if found necessary till completion of work.
3. Labour, materials, tools, paint etc. used in the work.

2.3.07 MODE OF MEASUREMENT : The measurement shall be for unit cubic meter of brick work or as specified in the schedule of work. The brick wall shall be measured for it's length, breadth and depth.

2.3.08 MODE OF PAYMENT : The contract rate shall be for unit cubic meter or as specified in the schedule of work.

2.4 CEMENT PLASTER :

2.4.01 GENERAL : This specification covers the requirement of the Cement plaster in the specified proportions.

2.4.02 CEMENT MORTAR : Cement and sand shall be mixed to the proportions as described in the schedule. Cement and sand shall be first mixed dry on the dry platform after which sufficient clean water shall be added to bring the whole mix into a plastic condition. No mortar which has started to set shall be used nor such mortar remixed with new one. It shall be removed from the work site at once.

2.4.03 PLASTERING : In all plaster work, mortar shall be firmly applied and well pressed into the joints on the surface and drubbed and leveled with a flat wooden rule to give required thickness. Long straight edge shall be freely used to ensure a perfectly plane and even surface. All corner must be finished to their true angle or rounded as directed. Cement plaster should be done in square or strips and shall be done from top to downward.

2.4.04 FLOATING COAT : The floating coat over the plaster shall be so done whenever specified in the item with neat cement to finish the surface so that cracks, crevices etc. are not developed in the plaster.

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

2.4.06 WATERING AND CURING : All the plaster work shall be kept damp continuously for a period of 14 days to prevent excessive evaporation. In hot and dry weather matting or gunny bag may be hung on the the out side of the plaster in the beginning and kept moist.

2.4.07 THE RATE INCLUDES FOR :

1. Erecting, dismantling and removing the scaffolding.
2. Preparation of the surface to receive the plaster of specified thickness and number of coats, curing etc.
3. Labour, materials, tools and plants used to complete the work.

2.4.08 MODE OF MEASUREMENT : The measurement shall be for unit square meter of cement plaster. The plaster shall be measured for it length, breadth / depth.

2.4.09 MODE OF PAYMENT : The contract rate shall be for unit square meter of plaster.

2.5.0 CUTTING OF ASPHALT ROAD AND PAVED YARD :

2.5.01 GENERAL : This specification covers the scope of cutting and breaking the asphalt, concrete roads, paths etc. and making good to its original condition.

2.5.02 MATERIAL : Wherever cutting is done across public paths, roads etc. the orders of materials excavated shall be preserved in well manner and reinstatement shall be done in the same order and road brought to the original condition. The contractor shall made up for any deficiency in/material at his own cost.

2.5.03 WORKMANSHIP : The cutting of road and paved yard shall be done as directed by the E-I-C, Ramming the sub-grade for piping work. The soling stones, spreading the metals to required thickness and making water bound with stone dust/ murrum as per requirement shall be reinstated to the original condition at his own cost.

2.5.04 THE RATE INCLUDES FOR :

1. Cutting asphalt road, water bound macadam and soling and stacking usable material at site.
2. Ramming sub-grade for laying pipe line and making asphalt road in original condition after completion of work.
3. Labour, materials, tools and plants used to complete the work.

2.5.05 MODE OF MEASUREMENT : The measurement shall be for unit square meter. The cutting portion shall be measured for its length and breadth.

2.5.06 MODE OF PAYMENT : The contract rate shall be for unit square meter.

2.6 REMOVAL OF FOOT PATH TILES :

2.6.01 GENERAL : This specification covers the scope of removing stone tiles from foot paths and refixing the tiles as good to its original condition.

2.6.02 MATERIAL : Wherever cutting is done across pubic foot paths and roads, the orders of materials removed from foot paths shall be preserved in well manner and reinstatement shall be done in the same order and foot path brought to the original condition. The contractor shall make up for any deficiency in material at his own cost.

2.6.03 WORKMANSHIP : The foot path tiles shall be removed in required area required or as directed by the E-I-C. Ramming the sub-grade for laying and fixing the tiles after completion of work to the original condition with 1:3 cement mortar.

2.6.04 THE RATE INCLUDES FOR :

1. Removing the stone tiles from foot paths and stacking at site.
2. Ramming sub-grade for refixing the tiles including cement, sand, tiles etc.
3. Labour, materials, tools and plants used to complete the work.

2.6.05 MODE OF MEASUREMENT : The contract rate shall be for unit square meter and it shall be measured for it length and breadth.

2.6.06 MODE OF PAYMENT : The contract rate shall be for unit square meter.

2.7 REMOVAL OF KERB STONE :

2.7.01 GENERAL : This specification covers the scope of removing road side kerb stone and refixing the kerb stone as good to its original condition.

2.7.02 MATERIAL : Wherever cutting is done across public paths and roads, the order of materials shall be preserved in well manner and reinstatement shall be done in the same order and it shall be brought to the original condition. The contractor shall make up for any deficiency in material at his own cost.

2.7.03 WORKMANSHIP : The road side kerb stone shall be removed to the required length or as directed by the E-I-C. Ramming the sub-grade for fixing the kerb stone after completion of work in the original condition with 1:3 cement mortar.

2.7.04 THE RATE INCLUDES FOR :

1. Removing the kerb stone and stacking at site.
2. Ramming sub-grade for refixing the kerb stone including cement, sand, kerb stone etc.
3. Labour, materials, tools and plants used to complete the work.

2.7.05 MODE OF MEASUREMENT : The measurement shall be for unit running meter and it shall be measured for its length.

2.7.06 MODE OF PAYMENT : The contract rate shall be for unit running meter,

2.8 STRUCTURAL STEEL WORK :

2.8.01 GENERAL : This specification covers the requirement of providing, fabrication and erection of Structural steel work including painting.

2.8.02 MATERIAL : All the Structural steel shall conform to IS 226 and IS 800. They shall be free from defects and shall have uniform section with smooth finish.

2.8.03 FABRICATION AND ERECTION : Cutting, holding, assembly, riveting, bolting, welding, machining, painting, marking and erection shall be carried out in accordance with approved plans and as directed by Engineer-in-charge and shall comply with IS 800.

2.8.04 DAMAGED MEMBER : Any material found, damaged or defective shall not be used and contractor has to replace the same at his own cost and charges.

2.8.05 PAINTING : Painting shall be conforming to IS 800. One priming coat of Zinc chromate shall be applied immediately after fabrication and two coats of oil paint of approved shade be applied after completion of erection.

2.8.06 INSPECTION AND TESTING : These shall be carried out in conformity with IS 800.

2.8.07 THE RATE INCLUDES FOR :

1. Supplying, fabrication, erecting in position at site the structural steel sections.
2. All labour, materials and use of tools and equipment and painting.

2.8.08 MODE OF MEASUREMENT : The measurement shall be for unit weight.

2.8.09 MODE OF PAYMENT : The contract rate shall be for unit weight.

3.0 SANITARY INSTALLATIONS

3.1 INDIAN WATER CLOSET

3.1.01 GENERAL : The item pertains for providing white or colour glazed vitreous chinaware Indian water closet of size and colour as specified in the schedule including fixing.

3.1.02 MATERIAL : Squatting Pan (Orissa Pattern) is of white or colour glazed vitreous China conforming IS 2556 Part III. Pan shall have flushing rim and are inlet of self draining type. It shall have weep hole at the following inlet to the Pan. The flushing inlet shall be in front unless otherwise specified. The inside of the bottom of the pan shall have sufficient slope from the front to the outlet and surface shall be uniform and smooth to enable easy and quick disposal while flushing. The exterior surface of the outlet below the flange shall be an unglazed surface which shall have groove at right angle to the axis of the outlet. In all the cases pan shall have be provided with 100 mm Glazed Vitreous China `P` or `S` trap with 50 mm water seal and 40 mm size vent

3.1.03 FIXING : The water closet pan shall be placed in position as shown in the drawing. The IWC shall be supported on brick masonry in CM 1:4 or as directed by the Engineer-in-charge. The pan shall be fixed slightly lower than the floor level. If the pan or trap is damaged during handling of fixing, it shall be replaced by the contractor at his own cost. The pan, trap and C.I. pipe shall be jointed in 1:1 Cement Mortar with hemp yarn caulked. The gap between W.C. and floor shall be finished with white/matching cement as directed.

3.1.04 PROTECTION AND FINAL CLEANING : The IWC shall be covered with husk and sand till all the civil and electrical works are completed and shall be removed and cleaned on completion of civil and electrical works prior to testing and handing over. However the contractor should ensure that the out let is plugged with gunny bags or similar materials to avoid the pipe getting blocked.

3.1.05 THE RATE INCLUDES FOR :

1. Water Closet pan with SCI trap `P` or `S` type and jointing in 1:1 cement mortar with hemp yarn caulked.
2. Cutting wall / slab / beam etc. and making all the damage goods to original condition after completion of work.
3. Testing the entire system and rectification of defects, if any.
4. All necessary labour, material and use of tools.

3.1.06 MODE OF MEASUREMENT : The measurement shall be for each unit of W.C. Pan fixed.

3.1.07 MODE OF PAYMENT : The contract rate shall be for each unit of W.C. pan fixed.

3.2 EUROPEAN/ ANGLO INDIA WATER CLOSET :

3.2.01 GENERAL : The item pertains for providing white or colour glazed vitreous chinaware European or Anglo Indian water closet with seat and cover of size and colour as specified in the schedule including fixing.

3.2.02 MATERIAL : European type water closet shall be wash down pattern unless otherwise specified. Water closet shall be vitreous china conforming to IS 2556 (Part-I & II). The closet shall be of one piece construction and shall have minimum two hole of 6.5 mm diameter for fixing closet to floor. Closet shall have an integral flushing rims of self draining type. Each water closet shall have an integral trap with either `S` or `P` outlet with and trap shall be uniform and smooth in order to enable an efficient flush. Plastic seat and cover shall be of black colour or as specified, they shall have conformity to IS2548 Part I & II.

3.2.03 FIXING : The water closet pan shall be placed in position as shown in the drawing. If the pan trap is damaged during handling or fixing, it shall be replaced by the contractor at his own cost. The pan, soil pipe shall be jointed in 1:1 Cement Mortar with hemp yarn caulked. The gap between W.C. and floor shall be finished with white/matching cement and sand as directed. Seat and cover shall be fixed to the Pan by two corrosion resistance hinge with 65 mm shank and threaded to within 25 mm from of flange. Seat shall be fixed in level by providing the washers of rubber with non ferrous or stainless steel washer to bolt.

3.2.04 THE RATE INCLUDES FOR :

1. European type water closet with an integral `P` or `S` trap, plastic seat cover, etc. jointing in 1:1 cement mortar with hemp yarn caulked.
2. Cutting hole in wall / slab / beam etc. wherever required. and making all damages good to original condition after completion of work
3. Testing the entire system and rectification of defect if any.
4. All necessary labour, material and use of tools.

3.2.05 MODE OF MEASUREMENT : The measurement shall be for each unit of W.C. fixed.

3.2.06 MODE OF PAYMENT : The contract rate shall be for each unit of W.C. fixed.

3.3 WASH BASIN :

3.3.01 GENERAL The item pertains for providing colour or white glazed vitreous chinaware wash basin with or without pedestal of size and colour as specified in the schedule including fixing.

3.3.02 MATERIAL :. Wash basins shall be of vitreous china conforming to IS : 2556(Part-IV) of flat back or angle back as specified shall be of one piece construction including combined over flow, basin shall be provided with single or double tap holes of size 28 mm square or 30 mm rounded. Each basin shall have circular waste hole, or 5 sq.cm slot type over flow. Pedestals for wash basin shall be exactly same glazing that of basin. Pedestal shall be capable of supporting the basin and completely recessed at the back to accommodate supply and waste pipes and fittings. The basin shall be supported on pan of C.I cantilever brackets conforming to IS 775. Use of MS angle or Tee Section as bracket is not permitted.

3.3.03 FIXING The wash basin shall be fixed in position as indicated in the drawing. Basin shall be supported on a pair of C.I brackets which is embedded in cement concrete (1:2:4) block 100 x 75 x 150 mm.

Oval shape or round shape wash basins are required to be fixed in RCC platform with stone tapping either fully sunk in stone top or flush with stone topping.

The wall plaster on seat shall be cut to rest over the top edge of the basin so as not to leave any gap for water seepage through between wall plaster & skirting of basin. The gap between basin and wall shall be finished with white matching cement.

3.3.04 THE RATE INCLUDES FOR :

1. Wash Basin with pair of C.I bracket as required.
2. Cutting hole in wall / slab / beam etc. wherever required. and making all damages good to original condition after completion of work.
3. All necessary material, labour and use of tools.

3.3.05 MODE OF MEASUREMENT : The measurement shall be for each unit of wash basing fixed.

3.3.06 MODE OF PAYMENT : The measurement shall be for each unit of wash basin fixed.

3.4 URINAL :

3.4.01 GENERAL : The item pertains for providing colour or white glazed vitreous chinaware urinal in single or range (1,2 & 3) and size as specified in the schedule with necessary fittings and appliances including fixing.

3.4.02 MATERIAL :

3.4.02.1 BOWL TYPE (WITH FLUSHING RIM) : Urinal basin shall be flat back or corner wall type lipped in front. The vitreous china conforming to IS 2556 (Part VI). Urinal shall have and integral flushing rim and inlet or supply horn for connecting flush pipe. Flushing rim and inlet shall be of the self draining type. At bottom of basin and outlet horn for connecting outlet shall be provided. The inside surface of the urinal shall be uniform and smooth throughout to ensure efficient flushing.

3.4.02.2 BOWL TYPE FLAT BACK WITHOUT FLUSHING RIM : They shall be of vitreous china conforming to

IS:2556 (Part-VI) constructed in one piece with providing slot or alternative fixing arrangement at flat back and where the integral flushing rim is not provided, they shall be provided with ridges in side the bowl to divert towards the front line of the urinal.

STALL URINALS : The stall urinal and its screen shall be glazed fire clay conforming IS :771 (Part-III, Sec-2). The inside surface of stall and screen shall be regular and smooth throughout to ensure efficient flushing.

3.4.02.4 CP BRASS FLUSH PIPE : The flushing arrangement to urinals for single or in range shall be of CP brass with CP brass spreader of 15 mm dia conforming to IS : 407. The capacity of flush pipe for urinal in a range shall be as follows :

Nos. of urinals in range	Capacity of flush tank	Size of C.P. brass Flush pipe	
		Main	Distribution
One	5 litres	15mm	15 mm
Two	10 litres	20 mm	15 mm
Three	10 litres	25 mm	15 mm

3.4.03 FIXING :

3.4.03.1 BOAL TYPE FLAT BACK URINAL WITHOUT FLUSHING RIM (Single or Range): Urinal shall be fixed in position by using rawl plug, wooden plug, C.P screws etc. It shall be fixed at height of 65 cm from the standing level to the top of the lip of urinal or as directed by the Engineer-in-charge. Each urinal shall be connected with 32 mm size waste pipe which shall discharge into channel or a floor trap.

3.4.03.2 STALL URINALS : The lip of the stall urinal shall be flush with the finished floor level. The stall urinal shall be laid over a fine sand cushion on average 25 mm thickness. The gap between wall surface, finished floor level and urinals shall not be more than 3mm and filled with water proofing plastic compound.

3.4.03.3 CP BRASS FLUSHING ARRANGEMENT : The flushing arrangement to urinal in single or range shall be of CP brass from 25 mm dia to 15 mm dia and CP brass spreader of 15 mm size to each urinal including the cost of CP brass elbows, tees, coupling, crosses, clamps, clips, union, CP brass check nut and screws etc.

3.4.04 THE RATE INCLUDES FOR :

1. Glazed Urinals(single or in range) and CP brass pipe flushing arrangement including the cost of jointing material.
2. Cutting hole wherever required and making all damage good to original condition after completion of work.
3. Testing the entire system and rectification of defects if any.
4. All necessary materials, labour and use of tools.

3.4.05 MODE OF MEASUREMENT : The measurement shall be for each unit of urinal set (single or range) fixed.

3.4.06 MODE OF PAYMENT : The contract rate shall be for each unit of urinal set (single or range) fixed.

3.5 URINAL SQUATTING PLATE :

3.5.01 Material : The squatting plates shall be of white vitreous china conforming to IS : 2556 (Part-I), IS : 2556 (Part-VI) with internal flushing rim with front or side inlet. Each squatting plat shall have integral longitudinal flush pipe. There shall be of 100 mm dia white glaze vitreous china channel with slope and outlet piece in front.

3.5.02 FIXING : The plate shall be fixed in position. The top edge of squatting plate shall be flush with the finished floor level adjacent to it. It shall be embedded on a layer of 25 mm thick cement mortar 1:6 laid over a bed of cement concrete 1:3:6. Gap between wall, floor etc. shall be finished with white/matching cement.

3.5.03 THE RATE INCLUDES FOR :

1. Urinals(single or in range) squatting plate.
2. Cutting hole wherever required and making all damage good to original condition after completion of work.
3. Testing the entire system and rectification of defects if any.
4. All necessary materials, labour and use of tools.

3.5.04 MODE OF MEASUREMENT : The measurement shall be for each unit of squatting plate (single or range) fixed.

3.5.05 MODE OF PAYMENT : The contract rate shall be for each unit of urinal squatting plate (single or range) fixed.

3.6 MARBLE PARTITION :

3.6.01 GENERAL : The item pertains for providing marble partition of size and colour as specified in the schedule including fixing.

3.6.02 MATERIAL : The partition shall be of 20 mm thick marble slab of size as specified in the schedule. it shall be polished on both sides with exposed to proper shape the exposed edges of Marble shall be made smooth corners rounded. Cracked or damaged marble slab shall not be used in the work and shall be replaced if any by the contractor at his own cost and charges +/- 3mm tolerance shall be permissible for thickness of slab.

3.6.03 FIXING : Partition shall be fixed vertically in position as indicated in the drawing at proper height. 100 mm wide chases shall be cut in the wall and the partition shall embedded at least 50 mm in the wall using 1:2:4 cement concrete. After fixing the partition slab, the chases cut in the wall shall be made good to original condition.

3.6.04 THE RATE INCLUDES FOR :

1. Marble partition slab including cost of cement concrete, cement mortar etc.
2. All necessary labour, material and use of tools.

3.6.05 MODE OF MEASUREMENT : The measurement shall be for each unit of marble partition fixed.

3.6.06 MODE OF PAYMENT The contract rate shall be for each unit of marble partition fixed.

3.7 DIVISION PLATE / PARTITION PLATE :

3.7.01 GENERAL : The item pertains for providing white or colour glazed vitreous chinaware division plate of size and colour as specified in the schedule including fixing.

3.7.02 MATERIAL : Division plate shall be white or colour glazed of size as specified in the schedule, and shall conform to IS .2556 PART VI.

3.7.03 FIXING : Division plate shall be fixed vertically in position at proper height with expandable anchor fasteners, CP brass screws, wooden plugs etc.

3.7.04 THE RATE INCLUDES FOR :

1. Glazed division plate including the cost of CP brass screws, wooden plugs, expandable anchor fasteners etc.
2. All necessary labour, material and use of tools.

3.7.05 MODE OF MEASUREMENT : The measurement shall be for each unit of division plate fixed.

3.7.06 MODE OF PAYMENT : The contract rate shall be for each unit of division plate fixed.

3.8 HALF ROUND CHANNEL :

3.8.01 GENERAL : The item pertains for providing colour or white glazed vitreous chinaware half round channel of size and colour as specified in the schedule including laying and fixing.

3.8.02 MATERIAL: The half round channel shall be of white or colour glazed vitreous chinaware of size as mentioned in the schedule with or without dead end and shall conform to IS 2556 part VII.

3.8.03 FIXING : The channel shall be laid to the correct alignment to required slope. It shall be fixed on 80 mm thick bed of 1:2:4 cement concrete. The channel shall be used in standard length. Pieces are not allow except where it is necessary to make up exact length. The joint and gap shall be finished with white / matching colour cement.

3.8.04 THE RATE INCLUDES FOR :

1. Cement concrete, cutting the channel and wastage etc.
2. Supplying & fixing vitreous china half round channel
3. All necessary labour, material and used of tools.

3.8.05 MODE OF MEASUREMENT : The measurement shall be for unit running meter length of half round channel of specified diameter fixed.

3.8.06 MODE OF PAYMENT : The contract rate shall be for unit running meter of half round channel fixed.

3.9 GLAZED FLOOR TRAP WITH DOME SHAPED GRATING :

3.9.01 GENERAL : The item pertains for providing white glazed vitreous chinaware floor trap with dome shaped C.P. Brass grating of size as specified in the schedule including fixing.

3.9.02 MATERIAL : The trap shape be of white vitreous chinaware of 100 mm dia. or as specified in the schedule with hinged type dome shaped grating of chromium plated brass or stainless steel as specified.

3.9.03 FIXING : The trap shall be laid to the correct alignment and to required slope. The trap shall be fixed on 80 mm thick bed or 1:2:4 cement concrete. The caulking shall be done using 1:1 cement mortar and hemp yarn.

3.9.04 THE RATE INCLUDES FOR :

1. Floor trap, dome shaped grating, concrete, cement mortar etc.
2. Caulking with 1:1 cement mortar with hemp yarn.
3. All necessary labour, material and use of tools.

3.9.05 MODE OF MEASUREMENT : The measurement shall be for each unit of floor trap fixed.

3.9.06 MODE OF PAYMENT : The contract rate shall be for each unit of floor trap fixed.

3.10 TOILET PAPER ROLL HOLDER :

3.10.01 GENERAL : The item includes providing white or colour glazed vitreous chinaware toilet roll holder of size as mentioned in the schedule including fixing.

3.10.02 MATERIAL : The toilet paper roll holder shall be of CP brass or vitreous china on specified and of size and design as approved by the Engineer-in-charge. Toilet paper roll holder shall conform as per IS standard and should have ISI mark.

3.10.03 FIXING : Toilet paper roll holder shall be fixed in position by means of C.P brass covers and rawl plug embedded in the wall. Vitreous china toilet paper roll holder shall fixed into the wall with 1:2 cement mortar. The pocket shall be cut in wall for toilet paper roll holder if not left finishing the gap with white/matching cement.

3.10.04 THE RATE INCLUDES FOR :

1. Toilet paper roll holder, cement, sand, curing etc.
2. Cutting the pocket if they are not left.
3. All necessary labour, material and use of tools.

3.10.05 MODE OF MEASUREMENT : The measurement shall be for each unit of toilet paper roll holder fixed.

3.10.06 MODE OF PAYMENT : The contract rate shall be for each unit of toilet paper roll holder fixed.

3.11 PVC WATER INLET CONNECTION :

3.11.01 GENERAL : The item pertains to providing colour or white PVC water inlet connection for cistern and wash basins.

3.11.02 MATERIAL : PVC water inlet connection shall conform to IS specifications and shall be of standard pattern with nylon insulation of minimum 450 mm long with CP brass check nut at both the end and shall be able to withstand the testing pressure of 1 MPa (10 kg/sq.cm.)

3.11.03 FIXING : The PVC water inlet connection shall be fixed in position as indicated in the drawing or as directed by the Engineer-in-charge for flushing cistern and wash basins.

3.11.04 THE RATE INCLUDES FOR :

1. Supplying and fixing of PVC water inlet connection.
2. All necessary labour, material and use of tools.

3.11.05 MODE OF MEASUREMENT : The measurement shall be for each unit of water inlet connection fixed.

3.11.06 MODE OF PAYMENT : The contract rate shall be for each unit of PVC water inlet connection fixed.

3.12 GLAZED FIRE-CLAY/ VITREOUS CHINA SINK:

3.12.01 GENERAL : Item includes providing white or colour glazed -fire clay sink for kitchen or vitreous china sink for lab as specified in the schedule of quantities including fixing.

3.12.02 MATERIAL : Laboratory sink shall be of vitreous china confirming to IS 2556 (PART-V) and kitchen sink shall be of glazed fire-clay conforming to IS 771 (Part-II) and shall have combined over flow of the weir type and invert shall be 30 mm below the top edge. These shall be of one piece construction and floor of sink shall gently slope towards the outlet. The outlet of sink should be suitable for waste fitting having flanges 88 mm diameter and waste hole of 65 mm diameter. the waster hole shall be either rebated or beveled having the depth of 10 mm. C.I brackets for supporting sink shall confirm to IS: 775.

3.12.03 FIXING : The sink shall be supported on C.I cantilever brackets, embedded in cement concrete 1:2:4 block of size 100 x 75 x 150 mm. Bracket shall be fixed in the position before dado work is done. The height of front edge of sink from floor level shall be 80 cm or as directed by the Engineer-in-charge. The gap between floor/wall and sink shall finish with white cement.

3.12.04 THE RATE INCLUDES FOR :

1. Sink & C.I brackets (Pair) cement, sand etc.
2. All necessary labour, material and use of tools.

3.12.05 MODE OF MEASUREMENT : The measurement shall be for each unit of sink fixed.

3.12.06 MODE OF PAYMENT : The contract rate shall be for each unit of sink fixed.

3.13 STAINLESS STEEL SINK :

3.13.01 GENERAL : Item includes providing the stainless steel sink with or without drain board of size as specified in the schedule including fixing.

3.13.02 MATERIAL The sink shall be manufactured from stainless steel of Salem or equivalent steel conforming to IS: 13983. Stainless steel sink shall be of one piece construction moulded out of 19 SWG (1mm) stainless steel sheet of grade AISI 304 (18/8) with stainless steel choke – stop strainer (waste coupling) checknuts conforming to IS 13983.

3.13.03 FIXING : The sink shall be fixed in position as indicated in the drawing. The sink shall be placed over the brackets or on the platform. Gap between sink and platform / wall shall be finished with white / matching cement.

3.13.04 THE RATE INCLUDES FOR :

1. S.S. sink with waste coupling cement sand etc.
2. All necessary labour, material and use of tools.

3.13.05 MODE OF MEASUREMENT : The measurement shall be for each unit of s.s. sink fixed.

3.13.06 MODE OF PAYMENT : The contract rate shall be for each unit s.s. sink fixed.

3.14 SINK DRAIN BOARD :

3.14.01 GENERAL : The item includes providing white or colour glazed / fire clay drain board of size mentioned in the schedule fixing.

3.14.02 MATERIAL : The drain board shall be manufactured from stainless steel of Salem or equivalent steel conforming to IS: 13983. Stainless steel sink shall be of one piece construction and its thickness not less than 1 mm.

3.14.03 FIXING : The drain board shall be fixed in the position as indicated in the drawing. It shall be place over the brackets or on the platform. Gap between board and platform / wall shall be finished with white /matching cement.

3.14.04 THE RATE INCLUDES FOR :

1. Drain board, cement, sand etc.
2. All necessary labour, material and use of tools.

3.14.05 MODE OF MEASUREMENT : The measurement shall be for each unit of drain board fixed.

3.14.06 MODE OF PAYMENT : The contract rate shall be for each unit of drain board fixed.

3.15 SOAP DISH :

3.15.01 GENERAL : The item includes providing white or colour glazed chinaware type soap dish of size as mentioned in the schedule including fixing.

3.15.02 MATERIAL :. Soap Dish shall be of CP brass or vitreous China on specified and of size, design an approved by the Engineer-in-charge. Soap Dish shall conform to relevant IS standard and should have ISI certification mark.

3.15.03 FIXING : Soap Dish shall be fixed in position by means of C.P brass covers and rawl plug embedded in the wall. Vitreous china Soap Dish shall fixed into the wall with 1:2 cement mortar. The pocket shall be cut in wall, if not left, finishing the gap with white/matching cement.

3.15.04 THE RATE INCLUDES FOR :

1. Soap dish, cement, sand, curing etc.
2. Cutting the pocket if they are not left.
3. All necessary labour, material and the use of tools.

3.15.05 MODE OF MEASUREMENT : The measurement shall be for each unit of soap dish fixed.

3.15.06 MODE OF PAYMENT : Contract rate shall be for each unit of soap dish fixed.

3.16 GLASS MIRROR :

3.16.01 GENERAL : The item providing beveled or plain edges mirror with or without frame of size as mentioned in the schedule including fixing.

3.16.02 MATERIAL : The mirror shall be of superior sheet glass with edges rounded off or beveled, size 600 x 450 mm unless specified in the schedule. It shall be free from flaws, specks or bubbles and thickness plated and should not be less than 5.0 mm. The back of mirror shall be uniformly silver plated and should be free from silvering defects. Silvering shall now have a protective uniform covering of red lid paint, where beveled edge mirror are not available. Fancy looking mirrors with PVC beading/border or aluminum beading on stainless steel beading/border based on manufacturer's specification, provided nothing extra shall be paid on this account. The backing of mirror shall be provided with 6mm thick marine plywood or environmentally friendly material other than asbestos cement sheet.

3.16.03 FIXING : Mirror shall be fixed in position with 6mm thick marine ply wood backing. It shall be fixed by means of 4 nos. of CP brass screws & caps over rubber washers and rawl plug or as per the manufacturer's specification unless specified otherwise the longer side shall be fixed horizontally.

3.16.04 THE RATE INCLUDES FOR :

1. Glass mirror with plywood backing CP screws and CP caps etc.
2. All necessary labour material and the use of tools.

3.16.05 MODE OF MEASUREMENT : The measurement shall be for unit square meter or each unit to glass mirror of size as specified in the schedule.

3.16.06 MODE OF PAYMENT : The contract rate shall be for unit square meter or each unit of glass mirror of size as specified in the schedule.

3.17 GLASS SHELF :

3.17.01 GENERAL : The item includes providing glass shelf of size as mentioned in the schedule including fixing.

3.17.02 MATERIAL : Glass shelf shall consist of an assembly of glass shelf frame of size 600 x 125 mm or as specified in the schedule. It shall be with a pair of CP Brass brackets fixed to the wall with CP screws and CP brass rails alround with guard bar of 6 mm diameter fixed to the glass shelf frame with five numbers CP brass brackets. . The glass shall not be less than 5 mm thick. PVC stainless steel shelf or as per manufacturer`s specification and size as specified in the schedule of work shall be provided.

3.17.03 FIXING : The complete accessories shall be fixed to proper line and level as indicated in drawing with 40 mm long CP brass screws, wooden rawl plug, drilling hole and making good the wall to original condition after fixing the glass shelf.

3.17.04 THE RATE INCLUDES FOR :

1. Glass shelf with glass, CP bracket, guard bars, CP screws etc.
2. All necessary labour material and the use of tools.

3.17.05 MODE OF MEASUREMENT : The measurement shall be for each unit of glass shelf fixed.

3.17.06 MODE OF PAYMENT : The contract rate shall be for each unit glass shelf fixed.

3.18 LIQUID SOAP DISPENSER :

3.18.01GENERAL: The item includes providing CP liquid soap dispenser of shape as mentioned in the schedule including fixing.

3.18.02 MATERIAL : Liquid Soap Dispenser shall be of C.P brass of heavy quality and from list of approved make.

3.18.03 FIXING : The liquid soap dispenser shall be fixed to proper height and level as indicated in drawing with 40 mm long CP brass screws, wooden rawl plug, drilling hole etc. and making good the wall to original condition after fixing.

3.18.04 THE RATE INCLUDES FOR :

1. Liquid soap dispenser with CP brackets CP screws etc.
2. All necessary labour, material and the use of tools.

3.18.05 MODE OF MEASUREMENT : The measurement shall be for each unit of liquid soap dispenser fixed.

3.18.06 MODE OF PAYMENT : The contract rate shall be for each unit of liquid soap dispenser fixed.

3.19 TOWEL ROD/TOWEL RING :

3.19.01 GENERAL :The item includes providing Towel rod / towel ring of size as mentioned in the schedule including fixing.

3.19.02 MATERIAL : Towel rail shall be of C.P brass with two CP brass bracket coated with chromium plating of thickness not less than grade No.2 of IS 4827. The size of rail shall be 600 mm x 20 mm dia unless otherwise specified in the schedule. Towel ring of CP brass with one CP brass bracket with thickness not less than Grade No.2 of IS 4827. The diameter of the ring shall be 175 mm unless otherwise specified in the schedule. The diameter of ring rod shall not be less than 8 mm.

3.19.03 FIXING : The towel rod/ ring shall be fixed to proper line and level as indicated in drawing with CP brass screws, wooden raw plug, drilling hole etc. and making good the wall to original condition after fixing the towel rod.

3.19.04 THE RATE INCLUDES FOR :

1 Towel rod rail/ring CP brackets & screws etc.
2. All necessary labour, material and the use tools.

3.19.05 MODE OF MEASUREMENT : The measurement shall be for each unit of towel rod fixed.

3.19.06 MODE OF PAYMENT : The contract rate shall be for each unit of towel rod fixed.

3.20 SHOWER ROSE :

3.20.01 GENERAL : The item pertains to provide chromium plated brass shower rose of specified diameter with accessories including fixing.

3.20.02 MATERIAL : The shower rose shall be CP brass of approved and heavy quality. It's accessories shall conform to IS 1239 Part II.

3.20.03 FIXING : Shower rose shall be fixed to be water supply pipe line with necessary G.I fittings etc. as required by the Engineer-in-charge. Jointing shall be done with the zinc, spun yarn etc. A few turns of fine hemp yarn dipped in linseed oil shall be taken over the threaded ends to obtain complete water tightness. Leaky joint shall be remade to make it leak proof at his risk & cost.

3.20.04 THE RATE INCLUDES FOR :

1. Shower rose, bend, socket, union/nuts, nipple etc.
2. All necessary labour, material and the use of tools.

3.20.05 MODE OF MEASUREMENT : The measurement shall be for each unit of shower rose fixed.

3.20.06 MODE OF PAYMENT : The contract rate shall be for each unit of shower rose fixed.

3.21 BIB TAP, STOP COCK & ANGLE STOP COCKS :

3.21.01 GENERAL : The item pertains to provide chromium plated brass bib tap and stop cock and angle stop cocks, free flanges (if joined to concealed pipe) including fixing

3.21.02 MATERIAL : Bib cock (Bib tap) is drawn off tap with a horizontal inlet and free out let and a stop cock is a valve with a suitable means of connections for insertion in a pipe line for controlling or stopping the flow. These shall be of size 15 mm size or as specified and shall be of screw down type. The closing device shall work by means of disc. carrying a renewable non-metallic washer with shuts against the water pressure on a seating right angles to the axis of the threaded spindle which operates it. The handle shall be crutch, butterfly or fancy design type securely fixed to the spindle. The tap shall open anti clock wise direction.

Brass bib taps and stop cocks and angle stop cocks shall conform to IS 781, they shall be polished bright. The minimum finished weight of different sizes of bib tap weight of 15 mm size bib tap and stop cock shall be as per table given below. They shall be sound and free from taps, blow hole and fitting. Internal & External surface shall be clean, smooth and free from sand and neatly dressed. Taps shall be nickel chromium plated and thickness of coating shall not be less than service grade No.2 of IS 4827 and plating shall be capable of taking high polish which shall not be easily tarnished.

MINIMUM FINISHED MASS OF BIB TAPS AND STOP VALVES AS PER IS 781:1984 (Reaffirmed 2001)

Size	Minimum Finished Mass			
	bib taps	Stop Valves		
		Internally threaded	Externally threaded	Mixed end
1	2	3	4	5
Mm	kg	kg	kg	Kg
8	0.250	0.220	0.250	0.235
10	0.330	0.330	0.350	0.325
15	0.400	0.330	0.400	0.365
20	0.750	0.675	0.750	0.710
25	1.250	1.180	1.300	1.250
32	-	1.680	1.800	1.750
40	-	2.090	2.250	2.170
50	-	3.700	3.850	3.750

Every tap complete with its component shall with stand an internally applied hydraulic pressure of 2 MPa (20 kg/sq.cm) maintained for a period of 2 minutes during the period it shall neither leak nor sweat. Leaky joint shall be remade to make it leak proof without any extra cost from contractor.

3.21.04 FIXING : Bib tap stop cock shall be fixed to the pipe line with C.P. brass or G.I. specials, if required or as ordered by Engineer-in-charge. Jointing shall be done with white zinc, spun yarn etc. A few turns of fine hemp yarn dipped in linseed oil shall be taken over the threaded ends to obtain complete water tightness.

3.21.04 THE RATE INCLUDES FOR :

1. Bib tap and stop cock, special etc.
2. All necessary labour, material and the use of tools.

3.21.05 MODE OF MEASUREMENT : The measurement shall be for each unit of bib tap and stop cock fixed.

3.21.06 MODE OF PAYMENT : The contract rate shall be for each unit of bib tap or stop cock angle stop cock fixed.

3.22 COMBINATION TAP ASSEMBLY (WALL / PILLAR MOUNTED) :

3.22.01 GENERAL : The item pertains to provide chromium plated brass combination tap assembly, wall mounted hot & cold mixing for bath ,pillar mounted hot & cold mixing for sink ,basin, tub etc. including free flanges and fixing.

3.22.02 MATERIAL : The combination tap assembly shall be 15 mm nominal size or as specified in the schedule. It shall be of C.P. brass approved and heavy quality, and shall conform to I.S. 8931.

Combination tap assembly shall be chromium plated-brass and shall conform to IS 8931.The nominal size of combination tap assembly shall be 15 mm nominal size or as specified. Casting of combination tap assembly shall be sound and free from laps, blow hole and pitting. External and internal surface shall be clean, smooth and free from sand and be neatly dressed. All the parts fitted to pillar tap shall be axial, parallel and cylindrical with surfaces smoothly finished. Thickness of C.P coating shall not be less than service grade no.2 of IS 4827 and plating should be capable of taking high polish which shall not easily tarnish or scale.

3.22.03 TESTING : Combination tap assembly shall withstand and internally applied hydraulic pressure of 1.6Mpa (16 kg/ sq.cm) for period of 1 minutes during which, it shall neither leak nor sweat. Leaky joint shall be remade to make it leak proof.

3.22.04 FIXING : Combination tap assembly shall be fixed to the pipe line as indicated in the drawing with necessary special as required or as ordered by Engineer-in-charge. Jointing shall be done with white zinc, spun yarn etc. A few turns of fine hemp yarn dipped in linseed oil shall be taken over the threaded ends to obtain complete water tightness.

3.22.05 THE RATE INCLUDES FOR :

1. Combination tap assembly (wall mounted / pillar mounted as specified in the schedule of work) including free flanges and fixing.
2. All necessary labour, material and the use of tools.

3.22.06 MODE OF MEASUREMENT : The measurement shall be for each unit of combination tap assembly fixed.

3.22.07 MODE OF PAYMENT : The contract rate shall be for each unit of combination tap assembly fixed.

3.23 PILLAR TAP : (Non fancy & Fancy Type)

3.23.01 GENERAL : The item pertains to provide chromium plated brass pillar tap including fixing.

3.23.02 MATERIAL : The pillar tap shall be 15 mm nominal size or as specified in the schedule. Fancy type pillar tap shall be of C.P. brass approved quality and shall conform to I.S. 8931. Non fancy pillar tap shall be chromium plated-brass and shall conform to IS 1795. The nominal size of Pillar tap shall be 15 mm or as specified.

Casting of Pillar tap shall be sound and free from laps, blow hole and pitting. External and internal surface shall be clean, smooth and free from sand and be neatly dressed. All the parts fitted to pillar tap shall be axial, parallel and cylindrical with surfaces smoothly finished. The minimum of finish weight of Pillar tap shall not be less than 650 grams (body weight 250 gms, washer plate loose valve 150 gms and back nut 40 gms. Thickness of C.P coating shall not be less than service grade no.2 of IS 4827 and plating should be capable of taking high polish which shall not easily tarnish or scale.

3.23.03 TESTING: Pillar tap shall withstand and internally applied hydraulic pressure of 2 MPa (20 kg/sq.cm) for period of 2 minutes during which period, it shall neither leak nor sweat. Leaky joint shall be remade to make it leak proof without any extra cost from the contractor.

3.23.04 FIXING: Pillar tap shall be fixed to the pipe line as indicated in the drawing with necessary special as required or as ordered by Engineer-in-charge. Jointing shall be done with white zinc, spun yarn etc. A few turns of fine hemp yarn dipped in linseed oil shall be taken over the threaded ends to obtain complete water tightness.

3.23.05 THE RATE INCLUDES FOR :

1. Pillar tap including fixing.
2. All necessary labour, material and the use of tools.

3.23.06 MODE OF MEASUREMENT : The measurement shall be for each unit of pillar tap fixed.

3.23.07 MODE OF PAYMENT : The contract rate shall be for each unit of pillar tap fixed.

3.24 FLUSH VALVE :

3.24.01 GENERAL : The items pertains to provide chromium plated brass flush valve or brass concealed type flush valve with necessary accessories including fixing. (Free flanges if joined to concealed pipes)

3.24.02 MATERIAL : The Flush valve shall be nominal diameter as specified in the schedule of quantities. It shall be of C.P. brass approved and heavy quality, and shall conform to I.S. 9758. The fresh valve shall have working pressure of 0.15 to 0.5 MPa. The valve shall be tested to a Hydraulic pressure of 2 MPa for 2 minutes.

3.24.03 FIXING : Flush value shall be fixed to the pipe line as indicated in the drawing with necessary special as required or as ordered by Engineer-in-charge. Jointing shall be done with white zinc, spun yarn etc. A few turns of fine hemp yearn dipped in linseed oil shall be taken over the threaded ends to obtain complete water tightness. Leaky joint shall be remade to make it leak proof.

3.24.04 THE RATE INCLUDES FOR :

1. Flush valve, connecting pipe, socket, union, nipple, wall flanges if connected to concealed pipe.
2. All necessary labour, material and the use of tools.

3.24.05 MODE OF MEASUREMENT : The measurement shall be for each unit of flush valve fixed.

3.24.06 MODE OF PAYMENT : The contract rate shall be for each unit of flush valve fixed.

3.25 BATH TUB (Enamelled steel sheet) :

3.25.1 GENERAL : Item includes providing sheet steel bath tub of size and without side panel as specified in the schedule of quantities including fixing or placing.

3.25.2 MATERIAL : The bath tub shall conform to IS 3489. The bath tub shall be constructed of the fewest practicable number of sections which shall be such as to ensure a suitable finished surface for the reception of the enamel coating. Any welded surface shall be adequately cleaned off inside and outside the bath tub. The necessary surface shall be free from undulations, drawing line and other defects deleterious to the provision of a satisfactory enamel coating.

The interiors of the bath tub shall be adequately and evenly coated with vitreous enamel**.** The enamelling shall conform to IS : 772. Thickness of the enamel shall not be less than 0.2 mm and not more than 0.5 mm, External surface of the bath tub shall be given one ground or primer enamel coating. Gloss, colour & opacity shall be uniform and visually satisfactory. The finish shall be free from crazing, dimples, rundown sagging tilters not more than two in number on the interior surface, pinholes not more than two in number for coloured bath tubs and not more than four for white enamelled bath tubs, specks shall be less than one mm in size and max. five in number and there shall be no grouping of pinholes and specks. Warpage of edges set against wall or floor and edges of roll rims shall not exceed 5 mm/m, warpage of all other edges shall not exceed 7.5 mm/m.

In forming the roll the outer edges shall be flanged or rolled back underneath sufficiently to prevent exposure of sharp edges. The vertical height of the flanged or rolled edges shall be not more than 30 mm. At the tap end of the roll, there shall be a level area within a radious of at least 25mm from the centre of each tap hole.

3.25.3 FIXING : The bath tubs shall be as flat bottomed as practicable. The fall (slope) long the bottom head end to outlet shall be adequate for complete emptying. The waste hole shall be so formed as to be suitable for receiving 40 mm waste fitting. The bath tubs shall be provided at the tap end, with effective means of attaching an earth continuity conductor. With each bath tab, two spacing washers of suitable thickness to take up the difference between the thickness of the metal of the bath tub and the depth of the seating on pillar taps shall be supplied. In addition, two fibre or lead washers for each tap shall be supplied for fitting above and below the tap roll to prevent the enamel from erasing when the taps are tightened in position.

3.25.4 THE RATES INCLUDES FOR :

1. Enamelled sheet steel bath tub.
2. Placing/fixing the tub on C.I./MS supports.
3. Fixing the side panel if specified in schedule of quantities.
4. All necessary labour, material and use of tools.

3.25.5 MODE OF MEASUREMENT :- The measurement shall be for each unit of bath tub fixed or placed.

3.25.6 MODE OF PAYMENT : The contract rate shall be for each unit of bath tub fixed or placed.

3.26 BATH TUB : (Gel coated G.R.P. resin)

3.26.1 GENERAL : Item includes providing gel coated glass fibre reinforced polyester resin bath tub of size and with or without panel as specified in the schedule of quantities including fixing or placing.

3.26.2 MATERIAL : The bath tub shall conform to IS 6411. The fibre glass used in the manufacture of bath tubs shall be non alkaline conforming to `E' type or `A' type Grade. The proportion of the glass fibre shall not be less than 25% of the glass fibre reinforced polyester layer including gel coated layer. Unsaturated polyester resin used in the manufacture of bath tubs shall be resistant to not water and weathering. When filler and colouring materials are used, their quality and proportion should be compatible to the polyester and the materials shall not have any harmful effect on the quality and performance of bath tubs. The bath tub shall posses a uniform gel-coat on the working surface. The resin used in the gel-coat shall be isopthalic grade of polyester or epoxy resin or any equally suitable chemical resistant grade of resin. The get-coat shall not be less than 0.25 mm thickness nor more than 1.00 mm thickness.

In forming the roll, the outer edges shall be flanged or rolled back underneath sufficiently to prevent exposure of sharp edges. The vertical height of the flanged or rolled edges shall be not more than 30 mm. At the tap end of the roll, there shall be a level area within a radious of at least 25mm from the centre of each tap hole.

3.26.3 FIXING : The bath tub shall be one piece unit with an opening for waste outlet with floor sloping towards the outlet. An overflow shall normally be provided on the side near the waste outlet. An apron (side panel) may be provided, integrally or separately with the bath tub as specified in schedule of quantities. The waste opening shall be suitable for the proper installation of waste fittings which are ordinarily used for the purpose. The bath tub shall be provided with a supporting structure integral to the unit in between the space between the bottom of the bath tub and the floor of the building on which the bath tub rests unless otherwise specified. The materials of the supporting structure shall be at least equal to the material of the bath tub in resistance to deterioration with age and shall meet the requirement of fungus and vermin.

3.26.4 THE RATES INCLUDES FOR :-

1. Gel-coated G.R.P.R. bath tub.
2. Placing/fixing the tub on supports.
3. Fixing the side panel if specified in schedule of quantities.
4. All necessary labour, material and use of tools.

3.26.5 MODE OF MEASUREMENT : The measurement shall be for each unit of bath tub fixed or placed**.**

3.26.6 MODE OF PAYMENT : - The contract rate shall be for each unit of bath tub fixed or placed.

3.27 WASTE COUPLING :

3.27.01 GENERAL : The item pertains to provide chromium plated brass waste coupling including fixing.

3.27.02 MATERIAL : Waste Coupling shall confirm to IS 3311.Waste fittings shall be of CP with thickness of CP coating not less than service Grade No.2 of IS 4827 which is capable of receiving polish and will not easily scale off. The fitting shall conform in all respect to IS 2963 and shall sound, free from laps below, holes and fittings and other manufacturing defects. External and internal surface shall be clean and smooth. They shall be neatly dressed. The waste fitting for wash basin shall be of nominal size of 32 mm and for sink shall be nominal size 50 mm.

3.27.03 FIXING : Waste coupling shall be fixed to wash basin, sink or urinal as ordered with necessary specials. Jointing shall be done with white zinc, yarn etc. A few turns of fine hemp yarn dipped in the linseed oil shall be taken over the threaded ends to obtain complete water tightness. Leaky joint shall be remade to make it leak proof.

3.27.04 THE RATE INCLUDES FOR :

1. Waster coupling with necessary specials.
2. All necessary labour, material and the use of tools.

3.27.05 MODE OF MEASUREMENT : The measurement shall be for each unit of waste coupling fixed.

3.27.06 MODE OF PAYMENT : The contract rate shall be for each unit of waste coupling fixed.

3.28 BOTTLE TRAP :

3.28.01 GENERAL : The item pertains to provide chromium plated brass bottle trap including fixing.

3.28.02 MATERIAL : Bottle trap shall be of C.P with thickness of CP coating not less than service grade No. 2 of IS 4827 which is capable of receiving polish and will not easily scale off. The fitting shall conform in all respect of IS 2963 and shall be sound, free from laps below, holes and fittings and other manufacturing defects. External and internal surface shall be clean and smooth. They shall be neatly dressed and be truly machined so that nut smoothly moves on the body. The Bottle trap for wash basin shall be of nominal size of 32 mm and for sink shall be nominal size 50 mm.

3.28.03 FIXING : Bottle trap shall be fixed to wash basin, sink or urinal as indicated in the drawing with necessary specials or as ordered by the Engineer-in-charge. Jointing shall be done with white zinc, spun yarn etc. A few turns of fine hemp yarn dipped in linseed oil shall be taken over the threaded ends to obtain complete water tightness. Leaky joint shall remade to make it leak proof.

3.28.04 THE RATE INCLUDES FOR :

1. Bottle trap with necessary specials.
2. All necessary labour, material and the use of tools.

3.28.05 MODE OF MEASUREMENT : The measurement shall be for each unit of bottle trap fixed.

3.28.06 MODE OF PAYMENT : The contract rate shall be for each unit of bottle trap fixed.

3.29 COAT AND HAT HOOK :

3.29.01 GENERAL : The item pertains to provide chromium plated brass coat and hat hook including fixing

3.29.02 MATERIAL : Coat & Hook shall be of three way type of approved and heavy quality. Coat & Hat Hook shall be CP brass and three way hook type or minimum six way patti type of 125 mm x 30 mm x 6mm size. CP coating shall not be less than service grade No.2 of IS 4827.

3.29.03 FIXING : The Coat and hat hook shall be fixed to proper line & level as indicated in drawing with CP brass screws.

3.29.04 THE RATE INCLUDES FOR :

1. Coat and hat hook with CP screws etc.
2. All necessary labour, material and the use of tools.

3.29.05 MODE OF MEASUREMENT : The measurement shall be for each unit of coat and hat book fixed.

3.29.06 MODE OF PAYMENT : The contract rate shall be for each unit of coat and hook fixed.

3.30 FLUSHING CISTERN :

3.30.01 GENERAL : The item pertains to provide white or colour glazed chinaware / PVC / Cast Iron flushing cistern with all inside syphonic fitting including fixing.

3.30.02 MATERIAL : The flushing cistern shall be automatic or manually of rates high level or low level as specified for water closets and urinals.

Cisterns shall be of cast iron, vitreous china, enamelled pressed steel conforming to IS 774 for Flushing Type and IS 2326 for Automatic flushing cistern and Plastic (IS 7231). Cistern shall be mosquito proof. All working parts shall be designed to operate smoothly and efficiently. the cistern shall have removable covers which shall fit closely on it and be screwed against top displacement where operating mechanism is attached to the cover. This may be made in two section, but the section supporting the mechanism shall be securely fitted or screwed to the body. The outlet fitting of the cistern shall be securely connected to the cistern. The nominal internal diameter of the cistern outlet shall not be less than 32 mm and 38 mm for high level and low level respectively. Length of outlet cistern shall be 37 +/- 2 mm. Ball valve shall be screwed type 15 mm in diameter and shall confirm of IS 1703. The flat shall be made of polyethylene as specified in IS 9762. A high level cistern is intended to operate with minimum height of 125 cm and a low level cistern with maximum height of 30 cm between the top of the pan and under side of the cistern. A G.I chain strong enough to sustain a sudden applied pull of 10 kg or a dead load of 50 kg without any apparent or permanent deformation of the chain rings shall be attached to the ring or hook of the level manually operated high level C.I cistern. In case of low level cistern handle shall be of CP brass. In case of Plastic cistern, operation of cistern shall be through Push Button at the top for dual system and beyond plastic handle.

The discharge rate of the cistern as per IS 774 shall be 10 +/- .5 litres 6 second and 5 +/- .5 litres in 3 second for cistern capacity 10 ltrs. and 5 ltrs. respectively. Flush pipe shall be of class `B` G.I pipe of 32 +/- mm diameter for high level. Polyethylene flush pipe shall be low density confirming to IS 3076 or high density confirming to IS 4984 or UPVC pipe confirming to IS 4965 of 40 mm outer diameter.

Over flow pipe shall be of G.I. / PVC with mosquito proof jalli of 15 mm dia.

3.30.03 FIXING: The chinaware flushing cistern shall be placed over a pair of C.I. brackets. C.P. brass flush pipe shall be fixed to cistern and W.C. pan using check nut, spun yarn, cement mortar etc.

The cast iron flushing cistern shall be placed over a pair of C.I. or G.I. or PVC flush pipe of specified diameter shall be fixed to cistern and W.C. pan by using check nut, white zinc, spun yarn, cement mortar etc.

The PVC flushing cistern shall be placed or fixed as recommended by the manufacturer, PVC flush pipe of specified diameter shall be fixed to cistern and W.C. pan by using check nut, white zinc, spun yarn, cement mortar etc.

3.30.04 THE RATE INCLUDES FOR :

1. Supply and fixing flush tank, flush pipe and over flow pipe.
2. Painting all the metallic parts with two coats of flat oil paint over a coat of primer.
3. Cutting hole in wall / slab / beam etc. wherever required and making good the same to original condition after fixing.
4. Cost of jointing materials such as zinc, spun yarn, cement mortar 1:1 etc.
5. Testing the entire system and rectification of defects, if any.
6. All necessary materials, labour and use of tools.

3.30.05 MODE OF MEASUREMENT : The measurement shall be for each unit of flushing cistern fixed as a whole.

3.30.06 MODE OF PAYMENT : The contract rate shall be for each unit flushing cistern fixed as a whole.

3.31 BRACKET :

3.31.01 GENERAL : The item pertains to provide a pair of bracket for wash basin, sink, flushing cistern etc. including fixing.

3.31.02 GENERAL : The item pertains to provide a pair of bracket for wash basin, sink, cistern etc, including fixing.

3.31.03 FIXING : Brackets shall be embedded into or fixed to the wall with plugs, screws, nails etc. Hole shall be made in the wall, if they are not left for fixing the brackets and shall be made good after fixing. The gap shall be filled with 1:2 cement mortar and finishing shall be done with white / matching colour cement.

3.31.04 THE RATE INCLUDES FOR :

1. Supplying and fixing the brackets.
2. Painting brackets with two coats of flat oil paint over a coat of primer.
3. Cutting hole in wall beam etc. wherever required and making good the same to original condition after fixing.
4. All necessary materials, labour and use of tools.

3.31.05 MODE OF MEASUREMENT : The measurement shall be for each pair of bracket fixed included in the items of sink, wash basin, cistern etc. as specified in schedule of quantities.

3.31.06 MODE OF PAYMENT : The contract rate shall be for each pair of bracket fixed.

4.0 : WATER SUPPLY SYSTEM:

4.1 G.I. PIPING WORK (Exposed) :

4.1.01 GENERAL : The item includes provision of G.I. pipes with G.I. fitting of specified nom. bore and class as mentioned in the schedule including laying, fixing. The G.I. pipes and fittings shall run on the surface of the walls or ceilings unless otherwise specified.

4.1.02 MATERIAL : The pipes and fittings shall be of M.S. galvanised as specified in the schedule. They shall conform to IS 1239 (P-I). All the pipes and fitting shall have ISI certification mark. The specified nominal bore of the pipe shall refer to inside approximate bore according to the thickness corresponding to outside fixed diameter. The pipe and fittings shall be smooth, sound, free from any imperfections and neatly dressed. The pipe and fitting shall be able to withstand a hydrostatic test pressure of 5 MPa (50 Kg/cm2) maintained for at least 3 seconds at manufacturing works (lab test). The table showing the dimensions and different bores of pipes are given below.

WEIGHT OF GALVANISED & BLACK (BOTH) M.S. TUBES FOR ORDINARY USES IN WATER CONFORMING TO IS: 1239 (PART-1) 2004

Nominal Bore	Class	Outside Diameter		Wall thickness	Nominal Weight (Kg/M)	
		Maximum.	Minimum			
		Mm	mm	in mm	Plain Ended	Screwed & Socketed
15	L	21.4	21.0	2.0	0.947	0.956
	M	21.8	21.0	2.6	1.21	1.22
	H	21.8	21.0	3.2	1.44	1.45
20	L	26.9	26.4	2.3	1.38	1.39
	M	27.3	26.5	2.6	1.56	1.57
	H	27.3	26.5	3.2	1.87	1.88
25	L	33.8	33.2	2.6	1.98	2.00
	M	34.2	33.3	3.2	2.41	2.43
	H	34.2	33.3	4.0	2.93	2.95
32	L	42.5	41.9	2.6	2.23	3.27
	M	42.9	42.0	3.2	3.10	3.13
	H	42.9	42.0	4.0	3.79	3.82
40	L	48.4	47.8	2.9	3.23	3.27
	M	48.8	47.9	3.2	3.56	3.60
	H	48.8	47.9	4.0	4.37	4.41
50	L	60.2	59.6	2.9	4.08	4.15
	M	60.8	59.7	3.6	5.03	5.10
	H	60.8	59.7	4.5	6.19	6.26
65	L	76.0	75.2	3.2	5.71	5.83
	M	76.6	75.3	3.6	6.42	6.54
	H	76.6	75.3	4.5	7.93	8.05
80	L	88.7	87.9	3.2	6.72	6.89
	M	89.5	88.0	4.0	8.36	8.53
	H	89.5	88.0	4.8	9.90	10.10
100	L	113.9	113.0	3.6	9.75	10.00
	M	115.0	113.1	4.5	12.20	12.50
	H	115.0	113.1	5.4	14.50	14.80
125	M	140.8	138.5	4.8	15.90	16.40
	H	140.8	138.5	5.4	17.90	18.40
150	M	166.5	163.9	4.8	18.90	19.50
	H	166.5	163.9	5.4	21.30	21.90

Mark	Class	Colour Code	TOLERANCES					
			THICKNESS		WEIGHT			
					For Single Tube		For 10 tones load	
			(+)	(-)	(+)	(-)	(+)	(-)
L	"Light " class	Yellow Band	Not limited	8.0%	10.0%	8.0%	7.5%	5.0%
M	"Medium"" class	Blue Band	Not limited	10.0%	10.0%	10.0%	7.5%	7.5%
H	"Heavy" class	Red Band	Not limited	10.0%	10.0%	10.0%	7.5%	7.5%
Random length of tube:- unless otherwise specified 4.0 to 7.0 m includes one socket for screwed & socketed tubes			COATING:- Zinc coating as per IS 4736 (latest revision)					

4.1.03 LAYING : The plumbing contractor shall set the layout of the plumbing approved by the Engineer-in-charge as may be required by the bye-laws. Pipes shall be laid in plumb and in straight and parallel lines. When unavoidable, pipes may be buried for short distances provided additional protection is given against damage and where so required joints are not buried. Where directed by the Engineer –in-charge, A M.S. tube sleeve shall be fixed at a place the pipe is passing through a wall or floor for reception of the pipe and to allow freedom for expansion ,contraction and other movements. In case the pipe is embedded in walls or floors the pipes shall be painted with anticorrosive bitumastic paints of approved quality. The pipe shall not come in contact with mortar or lime concrete as the pipe is affected by lime. Under the floors the pipe shall be laid in layer of sand filling as done under concrete floors.

4.1.04 FIXING : The entire pipe line shall be fixed in position as shown in the drawing or as directed by the Engineer-in-charge. All pipes shall be fixed truly vertical and horizontal unless unavoidable. The pipe line shall be supported with "U" type G.I. clamps not less than 2 mm thick and G.I. nails not less than 40 mm long, wooden gutties etc keeping the pipe about 15 mm clear of the wall .

Spacing between clamps for fixing internal piping shall be as per IS 2065 – 1983 as given below :

Nom. bore of pipe	For Horizontal Runs	For Vertical Runs
15mm	2.0 M	2.5 M
20 mm to 32 mm	2.5 M	3.0 M
40 mm to 50 mm	3.0 M	3.5 M
65 mm to 80 mm	3.5 M	5.0 M

No joints shall be located inside the wall. If the pipe is required to be cut and the end threaded, the hums of the cut end shall be filed smooth and any obstruction in bore shall be entirely eliminated, down take line shall be provided with union of every floor for easy maintenance. This shall be made of line threaded pipe ends and coupler with check nut to avoid leakage. Die cast union shall not be permitted in the shaft.

4.1.05 JOINTING : While fixing the pipe line the joints shall be made by applying a few turns of hemp yarn dipped in linseed oil shall be taken over the threaded end of the pipe and socket screwed home using the pipe wrench, pipe connected shall touch each other and the socket covering each end about equally. The branch connection shall not protrude in the bore of parent pipe.

4.1.06 PAINTING : G.I. pipes and fittings running exposed shall be painted with two coats of oil paint of approved make and shade over a coat of approved primer.

4.1.07 TESTING : The pipes and fittings after they are laid and jointed shall be tested to hydraulic pressure of 1 MPa (10 Kg/sq.cm). The pipes shall be slowly and carefully charged with water allowing all air to escape and avoiding all shock or water hammer. The draw off 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 2 (two) hours. The pipes and fittings shall be tested in sections as the work of paying proceeds, having the joints exposed for inspection during the testing. Pipes or fittings which are found leaking shall be replaced and joints found leaking shall be redone, without extra payment.

4.1.08 THE RATE INCLUDES FOR :

1. Supplying GI pipes and GI fittings such as sockets, elbows, bends, tees, enlargers, reducers, checknuts, plugs, unions etc. of specified diameter & class including hemp yarn, linseed oil, clamps, screws, wooden gutties etc.
2. Laying, jointing and fixing the pipe with fittings including threading, cutting pipes, wastage etc.
3. All necessary materials, labour and use of tools

4.1.09 MODE OF MEASUREMENT : The measurement shall be for unit running metre length of pipe line of specified nom. bore laid or fixed and shall be taken along center line of the pipe line.

4.1.10 MODE OF PAYMENT : The contract rates shall be for unit running metre length of pipe line of specified nom. bore laid or fixed. No extra payment shall be made for fitting and fixtures.

4.2 G.I. PIPING WORK (Concealed) :

4.2.01 GENERAL : The item includes provision of G.I. pipes with concealed type fittings of specified nom. bore and class mentioned in the schedule including laying, fixing, wrapping with hessian cloth, painting and testing.

4.2.02 MATERIAL : Please refer clause 4.1.02

4.2.03 CHASES : Chases of size 75 mm x 75 mm shall be cut in the wall, floor, slab wherever required or as directed by chases cutting machine. After testing the pipe line the chases shall be filled with cement mortar 1:3 and surface made good to its original condition.

4.2.04 LAYING : : The plumbing contractor shall set the layout of the plumbing approved by the Engineer-in-charge as may be required by the bye-laws. Pipes shall be laid in plumb and in straight and parallel lines. No lime plaster or composition containing lime shall be allowed to come in direct contract with the pipe, which are to be concealed as the pipe is affected by lime.

4.2.05 FIXING : The entire pipe line shall be fixed in position as shown in the drawing or as directed by the Engineer-in-charge. All pipes and fittings, which are to be concealed, shall be properly embedded in the wall, flooring etc. after being treated. No moulding or plaster design or any ornamental plaster work shall be done over the walls or flooring or ceiling where concealed pipes have been laid.

If the pipe is required to be cut and the end threaded, the burns of the cut end shall be filed smooth and any obstruction in bore shall be entirely eliminated.

4.2.06 JOINTING : Please refer Clause No. 4.1.05

4.2.07 PAINTING : All the concealed piping work shall be thoroughly painted with two coats of anti-corrosive black bitumastic paint of approved quality shade over a coat of approved primer before concealing and filling the mortar.

4.2.08 INSULATION : The hot water pipe line concealed on the wall, floor etc. after painting shall be insulated with 2.5 mm thick 95% asbestos magnesia compound of approved make all round the pipe and fittings.

4.2.09 WRAPPING : After painting the cold water pipe line, it shall be wrapped with two layers of hessian cloth of approved quality.

4.2.10 TESTING : Please refer clause No.4.1.07

4.2.11. THE RATE INCLUDES FOR :

1. Supplying GI pipes and concealed type G.I. fittings such as sockets, elbows, bends, tees, enlargers, reducers, checknuts, plugs, unions etc. of specified diameter and class including hemp yarn, linseed oil etc.
2. Laying, jointing and fixing the pipe with fittings including threading, cutting pipes, wastage, etc.
3. Wrapping the cold water pipe line with hessian cloth including painting and testing.
4. Wrapping the hot water pipe line with asbestos cloth
5. Cutting 75 mm x 75 mm size chases in the wall, floor, slab, etc. and making good the same using 1:3 cement mortar after the pipeline is laid.
6. All necessary materials, labour and use of tools.

4.2.12 MODE OF MEASUREMENT : The measurement shall be for unit running metre length of pipe line of specified nom. bore laid or fixed and shall be measured along the center line of the pipe line.

4.2.13 MODE OF PAYMENT : The contract rate shall be for unit running metre length of pipe line of specified nom. bore laid or fixed. No extra payment shall be made for fittings and fixtures.

4.3 UNDER GROUND G.I. PIPING WORK :

4.3.01 GENERAL : The item includes supplying G.I. pipes and fittings of specified nom. bore and class as mentioned in the schedule including laying, jointing and painting.

4.3.02 MATERIAL : Please refer clause 4.1.02

4.3.03 TRENCHES : The galvanised iron pipes and fittings are to be laid in trenches. The widths and depths of the trenches for different diameter of the pipes shall be as given below :

Diameter of pipe (mm)	Min. Width of trench (mm)	Min. Depth of trench (mm)
15 to 50	300	600
65 to 100	450	750

When excavation is done in rock, it shall be cut deep enough to permit the pipes to be laid on a cushion of sand of min. 7.5 cm.

At joints the trench width shall be widened where necessary. The work of excavation and refilling shall be done true to line and gradient in accordance with general specifications for earth work in trenches as per clause 2.0.

4.3.04 LAYING : Where a pipe is to be laid under ground, the particular length of pipe should be protected by first painting before laying and then wrapping around the pipe a layer of jute or hessian cloth in the form of bandage, so that this cloth in the form of bandage, stick to the composition which has been freshly applied.

The pipe shall be laid into the trench and screwed with sockets, elbows, tees, bends etc. as necessary. The pipe line laid near electric train lines, power transmission lines, electric railway, power houses etc. should be provided with insulating joints at frequent intervals to guard against electrolysis.

Pipes shall be so laid as not to expose to sun or be subjected to any injury or risk to the pipe. As far as possible pipes shall be laid in straight and parallel lines. They shall be used in standard length pipe pieces being used only where necessary to make up the exact length.

4.3.05 JOINTING : Please refer clause No. 4.1.05

4.3.06 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.

4.3.07 TESTING : Same as clause 4.1.07

4.3.08 PAINTING : G.I. pipes and fittings shall be painted with two coat of anticorrosive paint before pipe line is laid and wrapping the pipe and fitting with jute or hessian cloth in the form of bandage.

4.3.09 THE RATE INCLUDES FOR :

1. Supplying G.I. pipes and fittings such as sockets, elbows, bends, tees, enlarges, plugs, reducers, checknuts, unions etc. of specified diameter including hemp yarn, linseed oil etc.
2. Laying, jointing and fixing the pipe with fittings including threading, cutting pipes, wastage etc.
3. Covering with hessian cloth, painting and testing the pipe line.
4. Dewatering the trench or pit till completion of work.
5. All necessary labour, material and use of tools.

4.3.10 MODE OF MEASUREMENT : The measurement shall be for unit running metre length of pipe line of specified nom. bore laid or fixed and shall be measured along the center line of the pipe line.

4.3.11 MODE OF PAYMENT : The contract rate shall be for unit running metre length of pipe line of specified nom. bore laid or fixed. No extra payment shall be made for fittings and fixtures.

4.4 HIGH DENSITY POLYETHYLENE PIPING WORK FOR WATER SUPPLY :

4.4.01 GENERAL : The item includes supplying of HDPE pipes with fittings of specified diameter including laying, fixing, cutting, jointing.

4.4.02 MATERIAL : The pipes and fittings shall conform to series IV of IS 4984. HDPE pipes and fittings shall be free from cracks, flaws and defects and shall be able to withstand a pressure as mentioned in the schedule.

4.4.03 EXAMINING : Before laying the pipe line, if 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.

4.4.04 LAYING : The pipes shall be carefully laid straight to the correct alignment in gradients as indicated in the drawing. All the 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 through out. 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.

4.4.05 FIXING : 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 mm thick or with suitable diameter HDPE clamps. The clamps shall be fixed into the wall with M.S. nails not less than 40 mm long./ Wooden gutties etc. chromium plated screws with wooden gutties fixing the pipe line on internal wall surface.

4.4.06 MAKING JOINT : The joining of pipes and fittings generally shall be done by Butt weld with heat mirror jointing. The pipe shall be cut to desired length, Care shall be taken that profile of cut surfaces is not changed and the fibrous material shall be removed with scraper or knife. The butt weld jointing shall be made with electrical heated plated at the required temperature around 205, + or - 5 degree Centigrade. While jointing, care shall be taken that formation of the rim at end of pipe after heating by hot plate should be made uniform and complete on both the ends. Holding and pressing of pipe is done manually or mechanically to give the leak proof joint.

4.4.07 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 a rim is made by heating the pipe end in a suitable device to 70-180 Centigrade and welding pre-heated rim of the pipe.

4.4.08 DEWATERING : In case of underground pipes, the contract rate shall include bailing or pumping out all the water till completion of work if accumulated during the progress of work either from seepage, springs, rain or any other cause.

4.4.09 TESTING : Solvent welded pipe shall not be pressure tested until at least 24 hours after the last solvent cemented joint has been done. All control valves shall be positioned open for the duration of the test and open end closed with water tight fittings. The testing pressure on completion of the work shall not be less than 1.5 time the working pressure of the pipes.

Pressure shall be applied either by hand pump or power driven pump. Pressure guages shall be correctly positioned and closely observed to ensure that at no time are the test pressure exceeded. The systems shall be slowly and carefully filled with water to avoid surge pressure or water hammer. Air vents shall be open at all high points so that air may be expelled from the system during filling.

When the system has been fully charged with water and air displaced from the line air vent shall be closed and the line initially inspected for seepage at joints and firmness of supports under load. Pressure is reached. Without any additional requirement of make-up-water the test pressure should not fall more than 0.02 MPa (0.2 kg./sq.cm)at the end of one hour test duration.

4.4.10 THE RATE INCLUDES FOR :

1. Supplying of HDPE pipes and fittings of specified diameter.
2. Laying and cutting the pipe wherever necessary and wastage.
3. Making the solution joint or mirror joint, painting if mentioned in schedule of quantities.
4. Fixing the pipe line with G.I. clamps not less that 20 mm x 1 mm thick and G.I./M.S. nails length not less than 40 mm or HDPE clamps, screws, rawl plug etc.
5. In case of underground pipes, dewatering the pit or trench till completion of work.
6. All necessary labour, materials and use of tools.

4.4.11 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 centre line of pipe. No measurement shall be recorded separately for fitting, making joint, painting if mentioned in schedule of quantities and testing.

4.4.12 MODE OF PAYMENT : The contract rate shall be for unit running meter length of pipe line laid.

4.5 PVC PIPING WORK FOR WATER SUPPLY :

4.5.01 GENERAL : The item includes supplying of PVC pipes with fittings of specified diameter including laying, fixing, cutting, joining, painting etc. for vent, over flow, waste water pipe line etc.

4.5.02 MATERIAL : The pipes and fittings shall conform to series IV of IS 4985-1978, PVC pipes and fittings shall be free from cracks, flaws and defects and shall be able to withstand a pressure as mentioned in the schedule of quantities.

4.5.03 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.

4.5.04 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 out side surfaces.

4.5.05 TRENCHES : The trench bottom shall be carefully examined for the presence of hard objects such as flints, rock projection or tree roots etc. Pipe shall be embedded in sand or soft soil, free from rock & gravel, back fill 150mm above the pipe shall also be of fine sand or soft soil. Pipe shall not be painted. The width of trench shall not be less than out side diameter of pipe plus 300 mm in case of gravel soils. Pipe shall be laid at-least 900 mm below the ground level (measured from the surface of the ground to the top of pipe).

4.5.06 LAYING : The pipes shall be carefully laid straight to the correct alignment in gradients as indicated in the drawing. All the 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 through out. 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.

4.5.07 FIXING : 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 mm thick or with suitable PVC clamps, The clamps shall be fixed into the wall with G.I. nails not less than 40 mm long and wooden gutties.

Spacing between clamps for fixing internal piping shall be as given below :

Pipe dia	For Horizontal Runs	For Vertical Runs
20 mm	700 mm	1050 mm
25 mm	750 mm	1125 mm
32 mm	825 mm	1240 mm
40 mm	975 mm	1460 mm
50 mm	975 mm	1460 mm

4.5.08 MAKING JOINT : The jointing of pipes and fittings generally shall be done with approved make cement solvent including making surface rough. The pipe shall be cut to desired length. Care shall be taken that profile or cut surfaces shall not be changed and the fibrous material shall be removed with scraper or knife.

4.5.09 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.

4.5.10 PAINTING : If mentioned in schedule of work, the exposed pipe line shall be painted with two coats of approved oil paint of matching colour over a coat of primer. Underground pipe line shall not be painted.

4.5.11 DEWATERING : 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.

4.5.12 TESTING : Please refer clause No.4.4.09

4.5.13 THE RATE INCLUDES FOR :

1. Supplying of PVC pipes and fittings of specified diameter.
2. Laying and cutting the pipe wherever necessary and wastage.
3. Fixing the pipe line with G.I. clamps not less than 2 mm thick and G.I./M.S. nails length not less than 40mm or with PVC clamps, screws, wooden gutties etc.
4. Making the solution joint, painting the pipe line if mentioned in schedule of quantities.
5. In case of underground piping, dewatering till completion of work.
6. All necessary materials, labour and use of tools.

4.5.14 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, painting if mentioned in schedule of work and testing.

4.5.15: MODE OF PAYMENT: Unit length of pipe line laid or fixed.

4.6 GUN METAL/ BRASS COPPER ALLOY FULL WAY VALVE :

4.6.01 GENERAL : The item includes provision of full way (gate or globe) valve of specified diameter as mentioned in the schedule including fixing. Full way valve is a valve suitable for controlling or stopping the flow in water supply lines.

4.6.02 MATERIAL :

Full way valve shall be of either Brass fitted with a cast iron hand wheel or Gun metal fitted with a C.I. hand wheel or copper alloy as the case may be and shall be of Gate valve type opening full way and of the size as specified conforming to IS 778. The weight of the full way gate valve shall be as per the table given below with a tolerance of 5 percent.

Diameter in mm	Flanged arch (Kg)	Screwed arch (Kg)
15	1.021	0.567
20	1.503	0.680
25	2.495	1.077
32	3.232	1.559
40	4.082	2.268
50	6.691	3.232
65	10.149	6.804
80	13.381	8.845

4.6.03 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 etc. The screwed, flanged joint shall be made with few turns of fine hemp yarn dipped in linseed oil taken over the threaded ends to obtain complete water tightness.

4.6.04 TESTING : The joints shall be tested to a hydraulic pressure of 1 MPa (10 kg/cm^2) along with the testing of pipe line.

4.6.05 THE RATE INCLUDES FOR :

1 Valve, G.I. fittings, hemp yarn, linseed oil, zinc, fixing and testing.

2. All necessary labour, materials and use of tools.

4.6.06 MODE OF MEASUREMENT : The measurement shall be for each unit valve of specified diameter fixed.

4.6.07 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.

4.7 WATER METER :

4.7.01 GENERAL : The item includes provision of Water meter with or without end flanges or non-return valve of specified diameter as mentioned in the schedule with strainer, sockets, flange, union, nuts etc. including fixing and testing.

4.7.02 MATERIAL : Water Meter shall conform to IS 779 (Domestic type) or IS 2373 (Bulk type) as specified in Schedule of Quantities and should have ISI certification mark. Non return valve and strainer shall be of the same diameter as that of water meter. Strainer, sockets, flange, union, union nuts, rubber packing etc. shall be as per the description of item.

4.7.03 FIXING : Water meter shall be fixed in position on the inlet pipe line and the joints shall be made either screwed or flanged with necessary sockets, flanges and union nuts as required or as directed by the Engineer-in-charge.

4.7.04 SCREWED JOINT : A few turns of fine hemp yarn dipped in linseed oil shall be taken over the threaded ends to obtain complete water tight joint.

4.7.05 FLANGED JOINT : The flange joint shall be made for flange type water meter and the joint shall be as per the specification of flanged joint.

4.7.06 TESTING : The joints shall be tested to a hydraulic pressure of 1 MPa (10 kg/cm^2) along with testing of pipe line for a minimum duration of two hours.

4.7.07 THE RATE INCLUDES FOR :

1. Water meter, hemp yarn, linseed oil, zinc, fixing and testing.
2. Supplying of strainer non-return valve, sockets, union nut etc.
3. Making screwed or flanged joints.
4. All necessary labour, material and use of tools.

4.7.08 MODE OF MEASUREMENT : The measurement shall be for each unit of water meter of specified diameter fixed.

4.7.09 MODE OF PAYMENT : The contract rate shall be for each unit Water Meter of specified diameter fixed. No extra payment shall be made towards making flanged and other joints and G.I. fittings used in fixing of the water meter.

4.8 PRESSURE REDUCING VALVE :

4.8.01 GENERAL : The item includes provision of pressure reducing valve of specified diameter as mentioned in the schedule including fixing.

4.8.02 MATERIAL: Pressure reducing valve is a device with suitable means of connection for insertion in a vertical pipe line for controlling the water pressure. Valve shall be of brass and shall be vertical flow type, conforming to IS 9739-1981.

4..8.03 FIXING : The valve shall be fixed in position on the pipe line as shown in the drawing or as directed. The screwed or flanged joint shall be made to obtain complete water tight joint.

4.8.04 TESTING : The joints shall be tested to a hydraulic pressure of 1MPa (10 kg/cm^2)along with testing of pipe line for a minimum duration of 2 hrs.

4.8.05 THE RATE INCLUDES FOR :

1. Supplying Valve including fixing and testing.
2. All necessary labour, materials and use of tools.

4.8.06 MODE OF MEASUREMENT : The measurement shall be for each unit of valve of specified diameter fixed.

4.8.07 MODE OF PAYMENT : The contract rate shall be for each unit of valve of specified diameter fixed.

4.9 CAST IRON WATER QUALITY PIPING WORK :

4.9.01 GENERAL : The item includes the provision of supplying water quality cast iron pipe of specified diameter including cutting, laying, fixing, and painting the pipe line.

4.9.02 MATERIAL : The pipes shall be centrifugally cast (spun) Iron Pressure pipe conforming to IS 1536 and shall be of class "LA", 'A' or "B". These shall be of socket and spigot or double flanged. All the pipes shall be cylindrical reasonably true with inner and outer surfaces and nearly concentric as practicable. The outer surface shall be smooth, sound, free from pin holes, cracks and other imperfections. The pipes shall be treated with solution of Dr. Angus Smith's solution. The coated surface shall give glossy finish. The table showing the dimensions & weight of different diameter of pipes is given below:

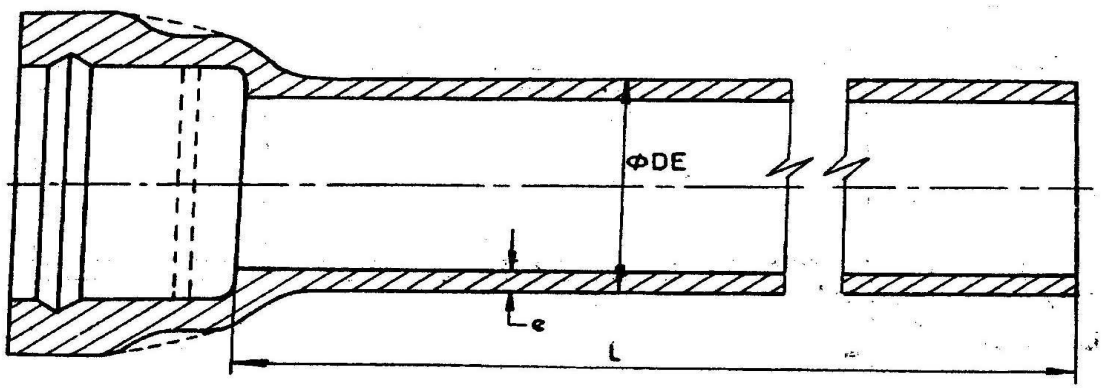
CENTRIFUGALLY CAST (SPUN) IRON 'WATER QUALITY' PIPES

Tolerences : a) Length ± 25 mm (b) weight 5% (c) Thickness ± (1+0.05e)mm

Value of `e` for

(i) LA class pipe e = 10/12 (7 + 0.02 DN) (ii) A class pipe e = 11/12 (7 + .02 DN)

(iii) B class pipe e = (7 + 0.02 DN)



CENTRIFUGALLY CAST (SPUN) IRON 'WATER QUALITY' PIPES WEIGHT FOR SOCKET & SPIGOT PIPES (IS 1536-2001)

Nom. Dia.	Cla -ss	Barrel				Socket Mass	Total weight for one working length ' L' in meter					
DN Mm		Lead joint DE mm	Push-on joint DE mm	Thick-ness e mm	Mass for 1 Mt kg	Kg.	3.66 Kg.	4 Kg.	4.5 Kg.	5 Kg.	5.5 Kg.	6 Kg.
80	LA	98	95	7.2	14.7	5.5	59.0	64.0	-	79.0	-	-
	A	98	95	7.9	16.0	5.5	64.0	70.0	78.0	86.0	-	-
	B	98	95	8.6	17.3	5.5	69.0	74.0	83.0	92.0	-	-
100	LA	118	115	7.5	18.6	7.1	75.0	82.0	91.0	100.0	109.0	119.0
	A	118	115	8.3	20.5	7.1	82.0	89.0	99.0	109.0	120.0	130.0
	B	118	115	9.0	22.0	7.1	88.0	95.0	106.0	117.0	128.0	139.0
125	LA	144	141	7.9	24.2	9.2	98.0	106.0	118.0	130.0	142.0	154.0
	A	144	141	8.7	26.4	9.2	106.0	115.0	128.0	141.0	155.0	168.0
	B	144	141	9.5	28.7	9.2	114.0	124.0	138.0	153.0	167.0	181.0
150	LA	170	167	8.3	30.1	11.5	122.0	132.0	147.0	162.0	177.0	192.0
	A	170	167	9.2	33.2	11.5	133.0	144.0	161.0	178.0	194.0	211.0
	B	170	167	10.0	35.9	11.5	143.0	155.0	173.0	191.0	209.0	227.0
200	LA	222	219	9.2	44.0	16.5	178.0	193.0	215.0	237.0	259.0	281.0
	A	222	219	10.1	48.1	16.5	193.0	209.0	233.0	257.0	281.0	305.0
	B	222	219	11.0	52.1	16.8	207.0	225.0	251.0	278.0	304.0	329.0
250	LA	274	271	10.0	59.3	22.9	240.0	260.0	290.0	319.0	349.0	379.0
	A	274	271	11.0	65.0	22.9	261.0	283.0	315.0	348.0	380.0	413.0
	B	274	271	12.0	70.6	22.9	281.0	305.0	341.0	376.0	411.0	447.0
300	LA	326	323	10.8	76.5	29.8	310.0	336.0	374.0	412.0	450.0	489.0
	A	326	323	11.9	84.0	29.8	337.0	366.0	408.0	450.0	492.0	534.0
	B	326	323	13.0	91.4	29.8	364.0	395.0	441.0	487.0	533.0	578.0
350	LA	378	375	11.7	96.3	37.5	390.0	423.0	471.0	519.0	567.0	615.0
	A	378	375	12.8	105.0	37.5	422.0	458.0	510.0	563.0	615.0	668.0
	B	378	375	14.0	114.5	37.5	457.0	495.0	553.0	610.0	667.0	725.0
400	LA	429	426	12.5	116.9	46.3	474.0	514.0	572.0	631.0	690.0	748.0
	A	429	426	13.8	128.7	46.3	517.0	561.0	625.0	690.0	754.0	819.0
	B	429	426	15.0	139.5	46.3	557.0	604.0	674.0	744.0	814.0	883.0
450	LA	480	477	13.3	141.0	56.0	572.0	620.0	690.0	761.0	832.0	902.0
	A	480	477	14.7	156.0	56.0	627.0	680.0	758.0	836.0	914.0	992.0
	B	480	477	16.0	169.0	56.0	675.0	732.0	816.0	901.0	986.0	1070.0
500	LA	532	529	14.2	165.2	66.0	671.0	727.0	809.0	892.0	974.0	1057.0
	A	532	529	15.6	181.0	66.0	728.0	790.0	880.0	971.0	1061.0	1152.0
	B	532	529	17.0	196.7	66.0	786.0	853.0	951.0	1049.0	1148.0	1246.0
600	LA	635	632	15.8	219.8	89.3	894.0	968.0	1162.0	1188.0	1298.0	1408.0
	A	635	632	17.4	241.4	89.3	973.0	1055.0	1141.0	1272.0	1404.0	1544.0
	B	635	632	19.0	262.9	89.3	1052.0	1141.0	1272.0	1404.0	1535.0	1667.0
700	LA	738	735	17.5	283.2	116.8	1153.0	1250.0	1391.0	1538.0	1675.0	1816.0
	A	738	735	19.3	311.6	116.8	1257.0	1363.0	1519.0	1675.0	1830.0	1986.0
	B	738	735	21.0	338.2	116.8	1355.0	1470.0	1639.0	1808.0	1977.0	2146.0
750	LA	790	787	18.3	317.2	131.7	1293.0	1400.0	1559.0	1718.0	1876.0	2035.0
	A	790	787	20.2	348.9	131.7	1409.0	1527.0	1702.0	1876.0	2051.0	2225.0
	B	790	787	22.0	380.6	131.7	1525.0	1644.0	1844.0	2029.0	2225.0	2415.0
800	LA	842	839	19.2	354.9	147.8	1447.0	1567.0	1745.0	1922.0	2100.0	2277.0
	A	842	839	21.1	389.1	147.8	1572.0	1704.0	1899.0	2093.0	2288.0	2482.0
	B	842	839	23.0	423.1	147.8	1696.0	1840.0	2052.0	2263.0	2475.0	2686.0
900	LA	945	942	20.8	421.8	182.6	1763.0	1910.0	2126.0	2342.0	2558.0	2773.0
	A	945	942	22.9	474.3	182.6	1918.0	2080.0	2317.0	2554.0	2791.0	3028.0
	B	945	942	25.0	516.6	182.6	2073.0	2249.0	2507.0	2766.0	3024.0	3282.0
1000	LA	1048	1045	22.5	518.3	222.3	2119.0	2295.0	2555.0	2814.0	3073.0	3392.0
	A	1048	1045	24.8	570.0	222.3	2308.0	2502.0	2787.0	3072.0	3357.0	3642.0
	B	1048	1045	27.0	619.2	222.3	2489.0	2699.0	3009.0	3318.0	3621.0	3938.0
1050	LA	1124	1118	23.6	583.4	309.6	2445.0	2643.0	2935.0	3227.0	3518.0	3810.0
	A	1124	1118	26.0	641.2	309.6	2656.0	2874.0	3195.0	3516.0	3836.0	4157.0
	B	1124	1118	29.0	713.3	309.6	2920.0	3163.0	3519.0	3876.0	4233.0	4589.0

4.9.03 UNLOADING : The pipe shall be unloaded where they are required. Where mechanical handling facility are not available, pipes weighing upto 60 kg shall be handled by two persons by hand passing and heavier pipes shall be unloaded from the lorry or wagon by holding them in loops, formed with ropes and sliding over plank set not steeper than 45 degrees. Two ropes always shall be used and only one pipe shall be unloaded at a time. Under no circumstances shall pipes be thrown down from the carriers or be dragged or rolled along hard surfaces. The pipes shall be checked for any visible damage while unloading and shall be sorted out for reclamation**.**

4.9.04 STORING : The pipes shall be lined upon on one side of the alignment of the trench, socket facing upgrade when line runs uphill and up stream when line runs on level ground. Each stack shall contain pipes of same class and size. Storage shall be done on firm, level and clean ground. Wedges shall be provided at the bottom layer to keep the stack stable.

4.9.05 CLEANING : The pipes shall be thoroughly cleaned with brush and washed if necessary to remove any accumulated stone, soil or dirt inside and inside of socket and outside of the spigot shall also be cleaned in similar way.

4.9.06 EXAMINATION : Before pipe is laid it shall be first examined for damage and cracks. No cracked or damaged pipe shall be used. The pipe shall be tested with a hammer to prove its soundness

4.9.07 DAMAGED MATERIAL : If any material found damaged or cracked, the same shall not be used in the work. The contractor has to replace the same at his own cost and charges.

4.9.08 TRENCHES : The depth of the trenches shall not be less than 1000 mm measured from the top of the pipe to the surface of the ground under roads and not less than 750 mm elsewhere. The width of the trench shall be the nominal diameter of the pipeline plus 400mm, but it shall not less than 550 mm in case of all kind of soil, excluding rock and not less than 1000 mm in case of rock.

Trench shall be so deep that the pipes may be laid to the required alignment and at required depth. The width of trench at bottom between face of sheeting shall be such as to provide not less than 200 mm clearance on either side of the pipe. Trenches shall be of such extra width, when required as will permit the convenient placing of timber supports strutting and planking handling of specials etc. The bed of trench, in soft or made up earth, shall be well watered and rammed before laying the pipes and depression, if any, shall be properly filled with earth and consolidated in 20 cm layers.

If the trench bottom is extremely hard or rocky or loose stoney soil, the trench shall be excavated 150mm below the trench grade. Rocks, stones or other hard substances from the bottom of the trench shall be removed & trench brought back to the required grade by filling with selected fine earth or sand or fine murrum & compact so as to provide a smooth bedding for pipe.

After the excavation of the trench is completed, hollows shall be cut at the required position to receive the socket of the pipe. The barrels of the pipes shall rest through their entire length on the solid ground that sufficient space left for jointing the under side of the pipe joints. These socket holes shall be refilled with sand after jointing the pipe.

The trench shall be kept free from water shoring and timbering shall be provided wherever required. Excavation below water table shall be done after dewatering the trenches.

The road crossing shall be excavated half at a time and where the pipe line/drain crosses on existing road after the pipe have been laid in the first half and the trench refilled. Care shall be taken not to disturb the electrical & communication cable net with during the course of excavation.

4.9.09 LOWERING : The pipe shall then be placed in trenches by means of proper sheer legs, chains and other tacts and shall be properly driven home. In no case pipe shall be rolled or dropped into the trench. One end of rope may be tied to a wooden or steel Pag or driven into ground and other end hold by men which when slowly released till lower the pipe into trench

4.9.10 LAYING : The pipes shall be carefully laid straight to correct alignment in raising or falling gradients. The socket end of the pipe shall face uphill. All the 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. While jointing the spigot it should be neatly placed into the socket for full length and properly supported. The pipe shall be carefully packed underneath so that they shall bear loads arising from traffic evenly through out their whole length. The entire length of pipe shall be supported on bed of the trench evenly through out. Care shall be taken to prevent any sand, earth or other materials from entering into the pipes during laying. At the end of the day's work the open end shall be suitably plugged.

No pipe shall be laid until the trench has been excavated to its required depth for a distance of about 5 M in front of the pipe to be laid. No pipe shall be covered until it has been passed by the Engineer-in-charge.

In unstable soils, such as soft soil and dry lumpy soil it shall be checked whether the soil can support the pipe and if required, suitable special foundation shall be provided.

Where the soils are drastically affected by extremes of saturation and dryness, those soils are subjected to extraordinary shrinkage which from wide and deep cracks in the earth surface may result in damage to underground pipe because of tight gripping bond between pipe and clay, subjecting to it excessive stresses as the clay shrinks. In such case an envelop of minimum 100 mm of tamped sand shall be made around the pipe line to avoid any bonding.

In places where rock is encountered, cushion of fine earth or sand shall be provided for a depth of 150mm by excavating extra depth of the trench where the gradient of the bad slopes is more than 30 depths, it may necessary do and or fine pipe against sliding downwards.

4.9.11 FIXING: The contractor shall first get the layout for pipe line approved by the Engineer-in-charge as may be required by the bye-laws. The pipe line shall be so fixed / laid as not to expose to the heat or subject to any injury or risk to the pipe. The socket end of the pipe shall be facing up. All the pipes 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

4.9.12 THRUST BLOCK : .Thrust blocks are required to transfer the resulting hydraulic thrust from the fittings of pipe on to a larger load bearing soil section. Thrust blocks shall be installed wherever there is a change in the direction/size of the pipe line or the pressure line diagram, or the pipe line ends at a dead end. If necessary, thrust blocks may be constructed at valves also. Thrust block shall be constructed taking into account the pipe size, water pressure, type of filling, gravity component when laid on slopes and the type of soil. In case of pipe line laid in soft soil, joints/couplings are to be anchored on each side by providing side thrust blocks without restricting the coupling.

Pipes on slopes need be anchored only when there is a possibility of the backfill around the pipe sloping down the hill and carrying the pipe with it. Generally for slopes upto 30 degrees, good, well drained soil carefully damped in layers.of 100mm under and over the pipe, right up to the top of trench will not require anchoring.

For steeper slopes, one out of every three pipes shall be held by straps fastened to vertical supports anchored in concrete.

4.9.13 BACK FILLING: Back filling shall follow the pipe installation as closely as possible to protect pipe from falling boulders, eliminating possibility of lifting of the pipe due to flooding of open trench and shifting pipe out of line by caved in soil.

The soil under the pipe and coupling shall be solidly tamped. The initial back fill material shall be free of large stones and dry lumps.

In bags and Monshers gravel or crushed stone may be used for this purpose. The initial back fill shall be placed evenly in a layer of 100 mm thick and consolidated up to a cushion of at least 300 mm cover over the pipe. Joints shall be taken care to resist the movement of the pipe due to pressure while testing.

4.9.14 TESTING :

After a new pipe has been laid, jointed and back filled (or any valved section thereof), it shall be subjected to the following two tests :

a) Pressure test at a pressure of at least double the maximum working pressure-pipe and joints shall be absolutely water tight under the test.

b) Leakage test (to be conducted after the satisfactory completion of the pressure test) at a pressure to be specified by the authority for a duration of two hours.

Hydrostatic Tests :

Portions of the line shall be tested by subjecting to pressure test as the laying progresses before the entire line is completed. In this way any error of workmanship will be found immediately and can be corrected at a minimum cost. Usually the length of the section to be tested shall not exceed 500 m.

Where any section of a main is provided with concrete thrust blocks or anchorages, test shall not be made until atleast two days have elapsed.

Prior to testing, enough back fill as described in 4.9.12 shall be placed over the pipe line to resist upward thrust. All thrust blocks forming part of the finished line shall have been sufficiently cured and no temporary bracing shall be used.

The open end of the section shall be sealed temporarily with an end cap having an outlet which can serve as an air relief vent or for filling the line, as may be required. The blind face of the end cap shall be properly braced during testing by screw jacks and wooden planks or steel plate

The section of the line to be tested shall be filled with water manually or by a low pressure pump. Air shall be vented from all high spots in the pipe line before making the pressure strength test because entrapped air gets compressed and causes difficulty in raising the required pressure for the pressure strength test.

The test pressure shall be gradually raised at the rate of approximately one kg/ sqcm/ mm. The duration of the test period if not specified shall be sufficient to make a careful check on the pipe line section.

Procedure for pressure test :

Each valved section of the pipe shall be slowly filled with water and all air shall be expelled from the pipe through hydrants and blow offs. If these are not available at high places, necessary tapping may be made at points of highest elevation before the test is made and plugs inserted after the tests have been completed.

If the trench has been partially back-filled the specified pressure based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Engineer-in-Charge. The duration of the test shall not be less than 5 minutes.

Examination under Pressure : All exposed pipes, fittings, valves, hydrants and joints should be carefully examined during the open-trench test. When the joints are made with lead, all such joints showing visible leaks shall be recaulked until tight. When the joints are made with cement and show seepage or slight leakage, such joints shall be cut out and replaced as directed by the authority. Any cracked or defective pipes, fittings, valves or hydrants discovered in consequence of this pressure test shall be removed and replaced by sound material and the test shall be repeated until satisfactory to the Engineer-in-Charge.

If the trench has been back-filled to the top, the section shall be first subjected to water pressure normal to the area and the exposed parts shall be carefully examined. If any defects are found, they shall be repaired and the pressure test repeated until no defects are found. The duration of the final pressure tests shall be at least one hour.

Procedure for Leakage Test :

Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved section thereof, necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.

No pipe installation shall be accepted until the leakage is less than the number of cm3/h determined by the formula :

$$ql = \frac{ND\sqrt{P}}{3.3}$$

Where ql = the allowable leakage in cm^3/h.

N = number of joints in the length of the pipe line.

D = diameter in mm, and

P = the average test pressure during the leakage testing kg/cm^2.

Variation from Permissible Leakage : Should any test of pipe laid in position discloses leakage greater than that specified in above para., the defective joints shall be repaired until the leakage is within the specified allowance.

4.9.15 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.

4.9.16 THE RATE INCLUDES FOR :

1. Supplying spigot and socket or monolithic double flanged C.I. Pipe of specified class & diameter.
2. Laying the pipe and cutting the pipe wherever necessary and wastage.
3. Dewatering the Trench or pit if found necessary till completion of work.
4. Fixing the pipe line using M.S. clamps not less than 3 mm thick with wooden gutties etc. if required.
5. Testing the pipe line.
6. All necessary labour, materials and use of tools.

4.9.17 MODE OF MEASUREMENT : The measurement shall be for unit running metre length of pipe line laid or fixed. .Measurement shall be taken along the centre line of the pipe deducting outer to outer length of specials.

4.9.18 MODE OF PAYMENT : Contract rate shall be for unit running meter length of pipe line laid or fixed.

4.10 SPECIALS FOR C.I. WATER SUPPLY PIPE LINE :

4.10.01 GENERAL : The item includes supplying cast iron water quality or M.S. specials of specified diameter for C.I. water supply pipe including laying, fixing and painting the specials.

4.10.02 MATERIALS : The specials for cast iron water quality pipe shall be conforming to IS 1538 & 13382 with socket and spigot or monolithic double flanged. All the fittings shall be cylindrical, reasonably true with inner and outer surfaces and nearly concentric as practicable. The outer surface shall be smooth, sound, free from pin holes, cracks and other imperfections. M.S. specials shall be made out of M.S. plate of thickness of 6 mm for pipes upto 100mm and 8 mm thick for pipes above 100 mm to 300. 10 mm thick for pipe above 300 mm.

4.10.02 A : M.S. specials shall be treated with Anticorrosive coating of Bituminous based coro coat.

4.10.03 CLEANING : The specials and fittings shall be thoroughly cleaned with brush and washed if necessary to remove any accumulated stone, soil or dirt inside the socket and outside of the spigot.

4.10.04 EXAMINING : Before special is laid, it shall be first examined for damage and cracks. No cracked or damaged pipe shall be used. The pipe shall be tested with a hammer to prove its soundness.

4.10.05 DAMAGED MATERIAL : If any material found damaged or cracked, the same shall not be used in the work. The contractor has to replace the same at his own cost and charges.

4.10.06 LOWERING : The specials shall then be placed in trenches by means of proper sheer legs, chains and other tacts and shall be properly driven home.

4.10.07 FIXING : The specials shall be fixed by means of lead or flanged joint on C.I. Pipe line wherever required and as shown in the drawing or as directed by the Engineer-in-charge.

4.10.08 TESTING : Joints shall be tested to a hydraulic pressure of 10 kg/cm2 alongwith testing of pipe line and shall be maintained for minimum two hours. All leakages, defects etc. shall be rectified.

4.10.09 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 till the completion of work.

4.10.10 THE RATE INCLUDES FOR :

1. Supplying spigot and socket or monolithic double flanged C.I. or M.S. specials.
2. Fixing the specials wherever necessary.
3. Dewatering the trench or pit if found necessary till completion of work.
4. All necessary labour, materials and use of tools.

4.10.11 MODE OF MEASUREMENT : The measurement shall be on the basis of IS 1538 for standard weight of specials and/or on the basis of actual unit weight for fixed specials.

4.10.12 MODE OF PAYMENT : The contract rate shall be on the basis of unit weight.

4.11 LEAD JOINT :

4.11.01 GENERAL : The item includes making lead joints for C.I.water quality pipes and fittings/specials including testing etc.

4.11.02 MATERIAL : Lead shall be conforming to IS 782 and of good quality manufactured by Hindustan zinc or equivalent. Fine hemp yarn shall be the best available in the market.

4.11.03 PREPARATION : Outside of the spigot and inside of the socket shall be thoroughly cleaned with brush. The spigot shall be carefully centred in the socket by one or more laps of spun hemp yarn twisted into ropes of uniform thickness thoroughly soaked in hot coal-tar or bitumen and cooled before use.

4.11.04 POURING : Pouring of lead shall be done by means of ropes covered with clay or by using special leading rings. The lead shall be melted rendering it thoroughly fluid and each joint shall be filled in one pouring.

4.11.05 CAULKING : The caulking shall be carried out with molten lead. Hemp yarn shall be driven into the bottom of the socket and leave the space required. The molten lead shall then be run in sufficient quantity so that after being caulked solid, the lead may project 3 mm beyond the face of the socket against the outside of the spigot, but must be flushed with the outside edge of the socket.

The lead taken from the pot shall be run hot into the joint and the joint filled in one running. The joint shall be caulked well, by a suitable caulking tool and 2 kg hammer and the joint left neat and smooth. In case C.I. fittings are also conforming to the same specification that of pipes, the consumption of lead will be worked out on the basis of actual consumption for each joints.

The following table shows consumption of the weight of lead & yarn per joint as per IS 3114 : 1994

Nominal Internal Dia in mm	Spun Yarn Mass in Kg.	Lead Mass in kg.	Depth of Lead Joint Mm
80	0.17	1.8	45
100	0.23	2.2	45
125		2.6	45
150	0.34	3.4	50
200	0.57	5.0	50
250	0.74	6.1	50
300	0.82	7.2	55
350	1.17	8.4	55
400	1.33	9.5	55
450	1.84	14.0	55
500	1.99	15.0	60
600	2.83	19.0	60
700		22.0	60
750	3.52	25.0	60
800		31.5	65
900	4.25	35.0	65
1000		41.0	65
1100		46.0	65
1200	6.01	52.0	70
1500		66.5	75

NOTE : i) The quantities of lead given are on average basis and a variation of 10 percent is permissible .
ii) Before pipe are jointed on large scale, three a four sample joints shall be made and the average consumption of lead per joint shall be got approved by the Engineer-in-charge.

4.11.06 TESTING : The pipe line after being laid and jointed shall be tested under the supervision of the Engineer-in-Charge. The testing shall be carried out by the contractor at his own cost and charges. Any joint found leaking shall be redone and all leaking pipes removed and replaced without extra cost.

The length of pipes to be tested shall be first filled with water from a higher section of pipe and the test pressure is applied. The test pressure shall be 10 kg per square centimeters and shall be maintained for two hours continuously.

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

4.11.08 THE RATE INCLUDES FOR :

1. Pig lead and treated yarn, fuel, wood, etc.
2. Winding the rope on spigot and centering the pipe, caulking, casting molten lead etc.
3. Testing and making good the defective joints.
4. Dewatering the trench or pit till completion of work.
5. All labour, material and use of tools.

4.11.09 MODE OF MEASUREMENT : The measurement shall be for each unit of lead joint made.

4.11.10 MODE OF PAYMENT : The contract rate shall be for each unit of lead joint made.

4.12 G M GATE VALVE CHAMBER :

4.12.01 GENERAL : The item includes construction of brick masonry valve chamber of size as specified in this schedule including providing M.S./G.I. frame and cover over R.C.C pre-cast cover with or without surface box.

4.12.02 MATERIAL : Brick work, plastering, concreting etc. shall be as per general specification under section II. Precast RCC cover slab, surface box, C.I/M.S frame and cover etc. shall be size and weight as specified in the schedule.

4.12.03 CONSTRUCTION :

a) Foundation concrete of mix 1:4:8 shall be of 150 mm thick with 150 mm offset alround or as specified in the schedule.

b) Brick masonry in cement mortar 1:4 as specified.

c) Plastering inside and outside surfaces of walls in two courses using cement mortar 1:3 of thickness as specified mixed with water proofing compound of specified Quality including inner surfaces finished smooth with neat cement punning.

4.12.04 RCC PRECAST/CAST IRON COVERS

4.12.04.1 RCC PRECAST COVER (for chambers of size upto 600 x 600 mm) : Chamber cover shall be casted as shown in the drawing having minimum 75 mm thick in cement concrete 1:2:4 or as specified in the schedule by using nominal reinforcement 100 kg/ Cum of concrete including shuttering, finishing, curing, placing in position etc.

4.12.04.2 CAST IRON/ M.S COVER : Cast iron/M.S cover of specified size and weight shall be supplied and placed over the chamber as directed. The cover shall be painted with 3 coats of black bitumastic paint.

4.12.05 DEWATERING : The water accumulated in the pit due to rain, seepage, springs or any other cause during the progress of work shall be pumped/bailed out till the completion of work.

4.12.06 THE RATE INCLUDES FOR :

1. Bed concrete, Brick masonry, cement plaster, RCC pre-cast cover slab with or without surface box cast /MS cover etc.
2. Dewatering the trench or pit if necessary.
3. All necessary labour, materials and use of tools.

4.12.07 MODE OF MEASUREMENT : The measurement shall be for each unit of valve chamber of specified internal size and depth constructed.

4.12.08 MODE OF PAYMENT : The contract rate shall be for each unit of valve chamber of specified internal size and depth constructed.

4.13 C.I. SLUICE VALVE CHAMBER :

4.13.01 GENERAL : The item includes construction of brick masonry valve chamber of size as specified in this schedule including providing M.S./G.I. frame and cover over R.C.C pre-cast cover with or without surface box.

4.13.02 MATERIAL : Brick work, plastering, concreting etc. shall be as per general specification under section II. Precast RCC cover slab, surface box, C.I/M.S frame and cover etc. shall be size and weight as specified in the schedule.

4.13.03 CONSTRUCTION :

a) Foundation concrete of mix 1:4:8 shall be of 150 mm thick with 150 mm offset alround or as specified in the schedule.

b) Brick masonry in cement mortar 1:4 as specified.

c) Plastering inside and outside surfaces of walls in two courses using cement mortar 1:3 of thickness as specified mixed with water proofing compound of specified Quality including inner surfaces finished smooth with neat cement punning.

4.13.04 RCC PRECAST/CAST IRON COVERS

4.13.04.01 RCC PRECAST COVER (for chambers of size above 1000 x 1000 mm)

Chamber cover shall be coated in minimum three equal parts or more as directed with lifting hooks as shown in the drawing. RCC slab shall be casted alongwith galvanised M.S. angle iron frame with stiffness and anchors made out of the sizes as specified in the schedule. The exposed portion of the angle frame shall be painted with the coats of silver paint over a a coat of primer.

RCC pre-cast slab shall be of 100 mm thick (unless otherwise specified) in cement concrete 1:2:4 of size as specified in the drawing schedule by using nominal reinforcement 100 kg/ Cum of concrete including shuttering, curing etc. and shall be placed in position as directed. cast iron road surface of prescribed weight shall be fixed to the cover slab during casting the slab for key rod operation.

Road surface box shall be of size 100x125x150 mm conforming to IS 3950 having hinged and weighting not less than 14 kg. The surface box shall be fixed on top of the RCC cover slab during the casting of slab for key rod operation. The surface box shall be painted with 3 coats of black bitumastic paint.

4.13.04.2 CAST IRON/ M.S COVER : Cast iron/M.S cover of specified size and weight shall be supplied and placed over the chamber as directed. The cover shall be painted with 3 coats of black bitumastic paint.

4.13.05 DEWATERING : The water accumulated in the pit due to rain, seepage, springs or any other cause during the progress of work shall be pumped/bailed out till the completion of work.

4.13.06 THE RATE INCLUDES FOR :

1. Bed concrete, Brick masonry, cement plaster, RCC pre-cast cover slab with or without surface box cast /MS cover etc.
2. Dewatering the trench or pit if necessary.
3. All necessary labour, materials and use of tools.

4.13.07 MODE OF MEASUREMENT : The measurement shall be for each unit of valve chamber of specified internal size and depth constructed.

4.13.08 MODE OF PAYMENT : The contract rate shall be for each unit of valve chamber of specified internal size and depth constructed.

4.14 FLANGES & FLANGED JOINT : (Screwed or welded Flanges)

4.14.01 GENERAL : The item includes supplying flanges and providing flanged joint for G.I./ M.S./ C.I pipes, fittings and specials including testing.

4.14.02 MATERIAL : The CI flanges shall be confirming to IS 3516 or IS 1536. The heavy quality G.I./ M.S. flanges shall be conforming to I.S.6392 having thickness not less than 20 mm for pipes having diameter beyond 80 mm and 12 mm for pipes having diameter below 80 mm including drilling holes in new flanges, jointing with the pipe by means of welding or screwed joint. Rubber insertion shall be of three ply not less than 3 mm thick of approved make or fiber board impregnated with chemically neutral mineral oil having smooth & hard surface weighing not less than 112 gm/mm thickness. Bolts, nuts and washers used shall be of good quality.

4.14.03 MAKING JOINT : Flanged joints shall be made by jointing the facing of the flange with the packing of rubber insertion and boiling up evenly on all sides. A thin layer of lead wool shall be provided for making the joints water tight where facing of the pipe is not true. The packing shall be of rubber insertion of three ply and of approved make and thickness. The packing should be of full diameter of the flange with proper pipe hole and bolt hole; cut even at both the inner and outer edges.

4.14.04 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 till the completion of work.

4.14.05 TESTING : The joints shall be tested along with pipe line after the pipe line is laid and jointed. The testing shall be as per the clause of testing of the pipe line

4.14.06 THE RATE INCLUDES FOR :

1 Cost of flanges, making bolt holes in flanges, supplying rubber insertion, making flanged joint.
2. Testing and making good the defective joints.
3. Dewatering the trench or pit till completion of work.
4. All labour, material and use of tools.

4.14.07 MODE OF MEASUREMENT : The measurement shall be for each unit of flange joint of specified size made with supplying one or two new flanges as specified in the schedule of quantities.

4.14.08 MODE OF PAYMENT: The contract rate shall be for each unit of flange joint made.

4.15 FLEXIBLE PUSH-ON JOINT (TYTON/ RING JOINT)

4.15.1 GENERAL : The item includes push-on joint with rubber ring for C.I. pipes, fittings and including testing.

4.15.2 MATERIAL : Rubber ring shall be moulded or tubular natural or synthetic rubber gasket conforming IS 12820.

4.15.3 JOINTING : The groove and the socket shall be thoroughly cleaned before inserting the rubber gasket while inserting the gasket it shall be made sure that it faces the proper direction and that it is correctly seated in the groove. After cleaning dirt or foreign materials from the plain end, non petroleum lubricant shall be applied in accordance with the pipe manufacturer's recommendations. The plain end of the pipe is pushed into the socket of the pipe and while pushing, the pipe shall be kept straight. If any deflections are to be made in the alignment, it may be made after the joint is assembled. The permissible deflection shall not be exceeded as per IS 3114 for socket and spigot rubber joint is 5 ° for 80 to 300 mm nom. bore, 4° for 350 to 400 mm nom bore and 3° for 450 to 750 mm nom bore pipe. A timber header shall be used between the pipe and crowbar or jack to avoid damage to the pipe while the plain end of the pipe is pushed into the socket either with a crowbar or jack or lever puller.

4.15.4 TESTING : The joints shall be tested along with pipe line after the pipe line is laid and jointed. The testing shall be as per the clause of testing of the pipe line

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

4.15.6 THE RATE INCLUDES FOR :-

1. Rubber ring, lubricant etc.
2. Testing and making good the defective joints.
3. Dewatering the trench or pit till completion of work.
4. All labour, material and use of tools.

4.15.7 MODE OF MEASUREMENT : The measurement shall be for each unit of rubber ring joint made.

4.15.8 MODE OF PAYMENT : The contract rate shall be each unit of rubber ring joint made.

4.16 C. I. SLUICE VALVE :

4.16.01 GENERAL : The item includes supplying of C.I. Sluice Valve of specified diameter as mentioned in the schedule including fixing.

4.16.02 MATERIAL : The Sluice valve shall be of Class or pressure rating as specified in the schedule of quantities and conforming to I.S. 14846. The valve shall be of cast iron and / or spheroidal iron having non-rising spindle with hand wheel & spindle of stainless steel.

4.16.03 FIXING : The C.I. sluice valve shall be fixed in position as indicated in the drawing or as directed. They shall be fitted with the tail pieces on both sides by means of flange joints.

4.16.04 DEWATERING : The contract rate shall include bailing or pumping out all the water if accumulated during the progress of the work either form rain, seepage, springs or any other cause till completion of the work.

4.16.05 TESTING : The Sluice Valve and the joints shall be tested as per the clause of testing of the pipe line The testing shall be done along with the pipe line testing.

4.16.06 THE RATE INCLUDES FOR :

1. Supplying and fixing of C.I. Sluice Valve of specified diameter.
2. Dewatering the trench or pit till completion of work.
3. All necessary labour, materials and use of tools.

4.16.07 MODE OF MEASUREMENT : The measurement shall be for each unit of Sluice Valve fixed. Tail piece, making flange joint and lead joint shall be measured under the relevant items.

4.16.08 MODE OF PAYMENT : The contract rate shall be for each unit of Sluice Valve fixed.

4.17 C.I. NON RETURN VALVE :

4.17.01 GENERAL : The item includes supplying of C.I. Non-Return Valve of specified size in the schedule of quantities including fixing.

4.17.02 MATERIAL : Non-return valve shall be conforming to IS 9338 or IS 5312 as specified in schedule of quantities. The body, domes, covers, stuffing box, thrust plates, hand wheel, wedges, gland and cap shall be of cast iron not less than of grade FG200 and all in side working parts should be of any non ferrous or ferrous materials such as gun metal. Valve of single door pattern swing type shall have test pressure of PN1.6(50 to 125 mm size), PN1.0 (150 to 300mm size),PN0.6 (350 to 600 mm size)as per IS 5312 (part.1). Valve of multi door pattern swing type shall have test pressure of PN0.6(400 to 1200 mm size), PN1.0 (400 to 1200mm size)as per IS 5312 (part 2).Valve shall be tested for the body and seat and the defective valve shall be replaced by the contractor at his own cost.

4.17.03 FIXING : The C.I. Non-Return valve shall be fixed in position as indicated in the drawing or as directed. They shall be fitted with the tail pieces on both sides by means of flange joints.

4.17.04 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.

4.17.05 TESTING : The C.I. Non-Return valve shall be fixed in position shall be tested hydraulically to a minimum pressure as per testing clause of piping work. The testing shall be done along with the testing of pipe line.

4.17.06 THE RATE INCLUDES FOR :

1. Supplying and fixing of C.I. Non-Return Valve of specified dia.
2. Dewatering the trench or pit till completion of work.
3. All necessary labour, materials and use of tools.

4.17.07 MODE OF MEASUREMENT : The measurement shall be for each unit of Non-Return Valve fixed. Tail piece, making flange joint and lead joint shall be measured under the relevant items.

4.17.08 MODE OF PAYMENT : The contract rate shall be for each unit of Non-Return Valve fixed.

4.18 FOOT-VALVE :

4.18.01 GENERAL : The item includes supplying of C.I. body. Foot-Valve of specified diameter as mentioned in the schedule including fixing.

4.18.02 MATERIAL : Foot-Valve shall be conforming to IS 4038 and with C.I. body not less than of grade FG200 and strainer with internal gun metal working parts. The valve shall be screwed end (25 to 150 mm size),flanged end (50 to 450 mm size), single disc type (up to 150 mm size), two disc type (exceeding 150 mm size), lift type (up to 100 mm size) The valve shall be tested for housing 0.6 MPa (6 kg/cm2)and for seat 0.2 MPa (2 kg/cm2) for 2 minutes as per IS 4038. The ball type foot valve with nytrile rubber ball and with bronze seat may be used as specified in the schedule of quantities. The defective Foot-Valve shall be replaced by the contractor at his own cost.

4.18.03 FIXING : Foot-valve shall be fixed in position as shown in the drawing or as directed. They shall be fitted by means of flange joints.

4.18.04 TESTING : The C.I. Foot-Valve and the joints shall be tested hydraulically to a minimum pressure as per testing clause of piping work .The testing shall be done along with the testing of pipe line.

4.18.05 THE RATE INCLUDES FOR :

1. Supplying and fixing of C.I. Foot-Valve of specified diameter.
2. All necessary labour, material and use of tools.

4.18.06 MODE OF MEASUREMENT : The measurement shall be for each unit of Foot-Valve fixed. Tail piece, making flange joint and lead joint shall be measured under the relevant items.

4.18.07 MODE OF PAYMENT : The contract rate shall be for each unit of Foot-Valve fixed.

4.19 AIR VALVE :

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

4.19.02 MATERIAL : The Air Valve shall be of heavy quality conforming to IS 14845 with IS certification mark and isolation valve.. The body, domes, covers, stuffing box, thrust plates, wedges, gland and cap shall be of cast iron not less than of grade 20 and inside working parts should be of any non-ferrous or ferrous materials.

4.19.03 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.

4.19.04 TESTING : The Air Valve and the joints shall be tested hydraulically to a minimum pressure as per testing clause of piping work. The testing shall be done along with the testing of pipe line.

4.19.05 THE RATE INCLUDES FOR :

1. Supplying and fixing Air Valve of specified diameter and type.
2. Supplying G.I. pipe and fittings if required.
3. All necessary labour, material and use of tools.

4.19.06 MODE OF MEASUREMENT : The measurement shall be for each unit of Air Valve fixed C.I. and G.I. specials, making lead or flange joint etc. shall be measured under the relevant items.

4.19.07 MODE OF PAYMENT : The contract rate shall be for each unit of air valve fixed.

4.20 BUTTER FLY VALVE :

4.20.01 GENERAL : The item includes supplying and fixing of butterfly valve of specified diameter as mentioned in the schedule.

4.20.02 MATERIAL : The butterfly valve shall be flanged type or as specified conforming to IS 13095 & BS - 5155. The valve shall be bubble tight, resilient sealed suitable for flow in either direction with accompanying flanges and steel handle.

4.20.03 FIXING : The butterfly valve shall be fixed to the pipe line in position as indicated in the drawing and as directed by the Engineer-In-Charge.

4.20.04 TESTING : The valve and the joints shall be tested to a minimum hydraulically pressure of 10kg/sqcm for a duration of two hours or as per testing clause of piping work. The testing shall be done along with the testing of pipe line. The leaky joints shall be rectified to the satisfaction of the Engineer-in-Charge.

4.20.05 THE RATE INCLUDES FOR :

1. Supplying and fixing Butterfly Valve of specified diameter.
2. Supplying G.I. pipe and fittings if required.
3. All necessary labour, material and use of tools.

4.120.06 MODE OF MEASUREMENT : The measurement shall be for each unit of butterfly Valve fixed. C.I. and G.I. specials, making lead or flange joint etc. shall be measured under the relevant items.

4.20.07 MODE OF PAYMENT : The contract rate shall be for each unit of butterfly valve fixed.

4.21 STAND POST TYPE FIRE HYDRANT :

4.21.01 GENERAL : The item includes supplying of C.I. Stand Post type Fire hydrant, C.I. sluice valve etc. including fixing.

4.21.02 MATERIAL : Stand post column shall be fitted with 65 mm size instantaneous male coupling and 80 mm size C.I. duck-foot bend, C.I. sluice valve etc.. Stand post hydrant shall conform to the relevant IS code. 80 mm socketed or flanged tail piece shall be as per site requirements. Sluice valve shall conform to the relevant IS code with necessary flanged/lead joints.

4.21.03 FIXING : Hydrant and C.I. sluice valve shall be fixed in position as indicated in the drawing or as directed. They shall be fitted by means of flange joints on the pipe line.

4.21.04 TESTING : The Hydrant and the joints shall be tested under the testing clause of pipe line. The testing shall be done along with the testing of pipe line.

4.21.05 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.

4.21.06 THE RATE INCLUDES FOR :

1. Supplying and fixing 80 mm dia. stand post column fitted with 65 mm size instantaneous male coupling, C.I. duck-foot bend, C.I. sluice valve, making lead/flanged joints etc.
2. Dewatering the trench or pit till completion of work.
3. All necessary labour, material and use of tools.

4.21.07 MODE OF MEASUREMENT : The measurement shall be for each unit of stand post hydrant fixed. Tail piece, making additional flange joint, lead joint for extension piece etc. shall be measured under the relevant items.

4.21.08 MODE OF PAYMENT : The contract rate shall be for each unit of stand post hydrant with C.I. Sluice valve fixed.

4.22 FERRULE CONNECTION :

4.22.01 GENERAL : The item includes making ferrule connection with existing C.I. or G.I. water supply line including fittings and fixtures.

4.22.02 MATERIAL : The ferrule shall be of gun metal or hard brass of diameter as specified in the schedule. It shall be fitted with screwed plug or valve capable of completely shutting off water supply. Coupling shall be casted in one piece with cast iron bell mouth cover.

4.22.03 FIXING : The ferrule shall be fixed to the water supply pipe line of specified diameter without protruding inside including making hole in the water main and covering with cast iron bell mouth cover. The ferrule shall be fitted water tight.

4.22.04 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 till completion of the work.

4.22.05 TESTING : Ferrule shall be tested under the testing clause of pipe line. The testing shall be done along with the testing of pipe line.

4.22.06 THE RATE INCLUDES FOR :

1. Ferrule, coupling and cast iron bell mouth cover.
2. Boring hole in the water main and fixing ferrule.
3. Dewatering the trench or pit till completion of work.
4. All necessary labour, materials use of tools.

4.22.07 MODE OF MEASUREMENT : The measurement shall be for each unit of ferrule connection.

4.22.08 MODE OF PAYMENT : The contract rate shall be for each unit of ferrule connection.

4.23 MAKING CONNECTION WITH WATER MAIN:

4.23.01 GENERAL : The item includes connection with the existing C.I. or G.I. water supply line including fittings & fixtures.

4.23.02 MATERIAL : C.I. or G.I. specials shall be conforming to relevant IS code and flange joint or lead joint shall be as per specifications described herein before.

4.23.03 MAKING CONNECTION : The connection shall be made with existing C.I. or G.I. water pipe line of specified diameter. The existing water supply pipe line shall be cut or disjointed carefully where the connection is to be made. The connection shall be made with providing C.I. or G.I. specials as per site requirement including making flanged joint or lead joint.

4.23.04 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 till completion of the work.

4.23.05 TESTING : The connection shall be tested under the testing clause of pipe line. The testing shall be done along with the testing of pipe line.

4.23.06 THE RATE INCLUDES FOR :

1. Cutting, disjointing the C.I. or G.I. water supply line.
2. Supplying of C.I. or G.I. specials
3. Making flanged joint, lead or screwed joint including providing new flange.
4. Dewatering the trench or pit till completion of the work.
5. All necessary labour, material and use of tools.

4.23.07 MODE OF MEASUREMENT : The measurement shall be for one job making connection with existing water supply line complete in all respect. Including required fittings, fixtures, specials, making flanged joint or lead joint etc. which shall not be measured separately.

4.23.08 MODE OF PAYMENT : The contract rate shall be for one job making connection with existing water supply line complete in all respect. No payment shall be made for any required fittings, fixtures, and specials and making flanged joint or lead joint used in the connection.

4.24 MAKING CONNECTIONS WITH MUNICIPAL WATER MAIN :

4.24.01 GENERAL : The item includes connection with existing C.I. or G.I. water supply line including fittings and fixtures.

4.24.02 MATERIAL : C.I. of G.I. specials shall be conforming to relevant IS code and flange joint or lead joint shall be as per specifications described herein before.

4.24.03 MUNICIPAL CHARGES : If the connection shall be made with the water supply line of Municipal Corporation, the contractor shall obtain necessary permission from the concerned municipal authorities. He shall pay all the necessary charges towards the connection being permitted by the Municipality.

4.24.04 MAKING CONNECTION : The connection shall be made with existing C.I. or G.I. water pipe line of specified diameter. The existing water supply pipe line shall be cut or disjointed carefully where the connection is to made. The connection shall be made with providing CI or GI. specials as per site requirement including making flanged joint or lead joint.

4.24.05 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.

4.24.06 TESTING : The connection shall be tested under the testing clause of pipe line. The testing shall be done along with the testing of pipe line.

4.24.07 THE RATE INCLUDES FOR :

1. Cutting, disjointing the C.I. or G.I. water supply line.
2. Supplying C.I. or G.I. specials.
3. Making flanged joint, lead joint or screwed joint including providing new flange.
4. Dewatering the trench or pit till completion of work.
5. All necessary labour, material and use of tools.

4.24.08 MODE OF MEASUREMENT : The measurement shall be for one job of making connection with existing water supply line complete in all respect, including required fittings, fixtures, specials, making flanged joint or lead joint etc. Which shall not be measured separately.

4.24.09 MODE OF PAYMENT : The contract rate shall be for one job of making connection with existing water supply line.

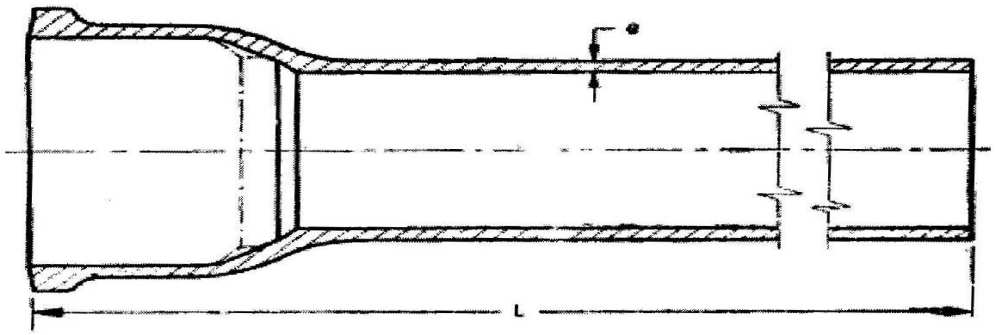
5.0 DRAINAGE SYSTEM

5.1 CAST IRON SOIL QUALITY PIPING WORK :

5.1.01 GENERAL The item includes supplying of soil quality CAST IRON pipe of specified diameter with fittings and fixtures including laying, fixing, cutting, jointing and painting the pipe line.

5.1.02 MATERIAL Cast Iron soil quality pipes and fittings shall have ISI certification mark. Sand -Cast, Cast Iron Soil quality or rain water pipes and fittings shall confirm to IS 1729 and centrifugally cast (Spun Cast) cast iron soil quality pipe shall confirm to IS 3989. All the pipes and fittings shall be cylindrical reasonably true with inner and outer surfaces and nearly concentric as practicable. The outer surface of the pipe and fitting shall be finished well, sound, free from pin hole, cracks and other imperfections. The pipes & fittings shall be treated with solution of Dr. Angus Smith's solution.

The dimensions, weight of Sand-Cast Iron/ Ductile Iron pipes and fittings shall be as per following table of IS 1729 – 2002 or its latest revision.



Tolerance : Mass (-) 5% , thickness (-) –2mm, pipe length (+/-) 20 mm, fitting length (+/-) 10 mm

Sr. No	Nominal Dia.	Thickness of wall	Nominal weight for pipes of overall length (L) (Exclusive of ears)								
			2.0 m	1.80m	1.50m	1.20m	0.90m	0.75m	0.6m	0.45 m	0.3m
			kg.	kg.	kg.	kg.	kg.	kg..	kg.	kg.	Kg.
1.	50 mm	5 mm	12.65	11.41	9.56	7.9	6.0	5.1	4.2	3.3	2.4
2.	75 mm	5 mm	18.37	16.52	13.83	11.5	8.8	7.5	6.1	4.8	3.4
3.	100 mm	5 mm	24.15	21.67	18.14	15.1	11.6	9.8	8.0	6.3	4.5
4.	150 mm	5 mm	35.66	31.92	26.70	22.6	17.3	14.7	12.1	9.5	6.9

The Dimensions, weight of Spun cast pipes and fittings shall be as per following table of IS 3989 - 1984 or its latest revision.

Tolerances : ((a) Thickness (-)15% (b) Weight (-) 10% (c) Length (+ / -) 20 mm) shall as per IS 3989

SN	Nominal Dia.	Thickness	Approximate weight for pipes of overall length (L)				
			3.0m	2.5m	2.0m	1.8m	1.5m
			kg.	kg.	kg.	kg.	kg.
1.	50 mm	3.5 mm	13.4	11.3	9.2	8.4	7.1
2.	75 mm	3.5 mm	20.0	16.8	13.8	12.5	10.6
3.	100 mm	4 mm	30.0	25.5	21.0	18.8	16.0
4.	150 mm	5 mm	56.0	47.0	38.5	34.9	29.5

5.1.03 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 remove from the site by the contractor at his own cost & charge.

5.1.04 CLEANING : All pipes and fittings shall thoroughly cleaned with brush and washed if necessary to remove any accumulated stone, soil or dirt inside and out side of piping material.

5.1.05 FIXING : The pipe shall be fixed as shown in the drawing. If the holes are not left in parapet, wall, beam, slab, floor, etc., they shall be cut and cavity surrounding the pipe made good properly after fixing the pipe. The pipe shall be fixed with nails and M.S. clamps having thickness not less than 3 mm , 20 mm wide or as specified in the schedule with socket facing up.

Spacing between clamps for fixing internal piping shall be as per IS 2065 – 1983 as given below :

Nom. dia of pipe	Horizontal Runs	Vertical Runs
50 mm	2 M	2 M
80 & 100 mm	2.5 M	2.5 M

The pipe and fitting shall be kept 50 mm away from the wall face to facilitate cleaning and painting etc. For rain water pipe the inlet end shall be carefully fixed to admit water from roof and shoe shall be fixed at outlet. Cowl shall be fixed at top end of the vent pipe.

5.1.06 LAYING : The pipes shall be carefully laid straight to correct alignment in gradients as indicated in the drawing or as directed by the Engineer-in-charge. The socket end of the pipe shall be uphill. All the pipes 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. While joining, the spigot shall be neatly placed into the socket for full length and properly supported. The entire length of pipe shall be evenly supported on the trench bed through out. 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 suitably plugged.

No pipe shall be laid until the trench has been excavated to its required depth for a distance of about 5 M in front of the pipe to be laid. No pipe shall be covered until it has been passed by the Engineer-in-charge.

5.1.07 MAKING LEAD JOINT : The spigot shall be carefully centered in the socket by one or more laps of spun hemp yarn twisted into ropes of uniform thickness thoroughly soaked in hot coal-tar or bitumen and cooled before use. The joints shall be made with molten lead and hemp yarn. The lead shall be melted rendering it thoroughly fluid and each joint shall be filled in one pouring. The lead may project 3 mm beyond the face of the socket against the outside of spigot, but must be flushed with the outside edge of the socket.

After the lead has been run into the joint, the lead shall be thoroughly caulked by a suitable caulking tool and 2 Kg hammer and the joint left neat and smooth. The consumption of lead will be worked out on the basis of actual observation at site. The following table shows consumption of lead and yarn per joint.

DIAMETER OF PIPE (MM)	YARN (in kg.)	LEAD (in kg.)
50	0.06	0.77
80	0.09	0.88
100	0.11	0.98
150	0.18	1.20

5.1.08 TESTING : The pipe line which is laid on the ground or below the ground level, the joints shall be tested with two meter head of water from a higher section of pipe line.

The pipe line fixed vertically on the wall shall be tested by the smoke test. The Greasy cotton waste shall be burnt in a smoke machine consisting of bellows and a burner. If any lead joint is found to be sweating or leaking, the contractor shall rectify the same till water tightness is attained to the full satisfaction of the Engineer-in-charge.

5.1.09 DEWATERING : In case of underground piping, the contract rate shall include bailing or pumping out all the water till completion of work if accumulated during the progress of work either from seepage, springs, rain or any other cause,

5.1.10 THE RATE INCLUDES FOR :

1. Supplying of C.I. soil quality Pipes and fittings, cowl for vent and shoe for rain water pipe of specified diameter with M.S. clamps and nails.
2. Laying, fixing, cutting and joining the pipe wherever necessary and wastage.
3. Making the lead joint including cost of fuel, wood, jointing with lead, spun yarn etc.

4 Fixing the pipe line with M.S. clamps not less than 3 mm thick, 20 mm wide and M.S. nails length not less than 60 mm and painting the clamps and nails.

5. Supplying and fixing rubber gasket to every cleaning access of cast iron pieces.

5 Painting the pipe line with two coats of black anti corrosive bitumastic paint or painting with synthetic enamel paint over appropriate primer, in case the pipe line exposed in elevation.

7. Testing the pipe line with smoke test or with two meter head of water.
8. Dewatering if necessary till completion of work.
9. All necessary materials, labour and use of tools.

5.1.11 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 lead joint, painting and testing.

5.1.12 MODE OF PAYMENT : The contract rate shall be for unit running meter length of pipe line laid or fixed.

5.2 UPVC- SWR PIPING WORK :

5.2.01 GENERAL : 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.

5.2.02 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.

5.2.03 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.

5.2.04 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 out side surfaces.

5.2.05 LAYING : The pipes shall be carefully laid straight to the correct alignment in gradients as indicated in the drawing. All the 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 through out. 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.

5.2.06 FIXING : 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 of 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.

5.2.07 MAKING JOINT : 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.

5.2.08 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.

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

5.2.10 DEWATERING : 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.

5.2.11 TESTING : Please see clause no.5.3.10

5.2.12 THE RATE INCLUDES FOR :

1. Supplying of UPVC-SWR pipes and fittings of specified diameter.
2. Laying and cutting the pipe wherever necessary and wastage.
3. 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.
4. Making the solution joint and painting if mentioned in schedule of work the pipe line.
5. In case of underground pipes , dewatering if necessary till completion of work.
6. All necessary materials, labour and use of tools.

5.2.13 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, painting if mentioned in schedule of work and testing.

5.2.14 MODE OF PAYMENT : The contract rate shall be for unit running meter length of pipe line laid or

5.3 HIGH DENSITY POLYETHYLENE PIPING WORK FOR DRAINAGE:

5.3.01 GENERAL : The item includes supplying of HDPE pipes with fittings of specified diameter including laying, fixing, cutting, jointing.

5.3.02 MATERIAL : The pipes and fittings shall conform to IS 14333. HDPE pipes and fittings shall be free from cracks, flaws and defects and shall be able to withstand a pressure as mentioned in the schedule.

5.3.03 EXAMINING : Before laying the pipe line, if 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.

5.3.04 LAYING : Please refer clause 4.4.03

5.3.05 FIXING : Please refer clause 4.4.05

5.3.06 MAKING JOINT : Please refer clause 4.4.06

5.3.07 DETACHABLE JOINT : Please refer clause 4.4.07

5.3.08 ANTISYPHONAGE : The HDPE pipes shall be used for anti-syphonage including provision, cutting, wastage, bending, dressing, jointing with cement solution, necessary plugs, brass fittings such a brass thimbles, brass union, brass cleaning caps and other brass fittings as required.

5.3.09 DEWATERING : In case of under ground piping works, the contract rate shall include bailing or pumping out all the water till completion of work if accumulated during the progress of work either from seepage, springs, rain or any other cause .

5.3.10 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 below 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.

5.3.11 THE RATE INCLUDES FOR :

1. Supplying of HDPE pipes and fittings of specified diameter.
2. Laying and cutting the pipe wherever necessary and wastage.
3. Making the solution joint or mirror joint, painting if mentioned in schedule of work
4. Fixing the pipe line with G.I. clamps not less that 20 mm x 1 mm thick and G.I./M.S. nails length not less than 40mm or HDPE clamps, screws, rawl plug etc.
5. In case of underground pipes , dewatering the pit or trench till completion of work.
6. All necessary labour, materials and use of tools.

5.3.12 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 centre line of pipe. No measurement shall be recorded separately for fitting, making joint, painting if mentioned in schedule of work and testing.

5.3.13 MODE OF PAYMENT : The contract rate shall be for unit running meter length of pipe line laid.

5.4 PVC PIPING WORK :

5.4.01 GENERAL : The item includes supplying of PVC pipes with fittings of specified diameter including laying, fixing, cutting, joining, painting etc. for vent, over flow, waste water pipe line etc.

5.4.02 MATERIAL : The pipes and fittings shall conform to series IV of IS 4985, PVC pipes and fittings shall be free from cracks, flaws and defects and shall be able to withstand a pressure as mentioned in the schedule.

5.4.03 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.

5.4.04 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 out side surfaces.

5.4.05 LAYING Please refer clause 4.5.05

5.4.06 FIXING : Please refer clause 4.5.06

5.4.07 MAKING JOINT :. Please refer clause 4.5.07

5.4.08 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.

5.4.09 PAINTING : If mentioned in schedule of work, the pipe line shall be painted with two coats of approved oil paint of matching colour over a coat of primer.

5.4.10 DEWATERING : 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.

5.4.11 TESTING : Please refer para 5.3.10.

5.4.12 THE RATE INCLUDES FOR :

1. Supplying of PVC pipes and fittings of specified diameter.
2. Laying and cutting the pipe wherever necessary and wastage.
3. 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 PVC clamps, screws, wooden gutties etc.
4. Making the solution joint and painting the pipe line if mentioned in schedule of work.
5. In case of underground piping, dewatering if necessary till completion of work.
6. All necessary materials, labour and use of tools.

5.4.13 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, painting and testing.

5.4.14 MODE OF PAYMENT : The contract rate shall be for unit running meter length of pipe line laid or fixed.

5.5 GULLY TRAP :

5.5.01 GENERAL : The item includes provision of S.W. Gully trap with C.I. frame including construction of Gully Trap Chamber.

5.5.02 MATERIAL : The Gully Trap shall be of salt glazed stoneware with 150 mm nominal square inlet or as specified in the schedule with 100mm diameter outlet. Brick work, plastering, concreting shall be as per general specifications under section-II.

5.5.03 CONSTRUCTION :

1. Internal dimension of the Gully trap chamber shall be as specified in the schedule.
2. Foundation of 1:4:8 concrete shall be 150 mm thick, and shall have 100mm offset.
3. Brick masonry shall be of 200 mm thick in cement mortar 1:6 and masonry shall be plastered with 15mm thick plaster in 1:3 cement mortars inside and outside surface with neat cement finish.

5.5.04 C.I. FRAME AND COVER : C.I. frame and cover shall be fixed with the cement concrete 1:2:4 at the top of Gully trap chamber, the weight of frame and cover shall not be less than 7.5 kg. and they shall be painted with two coasts of black bitumastic paint.

5.5.05 DEWATERING : 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.

5.5.06 THE RATE INCLUDES FOR :

1. Supplying of stoneware gully trap with C.I. frame and cover.
2. Concreting, brick work, plastering, fixing frame and cover.
3. Dewatering if necessary till completion of work.
4. All necessary materials, labour and use of tools.

5.5.07 MODE OF MEASUREMENT : The measurement shall be for unit of Gully Trap chamber of specified internal size and depth constructed including stoneware Gully Trap and C.I. frame and cover fixed.

5.5.08 MODE OF PAYMENT : The contract rate shall be for unit of Gully Trap chamber constructed as a whole.

5.6 C.I. NAHANI / FLOOR TRAP :

5.6.01 GENERAL : The item includes supplying of cast iron nahani / floor trap with CP brass/stainless steel grating of specified diameter with fittings and fixtures including fixing and jointing with the pipe line.

5.6.02 MATERIAL : 65 mm nominal outlet dia C I Nahani trap weighing not less than 4.5 kg with an effective water seal of 20 mm or 75mm nom. outlet dia. floor trap (100mm inlet dia.)/ nahani trap (165mm inlet dia.) conforming to IS 3989 or IS1729 shall be provided as specified in the schedule of quantities. Top grating shall be of CP brass or stainless steel of heavy quality of size and shape to suit the trap.

5.6.03 FIXING : C.I. nahani/ floor trap with the bend and pipe piece shall be fixed in position over the bed of 1:2:4 cement concrete. The jointing trap and pipe shall be caulked with 1:1 cement mortar. The grating shall be fixed over the nahani / floor trap flush with the floor level and the gap finished with matching cement.

5.6.04 THE RATE INCLUDES FOR :

1. C.I. nahani/ floor trap with CP brass or stainless steel grating as specified in the item.
2. Fixing the trap and getting with cement mortar or concrete.
3. All necessary materials, labour and use of tools.

5.6.05 MODE OF MEASUREMENT : The measurement shall be for unit of nahani trap fixed.

5.6.06 MODE OF PAYMENT : The contract rate shall be for unit of nahani trap fixed.

5.7 RAIN WATER GRATING :

5.7.01 GENERAL : The item includes supplying of cast iron grating of specified diameter including fixing and painting.

5.7.02 MATERIAL : The rain water grating shall be Cast Iron with closed grained without any casting defects. The thickness should be uniform throughout, one shaped C.I. grating.

5.7.03 FIXING : C.I. rain water grating shall be fixed in position with 1:1 cement mortar.

5.7.04 THE RATE INCLUDES FOR :

1. The cast iron rain water grating cement, sand etc.
2. Fixing the grating.
3. All necessary materials, labour and use of tools.

5.7.05 MODE OF MEASUREMENT : The measurement shall be for each unit of grating fixed.

5.7.06 MODE OF PAYMENT : The contracts rate shall be for each unit of grating fixed.

5.8 LEAD SHEET FLASHING :

5.8.01 GENERAL : The item includes supplying lead sheet flashing of specified size including laying, fixing, cutting, jointing and laying.

5.8.02 MATERIAL : Lead sheet flashing shall not be less than 3 mm thick & weight should not be less than 38 Kg. per sqm.

5.8.03 FIXING : The lead sheet shall be fixed all around the rain water pipe. The sheet shall project one diameter of socket all-round beyond the outer face of the socket & shall project inside the socket at least half the diameter of the rain water pipe socket. It shall be fixed by bending & breaking the sheet to shape, placing, tucking below waterproofing courses etc.

5.8.04 THE RATE INCLUDES FOR :

1. The lead sheet flashing, cement concrete and cement mortal etc.
2. Fixing the lead sheet in position.
3. All necessary materials, labour and use of tools.

5.8.05 MODE OF MEASUREMENT : The measurement shall be for each unit of lead sheet flashing fixed.

5.8.06 MODE OF PAYMENT : The contract rate shall be for each unit of lead sheet flashing fixed.

5.9 RAIN WATER G.I. SPOUT :

5.9.01 GENERAL : The item include supplying of G.I. rain water spouts of specified diameter with or without fitting at outlet including fixing. Cutting and painting.

5.9.02 MATERIAL : The rain water spout shall be of heavy quality G.I. pipe of approximate 400 mm length or as specified in the schedule of work. The 'T' of same diameter shall be fixed at the out let of spout. G.I. Pipe and fitting shall be as per specifications under section IV.

5.9.03 FIXING : G.I. rain water spout shall be fixed in the position as shown in the drawing including breaking, cutting RCC pardi, brick wall, RCC floor etc. It shall be fixed with 1:1 cement mortar and 1:2:4 cement concrete.

5.9.04 PAINTING : The exposed part of spout shall be painted with two coats of approved flat oil paint over a coat of primer.

5.9.05 THE RATE INCLUDES FOR :

1. The G.I. rain water spout, cement concrete and cement mortar.
2. Fixing and painting the spout.
3. All necessary materials, labour and use of tools.

5.9.06 MODE OF MEASUREMENT : The measurement shall be for each unit of G.I. spout fixed.

5.9.07 MODE OF PAYMENT : The contract rate shall be for each unit of G.I. spout fixed.

5.10 RAIN WATER C.I. SPOUT :

5.10.01 GENERAL : The item include supplying of C.I. spouts of specified diameter including fixing, cutting, and painting,

5.10.02 MATERIAL : The spout shall be of heavy quality C.I. pipe of approximate 600 mm long or as specified in the schedule of work. Pipe shall be as per specifications of C.I. piping work under Section-V.

5.10.03 FIXING : C.I. rain water spout shall be fixed in the position including breaking, cutting RCC/ brick structure etc. It shall be fixed with 1:1 cement mortar and 1:2:4 cement concrete.

5.10.04 PAINTING : The exposed part of spout shall be painted with two coasts of anticorrosive black bitumastic paint over a cost of primer.

5.10.05 THE RATE INCLUDES FOR :

1. The C.I. Spout, cement concrete and cement mortar.
2. Fixing and painting the spout.
3. All necessary materials, labour and use of tools.

5.10.06 MODE OF MEASUREMENT : The measurement shall be for each unit of C.I. spout fixed.

5.10.07 MODE OF PAYMENT : The contracts rate shall be for each unit of C.I. spout fixed.

5.11 GARBAGE CHUTE :

5.11.01 GENERAL : The item include supplying of A.C. garbage chute of specified diameter including fixing & cutting.

5.11.02 MATERIAL : Garbage chute shall be of asbestos cement of dimension as mentioned in the schedule. The refuse disposal system shall consist of A.C. pipes, A.C. refuse junction, A.C. adapter of suitable size and M.S. or Aluminum hopper of 18 gauge suitably capped with vent covers and providing the AC junction at terrace floor opening for periodical flushing / cleaning purpose. Inlet hopper which is to be located at each floor shall be closed with rubber seal along the shutter and shall be of 18 gauge aluminum / M.S. sheet and suitable for all diameter of shafts.

5.11.03 FIXING : A.C. refuse junction shall be fixed at convenient height and it should not exceed 75 cms. From floor level or as directed by the Engineer-in-charge.

Square opening of refuse junctions shall be embedded in masonry or in cement concrete and M.S. Aluminum hoppers shall be fitted with nuts and bolts to the square junction opening and the frame shall flush with the wall.

The refuse disposal system shall be supported by M.S. flats not less than 20 mm x 3 mm thick encircling the pipe or junction below the socket and fixed to the wall with two screws of suitable length on each end of M.S. flats. The entire fixing of the garbage chute shall be carried out as directed by the Engineer-in-charge.

5.11.04 JOINTING : Joints of sockets and spigot shall be caulked to about 25 mm in depth with bitumastic jointing compound and remaining gap may be grouted with 1:2 cement mortar.

5.11.05 THE RATE INCLUDES FOR :

1. The A.C. garbage chute with all fittings
2. Fixing the garbage chute and joining with 1:1 cement mortar.
3. All necessary materials, labour and use of tools.

5.11.06 MODE OF MEASUREMENTS : The measurement shall be for per running meter length of garbage chute fixed.

5.11.07 MODE OF PAYMENT : The contract rate shall be for per running meter length of garbage chute fixed.

5.12 INSPECTION CHAMBER :

5.12.01 GENERAL : The item includes provision of brick masonry Inspection Chamber of internal size as specified in the schedule.

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

5.12.03 CONSTRUCTION :

1. Internal dimensions and initial depth shall be as specified in the schedule or as shown in the drawing.
2. Foundation of 1:2:4 concrete shall be 150 mm thick and shall have 150 mm offset.
3. 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.
4. Brick masonry shall be 200 mm thick in cement mortar 1:2 or as specified in the schedule of work, making brick tapering for longitudinal wall 450 mm from top of cover of the chamber.
5. 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.

5.12.04 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.

5.12.05 THE RATE INCLUDES FOR :

1. Concreting in foundation, forming the channels, constructing brick masonry and plastering over the brick work, and finishing smooth in side surfaces.
2. Cutting existing stoneware/RCC Hume pipe line to facilitate construction the Inspection chamber.
3. Dewatering the pit if found necessary till completion of work.
4. All necessary labour, materials and use of tools.

5.12.06 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 R.M.

5.12.07 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.

5.13 CIRCULAR MANHOLE :

5.13.01 GENERAL : The item includes provision of brick masonry Circular manhole of internal size as specified in the schedule.

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

5.13.03 CONSTRUCTION :

1. Internal dimensions and initial depth shall be as specified in the schedule of work or as shown in the drawing.
2. Foundation of 1:2:4 concrete shall be 300 mm thick and shall have 300 mm offset.
3. 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.
4. Brick masonry shall be in cement mortar 1:2 or as specified in the schedule of work. One meter height from top shall be conical in shape and shall be constructed in 200 mm thick brick masonry and remaining height shall be 300 mm thick in cylindrical shape.
5. 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.

5.13.04 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.

5.13.05 THE RATE INCLUDES FOR :

1. Concreting in foundation, forming the channels, constructing brick masonry and plastering over the brick work and finishing smooth inside surfaces.
2. Cutting existing stoneware/RCC hume pipe line to facilitate construction of new manhole.
3. Dewatering the pit if found necessary till completion of work.
4. All necessary labour, materials and use of tools.

5.13.06 MODE OF MEASUREMENT : The measurement shall be for one circular manhole of specified finished internal size and initial depth measured vertically from top of the frame and cover to the invert of manhole. Extra over for additional depth or rebate for lesser depth shall be measured in R.M.

5.13.07 MODE OF PAYMENT : The contract rate shall be for unit circular manhole of specified internal size and initial depth, Extra/Rebate for additional/lesser depth respectively shall be paid in RM.

5.14 EXTRA DEPTH FOR INSPECTION CHAMBER AND MANHOLE :

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

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

5.14.03 CONSTRUCTION : Extra depth for inspection chamber and manhole shall be constructed under the clause 5.12.00 & 5.13.00 of the Section - 5.

5.14.04 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.

5.14.05 THE RATE INCLUDES FOR :

1. Constructing brick masonry and plastering over the brick work.
2. Dewatering the pit if found necessary till completion of work.
3. All necessary labour, materials and use of tools.

5.14.06 MODE OF MEASUREMENT : The measurement shall be for unit meter depth or part thereof for inspection chamber / circular 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 lessor depth shall be measured in R.M.

5.14.07 MODE OF PAYMENT : The contract rate shall be for unit meter depth of inspection chamber / circular manhole constructed.

5.15 DROP CONNECTION :

5.15.01 GENERAL : The item includes provision of drop connection of salt glazed of nominal diameters as specified in schedule of quantities including 1:2:4 cement concrete encased to pipe all round.

5.15.02 MATERIAL : Concreting, mortar for jointing the pipes, hemp yarn, salt glazed stoneware pipes and specials like bends, tees, crosses (double tees), plugs caps etc. of specified diameter shall be of grade 'A' or 'AA' conforming to IS 651. All the pipes and fitting shall be free from pin hole, cracks and other imperfections and should have be free from pin holes, cracks and other imperfections and should have the glossy finish in salt glazing, necessary form work for encasing the pipe.

5.15.03 DAMAGED MATERIAL : Any material found damaged or cracked shall not be used in the work and contractor has to replace the same from the site at his own cost and charges.

5.15.04 LAYING, FIXING, JOINTING, CLEANING, TESTING : Above shall be done as specified in clause 5.18.00 i.e. salt glazed stone ware piping work.

5.15.05 ENCASING THE PIPE LINE : After the joints and pipes have been proved to be water tight then pipe line shall be embedded in cement concrete as specified in the schedule of quantities and as shown in drawings including necessary form work.

5.15.06 DEWATERING : The contractor 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.

5.15.07 THE RATE INCLUDES FOR :

1. Stone ware pipe with specials viz. bends, tees, crosses (double tees), plugs, caps etc. cement mortar 1:1 and spun yarn
2. Laying, jointing and testing the pipe line including cutting & wastage
3. Concreting and formwork for encasing
4. Dewatering if found necessary till completion of work.
5. All necessary labour, materials and use of tools.

5.15.08 MODE OF MEASUREMENT : The measurement shall be for one drop connections of specified nominal dia. of pipe & depth of drop connection shall be measured vertically from the bed level of drop pipe cleaning chamber (i.e. finished top of bed concrete) to the invert level of manhole or chamber. Extra/Rebate for additional/lesser than the initial depth respectively shall be measured in RM.

5.15.09 MODE OF PAYMENT : The Contract rate shall be for one drop connection of specified nominal diameter & depth as specified in the schedule & drawings.

5.16 EXTRA OVER DEPTH FOR DROP CONNECTION :

5.16.01 GENERAL : The item includes provision of extra depth for drop connection including providing and laying salt glazed stone ware pipe & specials, 1:2:4 (or as specified in schedule) cement concrete for on casing the pipe al round square in shape all as specified in drawings & schedule.

5.16.02 MATERIAL : Concreting, mortar for jointing the pipes, hemp yarn, salt glazed stoneware pipes and specials of specified diameter shall be of grade 'A' or 'AA' class and conforming to IS 651-1971. All the pipes and fittings shall be free from pin holes. Cracks & other imperfection and should have the glossy finish of salt glazing, necessary form work encasing the pipes.

5.16.03 DAMAGE / MATERIALS : This clause shall be as per clause 5.21 salt glazed stone ware piping work.

5.16.04 LAYING, FIXING JOINTING, CLEANING AND FIXING : This clause shall be as per clause 5.21 i.e. salt glazed stone ware piping work.

5.16.05 ENCASING THE PIPE LINE : This clause shall be as per clause 5.15.05 as i.e. Drop connection.

5.16.06 DEWATERING : This clause shall be as per clause 5.15.06 i.e. drop connection.

5.15.07 THE RATE INCLUDES FOR :

1. S.W. pipe with specials, cement mortar 1:1 and spun yarn.
2. Laying, jointing and testing the pipe line including cutting and wastage.
3. Concreting and form work for encasing
4. Dewatering if found necessary till completion of work.

5.16.08 MODE OF MEASUREMENT : The depth of drop connection shall be measured vertically from the bed level of drop pipe cleaning chamber (i.e. finished top of bed concrete) to the invert level of manhole or chamber and initial depth shall be deducted.

5.16.09 MODE OF PAYMENT : Contract rate shall be for unit meter depth or part thereof for drop connection

5.17 DROP PIPE CLEANING CHAMBER :

5.17.01 GENERAL : The item includes construction of brick masonry valve chamber of size as specified in this schedule including providing M.S./G.I. frame and cover over R.C.C pre-cast cover with or without surface box.

5.17.02 MATERIAL : Brick work, plastering, concreting etc. shall be as per general specification under section II. Precast RCC cover slab, surface box, C.I/M.S frame and cover etc. shall be size and weight as specified in the schedule.

5.17.03 CONSTRUCTION :

a)Foundation concrete of mix 1:2:4 shall be of 150 mm thick with 150 mm offset alround or as specified in the schedule.

b)Brick masonry in cement mortar 1:2 as specified.

c)Plastering inside and outside surfaces of walls in two courses using cement mortar 1:1 of thickness as specified mixed with water proofing compound of specified Quality including inner surfaces finished smooth with neat cement punning.

5.17.04 RCC PRECAST/CAST IRON COVERS

5.17.04.1 RCC PRECAST COVER (for chambers of size upto 600 x 600 mm) : Chamber cover shall be casted as shown in the drawing having minimum 75 mm thick in cement concrete 1:2:4 or as specified in the schedule by using nominal reinforcement @ 100 kg/ Cum. of concrete including shuttering, finishing, curing, placing the cover in position as directed by Engineer-in-charge.

5.17.04.2 CAST IRON/ M.S COVER : Cast iron/ M.S cover of specified size and weight shall be supplied and placed over the chamber as directed. The cover shall be painted with 3 coats of black bitumastic paint.

5.17.05 DEWATERING : The water accumulated in the pit due to rain, seepage, springs or any other cause during the progress of work shall be pumped/bailed out till the completion of work.

5.17.06 THE RATE INCLUDES FOR :

1. Bed concrete, Brick masonry, cement plaster, RCC pre-cast cover / MS cover etc.
2. Dewatering the trench or pit if necessary.
3. All necessary labour, materials and use of tools.

5.17.07 MODE OF MEASUREMENT : The measurement shall be for each unit of chamber of specified internal size and depth constructed.

5.17.08 MODE OF PAYMENT : The contract rate shall be for each unit of chamber of specified internal size and depth constructed.

5.18 C.I. FRAME AND COVER FOR MANHOLES :

5.18.01 GENERAL : The item includes supply LD/MD/HD/EHD/C.I. frame and cover as specified in schedule including fixing and painting.

5.18.02 MATERIAL : C.I. Frame and cover shall conform to IS 1720 and shall have IS certification mark with grade LD/MD/HD/EHD and the weight of frame and cover shall not be less than as specified in the schedule.

5.18.03 FIXING : Frame shall be fixed in the cement concrete 1:2:4 for bearing course and capping on the brick masonry wall of the chamber of manhole and finishing shall be done in 1:2 cement plaster finished smooth with neat cement.

5.18.04 PAINTING : The frame and cover shall be painted with two coats of approved black bitumastic anticorrosive paint over a coat of primer.

5.18.05 THE RATE INCLUDES FOR :

1. C.I. frame and cover, cement concrete, cement plaster, painting etc.
2. All necessary labour, material and use of tools.

5.18.06 MODE OF MEASUREMENT : The measurement shall be for C.I. Frame & cover on actual unit weight basis.

5.18.07 MODE OF PAYMENT : The contract rate shall be for C.I. Frame and cover on actual unit weight basis.

5.19 PRECAST CONCRETE FRAME AND COVER FOR MANHOLES :

5.19.01 GENERAL : The item includes supply LD/ MD/ HD/ EHD factory made precast steel fiber reinforced concrete (SFRC) frame and cover as specified in schedule including fixing and placing.

5.19.02 MATERIAL : The precast frame and cover shall be of steel fiber reinforced concrete (SFRC) conforming to IS 12592 and shall be of approved make. The frame and cover shall be of LD/ MD/ HD/ EHD grade, size and thickness as mentioned in the description of the item. The defective Frame and cover shall be replaced by the contractor at his own cost and charges.

5.19.03 FIXING : Frame shall be fixed in cement concrete 1:2:4 for bearing course & capping on the top of masonry wall of chamber or manhole and finishing shall be done in 1:2 cement plaster finished smooth with neat cement.

5.19.04 THE RATE INCLUDES FOR :

1. Precast S.F.R.C. Frame and cover, cement concrete, cement plaster etc.
2. All necessary labour, material and use of tools.

5.19.05 MODE OF MEASUREMENT : The measurement shall be for unit set of Precast S.F.R.C. Frame and cover fixed.

5.19.06 MODE OF PAYMENT : The contract rate shall be for unit set of Precast S.F.R.C. Frame and cover fixed.

5.20 CAST IRON STEPS / RUNGS :

5.20.01 GENERAL : The item includes supplying of cast iron steps including fixing and painting

5.20.02 MATERIAL : The steps shall be of cast iron and minimum 150 mm wide. The minimum weight of each step shall not be less than 5 kg or as specified in the schedule.

5.20.03 FIXING : The steps shall be fixed in brick masonry wall with 1:2:4 cement concrete with 75 mm cement concrete cover at all around the step. The first step shall be 450 mm below from top surface of structure and next shall be fixed 300 mm centre to centre in two rows at 300 mm distance or as shown in the drawing.

5.20.04 PAINTING : The projected portion of the cast iron step shall be painted with two coats of approved black bitumastic anti corrosive paint over a coat of primer.

5.20.05 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.

5.20.06 THE RATE INCLUDES FOR :

1. C.I. Steps cement concrete and painting etc.
2. Dewatering if found necessary till completion of work.
3. All necessary labour, material and use of tools.

5.20.07 MODE OF MEASUREMENT : The measurement for C.I. steps shall be on actual unit weight basis or unit C.I. step fixed as specified in the schedule.

5.20.08 MODE OF PAYMENT : The contract rate for C.I. steps shall be on actual unit weight basis or unit C.I. step fixed.

5.21 SALT GLAZED STONE WARE PIPING WORK :

5.21.01 GENERAL : The item includes supplying, laying and fixing the salt glazed Stone ware pipes with necessary fittings of specified diameter including laying, jointing etc.

5.21.02 MATERIAL : Salt glazed stoneware pipes and specials of specified diameter shall be of grade "A" or "AA" conforming to IS 651. All the pipes and fitting shall be free from pin holes, cracks and other imperfections and should have the glossy finish of salt glazing.

5.21.03 DAMAGED MATERIAL : Any material found damaged or cracked shall not be used in the work contractor has to replace the same from the site at his own cost and charge.

5.21.04 TRENCHES : The trench shall be so dug that the pipe can be laid to the required alignment and at the required depth. When the pipe line is under road way, a minimum cover of 900 mm is recommended for adoption, but it may be modified to suit local conditions.

Unless otherwise specified by the Engineer-in-Charge, the width at bottom of trenches for different diameters of pipe laid at different depth s shall be as given below:-

a) For all diameters, upto an average depth of 1200 mm , width of trench in mm shall be equal to diameter of pipe plus 300 mm.

b) For all diameters for depths above of 1200 mm , width of trench in mm shall be equal to the diameter of pipe plus 400 mm

c) Not withstanding (a) & (b) above, the total width of trench shall not be less than 750 mm for depths exceeding 900 mm.

The width of trench in the upper reaches shall be increased as described in sub head under “Earth Work.”

5.21.05 LAYING AND FIXING : Pipes shall be laid carefully to the correct alignment, levels and gradient and care shall be taken to prevent for entering the sand, earth or other foreign material into the pipes during laying. The pipes between manhole shall be laid truly in straight line, without vertical or horizontal undulations.

All inverts shall be laid from sight rails fixed at the true levels, with proper boning rods, The pipes shall be laid sockets facing up the gradient, alignment at the lower end and with the socket resting in the concrete bed if specified. Each pipes shall be laid singly and no pipe shall be laid until the trench has been excavated up to the required depth for a distance of 5meter in front of the pipes to be laid.

5.21.06 JOINTING : Spun yarn soaked in cement wash shall be passed round the spigot and spigot inserted in the socket, The spun yarn shall then be caulked with 1:1 cement mortar with a little water, pressed into the joint with hand and finished at 45 degree The mortar shall be cured for seven days.

The following table shows the details of materials used for jointing the S.W. pipe.

Internal dia of pipe (mm)	Depth of socket in mm	Depth of yarn in mm	Depth of C.M. paste in mm
100	50	20	33
150	56	30	30
230	65	30	35

5.21.07 CLEANING : Interior surface of the pipes and fittings shall be cleaned off from all dirt, cement mortar and superfluous materials.

5.21.08 TESTING : The joints of S.W. Pipe line shall be tested for a minimum 2.50 metre water head over the crown of the highest pipe between the two manholes. The lower end shall be plugged water tight. Water shall then be filled in the inspection chamber or manhole at the upper end of the line with 2.50 metre depth of water over the crown. If it is found the certain pipe joints are leaking, the water shall be drained off and joints shall be re-caulked. The hydraulic test shall be carried out in accordance with IS 4127.

5.21.09 ENCASING THE PIPE LINE : After the joints and pipes have been proved to be water tight then pipe line shall be embedded in cement concrete if specified to the extent of one half of external diameter of the pipes as directed, the concrete being made to slope away towards the sides of the foundations bed. Refilling shall be done with fine selected materials and shall be done in layers not exceeding 150mm thick, watered, consolidated and rammed properly, as specified.

5.21.10 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.

5.21.11 THE RATE INCLUDES FOR :

1. S.W. Pipes with specials, cement mortar 1:1 and spun yarn.
2. Laying, jointing and testing the pipe line including cutting and wastage.
3. Dewatering if found necessary till completion of work.
4. All necessary labour, materials and use of tools.

5.21.12 MODE OF MEASUREMENT : The measurement shall be for unit meter length of pipe line laid. The pipe shall be measured along the center line over all fittings. The measurement does not include for encasement of the pipe, which will be paid the relevant item.

5.21.13 MODE OF PAYMENT : The contract rate shall be for unit meter S.W. pipe line laid.

5.22 SEWER TRAP :

5.22.01 GENERAL : The item includes supplying, laying and fixing the Stone ware sewer trap of specified diameter including fixing, jointing and embedding.

5.22.02 MATERIAL : Sewer trap shall be salt glazed of stoneware of specified diameter and shall be of grade "A" or "AA" conforming to IS 651. Sewer trap should be free from pin holes, cracks and other imperfections and should have the glossy finish of salt glazing.

5.22.03 DAMAGED MATERIAL : Any material found damaged or cracked shall not be used in the work and contractor has to replace the same from the site at his own cost and charge.

5.22.04 FIXING : Sewer trap shall be laid carefully to the correct alignment, levels and gradient and care shall be taken to prevent for entering the sand, earth or other free material into the trap during laying. The trap shall be on bedded in CC 1:2:4 including necessary form work.

5.22.05 TESTING : The testing shall be done along the testing of server line with the same specification.

5.22.06 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.

5.22.07 THE RATE INCLUDES FOR :

1. S.W. sewer trap, cement mortar 1:1 and spun yarn.
2. Laying, jointing on bedding in CC 1:2:4
3. Dewatering if found necessary till completion of work.
4. All necessary labour, materials and use of tools.

5.22.08 MODE OF MEASUREMENT : The measurement shall be for each unit of sewer trap fixed.

5.22.09 MODE OF PAYMENT : The contract rate shall be for each unit of sewer trap fixed.

5.23 CONNNECTION WITH DOMESTIC SEWER :

5.23.01 GENERAL : The item includes the provisions of connecting sewer line with existing sewer line chamber or manhole including cutting, breaking of masonry, road surface and making good to the original condition of the damages.

5.23.02 MATERIAL : Concreting, Brick work, plastering etc. shall be as per specification as given in general specification of section II.

5.23.03 MAKING CONNECTION :

1. Breaking or cutting the road surface for sewer connection.
2. Restoring all the excavated items in proper manner as directed by the Engineer-in-charge
3. Cutting the brick masonry wall to required size of existing manhole or inspection chamber.
4. Connecting the sewer line to the chamber or manhole.
5. Making good to the original condition all the damages after completion of sewer connection.
6. Disposing off all the superfluous material as directed.

5.23.04 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.

5.23.05 THE RATE INCLUDES FOR :

1. Cutting the road surface as required and making good.
2. Restoring all the excavated materials and disposal of superfluous materials.
3. Cutting the manhole masonry, making good masonry and other damages to the original condition according to the bye-laws.
4. Dewatering if found necessary till completion of work.
5. All the necessary labour, materials and use of tools.

5.23.06 MODE OF MEASUREMENT : The measurement shall be for one job.

5.23.07 MODE OF PAYMENT : The contract rate shall be for one job.

5.24 CONNECTION WITH MUNICIPAL SEWER LINE :

5.24.01 GENERAL : The item includes the provisions of connecting sewer line with existing municipal sewer line chamber or manhole including cutting, breaking of masonry, road surface and making good to the original condition of the damages.

5.24.02 MATERIAL : Concreting, brick work, plastering etc. shall be as per specification as given in general specification under section II.

5.24.03 MAKING CONNECTION :

1. Breaking or cutting the road surface for sewer connection.
2. Restoring all the excavated items in proper manner as directed by the Engineer-in-charge.
3. Cutting the brick masonry wall to required size of municipal manhole or inspection chamber.
4. Connecting the sewer line to the chamber or manhole of Municipal sewer line.
5. Making good to the original condition all the damages after completion of sewer connection.
6. Disposing off all the superfluous materials as directed.
7. All necessary labour, materials and use of tools.

5.24.04 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.

5.24.05 MUNICIPAL CHARGES : The contractor shall obtain the necessary permission for connecting the sewer line to the municipal sewer from the concerned authorities. He shall pay all necessary charges towards the connection given by the municipality.

5.24.06 THE RATE INCLUDES FOR :

1. Cutting the road surface as required and making good.
2. Restoring all the excavated materials and disposal of superfluous materials.
3. Cutting the manhole masonry, making good masonry and other damages to the original condition according to the bye-laws.
4. All the municipal charges towards connection.
5. Dewatering if found necessary till completion of work.
6. All necessary labour, material and use of tools.

5.24.07 MODE OF MEASUREMENT : The measurement shall be for one job

5.24.08 MODE OF PAYMENT : The contract rate shall be for one job.

6.0 WATER TANK, SEPTIC TANK, UPFLOW FILTER & SOAK PIT

6.1 FRAME AND COVER :

6.1.01 GENERAL : The item includes supplying of M.S. or C.I. frame with cover of size as specified in the schedule including fixing and painting. The frame and cover shall be of mosquito proof condition and approved by the Municipality

6.1.02 MATERIAL : The frame and cover shall be of mild steel or cast iron as specified in the schedule. The weight of frame and cover shall not be less than 50 kilogram's. They should have locking arrangement.

6.1.03 FIXING : The frame shall be fixed in the roof slab of tank or built with hold fast to R.C.C. slab by chasing or cutting slab and grouting with 1:2 cement mortar.

6.1.04 PAINTING : The frame and cover shall be painted with two coats of approved anti corrosive black bitumastic paint over a coat of approved quality primer.

6.1.05 THE RATE INCLUDES FOR :

1. Supplying and fixing frame and cover with locking arrangement.
2. All necessary materials, labour, painting and use of tools.

6.1.06 MODE OF MEASUREMENT : The measurement shall be on actual unit weight basis.

6.1.07 MODE OF PAYMENT : The contract rate shall be for unit weight basis.

6.2 SPOOL PIECE :

6.2A MILD STEEL / CAST IRON :

6.2A.01 GENERAL : The item includes supplying of M.S. Spool piece with end coupling or C.I. Spool piece with end flanges of size as specified in the schedule including fixing and painting.

6.2A.02 MATERIAL : Spool piece shall be in length 400 mm of G.I. pipe with end coupling or to 600 mm of C.I. spun pipe with end flanges, as specified in the schedule, A mild steel plate of size 3D x 3D or 200 mm x 200 mm whichever is more (where 'D' is the outer diameter of pipe) and shall be welded on the pipe such a way that it can be placed in the center of the RCC wall/ floor. The plate shall not be less than 4 mm thick.

6.2A.03 FIXING : The Spool piece shall be fixed in position as shown in the drawing or as directed by the Engineering in charge. The spool piece in RCC wall / floor of water tank / septic tank shall be fixed by making hole in the shuttering and tying it with reinforcement with M.S. wire, all as directed by the Engineer-in-charge.

6.2A.04 PAINTING : Projected length of Spool piece shall be painted with two coats of oil paint or anticorrosive black bitumastic paint as specified.

6.2A.05 THE RATE INCLUDES FOR :

1. Supplying and fixing of spool piece.
2. All necessary materials, labour, painting and use of tools.

6.2A.06 MODE OF MEASUREMENT : The measurement shall be taken for each spool piece of specified diameter fixed.

6.2A.07 MODE OF PAYMENT : The contract rate shall be for each spool piece of specified diameter fixed.

6.2B STAINLESS STEEL :

6.2B.01 GENERAL : The item includes supplying of stainless steel Spool piece with end flanges with required number of bolt holes of size as specified in the schedule & drawings including fixing.

6.2B.02 MATERIAL : Spool piece shall be of approximate 600 mm long or standard available length of stainless steel pipe conforming to ASTM A312, TP304/TP304L with end flanges as specified in the schedule. A stainless steel plate of size 3D x 3D or 200 mm x 200 mm, whichever is more (where 'D' is the outer diameter of pipe) and shall be welded on the pipe such a way that it can be placed in the center of the RCC wall/ floor. The plate shall not be less than 4 mm thick. The stainless steel pipe shall be seamless and scheduled / classified / graded as per actual system requirement and as per ANSI B36.19

6.2B.03 FIXING : The spool piece shall be fixed in position as shown in the drawing or as directed by the Engineer-in-charge. The spool piece in RCC wall and floor of water tank shall be fixed by making hole in the shuttering and tying it with reinforcement using M.S. wire, all as directed by the Engineer-in-charge.

6.2B.04 THE RATE INCLUDES FOR :

1. Supplying and fixing of spool piece.
2. All necessary materials, labour and use of tools.

6.2B.05 MODE OF MEASUREMENT : The measurement shall be on total weight / mass basis of pipe pieces, flanges and puddle plate fixed as one unit.

6.2B.06 MODE OF PAYMENT : The contract rate shall be for unit weight of each spool piece fixed.

6.3 OVER FLOW COUPLING :

6.3.01 GENERAL : The item includes supplying of C.P. Brass over flow coupling with mosquito proof jalli of size as specified in the schedule including fixing and painting.

6.3.02 MATERIAL : The overflow coupling shall be of heavy quality. Over flow coupling and Mosquito proof Jalli shall be of C.P. brass.

6.3.03 FIXING : The over flow coupling & jalli shall be fixed in position as shown in the drawing with leak proof joints.

6.3.04 THE RATE INCLUDES FOR :

1. Supplying & fixing Overflow coupling with mosquito proof jalli.
2. All necessary materials, labour, painting and use of tools.

6.3.05 MODE OF MEASUREMENT : The measurement shall be for each Over flow coupling fixed with mosquito proof jalli.

6.3.06 MODE OF PAYMENT : The contract rate shall be for each over flow coupling fixed.

6.4 BALL VALVE :

6.4.01 GENERAL : The item includes providing horizontal type ball valve with PVC or copper float of size as mentioned in the schedule including fixing.

6.4.02 MATERIAL : Horizontal plunger type ball valve with PVC or copper float shall be conforming to IS 1703. The lever shall be of brass and may be made in one piece and the diameter of the lever rod shall not be less than the diameter of the thread for boss of ball. Float shall be watertight and non-absorbent and shall not contaminate water. Adhesives for joining the part shall not be used. The minimum thickness for copper sheet of copper float shall be 0.45 mm up to 115 mm diameter and 0.55 mm for ball over 115 mm diameter. Valve shall be tested in closed position to the hydraulic pressure of 2 MPa for a minimum period of 2 minutes without leakage and sweating.

6.4.03 MINIMUM MASS : The minimum mass of finished ball valve and float of different size and class shall be as per Table No. 8 of IS 1703.

6.4.04 FIXING : Valve shall be fixed in position as indicated in the drawing with necessary socket, union nuts etc. as per site requirements. A few turns of fine hemp yarn dipped in linseed oil shall be taken over the threaded ends to obtain complete water tight joint. Leaking joint if any shall be rectified to make it leak proof.

6.4.05 TESTING : Testing shall be done along with the testing of pipe line, Separate testing if required shall be done as per ISI norms.

6.4.06 THE RATE INCLUDES FOR :

1. Supply of specified diameter ball valve with copper or PVC float & brass lever arm, hemp yarn, linseed oil, zinc etc.
2. All necessary materials, labour and use of tools.

6.4.07 MODE OF MEASUREMENT : The measurement shall be for each ball valve fixed.

6.4.08 MODE OF PAYMENT : The contract rate shall be for each ball valve fixed.

6.5 RUNGS

6.5.01 GENERAL : The item includes supplying of copolymer polypropylene, steel reinforced plastic foot rests/ Rungs of size as specified in the schedule including fixing and painting

6.5.02 MATERIAL : The Steps shall be of 20 mm size, round or square of copolymer poly propylene, steel reinforced plastic foot rests conforming to ASTMD-4101 or as specified in the schedule of work.

6.5.03 FIXING : The Rungs shall be fixed in position as shown in the drawing or as directed by the Engineer-in-charge. It shall be fixed with cement concrete 1:2:4 in position in stone / brick masonry wall or direct cast to concrete wall. The first step shall be fixed 450 mm below from the top surface of structure and other rungs shall be fixed 300 mm center to center (staggered) as shown in the drawing.

6.5.04 THE RATE INCLUDES FOR :

1. Copolymer steel reinforced rungs, cement concrete etc.
2. All necessary materials, labour and use of tools.

6.5.05 MODE OF MEASUREMENT : The measurement shall be on the basis of unit rung fixed.

6.5.06 MODE OF PAYMENT : The contract rate shall be for unit rung fixed.

6.6 POLYETHYLENE WATER TANK :

6.6.01 GENERAL : The item includes providing polyethylene plastic water tank with cover of capacity as mentioned in the schedule including fixing and making connections such as inlet, outlet, scour, overflow etc.

6.6.02 MATERIAL : The water tank shall be made out of best moulded Polyethylene plastic. It shall be vertical or horizontal type as specified, watertight and non-absorbent and shall not contaminate water. Adhesives shall not be used in joints. The cover shall be of polyethylene / M.S. / C.I. as approved.

6.6.03 FIXING : The plastic water tank with cover shall be installed and fixed as per the manufacturer's specification. The connections such as inlet, outlets, over flow, scour etc. of specified diameter shall be made as mentioned in the schedule including the cost of fittings, fixtures and pipe of approximate 400 mm long.

6.6.04 THE RATE INCLUDES FOR :

1. Supply of polyethylene plastic tank, cover, G.I. pipe, fittings etc.
2. Installation of tank and making connections.
3. All necessary materials, labour and use of tools.

6.6.05 MODE OF MEASUREMENT : The measurement shall be for each polyethylene water tank of specified capacity installed or per litre capacity of water tank.

6.6.06 MODE OF PAYMENT : The contract rate shall be for each polyethylene water tank of specified capacity installed. The support for the tank shall be paid under relevant item.

6.7 MEDIA FOR UP-FLOW FILTER :

6.7.01 GENERAL : The item pertains to the provision of Stone aggregate as filter media of specified size for upflow filter as mentioned in the schedule including laying and filling.

6.7.02 MATERIAL : The media of stone aggregate shall be irregular or cubical in shape. They shall be free from thin, elongated and flat pieces. They should have high specific surface area, high percentage void, space, resistance to abrasion or disintegration during placement, insolubility in sewage or other waste water and resistance to spelling and flaking.

6.7.03 LAYING : The filter media made up of stone aggregate ranging from 40 mm to 75 mm in sizes as shown in the drawing and the same shall be placed in different layers starting from bigger sizes to smaller sizes from bottom.

6.7.04 DEWATERING : The contract rate includes bailing or pumping out all the water if accumulated during the progress of work either from rain, seepage, springs or any other cause till completion of the work.

6.7.05 THE RATE INCLUDES FOR :

1. Supplying and laying stone aggregate.
2. Dewatering, if necessary till completion of work.
3. All necessary materials, labour and use of tools.

6.7.06 MODE OF MEASUREMENT : The measurement shall be for unit cubic meter aggregate filled.

6.7.07 MODE OF PAYMENT : The contract rate shall be for unit cubic meter aggregate filled.

6.8 GENERAL SPECIFICATIONS FOR WATER TANK AND SEPTIC TANK :

6.8.01 GENERAL : Construction of water tank, septic tank and up flow filter is required to be done very carefully with good quality materials. Dense, well compacted concrete of required strength has to be achieved in order to make water tight compartment. The slope in the bed of tank, invert levels of insert, and also the levels of partition and baffle walls should be properly maintained for proper flow of liquid.

6.8.02 TESTING OF WATER TANK AND SEPTIC TANK : After construction of tank, it shall be tested for leak proof ness. The tank shall be first filled with water up to the top of wall. The water level should not drop more than 50 mm within 48 hours. If the drop of water level is found more than 50 mm the defective and leakage point shall be rectified to the full satisfaction of the Engineer-in-charge.

6.8.03 COMMISSIONING OF SEPTIC TANK : Before commissioning the septic tank, a little quantity of digested sludge, horse or cow dung may be added as a seed sludge to start functioning of bacterial activity in sewage.

6.8.04 BACK FILLING : The back filling shall be done as per specification after satisfactory testing of the tanks. Back filling shall be done in layers all around the tank and above the roof slab of the tank up to the height / depth as directed by the Engineer-in-charge.

6.8.05 CLEANING OF WATER TANK : The cleaning of the tank shall be done by manually or by Hydro dynamic mechanism with low or high pressure as directed. Potable water, approved disinfectant etc. shall be used for cleaning of water tank before use.

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

6.8.07 MODE OF MEASUREMENT : The work shall be measured under relevant item in the schedule of quantities and paid for. Quoted rates are deemed to include for dewatering, back filling testing and commissioning of water tank, septic tank and up-flow filter.

6.8.08 MODE OF PAYMENT : No additional payments shall be made towards dewatering back filling & commissioning.

6.9 HUME PIPE SEPTIC TANK :

6.9.01 GENERAL : The item pertains to providing Hume pipe septic tank of specified diameter with vent pipe and cap including laying, fixing and making connections.

6.9.02 MATERIAL : The Hume pipe septic tank of specified diameter and capacity with vent pipe and cap. The Hume-pipe septic tank shall be in good condition without any damage and cracks.

6.9.03 LAYING AND FIXING : Hume pipe septic tank shall be fixed in position and level as indicated in the drawing as per the manufacturer's specifications. The pipe joints for connection shall be made in cement mortar 1:1 The vent pipe with cap shall be fixed to the septic tank. Septic tank shall be completely filled with water just before putting into use.

6.9.04 DEWATERING : The contract rate includes bailing or pumping out all the water if accumulated during the progress of work either from rain, seepage, springs or any other cause till completion of the work.

6.9.05 THE RATE INCLUDES FOR :

1. Hume pipe septic tank, vent pipe with cap, cement mortar etc.
2. Laying Hume pipe septic tank, fixing vent pipe, making inlet pipe connection and filling the tank with water.
3. Dewatering the pit, if necessary till completion of work.
4. All necessary labour, material and use of tools.

6.9.06 MODE OF MEASUREMENT : The measurement shall be for each unit of Hume pipe septic tank for specified capacity provided.

6.9.07 MODE OF PAYMENT : The contract rate shall be for each unit of Hume pipe septic tank for specified capacity provided.

6.10 SOAK PIT :

6.10.01 GENERAL : The item pertains to providing Soak pit of specified size as mentioned in the schedule of quantities including filling with brick bats and coarse sand filling around the honey comb brick wall.

6.10.02 MATERIAL : The brick bats shall be from properly burnt bricks and not from over burnt bricks, Coarse sand filling. Brick work and plastering shall be as per general specifications under section II.

6.10.03 CONSTRUCTION : Brick masonry shall be in cement mortar and its size and type shall be as specified in the schedule. The pit shall be filled with loosely packed brick bats. The coarse sand shall be filled around the honey comb brick wall of specified thickness.

6.10.04 DEWATERING : The contract rate includes bailing or pumping out all the water. If accumulated during the progress of work either from rain, seepage, springs or any other cause till completion of the work.

6.10.05 THE RATE INCLUDES FOR :

1. Providing all materials required for the construction of soak pit.
2. Dewatering the pit, if necessary till completion of work.
3. All necessary labour, materials and use of tools.

6.10.06 MODE OF MEASUREMENT : All the items shall be measured separately under the relevant items or as specified in the schedule of work.

6.10.07 MODE OF PAYMENT : All the items shall be paid separately under the relevant item or as specified in the schedule of work.

6.11 RCC SPUN PIPE FOR DRAIN WORK :

6.11.01 GENERAL : The item includes supplying. Laying and fixing the RCC spun pipe of specified diameter and class including all necessary fittings, laying, jointing etc.

6.11.02 MATERIAL : NP3 / NP2 class pipe and collar shall comply with IS 458.

6.11.03 LAYING : The pipe shall be laid to lines, level and slope as indicated in the drawing. The pipe drain shall rest on the bed throughout its length. To ensure this the space between under side of the pipe and the invert of the cradle shall be carefully grouted with cement slurry consisting of one part of cement to three parts of clean washed sand in a manner to avoid the voids during grouting. The contractor shall take precautions to see that dirt, earth or other foreign matter is not allowed on the surface of the cradle or of the pipe resting there on.

No pipe shall be laid / placed / jointed till the alignment of the pipe drain and its levels and gradient have been carefully checked and found correct.

6.11.04 CONCRETE CRADLE : The cradle of concrete shall be allowed to set at least for three days before any pipe is placed on it and the contractor shall take due care in setting the pipe on the cradle so that no damage to the cradle shall occur. If any damage to the cradle occur, it shall be remade or rectified. In case the damage to the cradle is beyond repair, contractor shall cut out the damaged section of the cradle and replace the same at his own cost to the complete satisfaction of the E-in-Ch.

6.11.05 JOINTING : The joints of pipe shall be made by loose collars and the connecting space shall be as minimum as possible. The collars shall be specially roughened inside to provide a better grip. The two adjacent pipe ends will be so designed and manufactured that when butted together concentrically, a dowel shall be left between the two ends. In this dowel, Cement mortar of 1:1 proportion or as specified in the schedule shall be filled. The remaining space between the pipe ends and the collar shall then be caulked with cement mortar 1:1 alround the external diameter of the pipes. Every joint shall be finished off smooth at an angle of 45 degree with the longitudinal axis of the pipe of the collars.

6.11.06 CLEANING : The interior of the pipe drains shall be cleaned off from all dirt, cement mortar & superfluous materials

6.11.07 TESTING : The joints of R.C.C. spun pipe line shall be tested for 1.80 meter water head over the crown of the highest pipe between the two manholes. The lower end shall be plugged water tight. Water shall than be filled in the manhole at the upper end of the line with 1800 mm depth of water over the crown.

The test shall be for an hour or longer as directed by the Engineer-in-charge. If the water level does not fall more than 12 mm in a length of 92 mtr. The test may be considered satisfactory. If it is found that certain pipe joints are leaking, the water shall be drained off and joints shall be remade/recaulked.

6.11.08 ENCASING THE PIPE LINE : After the joints and pipes have been proved to be water tight then pipe line shall be embedded in cement concrete if specified to the extent of one half of external diameter of the pipes as directed, the concrete being made to slope away towards the sides of the foundation bed, Refilling shall be done with fine selected materials in layers not exceeding 150mm thick, watered, consolidated and rammed properly, as specified.

6.11.09 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 or any other cause till completion of the work.

6.11.10 THE RATE INCLUDES FOR :

1. RCC Spun pipe with collar, cement mortar 1:2 and spun yarn.
2. Laying, jointing and testing the pipe line including cutting and wastage.
3. Dewatering if found necessary till completion of work.
4. All necessary labour, materials and use of tools.

6.11.11 MODE OF MEASUREMENT : The measurement shall be for length in running meter of pipe line laid and shall be measured along the center line.

6.11.12 MODE OF PAYMENT : The contract rate shall be for unit running meter of pipe line laid. Making the cradles and encasing the pipe line shall be paid under the relevant item.

6.12 GREASE TRAP CHAMBER :

6.12.01 GENERAL : The item includes provision of brick masonry Grease Trap Chamber of internal size as specified in schedule of work.

6.12.02 MATERIAL : Concreting, Brick work, plastering etc. shall be as per specifications given in general specification under section-II.

6.12.03 CONSTRUCTION :

1. Internal dimensions and depth shall be as specified in the schedule of work.

2.150 mm thick foundation shall be in 1:4:8 cement concrete and shall have 150 mm offset from outer surface of brick wall.

3. Brick masonry shall be in cement mortar 1:4

4. Brick masonry shall be plastered with 20 mm thick cement mortar 1:3 inside and outside surfaces in two courses, inside surface finished smooth with neat cement punning.

6.12.04 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.

6.12.05 THE RATE INCLUDES FOR :

1. Concreting in foundation, constructing brick masonry and plastering over the brick work.
2. Dewatering the trench or pit if found necessary till completion of work.
3. All necessary labour, materials and use of tools.

6.12.06 MODE OF MEASUREMENT : The measurement shall be for each unit of grease trap chamber of specified internal size and depth constructed.

6.12.07 MODE OF PAYMENT : The contract rate shall be for each unit of grease trap chamber of specified internal size

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7.0 FIRE FIGHTING SYSTEM :

7.1 M. S. -SEAMLESS PIPING WORK :

7.1.01 GENERAL : The item includes provision of MS-SEAMLESS pipes with fitting of specified nom. bore and class as mentioned in the schedule including laying, fixing. The MS-SEAMLESS pipes and fittings shall run on the surface of the walls or ceilings unless otherwise specified.

7.1.02 MATERIAL : The pipes and fittings shall be of M.S-SEAMLESS . They shall conform to IS 1978 or IS 3589 as specified in schedule of quantities. All the pipes and fitting shall have ISI certification mark. The specified nominal bore of the pipe shall refer to inside approximate bore according to the thickness corresponding to outside fixed diameter. The pipe and fittings shall be smooth, sound, free from any imperfections and neatly dressed. The table showing the dimensions and different bores of pipes are given below.

DIMENSIONS, WEIGHTS AND TEST PRESSURES OF PLAIN-END SEAMLESS LINE PIPE CONFORMING TO IS: 1978-1982

Nominal Size	Design -ation	Out side Diameter D	Plain End Weight Wpe.	Wall Thickn-ess t	Inside Dia Meter d	TEST PRESSURE, MIN		
						Grade Yst 210 Standard	Grade Yst 240 Standard	Grade Yst 170 Standard
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
mm		mm	kg/m	mm	mm	100 kPa	100 kPa	100 kPa
15	Std	21.3	1.28	2.8	15.7	48	48	48
20	Std	26.7	1.70	2.9	20.9	48	48	48
25	Std	33.4	2.52	3.4	26.6	48	48	48
32	Std	42.2	3.43	3.6	35.0	83	90	69
40	Std	48.3	4.07	3.7	40.9	83	90	96
50	Std	60.3	5.42	3.9	52.5	161	172	69
65	Std	73.0	8.69	5.2	62.6	172	172	69
80		88.9	4.50	2.1	84.7	59	68	41
		88.9	6.76	3.2	82.5	89	104	69
90		101.6	6.82	2.8	96.0	68	80	41
100		114.3	5.81	2.1	110.1	46	53	-
		114.3	7.70	2.8	108.7	61	71	-
		114.3	8.77	3.2	107.9	70	81	155
		114.3	9.83	3.6	107.1	78	91	--
		114.3	10.86	4.0	106.3	87	101	69
125		141.3	7.21	2.1	137.1	37	43	-
		141.3	10.90	3.2	134.9	56	65	-
150		168.3	8.61	2.1	164.1	31	36	-
		168.3	11.43	2.8	162.7	41	48	-
		168.3	13.03	3.2	161.9	47	55	-
		168.3	14.62	3.6	161.1	53	62	-
		168.3	16.21	4.0	160.3	59	76	-
200		219.1	17.04	3.2	212.7	36	45	-
		219.1	21.22	4.0	211.1	45	55	-
		219.1	25.37	4.8	209.5	54	63	-
		219.1	29.48	5.6	207.9	63	74	-
		219.1	33.57	6.4	206.3	73	84	-
		219.1	36.61	7.0	205.1	79	92	-
		219.1	41.14	7.9	203.3	90	104	-
250		273.1	26.54	4.0	265.1	36	42	-
		273.1	31.76	4.8	263.5	44	51	
		273.1	36.94	5.6	261.9	51	59	-
		273.1	42.09	6.4	260.3	58	68	-
		273.1	46.57	7.1	258.9	65	75	-
		273.1	51.03	7.8	257.5	71	83	-
		273.1	56.72	8.7	255.7	79	92	-
		273.1	60.50	9.3	254.9	85	98	-
		273.1	71.72	11.1	250.9	101	118	-

DIMENSIONS AND MASS PER METRE LENGTH OF PIPES AS PER IS 3589 : 2001

M.S. seamless pipes :- Tolerance for outside dia of pipe for all sizes ± 1%

Tolerance for thickness + 20% & - 12.5%

Sl No	Outside Dia. OD	Thic kne ss	Mass	Sl no	Outside Dia. OD	Thick ness	Mass	Sl No	Outside dia. OD	Thick ness	Mass
	Mm	mm	Kg/m		mm	mm	Kg/m			mm	Kg/m
1	168.3	2.6	10.6	3	273	3.6	23.9	5	355.6	4.0	34.7
		3.2	12.0			4.0	26.5			5.0	43.2
		4.0	16.2			5.0	33			5.6	48.3
		4.5	18.2			6.3	41.1			8.0	68.6
2	219.1	2.6	13.9	4	323.9	4.0	31.8	6	406.4	4.0	39.7
		3.6	19.1			4.5	35.4			5.0	49.5
		4.5	23.8			5.6	44			6.3	62.2
		6.3	33.1			7.1	55.5			8.8	86.3

7.1.03 LAYING : The plumbing contractor shall set the layout of the plumbing approved by the Engineer-in-charge as may be required by the bye-laws. Pipes shall be laid in plumb and in straight and parallel lines. When unavoidable, pipes may be buried for short distances provided additional protection is given against damage and where so required joints are not buried. Where directed by the Engineer –in-charge, A M.S. tube sleeve shall be fixed at a place the pipe is passing through a wall or floor for reception of the pipe and to allow freedom for expansion ,contraction and other movements. In case the pipe is embedded in walls or floors the pipes shall be painted with anticorrosive bitumastic paints of approved quality. The pipe shall not come in contact with mortar or lime concrete as the pipe is affected by lime. Under the floors the pipe shall be laid in layer of sand filling as done under concrete floors.

7.1.04 FIXING : The entire pipe line shall be fixed in position as shown in the drawing or as directed by the Engineer-in-charge. All pipes shall be fixed truly vertical and horizontal unless unavoidable. The pipe line shall be supported with "U" type G.I. clamps not less than 2 mm thick and G.I. nails not less than 40 mm long, wooden gutties etc keeping the pipe about 15 mm clear of the wall .

Spacing of fixing for internal piping shall be as per IS 2065 – 1983 as given below :

Nom. bore of pipe	For Horizontal Runs	For Vertical Runs
15mm	2 M	2.5 M
20 mm to 32 mm	2.5 M	3.0 M
40 mm to 50 mm	3.0 M	3.50 M
65 mm to 80 mm	3.5 M	5.0 M

No joints shall be located inside the wall. If the pipe is required to be cut , the hums of the cut end shall be filed smooth and any obstruction in bore shall be entirely eliminated

7.1.05 JOINTING : While fixing the pipe line the joints shall be made by electrical resistant welding or MS flanged joints. The branch connection shall not protrude in the bore of parent pipe. 10% welded joints shall be dye penetration (D.P.) tested.

7.1.06 PAINTING : MS – SEAMLESS pipes and fittings running exposed shall be painted with two coats of anticorrosive paint of approved make and shade over a two coats of red oxide primer. The underground or concealed pipe shall be protected from corrosion as per IS 10221.

7.1.07 TESTING : Please see clause No.4.1.07 except the test pressure, which shall be as specified in schedule of quantities.

7.1.08 THE RATE INCLUDES FOR :

1. Supplying MS-SEAMLESS pipes and MS fittings such as sockets, elbows, bends, tees, enlargers, reducers, checknuts, plugs, unions etc. of specified diameter & class including clamps, screws, wooden gutties etc.
2. Laying, jointing and fixing the pipe with fittings including ERW welding/ flanged joints, cutting pipes, wastage, painting the pipeline, anticorrosive treatment etc.
3. Excavation , Flanged joints ,Specials shall be paid separately.
4. All necessary materials, labour and use of tools

7.1.09 MODE OF MEASUREMENT : The measurement shall be for unit running metre length of pipe line of specified nom. bore laid or fixed. Measurement shall be taken along center line of the pipe line deducting outer to outer length of specials.

7.1.10 MODE OF PAYMENT : The contract rates shall be for unit running metre length of pipe line of specified nom. bore laid or fixed.

7.2 CAST IRON DOUBLE FLANGED WATER QUALITY PIPING WORK :

7.2.01 GENERAL : The item includes the provision of supplying water quality cast iron pipe of specified diameter including cutting, laying, fixing, and painting the pipe line.

7.2.02 MATERIAL : The pipes shall be Horizontally Cast Iron Pressure pipe conforming to IS 7181 and shall be of class "B". These shall be of monolithic double flanged. All the pipes shall be cylindrical reasonably true with inner and outer surfaces and nearly concentric as practicable. The outer surface shall be smooth, sound, free from pin holes, cracks and other imperfections. The pipes shall be treated with Dr. Angus Smith's solution. The coated surface shall give glossy finish. The table showing the dimensions & weight of different diameter of pipes is given below:

HORIZONTALLY CAST IRON DOUBLE FLANGED 'WATER QUALITY' PIPES

Tolerances : a) Length ± 10 mm (b) weight for pipes and flanges (i) + 8% and – 5% upto DN 150 and (ii) ± 5% for DN 200 and above. c) Thickness (i) wall thickness – (1 +0.05e) mm and (ii) Flange thickness ± (2+0.05b)mm

Where e = thickness of wall in mm, and b = thickness of flange in mm.

d) External diameter of Barrel (DE) for all nominal diameter (DN) tolerance is ± (4.5 + 0.001 5 DN)mm

HORIZONTALLY CAST IRON DOUBLE FLANGED 'WATER QUALITY' PIPES MASS AS PER IS 7181 – 1986.

NOMINAL DIAMETER	BARREL			MASS FOR ONE FLANGE (NOMINAL)
DN	DE (External Dia.)	E (Thickness)	Mass for one Metre Length nominal	
(1)	(2)	(3)	(4)	(5)
Mm	mm	mm	kg	Kg
80	98	10.0	19.8	3.7
100	118	10.5	25.4	4.2
125	144	11.1	33.1	5.3
150	170	11.7	41.6	6.7
200	222	12.8	60.1	9.3
250	274	14.0	81.8	12.0
300	326	15.2	106.1	14.8
350	378	16.3	133.5	19.0
400	429	17.5	162.6	23.4
450	480	18.7	197.0	26.5
500	532	19.8	229.3	32.1
600	635	22.2	306.5	44.0
700	738	24.5	394.3	59.9
750	790	25.6	443.8	69.7

7.2.03 UNLOADING : The pipe shall be unloaded where they are required. Where mechanical handling facility are not available, pipes weighing upto 60 kg shall be handled by two persons by hand passing and heavier pipes shall be unloaded from the lorry or wagon by holding them in loops, formed with ropes and sliding over plank set not steeper than 45 degrees. Two ropes always shall be used and only one pipe shall be unloaded at a time. Under no circumstances shall pipes be thrown down from the carriers or be dragged or rolled along hard surfaces. The pipes shall be checked for any visible damage while unloading and shall be sorted out for reclamation**.**

7.2.04 STORING : The pipes shall be lined upon on one side of the alignment of the trench, socket facing upgrade when line runs uphill and up stream when line runs on level ground. Each stack shall contain pipes of same class and size. Storage shall be done on firm, level and clean ground. Wedges shall be provided at the bottom layer to keep the stack stable.

7.2.05 CLEANING : The pipes shall be thoroughly cleaned with brush and washed if necessary to remove any accumulated stone, soil or dirt inside and inside of socket and outside of the spigot shall also be cleaned in similar way.

7.2.06 EXAMINATION : Before pipe is laid it shall be first examined for damage and cracks. No cracked or damaged pipe shall be used. The pipe shall be tested with a hammer to prove its soundness

7.2.07 DAMAGED MATERIAL : If any material found damaged or cracked, the same shall not be used in the work. The contractor has to replace the same at his own cost and charges.

7.2.08 TRENCHES : Trench shall be so deep that the pipes may be laid to the required alignment and at required depth. The width of trench at bottom between face of sheeting shall be such as to provide not less than 200 mm clearance on either side of the pipe. Trenches shall be of such extra width, when required as will permit the convenient placing of timber supports strutting and planking handling of specials etc. The bed of trench, in soft or made up earth, shall be well watered and rammed before laying the pipes and depression, if any, shall be properly filled with earth and consolidated in 20 cm layers.

If the trench bottom is extremely hard or rocky or loose stoney soil, the trench shall be excavated 150mm below the trench grade. Rocks, stones or other hard substances from the bottom of the trench shall be removed and trench brought back to the required grade by filling with selected fine earth or sand or fine murrum & compact so as to provide a smooth bedding for pipe.

After the excavation of the trench is completed, hollows shall be cut at the required position to receive the flanges of the pipe. The barrels of the pipes shall rest through their entire length on the solid ground that sufficient space left for jointing the under side of the pipe joints. These socket holes shall be refilled with sand after jointing the pipe.

The trench shall be kept free from water shoring and timbering shall be provided wherever required. Excavation below water table shall be done after dewatering the trenches.

The road crossing shall be excavated half at a time and where the pipe line/drain crosses on existing road after the pipe have been laid in the first half and the trench refilled. Care shall be taken not to disturb the electrical & communication cable net with during the course of excavation.

7.2.09 LOWERING : The pipe shall then be placed in trenches by means of proper sheer legs, chains and other tacts and shall be properly driven home. In no case pipe shall be rolled or dropped into the trench. One end of rope may be tied to a wooden or steel Peg or driven into ground & other end hold by men which when slowly released till lower the pipe into trench

7.2.10 LAYING : The pipes shall be carefully laid straight to correct alignment in raising or falling gradients. All the 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. While joining the flanges the pipes shall be properly aligned and supported. The pipe shall be carefully packed underneath so that they shall bear loads arising from traffic evenly through out their whole length. The entire length of pipe shall be supported on bed of the trench evenly through out. Care shall be taken to prevent any sand, earth or other materials from entering into the pipes during laying. At the end of the day's work the open end shall be suitably plugged.

No pipe shall be laid until the trench has been excavated to its required depth for a distance of about 5 M in front of the pipe to be laid. No pipe shall be covered until it has been passed by the Engineer-in-charge.

In unstable soils, such as soft soil and dry lumpy soil it shall be checked whether the soil can support the pipe and if required, suitable special foundation shall be provided.

Where the soils are drastically affected by extremes of saturation and dryness, those soils are subjected to extraordinary shrinkage which from wide and deep cracks in the earth surface may result in damage to underground pipe because of tight gripping bond between pipe and clay, subjecting to it excessive stresses as the clay shrinks. In such case an envelop of minimum 100 mm of tamped sand shall be made around the pipe line to avoid any bonding.

In places where rock is encountered, cushion of fine earth or sand shall be provided for a depth of 150mm by excavating extra depth of the trench where the gradient of the bad slopes is more than 30 depths, it may necessary do and or fine pipe against sliding downwards.

7.2.11 FIXING: The contractor shall first get the layout for pipe line approved by the Engineer-in-charge as may be required by the bye-laws. The pipe line shall be so fixed / laid as not to expose to the heat or subject to any injury or risk to the pipe.

7.2.12 THRUST BLOCK : .Thrust blocks are required to transfer the resulting hydraulic thrust from the fittings of pipe on to a larger load bearing soil section. Thrust blocks shall be installed wherever there is a change in the direction/size of the pipe line or the pressure line diagram, or the pipe line ends at a dead end. If necessary, thrust blocks may be constructed at valves also. Thrust block shall be constructed taking into account the pipe size, water pressure, type of filling, gravity component when laid on slopes and the type of soil. In case of pipe line laid in soft soil, joints/couplings are to be anchored on each side by providing side thrust blocks without restricting the coupling.

Pipes on slopes need be anchored only when there is a possibility of the backfill around the pipe sloping down the hill and carrying the pipe with it. Generally for slopes upto 30 degrees, good, well drained soil carefully damped in layers.of 100mm under and over the pipe, right up to the top of trench will not require anchoring.

For steeper slopes, one out of every three pipes shall be held by straps fastened to vertical supports anchored in concrete.

7.2.13 BACK FILLING: Back filling shall follow the pipe installation as closely as possible to protect pipe from falling boulders, eliminating possibility of lifting of the pipe due to flooding of open trench & shifting pipe out of line by caved in soil.

The soil under the pipe and coupling shall be solidly tamped. The initial back fill material shall be free of large stones & dry lumps.

In bags and Monshers gravel or crushed stone may be used for this purpose. The initial back fill shall be placed evenly in a layer of 100 mm thick and consolidated up to a cushion of at least 300 mm cover over the pipe. Joints shall be taken care to resist the movement of the pipe due to pressure while testing.

7.2.14 TESTING : Please see para 4**.** 9.14, except the test pressure, which shall be as specified in schedule of quantities.

7.2.15 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 till the completion of work.

7.2.16 THE RATE INCLUDES FOR :

1. Supplying monolithic double flanged C.I. Pipe of specified class & diameter.
2. Laying the pipe and cutting the pipe wherever necessary and wastage.
3. Dewatering the trench or pit if found necessary till completion of work.
4. Exvcavation, flanged joints, specials shall be paid separately.
5. Testing the pipe line.
6. All necessary labour, materials and use of tools.

7.2.17 MODE OF MEASUREMENT : The measurement shall be for unit running metre length of pipe line laid or fixed. .Measurement shall be taken along the centre line of the pipe deducting outer to outer length of specials.

7.2.18 MODE OF PAYMENT : Contract rate shall be for unit running meter length of pipe line laid or fixed

7.3 FLANGED JOINTS (Integral or Monolithic flanges)

7.3.1 GENERAL : The item includes, flanged joints for GI/ C.I/ MS monolithic/ cast-on double flanged pipes, flanged fittings, flanged specials including gaskets, nuts, bolts and testing.

7.3.2 MATERIAL : The gasket used between flanges of pipes shall be 3mm thick 3 ply rubber insertion or compressed fibre board or natural/ synthetic rubber conforming to IS 638 of thickness between 1.5 to 3 mm. The fibre board shall be impregnated with chemically natural mineral oil and shall have a smooth and hard surface. Its weight per square metre shall be not less than 112 g/mm thickness. Bolts, nuts and washers used shall be of good quality.

7.3.3 FIXING : Each bolt should be tightened a little at a time taking care to tighten diametrically opposite bolts alternatively. The practice of fully tightening the bolts one after another is highly undesirable.

7.3.4 DEWATERING : - The contract rate shall include bailing out all the water if accumulated during the progress of the work either from rain, seepage, springs or any other cause till the completion of work.

7.3.5 TESTING : The joints shall be tested along with pipe line after the pipe line is laid and jointed. The testing shall be as per the clause of testing of the pipe line

7.3.6 THE RATE INCLUDES FOR :

1. Compressed fibre board or rubber insertion of thickness 1.5 to 3 mm, nuts, bolts, washers etc.
2. Testing and making good the defective joints.
3. Dewatering the trench or pits, till completion of work.
4. All labour, material and use of tools.

7.3.7 MODE OF MEASUREMENT : - The measurement shall be for each unit of flange joint of specified nom. size made of monolithic/cast on double flanged pipes.

7.3.8 MODE OF PAYMENT : The contract rate shall be for each unit of flange joint made.

7.4 HYDRANT VALVES (Single/twin outlet landing valve)

7.4.01 GENERAL : The item includes supplying of Gun metal or stainless steel, single or double outlet (twin) hydrant landing valve with C.I./ S.S. hand wheel, detachable brass or stainless steel female coupling as specified in schedule of quantities.

7.4.02 MATERIAL: The hydrant landing valves shall be oblique Morris pattern GM or stainless steel conforming to IS 5290 / BS 5041 having instantaneous coupling having 100 / 150mm with blank cap and chain conforming to IS 901 to suit the hose pipes, including nuts, bolts, washers, gaskets with necessary fittings like `tee' to main riser 150mm or 100 mm dia as specified.

7.4.03 FIXING : Twin outlet valves shall be fixed on 100 / 150mm nominal bore and single outlet shall be fixed on 80 / 100mm nom. bore and court yard hydrant at 900 / 1200mm above ground level. The valve shall be flanged jointed.

7.4.04 PAINTING :- The hydrant valve unit shall be painted with three coats of signal red paint.

7.4.05 DEWATERING : In case of courtyard hydrant 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 clause till completion of work.

7.4.06 TESTING : The Hydrant valve shall be tested including fittings, joints alongwith the pipeline after the pipeline is laid.

7.4.07 THE RATE INCLUDES FOR :

Supplying and fixing 80 mm dia, single or twin outlet landing valve/hydrant valve of oblique Morris pattern with instantaneous 65 mm dia. Outlet coupling, making flanged joint.

1. In case of court yard hydrant dewatering the trench or pit till completion of work.
2. Testing the valves joints alongwith pipeline laid.
3. All necessary labour, materials and use of tools.

7.4.08 MODE OF MEASUREMENT : The measurement shall be for each unit of hydrant valve fixed. Additional flanged joints for extension piece shall be measured in relevant item.

7.4.09 MODE OF PAYMENT : The contract rate shall be for each unit of hydrant valve fixed.

7.5 FIRE HOSE PIPES : -

7.5.01 GENERAL : The item include supplying of approved synthetic hose pipe of 63 mm dia x 15 m long with guaranteed bursting pressure of 32 kg/Sqcm fitted with 63 mm dia. Instantaneous male and female brass/ss coupling on each end as specified in schedule of quantities.

7.5.02 MATERIAL : The hose pipe shall be Unlined Flax Canvas for fire fighting conforming to IS 4927,Fabric Reinforced Rubber Lined Woven-Jacketed (RRL) fire hose type A or Synthetic Fibre Woven-Jacketed (SFWJ)/ Elastomeric fire hose type B conforming to IS 636 or controlled percolations (CP) Hose conforming to IS 8423 all with ISI mark as specified in schedule of quantities. The instantaneous male and female coupling shall be of brass / SS conforming to IS 903 with ISI mark. The coupling shall be bound and riveted to Hose pipe with copper rivets & 1.5mm copper wire.

7.5.03 PLACING : The fire hose shall be stored in the hose pipe box single or double either in flaked or rolled manner.

7.5.04 THE RATES INCLUDES FOR :

1. Supplying and storing the hose pipe in hose pipe box fitted with 63 mm dia. Instant male & female. GM or SS or Brass coupling on each end. Hose pipe box will be paid in relevant item.
2. All necessary labour, material and use of tools.

7.5.05 MODE OF MEASUREMENTS : The measurement shall be for each unit of size hose pipe supplied and stored in the hose pipe box.

7.5.06 MODE OF PAYMENT : The contract rate shall be for each unit of the fire hose pipe supplied and placed.

7.6 FIRE HOSE BOX :-

7.6.01 GENERAL : The item include supplying fabricated MS sheet metal / FRP hose pipe box shall be capable to accommodate 1 or 2 nos. hose pipe as specified in the schedule of quantities.

7.6.02 MATERIAL : The hose pipe box shall be fabricated out of 16 / 18 gauge (as per item description) M.S. Sheet of size 750 x 450 x250 mm for accommodating 2 nos. of hose pipe and branch pipe with nozzle or hosy branch pipe with nozzle specified in schedule of quantities. The box shall have front glass door lock with angle iron frame.

7.6.03 FIXING : The hose pipe box shall be fixed with 4 nos. C.P. brass screws and rawl plugs on the wall as shown in the tender drawing and as shown by the Engr-in-Charge.

7.6.04 PAINTING : The MS box shall be painted with two coats of signal red enamel paint from outside and white enamel paint from inside.

7.6.05 THE RATES INCLUDES FOR :

1.Supplying and fixing fabricated M.S. Sheet metal hose pipe box with necessary painting.

2.All necessary, labour, material and necessary tools.

7.6.06 MODE OF MEASUREMENT :- The measurement shall be of each unit of hose pipe box supplied and fixed of specified size.

7.6.07 MODE OF PAYMENT : The contract rate shall be for each unit of the fabricated MS sheet metal box supplied & fixed.

7.7 BRANCH PIPE :

7.7.01 GENERAL : The item include supplying of Gun metal / stainless steel branch pipe fitted with detachable hexagonal nozzle as specified in schedule of quantities.

7.7.02 MATERIAL : The branch pipe shall be GM or SS conforming to IS 903 or universal pattern as per IS 2871. The branch pipe shall be 63 mm dia fitted with detachable hexagonal nozzle of 19 mm dia. suitable to connect hose pipe.

7.7.03 PLACING : The branch pipe with detachable nozzle shall be placed in the hose pipe box.

7.7.04 THE RATE INCLUDE FOR :-

1. Supplying & placing 63 mm dia. Branch pipe fitted with 19 mm dia. nozzle.
2. All necessary labour, material and necessary tools.

7.7.05 MODE OF MEASUREMENT : The measurement shall be for each unit of branch pipe with nozzle supplied and stored in the hose pipe box.

7.7.06 MODE OF PAYMENT : The contract rate shall be for each unit of the Branch pipe with nozzle supplied and placed.

7.8 FIRST AID HOSE REEL :-

7.8.1 GENERAL : The item include supplying of approved rubber hose reel of 20mm dia x 37 m (120') long with swinging drum with cut off outlet nozzle.

7.8.2 MATERIAL : The hose reel shall be high pressure rubber hose reel fitted on swinging wall mounted type drum of 20 mm dia x 37 m (120') long conforming to IS 884 alongwith 8mm dia. Outlet cut off nozzle GM or chromium plated brass or stainless steel as specified in schedule of quantities.

7.8.3 FIXING : The swinging wall mounted drum fitted with rubber hose reel shall be fixed on necessary bracket on the wall with 4 nos. of C.P. brass screws. The hose reel shall be connected to wet/dry riser and shall be fixed near to riser.

7.8.4 PAINTING : The drum and brackets shall be painted with two coats of signal red enamel paint from outside and white enamel pain from inside.

7.8.5 THE RATES INCLUDES FOR

1. Supplying and fixing swinging fabricated MS wall mounted drum on brackets fitted with hose reel, nozzle with necessary painting of drum and brackets.
2. All necessary labour, material and use of tools.

7.8.6 MODE OF MEASUREMENT : The measurement shall be for each unit of first aid hose reel with drum supplied and fixed.

7.8.7 MODE OF PAYMENT : The contract rate shall be for each unit of first aid fire hose reel with swinging drum supplied and fixed.

7.9 FIRE BRIGADE SERVICE INLET SIAMESE CONNECTION :-

7.9.1 GENERAL : The item include siamese connections suitable to connect the mobile pump to wet riser for supplying water to the vertical riser in case of emergency.

7.9.2 MATERIAL : The siamese connections shall have 2, 3 or 4 nos. of 63 mm dia. GM make inlet (instantaneous male coupling) as specified in schedule of quantities. The double flange C.I. body swing type non-return valve conforming to IS 5312 (part I) shall be flanged jointed to the vertical pipe of siamese connection. This includes blank cap drain valve of 25 mm dia and GI / MS pipe conforming to IS 1239 of necessary length and fittings required for connecting to main riser. The nom. bore of seamless pipe riser shall be 100mm or 150 mm as specified in schedule of quantities.

7.9.3 PAINTING : The exposed seamless pipe of siamese connection shall be painted with two coats of signal red anticorrosive paint over to coats of red oxide primer. The GM inlet housing box shall be painted with red enamel paint from outside and white enamel paint from inside. The underground pipe shall be given anticorrosive treatment as per IS 10221.

7.9.4 DEWATERING : The contract rate shall include bailing or pumping out all the water, if accumulated during the progress of the work while connecting the service inlet to the vertical riser, either from rain, seepage, springs or any-other cause till completion of work.

7.9.5 TESTING : The seamese connection shall be tested including fittings non-return valve, joints alongwith the pipe line after the pipe line is laid.

7.9.6 THE RATES INCLUDES FOR :

1. Supplying and fixing reamese connections with 2,3 or 4 nos of GM inlet (instantaneous male coupling) as specified in schedule of quantities.
2. Supplying and fixing C.I. double flange spring type non-return valve of C.I. or cast steel body as specified in schedule of quantities, weld joint.
3. Supplying and fixing blank caps, 25 mm dia GM drain valve and fittings, weld joints etc.
4. Seamless pipe of nom. bore as specified in schedule of quantities including painting, weld joints.
5. Supplying and fixing 14 gauge MS sheet with angle iron frame of suitable size to accommodate the no. of inlets as specified in schedule of quantities.
6. Dewatering the trench or pit till completion of work.
7. All necessary labour, material and use of tools.

7.9.7 MODE OF MEASUREMENT : The measurement shall be for each unit of the seamese connection provided.

7.9.8 MODE OF PAYMENT : The contract rate shall be for each unit of the seamese connection provided.

7.10 FIRE BRIGADE COLLECTIVE BREECHING INLET CONNECTION :

7.10.1 GENERAL : The item include the inlet connection to the fire compartment of the water tank with G.I. pipe for augmentation.

7.10.2 MATERIAL : The fire bridge inlet connection shall have 2, 3 or 4 nos. of 63 mm dia. GM make inlet (instantaneous male coupling) specified in schedule of quantities. The G.I. pipe for augmentation shall be confirming to IS 1239 (part I) of heavy quality and joints shall be with weld joint.

7.10.3 PAINTING : The exposed G.I. pipe of the connection shall be painted with two coats of signal red anticorrosive paint over two coats of red oxide primer. The underground pipe shall be given anticorrosive treatment as per IS 10221.

7.10.4 DEWATERING : The contract rate shall includes bailing or pumping out all the water, if accumulated during the progress of the work while connecting the collective breeching to the water tank fire compartment, either from rain, seepage, springs or any other cause till completion of work.

7.10.5 TESTING : The Inlet connection shall be tested including fittings weld joints and shall be tested under the testing head (clause) of G.I. piping work.

7.10.6 THE RATES INCLUDES FOR

1. Supplying and fixing fire bridge inlet connection with 2, 3 or 4 nos of GM inlet (instantaneous male coupling) as specified in schedule of quantities.
2. Supplying and jointing G.I. heavy quality pipe of nominal bore as specified in schedule of quantities.
3. Dewatering the trench or pit, till completion of work.
4. All necessary labour, material and use of tools.

7.10.7 MODE OF MEASUREMENT : The measurement shall be for each unit of the fire brigade inlet connection provided.

7.10.8 MODE OF PAYMENT : The contract rate shall be for each unit of the fire brigade inlet connection provided.

7.11 SEAMLESS PIPE PIECE :

7.11.1 GENERAL : The 80 mm nominal MS seamless pipe of required length with MS flange at one end and other end welded with MS riser.

7.11.2 MATERIAL : MS seamless 80 mm dia pipe piece shall be conforming to IS 1978 of 300, 450, 600 mm length as specified in schedule of quantities. The pipe piece shall be with M.S. flange with holes welded or integral at one end for fixing hydrant and other end to be welded with M.S. Riser in the shaft.

7.11.3 FIXING : The pipe piece shall be welded with M.S. Riser in the shaft. The 10% of the welded joint shall be dye penetration (D.P.) tested to the relevant IS code. The flange at other end shall be welded or integral to the pipe piece.

7.11.4 PAINTING : The pipe piece shall be painted with two coats of signal red paint over a two coats of read oxide primer.

7.11.5 TESTING : The pipe piece shall be tested along with MS seamless pipe risers under the respective head (clause) testing.

7.11.6 THE RATES INCLUDES FOR :-

1. Supplying of fixing pipe piece, welded joint at one end and integral or welded flange at other end.
2. Painting of pipe piece, testing and making good the defective joints.
3. All labour, material and use of tools.

7.11.7 MODE OF MEASUREMENT : The measurement shall be for each unit of seamless pipe piece fixed.

7.11.8 MODE OF PAYMENT : The contract rate shall be for each unit of seamless pipe piece fixed.

7.12 ORIFICE PLATE (ORIFICE FLANGE)

7.12.1 GENERAL : The item include providing and fixing GM / Brass or stainless steel orifice plate of not less than 6 mm thick or as specified in schedule of quantities, having suitable bore for reducing the pressure and to restrict the operating pressure within 3.5 to 4.00 kg / sqcm at the hydrant outlet at every floor.

7.12.2 MATERIAL : The orifice plate shall be Gun Metal/Brass/Stainless Steel and bore size shall be properly designed to reduce the pressure at the fire hydrant outlet as per fire brigade requirement.

7.12.3 FIXING : The orifice plate shall be fixed in position as indicated in drawing or as directed. It shall be fitted by means of flanged or welded or screwed joint as specified in schedule of quantities.

7.12.4 TESTING : The orifice plate shall be tested or calibrated to give the required pressure. The bore shall be modified or orifice plate shall be replaced without any extra cost.

7.12.5 THE RATE INCLUDES FOR :

1. Supplying and fixing orifice plate of specified bore
2. Making joints and fixing with nuts, bolts, gasket etc.
3. All necessary labour, material and use of tools.

7.12.6 MODE OF MEASUREMENT : The measurement shall be for each unit of orifice plate fixed.

7.12.7 MODE OF PAYMENT : The contract rate shall be each unit of orifice plate fixed.

7.13 PENDANT SPRINKLER :

7.13.1 GENERAL : The item include supplying and fixing pendant sprinkler of specified dia to distribution pipes connected to riser pipes.

7.13.2 MATERIAL : The pendant sprinkler shall be of automatic sprinkler as per IS 9972. It shall be fixed to the M.S. seamless distribution pipe line connected to riser pipe.

7.13.3 FIXING : The sprinkler shall be either welded or flange or screw jointed as specified in schedule of quantities.

7.13.4 TESTING : The sprinkler heads shall be tested for leakproof joints along with piping system as per testing head (clause) of MS seamless piping work.

7.13.5 THE RATES INCLUDES FOR :

1. Supplying and fixing pendant sprinklers.
2. Jointing and fixing with nuts, bolts, gasket etc.
3. All necessary labour, material and use of tools.

7.13.6 MODE OF MEASUREMENT : - The measurement shall be for each unit of pendant sprinkler fixed.

7.13.7 MODE OF PAYMENT : The contract rate shall be each unit of pendant sprinkler fixed.

7.14 PRESSURE GAUGE :-

7.14.1 GENERAL : The pressure gauge shall be of specified diameter and appropriate range and be complete with shut off gauge cocks.

7.14.2 MATERIAL : The pressure gauge shall be brass body syphon and cock dial type. The size of pressure gauge shall be 100 mm dia or 150 mm dia as specified in schedule of quantities. Dial range shall be adequate for the pressure encountered as specified. The Dial shall have the calibration in MKS and FPS units and shall be properly calibrated before installation. Accuracy over the selected range shall be ± 1%.

7.14.3 FIXING : The pressure gauge shall be fixed & screwed in the pipe making or drilling necessary holes in pipe line etc.

7.14.4 TESTING : The pressure gauge shall be tested for the leak proofness of the joints alongwith pipeline laid under testing clause of relevant seamless piping work.

7.14.5 THE RATES INCLUDES FOR

1. Supplying and fixing pressure gauge of diameter as specified in schedule of quantities.
2. All transport and handling charges.
3. All necessary labour, material and use of tools.

7.14.6 MODE OF MEASUREMENT : The measurement shall be for each unit of pressure gauge supplied and fixed.

7.14.7 MODE OF PAYMENT : The contract rate shall be for each unit of pressure gauge supplied and fixed.

7.15 `Y' STRAINER :-

7.15.1 GENERAL : The strainer shall be preferably of the approved `Y' type with C.I. or fabricated steel bodies or brass designed to the test pressure specified for the gate valve/sluice valve.

7.15.2 MATERIAL : The Strainer shall have G.M. or bronze screen with 0.8 mm to 3 mm perforations and a permanent magnet. Screening area of strainer shall be minimum 5 times more than pipe. Strainer shall be provided with flanges or threaded sockets as specified. It shall be designed so as to enable blowing out accumulated dirt and facilitate removal and replacement of the screen without disconnecting the main pipe. The strainer shall be provided with equal size isolating gate valves with rising spindles so that the strainer may be cleaned without draining the system. It shall be provided on suction or inlet side of the booster or other type of fire pump. It shall be provided with `tee' connection with gate valve for cleaning purpose.

7.15.3 FIXING : The strainer shall be either fixed by flange jointing or screwed jointing.

7.15.4 TESTING : The strainer shall be tested for the leak proofness of the joints alongwith pipeline laid under testing clause of relevant seamless piping work.

7.15.5 THE RATES INCLUDES FOR :-

1. Supplying and fixing `Y' strainer.
2. All jointing material, nuts, bolts & gaskets etc.
3. All necessary labour, material and use of tools.

7.15.6 MODE OF MEASUREMENT : The measurement shall be for each unit of `Y' strainer supplied and fixed.

7.15.7 MODE OF PAYMENT : The contract rate shall be for each unit of `Y' strainer supplied fixed.

7.16 FIRE EXTINGUISHERS :

7.16.1 GENERAL : The fire extinguisher shall be of specified type, capacity and fixing. The CO_2 type, DCP type, foam type or Halon 1211 type as specified in the schedule of quantities.

7.16.2 MATERIAL : The CO_2 type fire extinguisher shall be 4.5 kg capacity or as specified either portable or trolley mounted conforming to IS 2878. The DCP type fire extinguisher shall be of 10 kg capacity or as specified and shall be conforming to IS 4308. The Halon 1211 type size extinguisher shall be conforming to IS 11108. The fire extinguisher shall be supplied and placed without any damage, scratches and loss of accessories.

7.16.3 PLACING : The fire extinguishers shall be supplied and placed at proper place as shown in the drawing or as directed by the engineer-in-charge.

7.16.4 THE RATES INCLUDES FOR :-

1. Supplying and placing the fire extinguishers of specified capacity and type.
2. All transport and handling charges.
3. All necessary labour, material and use of tools.

7.16.5 MODE OF MEASUREMENT : The measurement shall be for each unit of fire extinguisher supplied and placed including all accessories.

7.16.6 MODE OF PAYMENT : The contract rate shall be for each unit of fire extinguisher supplied and placed.

7.17 FIRE BUCKETS :-

7.17.1 GENERAL : The item include supplying and placing fire bucket filled with sand kept on floor or wall hook.

7.17.2 MATERIAL : The fire bucket shall be galvanised Mild Steel of 13 liters or specified capacity and shall be conforming to IS 2546. The bucket shall be filled with clean, dry and screened sand.

7.17.3 PLACING : The buckets shall be supplied and kept on floor or wall hook as specified.

7.17.4 THE RATE INCLUDES FOR :

1. Supplying and placing galvanised mild steel bucket.
2. Providing clean, dry & screened sand.
3. Providing hooks on wall.
4. All labour, material and tools.

7.17.5 MODE OF MEASUREMENT : The measurement shall be for each unit of fire bucket supplied and palced.

7.17.6 MODE OF PAYMENT : The contract rate shall be for each unit of fire bucket supplied and placed.

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8.0 *CEMENT CONSUMPTION COEFFICIENTS (Derived on the basis of CPWD AOR)*

I. No	Brief Description of Item	Unit	Cement	
			kg	Bags
	Part-I-SANITARY INSTALLATIONS			
1	Fixing I.W.C. or European or pedestal type w.c.with flushing cistern and brackets, flush pipe with fittings and clamp including making good the walls and floors.	Each	**5.0**	**0.10**
2	Fixing 32 mm ϕ flush pipe	Each	**1.0**	**0.02**
3	Fixing w.c. pan only + a pair of foot rests.	Each	**2.5+0.5**	**0.06**
4	**Fixing flat back or wall type, lipped front, urinal basin :-**			
	a) One urinal with 5 litre cistern	Each	**2.5**	**0.05**
	b) Two urinal with 10 litre cistern	Each	**4.0**	**0.08**
	c) Three urinal with 10 litre cistern	Each	**6.7**	**0.13**
	d) Four urinal with 15 litre cistern	Each	**9.5**	**0.19**
	e) Urinal basin only	Each	**1.0**	**0.02**
5	**Fixing stall urinals**			
	a) Single stall urinal with 5 litre cistern	Each	**5.1**	**0.10**
	b) Two stall urinal with 10 litre cistern	Each	**10.2**	**0.20**
	c) Three stall urinal with 10 ltr. Cistern	Each	**15.3**	**0.31**
	d) Four stall urinal with 15 ltr. cistern	Each	**20.3**	**0.41**
	e) Stall urinal only	Each	**2.0**	**0.04**
6	Fixing lavatory basin/ sink with brackets & making good the walls	Each	**2.5**	**0.05**
7	Fixing wash basin/ kitchen sink	Each	**1.5**	**0.03**
8	Fixing T.W.draining board with brackets and making good the walls	Each	**1.4**	**0.03**
9	Fixing M.S. holder bat clamp in C.C. 1:2:4 block/ M.S. stay and clamp for C.I. pipe	Each	**0.5**	**0.01**
10	Fixing S.C.I trap with grating including making good the walls and floors	Each	**2.5**	**0.05**
11	**Cutting chase in B.W. for fixing S.C.I. pipe & making good the B.W. in In C.M. 1:3**			
	a) 100 mm dia	Each	**5.0**	**0.10**
	b) 50 mm dia	Each	**3.33**	**0.07**
12	Fixing square mouth S.W. gully trap with C.I. grating and B.M. Chamber	Each	**23.0**	**0.46**
13	Providing and fixing M.S. foot rests with 200 x 200 x 100 mm C.C. 1:3:6 block	Each	**0.88**	**0.018**
14	Fixing C.I. Steps (Rungs)	Each	**1.0**	**0.02**
	Part-II- WATER SUPPLY SYSTEM			
1	Constn.of BM valve chambers 1.0 M depth ,200 mm thick b.m. in cm 1:4 over 150 mm thick CC 1:2:4 bed also for capping and bearing Course on the top of masonry wall, 150 mm offset cp in cm1:3 mixed With w.p.comp.@ 2% by wt. Of cement , 20 mm thick both on int.& ext.surfaces, int. surfaces finished smooth with a floating coat of neat cement and ext.surfaces finished rough with wooden float , providing 100 mm thick RCC slab casted in G. M.S.angle box frame.			
a	Chamber 1 M. x 1 M. clear int.dim. without s.b.	Each	**493.00**	**9.86**
b	Chamber 1 M. x 1 M. clear int.dim. with s.b.	Each	**493.00**	**9.86**
c	Extra depth for V.C.over item No: (a&b).	RM	**236.50**	**4.73**
d	Chamber 1.2 M. x 1.2 M. clear int.dim. without s.b.	Each	**592.00**	**11.84**
e	Chamber 1.2 M. x 1.2 M. clear int.dim. with s.b.	Each	**592.00**	**11.84**
f	Extra depth for V.C.over item No: (d&e).	RM	**274.00**	**5.48**

I. No	Brief Description of Item	Unit	Cement	
			kg	Bags
2	Prov.Valve chamber(suitable for C.I. Frame & cover) of following int.dim.,200 mm b.m.in CM 1:4, over a 150 mm th. CC1:4:8 bed with 150 mm offset from all finished faces also for capping and bearing course on the top of masonry wall, 15 mm thick c.p.in cm1:3 with w.p.comp.@ 2% by wt.of cement on int.& ext.surfaces, all int.surfaces finished smooth with a floating coat of neat cement and ext.surfaces finished rough with wooden float.			
A	**Valve chamber of internal dimension 300x300 mm upto following depth.**			
a	Valve chamber of 300mm depth.	Each	**76.00**	**1.52**
b	Valve chamber of 450mm depth.	Each	**90.00**	**1.80**
B	**Valve chamber of internal dimension 450x450 mm upto following depth.**			
a	Valve chamber of 300mm depth.	Each	**98.50**	**1.97**
b	Valve chamber of 450mm depth.	Each	**116.00**	**2.32**
c	Valve chamber of 600mm depth.	Each	**133.50**	**2.67**
C	**Valve chamber of internal dimension 600x600 mm upto following depth.**			
a	Valve chamber of 300mm depth.	Each	**121.50**	**2.43**
b	Valve chamber of 450mm depth.	Each	**143.00**	**2.86**
c	Valve chamber of 600mm depth.	Each	**164.50**	**3.29**
3	Prov. Valve chamber (suitable for SFRC cover) of following int.dim.,200 mm b.m. in CM 1:4, over a 150 mm th. CC1:4:8 bed with 150 mm offset from all finished faces also for capping and bearing course on the top of masonry wall, 15 mm thick c.p.in cm1:3 with w.p.comp.@ 2% by wt.of cement on int.& ext. surfaces, all int.surfaces finished smooth with a floating coat of neat cement and ext.surfaces finished rough with wooden float, supplying & placing SFRC cover.			
A	**Valve chamber of internal dimension 300x300 mm upto following depth.**			
a	Valve chamber of 300mm depth.	Each	**76.00**	**1.52**
b	Valve chamber of 450mm depth.	Each	**90.00**	**1.80**
B	**Valve chamber of internal dimension 450x450 mm upto following depth.**			
a	Valve chamber of 300mm depth.	Each	**98.50**	**1.97**
b	Valve chamber of 450mm depth.	Each	**116.00**	**2.32**
c	Valve chamber of 600mm depth.	Each	**133.50**	**2.67**
C	**Valve chamber of internal dimension 600x600 mm upto following depth.**			
a	Valve chamber of 300mm depth.	Each	**121.50**	**2.43**
b	Valve chamber of 450mm depth.	Each	**143.00**	**2.86**
c	Valve chamber of 600mm depth.	Each	**164.50**	**3.29**
4	**Fixing G.I. pipe on wall including making good the walls (Note: 1 HaM = 100 M)**			
	a) 15 mm ϕ	HaM	**5.0**	**0.10**
	b) 20 mm ϕ	HaM	**6.0**	**0.12**
	c) 25 mm ϕ	HaM	**7.0**	**0.14**
	d) 32 mm ϕ	HaM	**7.5**	**0.15**
	e) 40 mm ϕ	HaM	**8.0**	**0.16**
	f) 50 mm ϕ	HaM	**8.0**	**0.16**
	g) 80 mm ϕ	HaM	**9.0**	**0.18**
	h) 100 mm ϕ	HaM	**10.0**	**0.20**
	i) 150 mm ϕ	HaM	**12.50**	**0.25**

I. No	Brief Description of Item	Unit	Cement	
			kg	Bags
	Part-III- SEWERAGE SYSTEM			
1a	Const.of rect.inspect.chambers of int.size 900 mm x 600 mm at bottom and int.size 900x450mm at top for depth upto 600mm & brick masonry in cm 1:2 , 230 mm th.wall incl.making brick tapering for log.walls for 450mm depth meas.from top of frame & cover, over 150mm thick CC1:2:4 with 150mm offset from all outer fini.wall surfaces,also for benching ,20mm th.c.p.in cm 1:1 with w.p.comp. @2% by wt.of cem.on int.& ext. surfaces, int.surfaces and channel finished smooth with floating coat of neat cement and ext.surfaces finished rough with wooden float.	Each	**312.50**	**6.25**
1b	Extra over item 4(a) for depth beyond 600 mm initial depth upto a depth of 1500 mm. all as per specification and as directed.	RM	**357.50**	**7.15**
2a	Const.of circular manhole of 1200 mm int.dia.at bottom and 540/600 mm at top for 1500 mm ini.depth & b.m.in cm 1:2, 200 mm th.wall for 1400 mm depth meas.from top of frame & cover of M.H.in conical shape and remaining ht. Const.345mm th.in cyl.shape over a 300 mm th.CC 1:2:4 bed with 300mm offset from outer finished wall surface,also for bench., 20mm th.plaster in cm1:1 with w.p.comp.@2% by wt.of cem.on int.&ext.surfaces,int.surfaces and channel finished smooth with floating coat of neat cement and ext.surfaces finished rough with wooden float.			
(i)	Top internal dia 540mm to suit MD & HD frame & cover.	Each	**1063.50**	**21.27**
(ii)	Top internal dia 600mm to suit EHD frame & cover.	Each	**1074.00**	**21.48**
2b	Extra over item 5(a) for a depth beyond 1500 mm initial depth & upto a depth of 2300 mm.	RM	**534.00**	**10.68**
3a	Const.of circular manhole of 1500 mm int.dia.at bottom and 540/600 mm at top for 2300 mm ini.depth & b.m.in cm 1:2, 200 mm th.wall for 2000 mm depth meas.from top of frame & cover of M.H.in conical shape and remaining ht. Const.345mm th.in cyl.shape over a 300 mm th.CC 1:2:4 bed with 300mm offset from outer finished wall surface,also for bench., 20mm th.plaster in cm1:1 with w.p.comp.@2% by wt.of cem.on int.&ext.surfaces,int.surfaces and channel finished smooth with floating coat of neat cement and ext.surfaces finished rough with wooden float.			
(i)	Top internal dia 540mm to suit MD & HD frame & cover.	Each	**1685.50**	**33.71**
(ii)	Top internal dia 600mm to suit EHD frame & cover.	Each	**1702.00**	**34.04**
3b	Extra over item 6(a) for a depth beyond 2300 mm initial depth.	RM	**635.00**	**12.70**
4	Constn.of b.m.drop pipe cleaning chamber of intl.size 300x300 mm for depth of 300 mm from top of cover & frame above S.W. drop pipe in b.m., in c.m.1:2 and 200mm thk.wall over 150mm offset from all outer finished wall surfaces of the chamber, p.& f. suitable MD precast SFRC cover 100 mm thk.CC 1:2:4 coping at top of b.m., 20mm cem.plastering in cm1:1, mixed with w.p.comp.@ 2% by wt.of cem.intl.& extl.surfaces of the chamber, all inside surfaces finishing smooth with floating coat of neat cement and extl. Surfaces finishing rough with wooden float.	Each	**138.50**	**2.77**

I. No	Brief Description of Item	Unit	Cement	
			kg	Bags
5	P.& f.drop connect.for ini.depth of 600mm including p.&l. followiing dia. S.W. pipe & specials including p.& f.bends, tees, crosses (double tees) plugs, caps etc., including jointing the joints with hemp yarn and C.M. 1:1,including encasing the pipes with CC 1:2:4 such that shape of the cross sect.through encased pipe shall be square of side length equal to o.d.of pipe plus 300mm.			
	a) 150mm nom. dia.	Each	**76.00**	**1.52**
	b) Extra depth over item 8(a) beyond 0.60 M initial depth	RM	**69.50**	**1.39**
	c) 230mm nom.dia.	Each	**88.50**	**1.77**
	d) extra depth over item 8© beyond 0.60 M initial depth	RM	**91.50**	**1.83**
	e) 300mm nom.dia.	Each	**95.00**	**1.90**
	f) extra depth over item 8(e) beyond 0.60 M initial depth	RM	**112.50**	**2.25**
6	P.& f.precast (SFRC) MH frame & covers conf.to IS 12592 of following sizes approved by BMC/CIDCO/E-I-C, tested as per IS 1726 (Part-I)1974 incl.cost of necessary steel reinf.,CC1:2:4 for fixing frame, for bed block (bearing course) and capping including necessary form work and cm1:2 for fixing the frame & for plast.expsosed surf.of CC surf.of bed block (b.c.) & capping fini. Smooth with floating coat of neat cement.			
	a) SFRC rect.frame for IC of size o/s 1130mm x 680mm, i/s clear opening 900mmx 450mm and RCC cover for IC of size 1000 mm x 550 mm			
	i) Medium Duty (Grade MD-10) frame sect.size 110mm wide x105 mm deep and cover thick. 50mm	Each	**80.40**	**1.608**
	ii)Heavy Duty (Grade HD-20) frame sect.size 115mm wide x150 mm deep and cover thick. 95mm	Each	**72.00**	**1.44**
	b) SFRC circular frame& cover			
	i) Medium Duty (Grade MD-10) SFRC frame of out. Dia. 840mm, clear intl.dia. 530mm, frame sect.size 155mm wide x115mm deep, SFRC manhole cover of 630mm dia. And 65 mm thick.	Each	**47.80**	**0.956**
	ii) Heavy duty (Grade HD-20)SFRC frame of out.dia. 940mm, clear intl.dia. 540mm deep, frame sect.size 200 mm wide x150mm deep, SFRC manhole cover of 630mm dia. And 95 mm thickn.	Each	**32.70**	**0.654**
	iii) Extra Heavy duty (Grade EHD-35) SFRC frame of out.dia. 940mm, clear intl.dia. 540mm deep, frame sect.size 200 mm wide x175 mm deep, SFRC manhole cover of 780mm dia. And 120 mm thick.	Each	**30.00**	**0.60**
7	P.&F.air tight C.I. frame & cover of size and number as specified in schedule, for M.H. & I.C. each weighing ranging from 100 to 300 Kgs. Including cost of CC 1:2:4 for bed block (bearing course) and capping, fixing frame including necessary form work, 1:2 cement mortar for fixing frame and smooth cement finished plaster over exposed concrete surfaces of bed block (bearing course) and capping.			
	a) C.I. rect. frame & cover for IC of int.size 900 x450mm			
	i) Medium Duty (Grade MD-10)	Each	**89.35**	**1.787**
	ii)Heavy Duty (Grade HD-20)	Each	**87.10**	**1.742**
	b) SFRC circular frame& cover of int. 560mm dia.			
	i) Medium Duty (Grade MD-10)	Each	**48.75**	**0.975**
	ii)Heavy Duty (Grade HD-20)	Each	**44.85**	**0.897**

I. No	Brief Description of Item	Unit	Cement	
			kg	Bags
8	P.& f.approved quality S.W. sewer trap of following sizes including placing the trap in position inside the manhole,embedding in C.C. 1:2:4, finishing the joints and rectifying the leakages.			
	a) 100mm dia	Each	**6.50**	**0.13**
	b) 150mm dia	Each	**11.00**	**0.22**
	c) 200mm dia	Each	**16.50**	**0.33**
	d) 230mm dia	Each	**19.50**	**0.39**
	e) 250mm dia	Each	**24.00**	**0.48**
	f) 300mm dia	Each	**31.00**	**0.62**
9	Making connections with the existing chamber or manhole incuding breaking the brick masonry wall re-doing the same to the original condition after the connection by adding approved w.p.comp.to the mortar.			
	a) 100mm dia	Each	**3.70**	**0.074**
	b) 150mm dia	Each	**5.30**	**0.106**
	c) 200mm dia	Each	**7.00**	**0.14**
	d) 230mm dia	Each	**8.00**	**0.16**
	e) 250mm dia	Each	**11.50**	**0.23**
	f) 300mm dia	Each	**14.50**	**0.29**
	g) 350 mm dia.	Each	**17.50**	**0.35**
	h) 400 mm dia.	Each	**20.50**	**0.41**
	i) 450 mm dia.	Each	**23.50**	**0.47**
	NOTE FOR S.W. PIPES:-			
	1. To arrive the cement consumption of different proportion of cement mortar,consider 2/3rd consumption for cm1:2 & 1/2 consumption for cm1:3 of the given consumption of cm 1:1.			
10	P.&L. following dia.best quality s.g.S.W.pipe conf.to IS 651-1980 with ISI mark and approved make, lowering and laying the pipe line in trenches for all depth including aligning & jointing with hemp yarn and finishing with cm 1:1 mixed with w.p. comp., curing, testing the line.			
	a) 100mm dia. ---------- 0.6m length	RM	**2.00**	**0.040**
	b) 150mm dia . ---------- " ----------	RM	**3.00**	**0.060**
	c) 200mm dia. ---------- " ----------	RM	**4.35**	**0.087**
	d) 230mm dia. ---------- " ----------	RM	**4.85**	**0.097**
	e) 250mm dia. ---------- " ----------	RM	**5.50**	**0.110**
	f) 300mm dia. ---------- " ----------	RM	**6.50**	**0.130**
	g) 350 mm dia. ---------- " ----------	RM	**7.80**	**0.156**
	h) 400 mm dia. ---------- " ----------	RM	**9.15**	**0.183**
	i) 450 mm dia. ---------- " ----------	RM	**9.75**	**0.195**
	j) 500 mm dia. ---------- " ----------	RM	**13.50**	**0.270**
	k) 600 mm dia. ---------- " ----------	RM	**16.80**	**0.336**

I. No	Brief Description of Item	Unit	Cement	
			kg	Bags
	NOTE FOR RCC / CC SPUN PIPES:-			
	1. To arrive the cement consumption of different proportion of cement mortar,consider 2/3rd consumption for cm1:2 & 1/2 consumption for cm1:3 of the given consumption of cm 1:1.			
	2. Pipes of 300mm dia.and above 3.0m,3.5m,4.0m in length may also be available except "NP1"class pipes.			
	3. The cement consumption for "P1" class pipe (which is available in the range of 80mm to 1200mm dia.) can be taken similar to "NP2" class pipe			
11	Supplying, lowering, laying, CC class "NP1" spun pipes of following class conforming to IS-458 with necessary collars or spigot socket, laid to correct grade and levels at all depth, including cutting to lengths, jointing with rubber ring or with hemp yarn and cement mortar 1:1, caulking the joints, and finishing, curing, testing etc. complete as per specifications.			
	a) 80 mm dia. ---------- 1.0 m Length	RM	**0.62**	**0.012**
	b) 100 mm dia.---------- "	RM	**0.71**	**0.014**
	c) 150 mm dia.---------- "	RM	**0.86**	**0.017**
	d) 200 mm dia.---------- "	RM	**1.06**	**0.021**
	e) 225 mm dia.---------- "	RM	**1.17**	**0.023**
	f) 250 mm dia.---------- "	RM	**1.26**	**0.025**
	g) 300 mm dia.---------- "	RM	**1.96**	**0.039**
	h) 350 mm dia.---------- "	RM	**2.65**	**0.053**
	i) 400 mm dia.---------- "	RM	**3.34**	**0.067**
	j) 450 mm dia.---------- "	RM	**4.03**	**0.081**
12	Supplying, lowering, laying, RCC spun pipes of following class conforming to IS-458 with necessary collars or spigot socket, laid to correct grade and levels at all depth, including cutting to lengths, jointing with rubber ring or with hemp yarn and cement mortar 1:1, caulking the joints, and finishing, curing, testing etc. complete as per specifications.			
A	**class-NP2 RCC**			
	a) 80 mm dia. ---------- 2.0 m Length	RM	**0.55**	**0.011**
	b) 100 mm dia.---------- "	RM	**0.75**	**0.015**
	c) 150 mm dia.---------- "	RM	**0.90**	**0.018**
	d) 200 mm dia.---------- "	RM	**1.15**	**0.023**
	e) 225 mm dia.---------- "	RM	**1.18**	**0.024**
	f) 250 mm dia.---------- "	RM	**1.35**	**0.027**
	g) 300 mm dia.---------- 2.5 m length	RM	**1.50**	**0.030**
	h) 350 mm dia.---------- "	RM	**2.20**	**0.044**
	i) 400 mm dia.---------- "	RM	**2.80**	**0.056**
	j) 450 mm dia.---------- "	RM	**3.60**	**0.072**
	k) 500 mm dia.---------- "	RM	**3.90**	**0.078**
	l) 600 mm dia.---------- "	RM	**4.80**	**0.096**

I. No	Brief Description of Item	Unit	Cement	
			kg	Bags
	m) 700 mm dia.---------- "	RM	**5.55**	**0.111**
	n) 800 mm dia.---------- "	RM	**6.30**	**0.126**
	o) 900 mm dia.---------- "	RM	**7.35**	**0.147**
	p) 1000 mm dia.---------- "	RM	**8.25**	**0.165**
	q) 1100 mm dia.---------- "	RM	**9.15**	**0.183**
	r) 1200 mm dia.---------- "	RM	**10.20**	**0.204**
	s) 1400 mm dia.---------- "	RM	**11.30**	**0.226**
	t) 1600 mm dia.---------- "	RM	**12.80**	**0.256**
	u) 1800 mm dia.---------- "	RM	**14.40**	**0.288**
	v) 2000 mm dia.---------- "	RM	**16.00**	**0.320**
	w) 2200 mm dia.---------- "	RM	**17.60**	**0.352**
B	**class-NP3 RCC**			
	a) 80 mm dia. ---------- 2.0 m Length	RM	**0.55**	**0.011**
	b) 100 mm dia.---------- "	RM	**0.70**	**0.014**
	c) 150 mm dia.---------- "	RM	**0.85**	**0.017**
	d) 200 mm dia.---------- "	RM	**1.15**	**0.023**
	e) 225 mm dia.---------- "	RM	**1.20**	**0.024**
	f) 250 mm dia.---------- "	RM	**1.74**	**0.0347**
	g) 300 mm dia.---------- 2.5 m length	RM	**1.74**	**0.0348**
	h) 350 mm dia.---------- "	RM	**2.85**	**0.057**
	i) 400 mm dia.---------- "	RM	**3.80**	**0.076**
	j) 450 mm dia.---------- "	RM	**4.15**	**0.083**
	k) 500 mm dia.---------- "	RM	**4.45**	**0.089**
	l) 600 mm dia.---------- "	RM	**5.26**	**0.105**
	m) 700 mm dia.---------- "	RM	**5.95**	**0.119**
	n) 800 mm dia.---------- "	RM	**6.75**	**0.135**
	o) 900 mm dia.---------- "	RM	**7.45**	**0.149**
	p) 1000 mm dia.---------- "	RM	**8.65**	**0.173**
	q) 1100 mm dia.---------- "	RM	**9.35**	**0.187**
	r) 1200 mm dia.---------- "	RM	**10.10**	**0.202**
	s) 1400 mm dia.---------- "	RM	**11.70**	**0.234**
	t) 1600 mm dia.---------- "	RM	**13.20**	**0.264**
	u) 1800 mm dia.---------- "	RM	**14.70**	**0.294**
	v) 2000 mm dia.---------- "	RM	**16.35**	**0.327**
	w) 2200 mm dia.---------- "	RM	**17.95**	**0.359**
	x) 2400 mm dia.---------- "	RM	**19.55**	**0.391**
	y) 2600 mm dia.---------- "	RM	**21.15**	**0.423**

I. No	Brief Description of Item	Unit	Cement	
			kg	Bags
C	**class-P2 RCC**			
	a) 80 mm dia. ---------- 2.0 m Length	RM	**0.55**	**0.0110**
	b) 100 mm dia.---------- ‘’	RM	**0.75**	**0.0150**
	c) 150 mm dia.---------- “	RM	**0.90**	**0.0180**
	d) 200 mm dia.---------- “	RM	**1.15**	**0.0230**
	e) 225 mm dia.---------- “	RM	**1.20**	**0.0240**
	f) 250 mm dia.---------- “	RM	**1.74**	**0.0347**
	g) 300 mm dia.---------- 2.5 m length	RM	**1.74**	**0.0348**
	h) 350 mm dia.---------- “	RM	**2.44**	**0.0488**
	i) 400 mm dia.---------- “	RM	**3.15**	**0.0630**
	j) 450 mm dia.---------- “	RM	**3.85**	**0.0770**
	k) 500 mm dia.---------- “	RM	**4.37**	**0.0873**
	l) 600 mm dia.---------- “	RM	**5.39**	**0.1077**
	m) 700 mm dia.---------- “	RM	**5.95**	**0.1190**
	n) 800 mm dia.---------- “	RM	**6.78**	**0.1355**
	o) 900 mm dia.---------- “	RM	**7.63**	**0.1526**
	p) 1000 mm dia.---------- “	RM	**8.45**	**0.1689**
D	**class-P3 RCC**			
	a) 80 mm dia. ---------- 2.0 m Length	RM	**0.28**	**0.0055**
	b) 100 mm dia.---------- ‘’	RM	**0.75**	**0.0150**
	c) 150 mm dia.---------- “	RM	**0.90**	**0.0180**
	d) 200 mm dia.---------- “	RM	**1.21**	**0.0242**
	e) 225 mm dia.---------- “	RM	**1.32**	**0.0263**
	f) 250 mm dia.---------- “	RM	**1.43**	**0.0286**
	g) 300 mm dia.---------- 2.5 m length	RM	**1.83**	**0.0365**
	h) 350 mm dia.---------- “	RM	**2.50**	**0.0500**
	i) 400 mm dia.---------- “	RM	**3.18**	**0.0636**
	j) 450 mm dia.---------- “	RM	**4.20**	**0.0840**
	k) 500 mm dia.---------- “	RM	**4.65**	**0.0930**
	l) 600 mm dia.---------- “	RM	**5.55**	**0.1110**
	m) 700 mm dia.---------- “	RM	**6.45**	**0.1289**
	n) 800 mm dia.---------- “	RM	**7.35**	**0.1469**

I. No	Brief Description of Item	Unit	Cement	
			kg	Bags
	Part-IV – STORM WATER DRAINS & CHAMBERS			
1a	**Construction of storm water chambers of internal sizes 600 mm x 600mm x** x 600mm initial depth, 450 thk. Wall in R.R.masonry in CM 1:6, 150mm thick bedding in CC1:4:8,50mm thk benching, 80mm high haunching in CC1:2:4, also for100mm thick capping & bearing course plastering in cm 1:4,20mm thick on sides of drain, 12mmthick ontop & base in cm1:4,finished smooth with neat cement ,supplying & placing medium duty (MD) RCC precast perforated cover 750mm x 600mm x75mm .etc complete and as directed by engineer in charge.	Each	**269.00**	**5.38**
b	Extra over item (a) over 0.6 m initial depth.	RM	**181.00**	**3.62**
2a	**Constn.of storm water chambers of internal sizes 600mm x1050mm** x 900mm initial depth, 450 thk. Wall up to 700mm depth from top of chamber & remaining hight 600mm thk.in R.R.masonry in CM 1:6, 150mm thick bedding in CC1:4:8,50mm thk. Benching, 80mm high haunching,100mm thick capping & bearing course in CC1:2:4, plastering in cm 1:4,20mm thick on sides of drain, 12mmthick on top & base in cm1:4,finished smooth with neat cement ,supplying and placing medium duty (MD) RCC precast perforated cover 750mm x 600mm x75mm .etc complete and as directed by engineer in charge.	Each	**432.65**	**8.65**
b	Extra over item (a) over 0.9 m initial depth.	RM	**316.80**	**6.34**

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9.0 RECOMMENDED MANUFACTURERS FOR SOME OF THE FACTORY MADE MATERIALS

Clause 9.1 GENERAL INSTRUCTIONS :

1. Products with relevant IS. Markings from the IS. Licensed manufacturers, who are in the market for the last three years with valid IS License, shall be considered for approval.

2. In case of items where IS Marked material is not available, the contractor shall procure the same from the following list, subject to prior approval of engineer-in-charge. Periodic tests shall be carried out as per contract / specifications at contractor's own cost.

3. In case of any new brand other than ISI certified or from departmental list of manufacturer is proposed, adequate information about the product and manufacturer, shall be provided at the tender stage.

4. Department reserves the right to accept / reject any new brand(s) proposed by the tenderer.

5. The contractor shall make his own arrangement to procure reinforcement steel bars. The same shall be either plain mild steel bars grade-I as per IS-432 (part-I) or high yield strength deformed bars as per IS 1786, or as shown and specified in the drawing. Steel shall be procured from agencies meeting with following criteria:

a) they shall have valid is license or certification of tor-allis engineer services pvt. Ltd.

b) steel shall be rolled directly from billets as per the process of IS 1786 / 432 as appropriate.

c) it shall conform to mechanical and chemical properties as per relevant is standards.

The contractor shall submit the test certificate of manufacturer. Regular test on steel supplied by the contractor shall be performed by the contractor at the approved lab in the presence of departmental engineer, as per relevant IS. Recommended manufacturer of steel are : SAIL, ISCO, TISCO, RINL.

6. Samples of materials, fittings etc. Shall be submitted by the contractor and got approved from the Engineer-in-Charge, before supply in bulk at site of work. The bulk supply shall strictly conform to the samples approved. The approved samples shall be kept in custody of the Engineer-in-Charge, till completion of the work.

9.2 : LIST OF RECOMMENDED MANUFACTURERS / AGENCIES :

In addition to the materials specified below, the manufacturers / agencies included in the list of approved products by Central Products Evaluation Committee of CPWD, as per Appendix – 'B' in CPWD specifications, shall also be considered for approval by the Department, subject to conformity with RRCAT specifications

SN	Description of items	Recommended manufacturers
1	Vitreous chinaware watercloset, Flush Tank, Wash Basin, Soap dish, Urinals, Toilet paper roll holder, Sink etc.	Parryware, Hindware, Cera, Neyser or approved eq.
2	CP brass fittings & fixtures such as Bib tap, Stop cock, Pillar tap, waste coupling, Bottle Trap etc.	Kingston, Jaguar, GEM, L&K, MARC, Parko or approved eq.
3	Seat & cover for EWC	Commander, Hindustan, Capri, Supreme or approved eq.
4	Glass, Mirror	Modi Guard, Saint Gobin, Float glass or appr. eq.
5	Stainless steel Sink	Nirali, Neelkanth, AMC, Jayna or approved eq.
6	G.I / M.S Pipes	ITC, TATA, Zenith, Ambika, Surya, Khandelwal, Jindal, Hissar or approved eq.
7	G.I Malleable fittings	PEC, MJM, Unik, Zoloto, 'R' or approved eq.
8	GM or copper alloy Gate / Peet / Globe / Check valve	Neta, Sant, Kingston, NEW, Leader, Zoloto, GG
9	Ball Valve	MBM, Sant, Techno, A.I (JS), Zoloto or approved eq.
10	Air Valve / Kinetic Air Valve	Durga, BSJ-Shau, VKE, Sant, Hawa, IVC, Mayur, BJC
11	Water meter	Capston, Keycee, Paramount or approved eq.
12	Sluice valve / Foot valve (swing & lift type)	BSJ-Shau, Mayur, Upadhyay, Minoti, Effco, Kartar, KPM, IVC, Leader, Durga.
13	C.I Water quality pipes	Electrosteel, KDUL, Kesoram or approved eq.
14	C.I Soil quality pipes	A-1, Neco, Rifco, SRIF or approved eq.
15	C.I Frame & Cover	A-1, Neco, Rifco, SRIF, Kajeco or approved eq.
16	S.W Pipe & Gully Trap	Kashmira, Rajura, Girco, Perfect, C.I.or approved eq.
17	RCC Hume pipe	IHP, Pranali, Premier, Shreeji, Pragati, Usha, JSP or app. eq
18	SFRC frame & cover / gratings	Bharat, Shreeji, SS, KK or approved eq.
19	HDPE Pipe	Prince, Goutam or approved eq.
20	SWR-PVC pipe & fittings	Prince, Premium, Supreme, Finolex, Kissan or approved eq.
21	Water supply – PVC pipes & fittings	Prince, Premium or approved eq.

SN	Description of items	Recommended manufacturers
22	Pig Lead	Hindustan Zinc
23	PVC flushing Cistern	Commander, Hindustan, Duralite or approved eq.
24	Pressure Gauge	Pie-big, Guru or approved eq.
25	Foot Valve (Ball type)	Normex
26	SBR / EPDM Gaskets	Prabhat, Orient, Paul, Durable or approved eq.
27	C.I fittings / Specials	Kejriwal, Upadhyay, Orient, Durga or approved eq.
28	Flush Valves	Jaguar, Parko,Orient or approved eq.
29	Electronic flush Valve for Urinal	Cera, Parryware, Jaguar, Utech, Robo, Angus or approved eq.
30	Check Valves (slim type)	Zoloto, Intervalve or approved eq.
31	Butterfly Valve	Audco, C&R, Intervalve, Keystone, IVC, Durga or approved eq.
32	Ball Valve (15 to 40 mm)	CIM, Sant or approved eq.
33	Cockroach trap	Chilly
34	CI double flanged non-return valve	Kirloskar, IVC, Leader, or approved eq.
35	Fire hydrant valves	New Age, Arihant, Bhogilal, Hiren Ind. Corpn. or approved eq.
36	Stand post hydrant	Kejariwal, Orient, Durga, Kamla, Janta or app eq.
37	Sprinkler head	Grinnel, Spray safe, Central, H.D or approved eq.
38	Pumps & Pump sets	Kirloskar, Mather & Platt, Becon, Crompton Greaves, Jyoti, Calama, shehara or approved eq.
39	Pipe coat material (pipe protection)	PYPECOAT
40	Fire Extinguishers	New Age, Arihant, Hiren, Safex, Firestone Ind. or approved eq.
41	Ductile iron pipes	Electro steel, Lanco, SAW or approved eq.
42	Ductile iron specials / fittings	Electro steel, Kejariwal, Kiswock, Truforms or approved eq.
43	Fire hose, First aid hose reel, Branch pipe, Siamese connections, Hose coupling, Nozzle, Sprinklers, Fire Brigade connection etc.	Firex, Minimax, Safex, New Age, Arihant, Bhogilal, Hiren or approved eq.

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List of Modifications / Changes in Specifications for Public Health Engineering Works

(For Departmental reference only)

Printing of Specification Books for PH works:

1	3 / 03	1000	**2**	4 / 05	500	**3**	6 / 06	500	**4**	4 / 08	1000

Modifications in 3rd edition June - 2006:

SN	PAGE	MODIFICATIONS / CHANGES
1	10	IS 13382 updated (2004), IS 13095 & 14845 added.
2	15	Clause 2.1.6.1 (d) revised pertaining to excavation in trenches.
3	39	Para 4.5.05 – TRENCHES, added in PVC piping
4	40	Para 4.5.09: PAINTING, added in PVC piping, and minor corrections
5	44	Para 4.9.08 TRENCHES, added in CI water quality piping
6	46	4.10,02 Materials : IS No.13382 added
7	50	Para 4.14.02 : MATERIAL : modified for Rubber insertion
8	51	Para 4.16.02 : MATERIAL : revised for CI sluice valve
9	53	Corrections in Para 1.19.01, 4.19.02 & 4.19.05.1
10	53	Specifications for Butterfly Valve (Para 4.20) added. All subsequent para numbers up to P.55 changed accordingly.
11	67	Para No. 5.21.04 – TRENCHES, inserted in SW piping work.. Subsequent para numbers changed accordingly.
12	84	Para 7.12.1 GENERAL, modified for Orifice plate.
13	85	Para 7.16.2 MATERIAL, modified for fire extinguishers
14	96	SECTION –9 OF BOOK: General Instructions and List of Recommended Manufacturers of Materials Revised.
15	Minor corrections done on P.5, 25, 31, 37, 41, 58 & 80.	

Modifications in the present (4th) edition April - 2008:

SN	PAGE	MODIFICATIONS / CHANGES
1	5	Para 1.1.08 for water supply main – corrected and Para 1.1.09 to 1.1.13 - Formalities with statutory bodies: Only relevant portion retained.
2	7-10	Few IS codes added in alphabet order.
3	40	Para 4.5.15 of mode of payment added for PVC piping & in Para 4.6 copper alloy added for Full way valves.
4	41	Para 4.7.02: IS Code for water meters indicated.
5	57	Para 5.2.02: Material for UPVC-SWR Piping work clarified.
6	59	Para 5.4.11: Testing for PVC piping work clarified.
7	68	Para 5.21.08: Testing for SW piping work clarified.
8	77	Para 7.1.07: Testing for MS seamless piping work clarified.
9	79	Para 7.2.14: Testing for CI water quality piping work clarified.
10	80	Para 7.4: General, Material & Fixing para of Hydrant valves clarified.
11	81	Para 7.5 & 7.6: General & Material para of Fire hose pipes & Fire hose box are clarified.
12	82	General para 7.7.01 of Branch pipe and Material Para 7.9.2 of Fire brigade service inlet Siamese connection are clarified.
13	96 & 97	Para 9.0: Recommended manufacturers for factory made materials updated and items pertaining to Electrical works deleted.
14	P.1, 34, 65, 77, 82, 83, 84, 89, 90, 96 & 97	Minor corrections / changes done

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