RAJKOT MUNICIPAL CORPORATION
RAJKOT

: Name of Work :

Providing Supplying Lowering, Laying, Jointing, Testing and Commissioning of DI Pipeline for Distribution Network with uPVC pipe house service connections of 15 mm to 40 mm dia. NB size pipes of ASTM standards pipes with their fittings in Khodiyar nagar and vishvakarma nagar (Kothariya Aghat) In Ward No.13 (Re-Tender)

e-TENDER No. RMC/WW/CZ/17-18/05

:: Milestone dates of e-Tendering ::	
1 Downloading of e-TENDER documents	06/06.2019
2. Pre-bid Meeting	14/06/2018 at 17.00 Hours in the Office of the Addl. City Engineer at Central Zone.
3. Online submission of e-TENDER	21/06/2019 upto 18.00 Hours
4. Physical submission of EMD, Tender fee, Documents required for pre-qualification and other necessary documents only bySpeed Post or Registered Post or Courier or Hand Delivery within 2 days of online submission.	25/06/2019 upto 18.00 Hours
5. Opening of online Primary Bid (Technical bid)	25/06/2019 at 18.00 Hours
6. Verification of submitted documents (EMD, Tender fee, Documents required for pre-qualification and other necessary documents.)	26/06/2019 at 11.00 Hours
7. Agency to remain present along with original documents for verification	27/06/2019 Between 16.00 to 17.00 Hours
8. Opening of online Commercial Bid (Price Bid) for Technically qualified bidders only (if possible)	27/06/2019 at 17.00 Hours
9. Bid Validity	One Eighty (180) calendar days

VOLUME – II

DETAILED TECHNICAL SPECIFICATIONS

:Authority :
Additional City Engineer
Water Works Department, Central Zone,
Rajkot Municipal Corporation
Dr. Ambedkar Bhavan
Dhebar Road
Rajkot – 360001

GENERAL TECHNICAL SPECIFICATIONS

1. Scope of Contract:

The work entitled "Water Supply Distribution Network for Navalnagar Area under Gurukul Headwork".

The scope of works comprises the following:

- Carrying out necessary topographical survey and geotechnical investigations
- Excavation of pipe trenches in soil, soft rock, hard rock, WBM and concrete roads, including dewatering.
- Supplying and Laying of DI pipes with all specials along the route as per the network map
- Jointing of pipes with existing pipes(wherever required) with all required accessories
- Obtaining statutory approval from railway and other government bodies.
- Contractor shall plan and accordingly phase the supply of items according to his requirement to best utilize the available storage space at site.
- Providing and fixing sluice valves, Scour valves and Air Valves on the existing as well as new pipeline, as specified in relevant datasheets, detailed technical specifications, particular technical specifications and BOQ.
- Providing pipe bedding as per the requirements.
- Backfilling of pipe trench with selected soil immediately after erection of pipe excluding pipe joints.
- Encasing of underground pipelines as per specifications.
- Hydro testing of pipeline in segments.
- Backfilling of pipe trench at pipe joints.
- Construction of RCC Sluice/ Butterfly Valve Chambers/RCC Thrust blocks/ Saddles/ Anchor blocks. The typical drawings for various structures are enclosed in Bid drawings for reference.
- Reinstatement of WBM, Tar and Concrete Roads after laying and testing of pipeline.
- Demolishing old structures in the route of pipeline, if required.
- Flushing of entire pipeline with clean water at least for 24 hours.
- Testing and commissioning.
- Preparation of as-built drawings.

1.1. Delivery Schedule:

The contract time shall be **as prescribed in tender document, from the notice to proceed**. The contractor shall submit his delivery schedule and the programme of works together with his tender in conformity with delivery schedule given in the documents.

1.2. Packing and Handling:

a. Necessary care shall be taken and required packing shall be provided to avoid damage to pipe barrels and the edges of the pipe ends in transit.

b. Where the goods are required to be dispatched at Railway risk, special packing as per IRCA rules are absolutely necessary, which would be payable by the contractor himself.

c. The contractor shall use proper handling equipment or follow suitable standard handling method for **DI pipes & DI Specials** as approved by the Engineer-in-charge to unload the materials at the delivery site to prevent damage to the goods.

d. The contractor shall take all care for Transportation & supply of HC connections items to be supplied with its standard handling process, stored at site under his store / the delivery site to prevent damage to the goods.

2.0 General Specifications:

All the items occurring in the work and as found necessary during actual execution shall be carried out in the best workman like manner as per specifications and as per instructions of the Engineer-in-charge. All material should be from approved vendor for that material

Extra claim in respect of extra work shall be allowed only if such work is ordered to be carried out in writing by the Engineer-in-charge and the same is made in a fortnight after its occurrence.

The contractor shall engage a qualified Engineer for the execution of work who will remain present for all the time on site and will receive instructions and orders from the Engineer-in-charge or his authorized representative. The instructions and orders given to the contractor's representative on site shall be considered as if given to the contractor himself.

A work order book as prescribed shall be maintained on the site of the work by the contractor and contractor shall sign the orders given by the inspecting officers and shall carry out them promptly.

Quantities specified in the tender may very at the time of actual execution and the contractor shall have no claim for compensation on account of such variation.

Diversion of road, if necessary, shall be provided and maintained during the currency of the contract by the contractor at his cost.

Figured dimensions of drawings shall supersede measurements by scale. Special dimensions or directions in the specifications shall supersede all other dimensions.

All levels are given in drawings and the contractor shall be responsible to take regular levels on the approved alignment before actually starting the work. The levels shall be connected to the G.T.S. levels and shall be got approved from the Engineer-in-charge.

If the arrangement for temporary drainage is required to be made during any work of this contract, this shall be made by the contractor without claiming any extra cost.

3. Classification of Strata :

All materials encountered in excavation will be classified in the following groups irrespective of made of excavating the materials and the decision of the Engineer-in-charge in this regard shall be final and binding to the contractor.

3.1. Soils & Hard Murrum:

Soils of all sorts, silt, sand, gravel, soft murrum, stiff clay, kunkar and other soft excavation not covered in the items mentioned hereunder. Hard materials comprising of all kinds of disintegrated rock or shale or Indurate conglomerate interspersed with boulders of size between 0.02M3 and 0.75M3, weathered and decomposed rock, which could be removed with, pick, bar, shovel wedges and hammers, thought not without some difficulties.

3.2. Soft-Rock & Hard-rock:

This shall include all materials which is rock but which does not need blasting and can be removed with a pick, bar, wedges, pavement breakers, pneumatic etc. This shall include rock occurring in mass or boulders bigger than 0.75 M3 each which need blasting. This will also include rock to be removed by chiseling or any other method where blasting is not permissible.

The contractor will have to arrange for land, power and water for manufacture of pipes. However, if requested by the contractor, the Engineer-in-charge after due verification of facts will recommend to appropriate authority for obtaining land and power for manufacture of pipes under this contract.

TECHNICAL SPECIFICATIONS

ITEM NO.1 :

Excavation for pipeline trenches with shoring, strutting and bailing out or pumping out water from trenches wherever necessary of required length, width and depth including excavation for socket and all safety measures and provisions such as site rails, fencing lighting, watching including refilling the trenches and clearing the site etc as stipulated in the tender specification complete before starting work and after completion of work for the lift and strata as specified below:

Upto 1 To 1.5mt depth

(a) In all sorts of soils & soft murrum & in hard murrum, boulders incl. Macadam road

(b) In Hard rock and/or in c.c. 1:2:4 or RCC with blasting and chiseling or by chiseling only.

Excavation for pipe line trenches with shoring, strutting, bailing or pumping out watered from trenches whenever necessary of required length, width and depth including extra excavations for sockets and all safety measures and provisions such as site rails fencing, lighting, watching including refilling the trenches in layers including ramming and removing the excavated staff with 90m lead and clearing the site etc. as stipulated in the tender specification complete before starting work and after completion of work for all lifts and soil strata as specified.

a) In all sorts of soil soft murmur, hard murrum, boulders, macadam and asphalt roads including breaking of lime and cement masonry and lime concrete.
b) In soft rock, cement concrete, hard rock, and cutting of cement concrete and R.C.C. of any proportion, etc. with controlled blasting and or chiseling whichever is necessary and feasible as required by site conditions.
c) In hard rock,

1.1 Clearing of sites :

1.1.1 The site at which the pipe line is to laid and the area required for setting out and other operations shall be cleared of all obstructions, loose stones, and rubbish of all kinds; stumps of trees, brushwood as well as all trees shall be removed as directed. The roots shall be entirely grubbed up.

1.1.2 The products of the clearings to be stacked in such a place and in such a manner, As directed by the Engineer-in-charge.

1.1.3 In site clearing, all trees not specially marked for preservation, bamboos jungle wood and brush wood shall be cut down and their roots grubbed up. All wood and materials from the clearing shall be the property of corporation and shall be arranged as directed by the Engineer-in-charge or his authorized agent. The materials found to be useful by the Engineer-in-charge shall be conveyed

and properly stacked as directed within the specified limit. Unless materials will be burnt or otherwise disposed off as directed.

1.1.4 All holes or hollows, whether originally existing or produced by digging up roots, shall be carefully filled up with earth, well rammed and leveled off, as may be directed shall not be paid for. The contractor shall get approval of design of shoring. The shoring shall be of sufficient strength to resist side pressure and ensure safety from slips and blows and to prevent damage to work and property and injury to persons. It shall be removed as directed after all the items of work for which it is required are completed.

1.1.5 Protection :

1.1.5.1 The foundation pits and trenches, etc shall be strongly fenced and red light Signals shall be kept at night in charge of watch-man to prevent accidents. Sufficient care and protective measure shall be taken to see that the excavation shall not affect or damage the adjoining structures. The contractor shall be entirely responsible for any injury to life and damage to the properties etc. Necessary protection work such as guide ropes, crossing places, barricades, the contractor at his own cost shall provide caution boards etc.

1.6 Classification of Strata :

1.6.1 The decision regarding classification of strata shall rest with the Engineer-in-Charge and his decision shall be final and binding to the contractor.

1.6.2 All the materials encountered in the excavation shall be classified as described in 2.0 of general specifications.

1.7 Dewatering :

1.7.1 Unless specially provided for as a separate item in the contract, the rate of excavation would include bailing or pumping out all water met with in excavation or which may accumulate in the excavation during the progress of the work either, by percolation, seepage, springs, rain or any other cause and diverting surface flow if any, by earthen bunds or by other means. The bunds shall be removed as soon as the work is completed.

1.7.2 Unless specially provided as a separate item of contract, pumping of water from foundation pit, trenches etc shall be carried out by the contractor at his won cost and he shall arrange for required numbers of dewatering pumping sets for the above work. He shall take precaution to prevent any damage to the foundation trenches, concrete or masonry or any adjacent structure. The excavation shall be kept free from water by the contractor (1) during inspection and measurement (2) When concrete and/or masonry work are in progress and till the construction work reaches above the natural water level and (3) till the Engineer – in – charge

considers that the mortar is sufficiently set. The rate shall be paid for cum. of excavation.

1.8 Excavation in Rock :

1.8.1 Blasting with Gun Power:

Blasting operations shall be carried out with the prior permission and in the presence of the Engineer – in – charge or his authorized representative and during fixed time hours of the day. All safety precautions such as providing safety nylon netting etc. shall be carried out as per instructions of the Engineer – in – charge.

Red danger flags shall be prominently displayed and all the people, except those who have actually to light the fuse must be away to a safe distance, not less than 200 meters.

All fuses shall be cut to the length required before being inserted into the holes.

The number of charges to be fired and the actual number of shots heard shall be compared and the person responsible must satisfy himself by examination that all the charges have exploded before work people are permitted to approach the scene. The withdrawal of a charge which has not exploded shall under no circumstances be permitted, but the tamping and charge shall be flooded with water and the hole marked in a distinguishing manner. The next hole to be fired shall be at a distance of about 500mm from the old hole and fired in the usual way.

The contractor or any of his competent authorized person shall be in charge of the blasting operations and shall be held responsible for strictly observing the safety rules, particularly applicable to blasting operations, in addition to other safety rules.

In blasting rocks with dynamite, the following general principles shall be observed.

In general, the following diameter of drills shall be used for different depth of boreholes:

From 1 – 2 metres	25 mm diameter
From 2 – 3 metres	37 – 50 mm diameter
From 3 – 4.75 metres	50 – 60 mm diameter

The borehole should generally be not more than 1.3m deep and the distance apart should be from one and half to twice the depth.

Cracks and fissures in the rock to be blasted shall be carefully studied to as certain the best portion forth the boreholes. Charge shall always be placed in a round piece of rock, if possible not nearer than 30mm from the crack.

Rules for blasting with dynamite and other high explosives

The person - in- charge must show that he is thoroughly acquainted with all blasting operations and that he understands the rules herewith laid down. He will be held responsible for any accident that may occur.

Boreholes must be of such sizes that the cartridge can easily pass down them. The position of all holes to be drilled must be marked out with white paint and the person – in – charge must take particular note of these positions.

The drilling operation being finished, the person – in – charge must make a second inspection and satisfy himself that the boreholes marked out by him have been drilled. The person – in – charge must prepare all charges necessary for boreholes.

Only ten holes may be loaded and fixed at one time and the charges should be fixed simultaneously as far as practicable. Boreholes must be thoroughly cleared before a cartridge is inserted.

The loading is to be done by the person – in – charge himself and the position of the charge holes carefully noted by him. Wooden tamping rods only to be used in charging holes (not pointed but cylindrical throughout, one cartridge at a time must be inserted and gently pressed with the tamping rod.

Immediately before firing blast, due warning must be given and the person – in – charge must see that all the labourers have retired to safety.

The safety fuse of the charged holes are to be lighted in the presence of the person – in – charge, who must see that the fuses of the holes charged have properly ignited. After the blast, the person – in – charge must carefully inspect the work and satisfy himself that all the charges have exploded.

1.8.2 Misfires:

Misfires are a source of great danger, if it is suspected that part of the blast failed to fire or is delayed, allow sufficient time to elapse before entering the danger zone. When fuse and blasting caps are used, a safe time, at least of an hour should be allowed.

None of the drillers are to work near this hole until the two following separations have been done by the person – in – charge.

(a) The person – in – charge should very carefully extract the tamping with a wooden scrapper and withdraw the fuse with the primer and detonator attached, after which a fresh primer and detonator with fuse should be placed in this hole and fired or.

The hole may be cleared of 300mm of tamping and the direction then ascertained by placing a stick in the hole. Another hole may then be drilled 150mm away and parallel to it, the hole to be then charged and fired. The person – in – charge shall also at once report to the Engineer – in charge all cases of misfire, that cause of the same and what steps have been taken in connection herewith.

1.8.2.1 Precautions against misfire:

The safety fuse should be cut in an oblique direction with a knife.

All saw dust must be cleared from the inside of the detonator this can be done by blowing down the detonator and tapping the open end. No instrument shall be inserted into the detonator for this purpose.

After inserting the fuse in the detonator, it shall be fixed by means of nippers.

If there is water present, or if the boreholes be damp, the junction of the fuse and detonator must be made water tight by means of grease, white or lead.

The detonator should be inserted into the cartridge, so that about one third of the copper tube is left exposed outside the explosives. The safety fuse outside the detonator, should be necessarily tied in position in the cartridge. Water proof fuse only to be used in the damp boreholes, or when water is present in the bore-holes.

If a misfire has been found to be due to defective fuse detonator or dynamite, the whole quantity or box from which the defective article was used shall be rejected.

Storage of materials for blasting shall be as per regulations/stipulations of the concerned authorities.

It shall be the contractor's responsibilities to arrange proper storage of explosives and obtain required permission from concerned authorities. No separate payment will be made for the above.

The refilling will generally refer to refilling of trenches up to ground level with excavated stuff.

Filling materials shall be from excavated stuff.
Excavated stuff to be used shall be cleared of all rubbish, large size stones, brick bats etc. Big clods shall be broken down to a size of 50 mm or less.

1.9 Refilling :

After the pipes have been laid and jointed and the chambers are constructed and as soon as the joints have been inspected and passed by the Engineer-in-charge, the pipe line has been tested for water tightness, and after all concrete work thoroughly set the trenches shall be fulfilled with the materials taken there from. In refilling the trenches, the utmost care shall be exercised so as not to disturb, break or damage the jointed pipes. over and around every pipe, the finest selected material shall be put. No lumps of rock earth or other material around the pipe or be thrown into the trenches until the same has been broken to specified size and pipes covered by the fine material above referred to. The selected fine material shall be carefully placed next to the permanent work and well packed and well rammed in layers of 150mm for a depth of at least 300mm over the top of the pipe. The remaining of the excavation shall be filled in with the best and most suitable portions of the excavated material in layers of not more than 600 mm deep, each layer shall be thoroughly rammed before the next layer is placed. One man shall be employed for hand ramming for every 30m of refilling up to the level of 300mm over the top of the pipe. Surplus soil shall be piled on top of the filling to the extent possible for expected subsidence. All road materials to from a compact neat surface. The surface of the filled in trench shall be hand rolled by a hand roller weighing not less the ½ tones as directed by the Engineer-in-charge.

The contractor shall maintain all refilling and surfaces until reinstated. The contractor shall responsible for claims arising from accidents due to subsidence or inadequate maintenance or improperly refilling work.

The contractor shall be responsible for any settlement during the defects liability period including monsoon and the same shall be refilled with stuff brought from outside, if necessary.

Where excavated material is not considered suitable for refilling by the Engineer-in-charge, the Contractor will be required to cart selected surplus excavated materials in place of unsuitable materials. The contractor may also be instructed to supply suitable granular or other hard filling material for use in refilling. Such imported filling material shall be paid for at the rates given in the Bill of quantities.

No payment shall be made for carting away surplus material arising either because of rejection of excavated material for refilling or because of surplus material.

Measurement:

The contractor's shall be for the **unit of one cubic meter** of the quantity excavated limited to the dimensions and provisions specified in the specifications or as directed by the Engineer-in-charge. The extra excavation to provide for jointing pipes, shoring etc. will not be paid for. The rates shall include cleaning and clearing the trench site by cutting grass, shrubs and trees of girth (circumference) not exceeding 10 feet and

removing their obstructing roots in the trench cleaning the site, setting out works as per sanctioned plans, provide shoring, excavation and removal of all material from trenches, backfilling the trenches up to natural ground level and all other operations described above. The wood obtained during site clearance shall be the property of the department concerned.

The excavated quantity divided into two sub groups

(a) Excavations up to depth of 1.5M

The trench section is to be provided with Max. width OD of pipe + 250mm to300mm either sides. Depth of trench shall be minimum Bedding + OD of pipe + 0.60mt. cover above the top of pipe.(For 100mm dia pipe). Depth of trench shall be minimum Bedding + OD of pipe + 1.0mt. cover above the top of pipe. (For Other dia pipe).

ITEM NO.2

Providing and supplying D. I. K-7 grade pipes for following nominal bore diameter with internal cement mortar lining including all taxes, insurance, transportation, freight charges, inspection charges, loading, unloading, transportation to sites of work etc complete(IS : 8329 : 2000) - 300 mm dia D.I. Pipes, 200 mm dia D.I. Pipes, 150 mm dia D.I. Pipes.

ITEM NO. 3

Providing and supplying D. I. K-7 grade pipes for following nominal bore diameter with internal cement mortar lining including all taxes, insurance, transportation, freight charges, inspection charges, loading, unloading, transportation to sites of work etc complete(IS : 8329 : 2000) - 100 mm dia D.I. Pipes

Note:

The DI Pipe shall be of cement mortar lining inside and zinc coating outside, bitumen coating as per manufacturing and testing IS 8329-2000 with ISI Mark suitable for pushup joint. All pipes with necessary EPDM Rubber Gasket (Rubber gasket IS-5382-1985) with existing GST.

A] DUCTILE IRON PIPES & FITTINGS/ SPECIALS :

Note: Wherever International Standards or Indian standards / specifications are mentioned, their equivalent or higher standards / specifications are also acceptable

Supply and Delivery of **Ductile Iron Pipe as per IS:8329-2000 & IS 9523/2000 DI fittings** or its latest revision or amendments if any including jointing material as EPDM ring as per IS 5382-1985 and ISO: 4633-1996 or its latest revision or amendments if any.

Standards

The following standards, specifications and codes are part of this specification. In all cases, the latest revision of the including all applicable official amendments and revisions shall be referred to. In case of discrepancy between this specification and those referred to herein, this specification shall govern.

1) ISO: 10803-1997 Design method for ductile iron pipes

2) IS:8329-2000 Centrifugally Cast (spun) ductile iron pressure pipes for water, gas and sewage & IS 9523 for DI Fittings/Specials.

3) ISO:2531-1991 Ductile iron pipes, fittings and accessories for pressure pipelines.

4) ISO:4179-1985 Ductile iron pipes for pressure and non pressure-Centrifugal cement mortar lining – General requirements.

5) IS:8112 Specification for 43 Grade ordinary Portland cement.

6) BS:3416 Bitumen based coatings for cold application, suitable for use in contact with potable water.

7) ISO:8179-1995 Ductile iron pipes-External coating-Part-1 Metallic Zinc with finishing layer.

8) IS:638 Sheet rubber jointing and rubber insertion jointing.

9) ISO:4633-1996 Rubber seals-Joint rings.

10) IS:5382-1985 Specification for Rubber sealing rings for gas mains, water mains and sewers.

11) AWWA C600 Installation of ductile iron water mains and their appurtenances.

1.0 Internal Diameter:

The nominal values of the internal diameters of pipe, expressed in millimeters are approximately equal to the number indicating their nominal sizes DN.

2.0 Length:

The working length of socket and spigot pipes shall be 5 m ,5.5 m, or 6 metres.

3.0 Thickness:

The wall thickness of pipe 'e' in mm shall be calculated as a function of the nominal diameter by the following equation with minimum of 5 mm

$e = K(0.5 + 0.001\ DN)$

where : e = wall thickness in mm, DN = the nominal diameter, K = the whole number coefficient

4.0 EPDM Rubber Gasket:
Rubber Gasket shall be suitably for Push-on-Joint.
The spigot ends shall be suitably chamfered or rounded off to facilitate smooth entry of pipe in the socket fitted with the rubber gasket
Rubber Gasket shall confirm to IS 5382-1985 and ISO : 4633-1996 its latest revision or amendments if any

5.0 Sampling Criteria:
Sampling criteria for various tests, unless specified in IS 8329-2000, shall be as laid down in IS 11606. Mechanical test, Brinell Hardness test, Hydrostatic test etc are shall be as per IS 8329-2000

6.0 Tolerances on External Diameter:
The nominal external diameter (DE) of the spigot end of socket and spigot pipes and when measured circumferentially using a diameter tape shall confirm to the requirements specified as follow. The positive tolerance is +1 mm and applies to all thickness classes of pipes. The maximum negative tolerance of the external diameter are specified as follow:

DN	Nominal	Positive Tolerance	Negative Tolerance
80	98	+1	-2.2
100	118	+1	-2.8
125	144	+1	-2.9
150	170	+1	-3.0
200	222	+1	-3.0
250	274	+1	-3.1
300	326	+1	-3.3
350	378	+1	-3.4
400	429	+1	-3.5
450	480	+1	-3.6
500	532	+1	-3.8
600	635	+1	-4.0

7.0 Tolerance on Ovality:
Pipes shall be as far as possible circular internally and externally. The tolerance for out-or-roundness of the socket and spigot ends is given below:

Nominal Diameter in mm	Allowable Difference Between Minor Axis and DE in mm
80 to 300	1.0

350 to 600	1.75
700	2.0
750 to 800	2.4
900 to 1000	3.5

8.0 Tolerance in thickness

The tolerance on wall thickness (e) and the flange thickness (b) of the pipes shall be as below:

Dimensions	Tolerance in mm
Wall thickness (e)	- (1.3 + 0.001 DN)1)
Flange thickness (b)	+ (2+0.05b) & - (2+0.05b)

9.0 Coating

Pipe shall be delivered internally and externally coated.

External Coating: Pipe shall be metallic zinc coated and after that it shall be given a finishing layer of bituminous paint as per IS - 8329-2000 Zinc coating shall comply with IS:8329/EN 545/ ISO 8179. Only molten zinc spray coating shall be acceptable. The average mass of sprayed metal shall not be less than 130 g/sqm with a local minimum of 110 g/sqm. Bitumen overcoat shall be of normal thickness of 70 microns unless otherwise specified. It shall be a cold applied compound complying with the requirements of BS 3416 Type II suitable for tropical climates factory applied preferably through an automatic process.

Damaged areas of coating shall be repainted on site after removing any remaining loose coating and wire brushing any rusted areas of pipe.

Internal lining: Internally pipe shall be Portland Cement mortar lined (as per IS - 8329-2000). The mortar shall contain by mass at least one part of cement to 3.5 part of sand. All pipes and fittings shall be internally lined with cement mortar using high speed centrifugal process in accordance with IWO 4179/IS 8329. Cement mortar lining shall be applied at the pipe manufacturing shop in conformity with the aforesaid standards. No admixtures n the mortar shall be used without the approval of the Engineer. The sand to cement proportion of sand if justified by the sieve analysis. Pipe lining shall be inspected on site and any damage or defective areas shall be made good to the satisfaction of the Engineer. Lining shall be uniform in thickness all along the pipe. The minimum thickness of factory applied cement mortar lining shall be as per IS: 8329 Annex-B or ISO 4179. This is given below.

Nominal Pipe Size (mm)	**Nominal lining thickness (mm)**
Up to 300	3
350-600	5
700-1200	6
1400-2000	9

10.0 Joint
Jointing of DI pipes and fittings shall be push-on type

Push-on-joints
The Contractor shall source the push-on-joint gaskets only from the pipe manufactures. In turn the pipe manufacturer shall supply at least 10% additional quantity of gaskets over and above the requirement to the Contractor at no extra cost. The gasket used for joints shall be suitable for natural and purified water conveyance. In jointing DI pipes and fittings, the Contractor shall take into account the manufacturer's recommendations as to the methods and equipments to be used in assembling the joints. In particular the Contractor shall ensure that the spigot end of the pipe to be jointed is smooth and has been properly chamfered, so that once the rubber ring is correctly positioned before the joint is made, does not get damaged by friction or sharp edges of the spigot Chamfer. The rubber rings and the recommend lubricant shall be obtained only through the pipe manufacturer.

Rubber ring bundles form every lot shall carry with them manufacturers test certificate for the following mechanical properties.

1. Hardness
2. Tensile strength
3. Compression set
4. Accelerated again test
5. Water absorption test
6. Stress relaxation test

Rubber rings shall be clearly labeled in bundles to indicate the type of ring, the type of joint, the size of the pipe with which they are to be used, the manufacturer's name and trade mark, the month and year of manufacture and the shelf life.

11.0 Testing of Pipe:
The main test among others to be conducted shall be as per IS:8329-2000 or with its latest revision/amendments.

[a] Mechanical Tests
Mechanical tests shall be carried out during manufacture of pipes as specified in the Standards. The frequency and sampling of tests for each batch of pipes shall be in accordance with IS 11606-1986. The test results so obtained for all the pipes and fittings of different sizes shall be submitted to Engineer. The method for tensile tests and the minimum tensile strength requirement for pipes and fittings shall be as per IS;8329/EN 545 for pipes and IS:9523/EN 545 for fittings.

[b] Brinell Hardness Test
For checking the Brinell hardness the test shall be carried out on the test ring or bars cut form the pipes used for the ring test and tensile test in accordance with IS:1500. The test shall comply with the requirements specified in IS:1500/ISO 6506.

[c] Re-tests
If any test piece representing a lot fails in the first instance, two additional tests shall be made on test pieces selected from two other pipes from the same lot. If both the test results satisfy the specified requirements the lot shall be accepted. Should either of these additional test pieces fall to pass the test, the lot shall be liable for rejection.

[d] For hydrostatic test at works, the pipes and fittings shall be kept under test pressure as specified in the standard for a period of minimum 15 seconds during which the pipes shall be struck moderately with a 700 g hammer for confirmation of satisfactory sound. They shall withstand the pressure test without showing any leakage, sweating or other defect of any kind. The hydrostatic test shall be conducted before surface coating and lining.

12.0 Quality Assurance
The manufacturer shall have a laid down **Quality Assurance Plan** for the manufacture of the products offered which shall be submitted along with the tenders and successful tendered shall have to get its approval from RMC. All the materials, pipe, specials, valves etc. shall have to be inspected through Third Party Inspecting Agency.

Mode of Payment : As per schedule B, R.M.C. will pay maximum upto 25% of total length of unlaid pipe supply item of respective diameter, restricted to 70 % of cost as per SoR of RMC. 30 % will be released as per "Break up for Interim Payment" given in Volume-III.

B] D. I. SPECIALS / FITTINGS :-

SPECIFICATION :
Supply of DI Specials, K-7 with ISI marked, conforming to IS 9523/2000 & BSEN:545/1995, suitable for jointing 100 mm to 350 mm dia. DI Pipes shall have the following :

A) EXTERNAL COATING :

1. Metallic Zinc with finishing layer of bituminous as per Annexure 'A' of IS: 9523/2000.
2. Zinc rich paint with finishing layer of bituminous as per Annexure 'A' of IS: 9523/2000.
3. Bituminous paint as per Annexure 'C' of IS: 9523/2000.

B) INTERNAL LINING :
1. Portland Cement (with or without additives) mortar as per Annexure – 'B' of IS: 9523/2000.
2. Cement Mortar with Coal coat as per Annexure 'B' of IS 9523/2000.
3. Bituminous paint as per Annexure 'C' of IS: 9523/2000.

C) METALURGY & MICRO STRUCTURE :

The metal used for manufacture of D.I. fittings as per IS : 9523-2000 shall conform to the appropriate grade as specified in IS : 1865-2005.

D.I. Fittings shall contain a Stub (as cast), minimum length -15mm x dia.- 10 mm., which at the time of Inspection can be cut at random to carry out Metallographic test to ascertain minimum 80% Graphite No dularity as per Clause – 9.1 of IS : 1865-2005, in the form - V or VI as per IS : 7754-2003.

D) MANUFACTURING & VERIFICATION:

All the DI fittings and specials shall conform to IS: 9523/2000 and shall be manufactured at well equipped foundries.

The QAP for the DI fittings shall include inspection of above two by Department's (/)senior technical representatives and shall necessarily require formal approval before manufacturing clearance.

Mode of Payment: As per schedule B

Item No.4
Manufacture,Supply & delivery of Ductile Iron Flange Socket Spigot Bends,Tees,reducer or any other specials as per BSEN-545/1995 Class-A series K-12 suitable for use with D.I. Pipe manufactured as per IS:8329/2000 delivery of Specials is to be made to site of work including all taxes, loading,unloading, carting, stacking, unsurance, inspection charges, octroi etc, complete - (80-300 mm)

Item No.5
Extra Specials for Manufacture,Supply & delivery of Ductile Iron Flange Socket Spigot Bends,Tees,reducer or any other specials as per BSEN-545/1995 Class-A series K-12 suitable for use with D.I. Pipe manufactured as per IS:8329/2000 delivery of Specials is to be made to site of work including all taxes, loading,unloading, carting, stacking, unsurance, inspection charges, octroi etc, complete - (80-300 mm)

A] DUCTILE IRON PIPES & FITTINGS/SPECIALS :

Note: Wherever International Standards or Indian standards / specifications are mentioned, their equivalent or higher standards / specifications are also acceptable

Supply and Delivery of **Ductile Iron Pipe as per IS:8329-2000 & IS 9523/2000 DI fittings** or its latest revision or amendments if any including jointing material as EPDM ring as per IS 5382-1985 and ISO: 4633-1996 or its latest revision or amendments if any.

Standards
The following standards, specifications and codes are part of this specification. In all cases, the latest revision of the including all applicable official amendments and revisions shall be referred to. In case of discrepancy between this specification and those referred to herein, this specification shall govern.

1) ISO: 10803-1997 Design method for ductile iron pipes

2) IS:8329-2000 Centrifugally Cast (spun) ductile iron pressure pipes for water, gas and sewage & IS 9523 for DI Fittings/Specials.

3) ISO:2531-1991 Ductile iron pipes, fittings and accessories for pressure pipelines.

4) ISO:4179-1985 Ductile iron pipes for pressure and non pressure-Centrifugal cement mortar lining – General requirements.

5) IS:8112 Specification for 43 Grade ordinary Portland cement.

6) BS:3416 Bitumen based coatings for cold application, suitable for use in contact with potable water.

7) ISO:8179-1995 Ductile iron pipes-External coating-Part-1 Metallic Zinc with finishing layer.

8) IS:638 Sheet rubber jointing and rubber insertion jointing.

9) ISO:4633-1996 Rubber seals-Joint rings.

10) IS:5382-1985 Specification for Rubber sealing rings for gas mains, water mains and sewers.

11) AWWA C600 Installation of ductile iron water mains and their appurtenances.

1.0 Internal Diameter:
The nominal values of the internal diameters of pipe, expressed in millimeters are approximately equal to the number indicating their nominal sizes DN.

2.0 Length:
The working length of socket and spigot pipes shall be 5 m ,5.5 m, or 6 metres.

3.0 Thickness:
The wall thickness of pipe 'e' in mm shall be calculated as a function of the nominal diameter by the following equation with minimum of 5 mm
$e = K(0.5 + 0.001\ DN)$
where : e = wall thickness in mm, DN = the nominal diameter, K = the whole number coefficient

4.0 EPDM Rubber Gasket:
Rubber Gasket shall be suitably for Push-on-Joint.
The spigot ends shall be suitably chamfered or rounded off to facilitate smooth entry of pipe in the socket fitted with the rubber gasket
Rubber Gasket shall confirm to IS 5382-1985 and ISO : 4633-1996 its latest revision or amendments if any

5.0 Sampling Criteria:
Sampling criteria for various tests, unless specified in IS 8329-2000, shall be as laid down in IS 11606. Mechanical test, Brinell Hardness test, Hydrostatic test etc are shall be as per IS 8329-2000

6.0 Tolerances on External Diameter:
The nominal external diameter (DE) of the spigot end of socket and spigot pipes and when measured circumferentially using a diameter tape shall confirm to the requirements specified as follow. The positive tolerance is +1 mm and applies to all thickness classes of pipes. The maximum negative tolerance of the external diameter are specified as follow:

DN	Nominal	Positive Tolerance	Negative Tolerance
80	98	+1	-2.2
100	118	+1	-2.8
125	144	+1	-2.9
150	170	+1	-3.0
200	222	+1	-3.0
250	274	+1	-3.1
300	326	+1	-3.3
350	378	+1	-3.4
400	429	+1	-3.5
450	480	+1	-3.6
500	532	+1	-3.8
600	635	+1	-4.0

7.0 Tolerance on Ovality:
Pipes shall be as far as possible circular internally and externally. The tolerance for out-or-roundness of the socket and spigot ends is given below:

Nominal Diameter in mm	Allowable Difference Between Minor Axis and DE in mm
80 to 300	1.0
350 to 600	1.75
700	2.0
750 to 800	2.4
900 to 1000	3.5

8.0 Tolerance in thickness
The tolerance on wall thickness (e) and the flange thickness (b) of the pipes shall be as below:

Dimensions	Tolerance in mm
Wall thickness (e)	- (1.3 + 0.001 DN)[1)]
Flange thickness (b)	+ (2+0.05b) & - (2+0.05b)

9.0 Coating
Pipe shall be delivered internally and externally coated.

External Coating: Pipe shall be metallic zinc coated and after that it shall be given a finishing layer of bituminous paint as per IS - 8329-2000 Zinc coating shall comply with IS:8329/EN 545/ ISO 8179. Only molten zinc spray coating shall be acceptable. The average mass of sprayed metal shall not be less than 130 g/sqm with a local minimum of 110 g/sqm. Bitumen overcoat shall be of normal thickness of 70 microns unless otherwise specified. It shall be a cold applied compound complying with the requirements of BS 3416 Type II suitable for tropical climates factory applied preferably through an automatic process.

Damaged areas of coating shall be repainted on site after removing any remaining loose coating and wire brushing any rusted areas of pipe.

Internal lining: Internally pipe shall be Portland Cement mortar lined (as per IS - 8329-2000). The mortar shall contain by mass at least one part of cement to 3.5 part of sand. All pipes and fittings shall be internally lined with cement mortar using high speed centrifugal process in accordance with IWO 4179/IS 8329. Cement mortar lining shall be applied at the pipe manufacturing shop in conformity with the aforesaid standards. No admixtures n the mortar shall be used without the approval of the Engineer. The sand to cement proportion of sand if justified by the sieve analysis. Pipe lining shall be inspected on site and any damage or defective areas shall be made good to the satisfaction of the Engineer. Lining shall be uniform in thickness all along the pipe. The minimum thickness of factory applied cement mortar lining shall be as per IS: 8329 Annex-B or ISO 4179. This is given below.

Nominal Pipe Size (mm)	**Nominal lining thickness (mm)**
Up to 300	3
350-600	5
700-1200	6
1400-2000	9

10.0 Joint
Jointing of DI pipes and fittings shall be push-on type

Push-on-joints
The Contractor shall source the push-on-joint gaskets only from the pipe manufactures. In turn the pipe manufacturer shall supply at least 10% additional quantity of gaskets over and above the requirement to the Contractor at no extra cost. The gasket used for joints shall be

suitable for natural and purified water conveyance. In jointing DI pipes and fittings, the Contractor shall take into account the manufacturer's recommendations as to the methods and equipments to be used in assembling the joints. In particular the Contractor shall ensure that the spigot end of the pipe to be jointed is smooth and has been properly chamfered, so that once the rubber ring is correctly positioned before the joint is made, does not get damaged by friction or sharp edges of the spigot Chamfer. The rubber rings and the recommend lubricant shall be obtained only through the pipe manufacturer.

Rubber ring bundles form every lot shall carry with them manufacturers test certificate for the following mechanical properties.

1. Hardness
2. Tensile strength
3. Compression set
4. Accelerated again test
5. Water absorption test
6. Stress relaxation test

Rubber rings shall be clearly labeled in bundles to indicate the type of ring, the type of joint, the size of the pipe with which they are to be used, the manufacturer's name and trade mark, the month and year of manufacture and the shelf life.

11.0 Testing of Pipe:
The main test among others to be conducted shall be as per IS : 8329-2000 or with its latest revision/amendments.

[a] Mechanical Tests
Mechanical tests shall be carried out during manufacture of pipes as specified in the Standards. The frequency and sampling of tests for each batch of pipes shall be in accordance with IS 11606-1986. The test results so obtained for all the pipes and fittings of different sizes shall be submitted to Engineer. The method for tensile tests and the minimum tensile strength requirement for pipes and fittings shall be as per IS;8329/EN 545 for pipes and IS:9523/EN 545 for fittings.

[b] Brinell Hardness Test
For checking the Brinell hardness the test shall be carried out on the test ring or bars cut form the pipes used for the ring test and tensile test in accordance with IS:1500. The test shall comply with the requirements specified in IS:1500/ISO 6506.

[c] Re-tests
If any test piece representing a lot fails in the first instance, two additional tests shall be made on test pieces selected from two other pipes from the same lot. If both the test results satisfy the specified requirements the lot shall be accepted. Should either of these additional test pieces fall to pass the test, the lot shall be liable for rejection.

[d] For hydrostatic test at works, the pipes and fittings shall be kept under test pressure as specified in the standard for a period of minimum 15 seconds during which the pipes shall be struck moderately with a 700 g hammer for conformation of satisfactory sound. They shall

withstand the pressure test without showing any leakage, sweating or other defect of any kind. The hydrostatic test shall be conducted before surface coating and lining.

12.0 Quality Assurance

The manufacturer shall have a laid down **Quality Assurance Plan** for the manufacture of the products offered which shall be submitted along with the tenders and successful tendered shall have to get its approval from RMC. All the materials, pipe, specials, valves etc. shall have to be inspected through Third Party Inspecting Agency.

Mode of Payment : As per schedule B, R.M.C. will pay maximum upto 25% of total length of unlaid pipe supply item of respective diameter, restricted to 70 % of cost as per SoR of RMC. 30 % will be released as per "Break up for Interim Payment" given in Volume-III.

B] D.I. SPECIALS / FITTINGS :-

SPECIFICATION :

Supply of DI Specials, K-9 with ISI marked, conforming to IS 9523/2000 & BSEN:545/1995, suitable for jointing 100mm dia. DI Pipes shall have the following :

A) EXTERNAL COATING :

1. Metallic Zinc with finishing layer of bituminous as per Annexure 'A' of IS: 9523/2000.
2. Zinc rich paint with finishing layer of bituminous as per Annexure 'A' of IS: 9523/2000.
3. Bituminous paint as per Annexure 'C' of IS: 9523/2000.

B) INTERNAL LINING :

1. Portland Cement (with or without additives) mortar as per Annexure – 'B' of IS: 9523/2000.
2. Cement Mortar with Coal coat as per Annexure 'B' of IS 9523/2000.
3. Bituminous paint as per Annexure 'C' of IS: 9523/2000.

C) METALURGY & MICRO STRUCTURE :

The metal used for manufacture of D.I. fittings as per IS : 9523-2000 shall conform to the appropriate grade as specified in IS : 1865-2005.

D.I. Fittings shall contain a Stub (as cast), minimum length -15mm x dia.- 10 mm., which at the time of Inspection can be cut at random to carry out Metallographic test to ascertain minimum 80% Graphite No dularity as per Clause – 9.1 of IS : 1865-2005, in the form - V or VI as per IS : 7754-2003.

D) MANUFACTURING & VERIFICATION:

All the DI fittings and specials shall conform to IS: 9523/2000 and shall be manufactured at well equipped foundries.

The QAP for the DI fittings shall include inspection of above two by Department's (/)senior technical representatives and shall necessarily require formal approval before manufacturing clearance.

Mode of Payment : As per schedule B, R.M.C. will pay maximum upto 25% of total length of unlaid pipe supply item of respective diameter, restricted to 70 % of cost as per SoR of RMC. 30 % will be released as per "Break up for Interim Payment" given in Volume-III.

Item No.6
Extra Welding of M.S.pipe Welding in all positionwith required number runs,for MS pipe internaly and /or externaly including gauging Wherever necessary,fixing appurtenances and other accessories in connection with pipe laying work as per specification-Butt joints for plate thickness 4 to 7 mm.

ItemNo.7
Gas cutting of M S pipe/plates-Gas cuttiong/Either square cut or V cut pipes,plates etc of thickness 5mm to 10mm.

Specifications of Additional items of work may be required for some job works.

1.1 General
Specials, such as tees, Y-pieces, bends (single or composite), tapers, etc. shall necessarily be in steel and shall be manufactured from 6 to 10 mm thick steel plate as per standards and tested and laid in the same manner as the pipes. Small branches, single piece bends, etc. may be fabricated at site, care being taken to ensure that the fabricated fittings have at least the same strength as the pipeline to which they are to be jointed.

1.2 Bends

(a) Bends shall be fabricated taking into account the vertical and horizontal angles for each case.

(b) The bends shall have welded joints and the upstream and downstream ends of each bend shall have a straight piece of variable lengths as required.

(c) Bends shall be designed with deflection angle of maximum 10 deg. between segments.

(d) When the point of intersection of a horizontal angle coincides with that of a vertical angle, or when these points can be made to coincide, a single combined or compound bend shall be used, designed to accommodate both the angles. The combined bend should have a pipe angle equal to the developed angle, arrived at from appropriate formula.

(e) All joints in bends shall be thermally stress relieved as specified.

(f) Details of thrust collars anchor bolts, holding down straps, saddle plates should be furnished together with full specifications in Contractor's fabrication drawing.

1.3 Flanges

Flanges shall be provided at the end of pipes or special where sluice valves, blank flanges, tapers, etc. have to be introduced. The flanges received from the manufacturers will have necessary bolt holes drilled. The Contractor shall assemble the flanges in the exact position by marginal cutting, if necessary, so as to get the desired position of the sluice valves, etc. either vertical or horizontal and shall then fully weld the flanges from

both sides in such a way that no part of the welding protrudes beyond the face of the flanges. In case the welding protrudes beyond the flanges and if the Engineer orders that such protrusions shall be removed, the Contractor shall file or chip them off. If required and when ordered by the Engineer, the Contractor shall provide and weld gusset stiffeners, as directed on site. The drilling pattern shall be matching with the drilling pattern of flanges of valves.

1.4 Blank Flanges

Blank flanges shall be provided at all ends left unattended for the temporary closure of work and also for commissioning a section of the pipeline or for testing the pipeline laid. For temporary closures, non-pressure blank flanges consisting of mild steel plates, tack welded at the pipe ends may be used. For pipes subjected to pressures, the blank flanges or domes suitably designed as per Engineer's requirements shall be provided.

1.5 Stiffener Rings

The Contractor shall provide stiffener rings wherever required by design. The Contractor shall weld the same to the pipes with one circumferential run on each side. All fillet welds shall have a throat thickness of not less than 0.7 times the width of welding.

1.6 Field Hydraulic Test

After erection at site and after the concrete anchor blocks have been constructed, the section of the pipeline shall be subjected to a hydraulic test as follows, to the test pressure as mentioned below:

1.6.1 The pressure test shall be conducted in as per IS- 5822-1986.
1.6.2 During the test, the pipe shall be struck sharp blows with 1 Kg hammer. Water shall not spout, ooze or sweat either through joints-welded or bolted or the body of the pipe. If any leakage noticed shall be repaired by the Contractor, which shall include coating and repairing of the damaged portion. Repairs and replacements and further testing including the cost of the plates and other raw materials shall be carried out by the Contractor at his own cost. If any leakages are observed during the defects liability period due to defective workmanship or material supplied by the Contractor, he shall repair the same to the entire satisfaction of the Employer, at his own cost.

Wt. of pipe specials shall be carried out before guniting and shall be paid on weight per Kg bases.

1.7 Welding of MS Pipe Line / Specials & cutting of pipeline

The item includes following operations:
i)Carting of pipes from departmental store to site of work
ii) Lowering and laying pipes and specials in trenches.
iii) Welding of pipes and specials as per IS 5822: 1994
iv)Testing of welded joint as specified in the IS 5822: 1994 para 6.2. & Tensile test for minimum one joint out of forty joints.
v)Hydraulic testing of the pipes

M.S. pipe/specials shall be lowered, laid and jointed by welding including preparation of ends wherever required, grinding as per relevant IS code of welding, testing etc. complete with hydraulic testing complete as per IS: 5822-1994.

1.7.1 SPECIFICATIONS FOR WELDING:

These specifications cover shop welding as well as site welding for requirement of M.S. pipe in particular length and M.S. specials. Following types of joints are considered for connecting the two pipes or pipe and specials.

Fillet weld with swaging of one end of pipe

OR

But weld without swaging of one end of pipe.

1.7.2 WELDING UNDER RAIN AND STRONG WIND:

If welding is to be done during rain or strong wind, suitable protection shall be provided for the parts to be welded and the welder. Pre-heating of electrodes shall be done so as to remove any moisture. Where this is not practicable, no welding shall be done on piping under such conditions.

All the types of bends, scour tees, air valve tees, tail pieces of valves and water meters etc. shall be fabricated as per standard practice from M.S. pipe to be supplied by Contractor. The contractor shall have to provide M.S. pipe pieces and 18 to 20 mm thick flanges of required diameter for branch of tees, reducers, enlargers, etc. and paid on m. basis in Item No.1 supply of M.S. pipe. Fillet or butt weld as may be required shall do joint. Holes of appropriate dia shall be drilled in flanges of specials at appropriate spacing to facilitate jointing of sluice valves, water meter, air valves and other types of valves.

The following does are applicable for welding:
IS 814 code for covered electrode for metal Arc welding for mild steel.
IS 815 CLASSIFICATION AND CODING OF COVERED ELECTRODES FOR METAL Arc WELDING OF MILD STEEL AND LOW ALLOY HIGH TENSILTE STEEL.
IS 1663 Part – I/ Part – II regarding method of tensile testing of steel sheets and stripes.
IS: 3600 codes of procedure for testing of fusion welding joints and weld metal in steel.

1.7.3 ELECTRODES:

The contractor shall use preferably Advani /Adore Orelikon overcord S.S. Greecon (Blue) or other electrodes as approved by Engineer-in-Charge depending upon the thickness of the plate and type of joint. They shall use standard current and Arc Voltage required for the machine in use as per manufacturer's directions. Welding electrode shall conform to test procedure of IS 814 and IS 815. The contractor shall submit manufacturer's test certificate for each batch of electrode use by him. Electrodes shall be stored unopened in

original containers. Electrodes when used shall be free of rust, oil, grease and all other matter which could be harmful for the good quality of welding.

1.7.4 QUALIFICATION OF WELDERS:

Only such welders who are experienced and whose workmanship is satisfactory shall be employed for the work. Welders will be individually tested for the welding skill before they are allowed to work.

1.7.5 WELDING PROCESS:

All welds shall be made down – hand by manual or automatic shielded arc welding process. Welding shall be done so that there shall be thorough fusion and complete penetration. Sealing runs in the inside shall be done manually. The joints for seams and circular welding shall be square but as per standard practice as per of IS: 816 shall be accepted.

1.7.6 END PREPARATION:

Ends to be welded will be preferably made by machining. However, preparation of ends may be made by flame cutting, provided all grooves and irregularities are ground off and all the oxidation is removed.

1.7.7 CLEANINIG:

The ends to be welded shall be properly cleaned. All paint, oil, grease, rust and oxide as well as all earth, sand or any other material sticking which could be harmful to the welding should be removed. Ends shall be totally dry while welding. No dirt or debris will be permitted in the pipeline. Prior to alignment the inside of each joint shall be adequately scrapped by approved means to the satisfaction of the Engineer-in-charge.

1.7.8 ALIGNMENT AND SPACING:

Pipes to be welded shall be aligned and fitted with external line up clamp and spaced in a suitable manner, so as to hold ends during welding at a distance to ensure full penetration. Root opening shall not be more than as specified. Internal off set shall not exceed 1.5 mm. The pipe piece to be butt-welded shall be coupled by means of pipe couplers or by yokes or bridge "c" clamps. Owner's inspector may check and approve the joint fit-up and alignment prior to the commencement of welding.

1.7.9 WELDING TECHNIQUE:

1.7.9.1 FOR BUTT JOINTS:

The maximum electrode size shall be 3.15 mm (10 SWG) and the electrode holder shall be connected, having due regard for the polarity requirement of the electrode approved for the use for pipe in horizontal position. Upward technique shall be used with the recommended values of current.

The root pass of butt joints, regardless of the technique used, shall be such as to achieve full penetration. However, projection of weld metal in to the pipe bore shall not exceed more than 5 mm. Root grooves and defective restart of the welding shall is care fully avoided. For pipes having dia greater then 500 mm all circumferential joints shall be welded on both sides i.e. outside and inside.

At each interruption of welding and on completion of each run, craters, weld irregularities and slag shall be removed by grinding or chiseling. After the welding is started and until the joint has been completed displacements, shocks, vibration or stresses shall be avoided in order to prevent cracks or breaks in the weld.

1.7.9.2 FOR FILLET WELDS:

The maximum electrode size shall be 4 mm (8 SWG). On completion of the root pass, any visual defect or irregularity shall be ground off to avoid defects or irregularities in the next pass.

1.7.9.3 JOINT COMPLETION:

Electrode size of more than 8 SWG (4 mm) shall not be allowed for filling of the weld upward technique shall generally be used for pipe in horizontal and vertical position welding. At each interruption of welding and after each run of welding is completed, chipping and slag removal shall be done. When the welding is completed, butt joints shall have a cover pass. It shall be slightly convex and fuse into the surface of the base metal in such a manner as to have a gradual notch free finish and good fusion at the joint edges. Welds shall have a regular appearance and shall be free from defects. Welder number shall be stamped alongside each weld whenever required by the Engineer-in-Charge / consulting engineer.

1.7.9.4 WELDING EQUIPMENT, TOOLS AND SUPPLIES:

All welding machines, line up clamps, beveling machines, cutting torches and other equipment, tools and supplies used in connection with the welding work shall be kept in good working condition so as to produce sound welds. The welding machines shall have adequate controls for obtaining current adjustment for all pipeline-welding requirements. Ground clamps shall be of such design as to be dependable and should not deflect the pipe and with as large a contact area as is practicable.

1.7.9.5 PREPARATION OF PIPE FACE FOR WELDING:

Before aligning, assembling and welding pipe faces shall be cleaned by scrapping by wire brushes or by any other method approved by Engineer-in-Charge. The correctness of shape and bevel edge will be checked with templates and required corrections carried out before welding.

1.7.10 WELDED JOINTS:

As required in the welding work following points shall be observe. The contractor shall use the standard electrode depending on thickness of the plate and type of joints. They shall also use standard current and arc voltage required for the machine in use as per the direction of the Engineer-in-Charge. Welding electrodes shall confirm to IS 814 of Indian or equivalent foreign make of required quality approved by Engineer-in-Charge shall be used wherever possible.

1.7.11 GAS CUTTING:

Gas cutting if required for preparing on site distance pieces, straps etc. and cutting out holes in the pipe line shall have to be carried out by the contractor at his own cost. After cutting the edges shall be made smooth and even by using electrical or pneumatic grinder so as to remove all inequalities. Care shall be taken to see that the shape of the material cut does not defect in any way at the time of cutting.

1.7.12 BLANK FLANGES:

Blank flanges shall be provided at all ends left unattached for temporary closure of work and also for commissioning a section of pipeline for testing the line laid. For temporary closure non pressure blank flanges consisting of M.S. plate tack welded at the pipe ends

may be used. The blank flanges or domes designed as per requirement shall be provided. Separate payment will not be made for the flanges or domes.

1.7.13 STRAPS:

Whenever pipe line is to be done from two faces and / or required to be done in broken stretches due to any difficulty met at site the final connection has to be done by introducing straps to cover the gap upto 30 cm length. Such straps shall be fabricated in field by cutting pipes splitting them longitudinally and tapping them over the ends connected in the form of collar. The collar shall be in two halves and shall have the inside diameter equal to the outside diameter of pipe to be connected. A minimum lap of 8 cm on either end of the pipe shall be kept and fillet welds shall be run for circumferential joint. The longitudinal joint of the collar shall be butt welded. The material for straps and labour for doing above work is included in the rate, and nothing extra shall be paid for material as well as labour. The joints shall be provided with Reinforced cement mortar coating outside and cement mortar lining inside.

1.8 HYDRAULIC TEST:

The final high pressure test on the completed sections over ground or in the trench shall be performed before back filling. The testing shall be carried out in strict compliance with the testing procedure that shall be specified by the Engineer-in-Charge / consultant. The final hydrostatic pressure test on the pipeline shall be performed with water. All arrangement required for testing should be made by the contractor and after testing they shall be removed to the entire satisfaction of the Engineer-in-Charge. Water to be used for testing should be clean, arranged and supplied by the contractor. While the line is full, hydrostatic pressure shall be applied at 1.5 times the internal design pressure and maintained on the line without significant loss. The testing shall be at least for 24 hours. Failure of the line disclosed by loss of pressure shall be located and reported by the contractor. Cost of required repairs shall be borne by the contractor. Before taking delivery and

commencement he should inspect the pipes and if any defect is noticed at the time of taking over he should bring it to the notice of the Engineer-in-Charge.

1.9 LINING AND PAINTING OF PIPES AND SPECIALS :

In inside the pipes & Specials, an epoxy painting of thickness 150 micron confirming to drinking water standards and as per ANNEX-B of IS 3589-2001 (specifications for internal epoxy paint lining will be applied) and outside the surface to pipe-Specials, heavy duty bituminous paint of three coat including primer shall be provided as prescribed in the relevant IS code of practice.,

1.9.1 General

The fabricated pipes and specials shall be painted externally with 2 shop coats and one filed coat of Heavy Duty Bitumen paint over a coat of Zinc Rich Epoxy Primer as specified hereunder.

1.9.2 Material

Zinc rich epoxy primer and Heavy Duty bitumen paint (Inertol 49 W or equivalent) conforming to the following specification shall be used for painting. Each lot of the paint supplied shall be accompanied by the certified copies of the results of the tests carried out by the manufacturer.

If any sample of the paint and / or primer is not conforming to the specification, the entire consignment to which the sample may pertain shall be rejected. Only those primers and painting materials that have been approved by the Engineer/Owner in writing shall be used for this work.

1.9.3 Painting

1.9.3.1General

a) Except with the permission of the ENGINEER, nothing but ready mixed paints of an approved make and brand shall be used. Thinning or heating of paints will not be permitted except with specific approval and in accordance with instructions. Any warming of paint shall be performed by means of a hot water bath and paint shall not be heated to temperature higher than 40 deg. C. All paint shall be in thoroughly mixed condition at the time of application. On completion of the work, the CONTRACTOR shall remove any oil stains or paint spots, leaving the structures and equipment in a clean and acceptable condition.

b) Paint shall be applied only to dry, freshly cleaned surfaces, free form dust, rust, scale, grease or other substances which might affect the adhesion or the durability of the coating. In no case shall paint be applied to surfaces that are not to be applied during rainy or misty weather, unless unavoidable, in which case the work shall have suitable and satisfactory protection and such protection shall be maintained until the paint has dried.

c) All paint shall be applied by skilled workmen in workmanship manner and the average coverage shall be equal to that recommended for first class work with the type of paint and on the kind of surface being painted.

1.9.3.2 Preparation of Surface of Painting

a) General

(i) All oil and grease shall be removed from surface to be painted by washing with a suitable solvent and by wiping with rags until completely clean. After removal of all oil and greases, surfaces of metal work required to be painted shall be cleaned by removing all rust, loose scale and dirt by sandblasting, grit blasting or other effective means. Surface which will be permanently or intermittently submerged or subjected to moisture from spray or excessive condensation shall be cleaned to clean metals by sand or grid blasting. After cleaning, all surfaces shall be maintained free from oil, greases, rust, dirt and other contamination's until they have received the final coat of paint.

(ii) Surface of stainless steel and bronze and machined surfaces which are attached or adjacent to metal work that is being cleaned or painted shall be protected by adhesive tape or other suitable means during the cleaning and painting operations.

b) Sand Blasting

i) The surface of the steel pipes and specials to be painted shall be thoroughly cleaned by sand or shot blast cleaning process to SA 2.5 finish, to remove all rust mill scale etc. oil and grease shall be removed by applying a suitable metal cleaning solution and wiping with clean rags. All foreign matter which can not be removed by blasting process shall be removed as directed by the Engineer/Owner.

ii) Blasting should be done at a pressure of 5.62 Kg/sq.cm. (80 p.s.i.) at the compressor end and at 4.93 Kg/sq/cm. (70 p.s.i.) at nozzle end. This pressure should be maintained during the entire blasting operations. Improper jointing of hose pipes and resultant reduction in pressure at nozzle end shall be checked and avoided.

iii) The blast cleaned surface shall be primed immediately after blasting is over. The sequence and the programme of blast cleaning and application of zinc rich epoxy primer shall be arranged in such a way that the blast cleaned surface shall not remain uncovered with zinc rich epoxy primer for more than 2 hours.

iv) Any deviation from above shall require the approval of the Engineer/Employer.

c) Manual Cleaning

Wherever manual cleaning is approved by the Engineer the internal surface of special shall be thoroughly cleaned by using scrapers and wire brushes to remove all rust, mill scale etc. to give a shining metallic (SA 2.5) surface. The surface so cleaned shall be washed with water and allowed to dry. A metal cleaning solution of approved make shall then be applied over it. After it is dry, the surface shall be again washed with water, scrapping wire brushes simultaneously. A copious use of water is necessary at

this state to ensure that the metal cleaning solution is completely removed. The primer coat shall be applied immediately after the surface has become dry.

1.9.3.3 Shop Painting

a) General

i) Immediately after cleaning and inspection, and before removal from the shop, all metal work except machine finished surfaces, and surfaces of metals to be embedded in concrete, shall be given one coat of zinc rich epoxy primer followed by two coats of **heavy duty Bitumen Paint** as specified hereafter. Surface not accessible after assembly or erection shall be given a second shop coat of primer. Machine finished surface shall be effectively coated with white load to prevent rust.

ii) No coating shall be applied closer than 100 mm from ends of pipes and specials and this coating shall be done after field welding. The exposed steel surfaces shall be protected by rust preventive applications which shall not interfere with the filed welding.

b) Application of Primer

i) No primer shall be applied without prior approval of the Engineer/Owner. During rain or fog, shells of the pipes and specials shall be protected from weather by suitable housing.

ii) The proportion of mixing of base and hardener shall be as specified by the manufacturer by weight and volume. The mix of zinc rich epoxy primer shall be prepared at the work site/yard not earlier than 15 minutes before applying the same on pipe and specials surfaces.

iii) On coat of zinc rich primer shall be applied by spray giving a film thickness of approximately one mil.

iv) No thinner shall be added to the ready mix paint without previous approval of the Engineer/Owner, and the finishing coats on top of the primer coat, shall only be applied after allowing the film to cure for at least 48 hours.

v) The priming coat shall be uniform in thickness and free from floods, runs, sags, drips, or bare sports. Any bare sports shall be recoated with an additional application of the primer. All runs, sags, floods or drips shall be removed or all such defects shall be remedied by repriming as per the instruction of the Engineer / Owner.

(c) Application of two shop coats of bitumen paint

application of the paint under very strong sun or in the early morning in winter shall be avoided. After application of zinc rich epoxy primer, the surface should be cleaned by duster and inspected. If during inspection any potion is found rusting the same shall be removed by emery paper and coated with zinc rich epoxy primer. When complete section is checked as above, two coats of heavy duty bitumen paint shall be applied. When one coat is applied, the date of application of this coat should be written on either

end of section. Before application the paint shall be properly stirred so as to get a good mix.

The painting shall be done by cross brushing i.e. one coat shall be given vertically and another coat shall be given horizontally so as to get required thickness, a good looking surface and also to avoid sagging of paint. To distinguish the second coat from first coat, the tint of the second coat shall be changed slightly. Every successive coat of paint shall be given only after the lapse of 48 hours of painting the previous coat. Before applying the next coat, the surface shall be properly cleaned by duster. The paint shall be stirred every time before applying with brush.

Each coat of Bitumen paint shall give a film thickness of **75 microns.**

1.9.4 Field Painting

The Contractor shall take proper care during loading / unloading and transport of the pipes and specials from the shop to the site of erection to preserve the shop paint in the best practicable condition.

After erection of the pipeline on installation all rust sports, damaged areas and site welded portion of the pipeline shall be cleaned to metal and shall be painted with one coat of zinc rich epoxy primer and two coats of heavy duty bitumen paint.

After lapse of 48 hours of application of repairing coats specified above a finish coat of heavy duty bitumen paint shall be applied to exterior surface to the entire pipeline, care being taken to clean the surface with duster prior to application of the said finish coat.

1.9.5 Inspection

The entire procedure of applying the paint as specified will be rigidly inspected right from the cleaning stage to the application of final coat by the Engineer / Owner. If, at any time, it is found that the procedure of applying the paint is not as per the standards laid down, all such painting work done shall be rejected and shall be rectified by the Contractor at his own cost, as directly by the Engineer / Employer.

1.9.6 Paint thickness

After completing 3 coats of heavy duty bitumen paint inspection of paint thickness will be done by the Engineer / Employer using Elcometer or other standard measuring devices. If the thickness is found to be less than specified the pipe shall be resurfaced to bring the same to the specified thickness as directed by the Engineer / Employer. All instruments and facilities for testing shall be provided by the Contractor.

1.9.7 Adhesion

Tow parallel knife cuts about 100 mm long and 20 mm apart shall be made thorough the coating. If necessary, the test knife may be heated to make the cut. The painted surface between the tow cuts shall be lifted off the pipe with a stiff blade. If the paint film does not peel off more than the width of the cut, the bond shall be deemed to be satisfactory. Should the width of peel exceed the width of the cut, two additional tests shall be made on the same pipe at two different locations. The painted surface shall be accepted if both

the tests are satisfactory. If the results of either of these tests are unsatisfactory, the painting work shall be rejected.

1.9.8 Covering Capacity

Covering capacity of paint shall be checked by taking into account the actual consumption of paint on site by dividing the area covered by paint by the quantity of paint actually consumed. The covering capacity shall be 8-10 sq.m./litre per coat of Bitumen paint giving a film thickness of 3-4 mills.

1.10 WELDING DEFECTIVE JOINT :

The defective joints should be cleared up to root pass and re-welded. Complete die penetration test for re-welded joint shall be given. Providing temporary arrangements to keep the pipe clean and in position. Labour for cutting pipes by gas cutting any other method and laying and fixing the same. Carting surplus pipes, pieces, scrap etc. to stores at plant site, head work or sub head work sites.

1.11. THE PROTECTION OF OTHER WORKS & MISCELLANEOUS WORKS COVERED AS SCOPE OF WORK.

Providing , transporting the pipes/ specials from the manufacturer/ factory to site, arranging pipes-specials along alignment. Cost of all materials like steel, cement, aggregate, bolts, nuts, washers, white lead, grease, rubber-packing etc. necessary for supply of specials, lowering, laying and jointing. Labour for laying pipes-specials in trenches to correct alignment at required depth with tools including cutting of pipes and specials if required for laying the pipes, including connecting pipes to specials and appurtenances. Cost of scaffolding, tools and plants, ropes etc. Protection of existing works from damage and cost of repairs to the damages carried out to the existing structures, poles, sewer, pipe line, telephone/electricity cables, electric lines, gas pipe line, etc.

Labour for making joints including welding with all materials for joints, tools as well as test for welds including testing of welded joint as per IS 5822: 1994 para 6.2 etc. including tensile test for at least one joint out of forty joints.

Testing of pipes for leakage under water pressure, and flushing the pipes after testing. Water required for this hydraulic testing and construction work shall have to be arranged by the contractor at his own cost.

METHOD OF MEASUREMENT OF PIPES:

The measurement of extra welding & gas cutting shall be recorded in running metres on weld length No payment shall be made for overlaps etc. 05% payment of this item shall be withheld for satisfactory hydraulic testing.

Payment against untested pipe - specials shall be made at 95% percent of the total tendered rate of supply and laying of pipes. Remaining payment shall be made on giving satisfactory hydraulic test by the contractor.

ITEM NO.8.

Lowering, laying and jointing C. I. S&S Spun Pipes suitable for Tyton joints / Mortarlined D.I. Pipes of various classes with CI / MS specials of following diameters in proper position, grade and alignment as directed by Engineer-in-charge including hydraulic testing etc. complete.

Spigot-Socket Joint

300 mm dia D.I. Pipes, 200 mm dia D.I. Pipes, 150 mm dia D.I. Pipes, 100 mm dia D.I. Pipes

GENERAL:

The pipes & joints shall be procured, supplied by the Contractor at work site at his own cost. Every care shall be taken in carting them to site. During transportation any damage shall be occurring to pipes for fittings the replacement of pipes given by the contractor at his own cost.

The trenches shall be well leveled so that pipes are laid evenly along them. The pipes shall be fixed within two rubber rings to be supplied by department at the place shown in schedule A, if directed by the Engineer-in-charge or mentioned in item of **Schedule B.** The specification for titan joints i.e. Rubber Rings shall be as per details specification shown above in item-1. The contractor shall make his own arrangement for obtaining permission for storing & stacking of pipes etc. from land boards whether they are Government, Municipal Local Bodies or Private land owner.

Every pipes before lowering into the trenches shall be got checked and thoroughly cleaned and the beds of the trenches shall be properly graded and leveled as required on the line, without any claim for extra cost whether it is required. The pipe shall be carefully lowered into the trenches with the help of a suitable type of chain pulley blocks, which shall first be approved by the Engineer-in-Charge. Each pipe shall be properly jacked and the spigot perfectly fixed into the socket. No jointing operation shall be started unless the gradients levels are approved by the Engineer-in-Charge or his representatives.

The pipes shall be laid complete in centerline ranged accurately by means of a string attached to both marked center of site rails and no deviation shall be permissible without the permission of Engineer-in-Charge. The pipe shall be laid in reasonably dry trenches and no circumstances on slushy bedding.

The pipes shall be brushed before lowering any laying or remove any soil or dirt etc. that may have accumulated.

The inside socket and outside of the spigot-shall be carefully cleaned. The pipe shall be lowered carefully with socket and toward and the flow of water or up till or as directed and spigot and should be carefully inserted into the socket and the space shall be filled with the joint.

DI specials shall be conforming to IS 9523-2000 and flanges shall be of PN-10 class.

PIPE CUTTING

For the installation of bends, branches and valves, pipelines require pieces of pipes of varying lengths. The exact length can only be determined on the site and one must be able to cut the pipes easily, quickly and safely.

CUTTING MACHINES

Today abrasive disc cutters with various kinds of power supply are used to cut ductile iron pipes. These cutters are powered by electric or compressed air connections or they can be driven indirectly by internal combustion engines. Many of the abrasive disc cutters in the market can be fitted with both abrasive cut off discs for cutting and with roughing discs for rounding off the cut edges. If only one machine is available on site then it should be suitable for both types of discs.

Stages in cutting operation

The pipe should be placed on level ground or on square timbers in such a way that during cutting, the cutting disc does not become jammed and the remaining pipe wall does not prematurely break away.

Marking : A line marked all around the pipe facilitates a straight cut. The line is simply drawn along a steel band which is bent around the pipe.

Cutting : Using the cutting disc, the ductile iron and cement mortar pipe wall is cut through completely at one point. The pipe is then cut along the marked line in a single operation.

Rounding off : For jointing into sockets of the push - on type, the new spigot end must be chamfered as the original spigot end. Only then the spigot end can be correctly inserted in the socket without damaging the gasket or pressing it out of it’s seat. A roughing disc is used for chamfering.

Re-coating : Subsequently, the bare metal surface should be recoated with zinc rich paint and a finishing layer of bitumen.

Marking the insertion depth : Before assembling the joint, lines should be marked on the new spigot, showing the correct insertion depth of the spigot end in the socket.

TESTING OF WATER PIPES:

After each section of the pipeline has been completed it shall be tested for water tightness before being covered. The contractor shall at his own cost fill up water in pipe line and given necessary hydraulic test section by section and the pipe line shall stand the pressure which shall stand the pressure which shall exceed the working pressure by

(a) 50% of the highest pressure in the section. (b) 30m whichever is less without showing any leakage or sweating anywhere in the pipes joints specials valves etc. it any defect are found the contractor shall be made good the same at his own cost. Any leaking joints shall be made good and above test pressure in to be lowered gradually after satisfactory test is & over. Municipal corporation will not be able to provide water for testing of the pipelines & water containers of the project. This shall have to be managed by the contractor at his costs and risk.

The hydraulic test shall be given again if considered necessary by the Engineer or his representative to show that no further leakages or sweating is there. The contractor shall have to make necessary arrangements for water testing as well as plugging the open the pipes etc. as directed without claiming any extra cost. The pipelines shall be kept filled with water for a work lines shall be kept filled with water for a week or till it is situated for testing is done.

If the pipe lines are laid in detached sanctioned & not in continuous length due to any reasons such as non availability of specials or due to obstacle etc. The contractor shall see that no end of pipes length is kept open-ends are immediately covered up either by suitable blank flange or cap slug or by means of double layer gunny bags clothes tied properly by mild steel wire without any claim for extra-cost.

The pipe laying across the state highways, national highways etc. will have to be done either through open cut method or through push through method depending upon the requirement to be prescribed by the sanctioning authority. However, mostly it would be push through method.

Item No.9

Removal of Excavated Stuff and Laying within the sites specified in Notification as directed by Engineer-in-Charge

After Refilling the pipe / chamber trenches by the excavated stuff is 15 cm thick layer, including ramming, watering and consolidating up to possible extent as specified in excavation & refilling item, the surplus stuff shall be disposed off at the following sites as directed within the prescribed limits of Notification as directed by the engineering in charge.

1. Beside Kotharia Police Station near Stone Quarry
2. All Quarry areas of Raiya Smart City

The excavated material of black cotton soil should be stacked at the location specified by the engineer in charge at no extra cost.

If the contractor fails to dispose the excavated stuff as specified, penalty will be imposed by Rajkot Municipal Corporation as per the Notification for C&D waste,

After refilling surplus earth shall have to carted by the contractor within specified limit including loading transporting unloading spreading without any extra cost.

Mode Of Measurement And Payment:
The rate shall be per Cubic Meter of truck-body basis.

Item No.10
Breaking of pavement surface

1. The work shall consist of removing, as herein after set forth; existing culverts, bridges, pavement, kerbs and other structures like guards-rails, fences, utility poles, manholes, catch basins, inlets, etc. Which are in place but interfere with the new construction or are not suitable to remain in place and of salvaging and disposing of the resulting materials and back-filling the resulting trenches and pits.

2. Existing culverts, bridges, pavements and other structures which are within the highway and which are designated to be removed, shall be removed up to the limits and extent specified in the drawings or as indicated by the Engineer-in-charge.

3. Dismantling and removal operations shall be carried out with such equipment and in such a manner as to leave undisturbed, adjacent pavement, structures and other work to be left intact.

4. All operations necessary for the removal of any existing structure which might endanger new construction shall be completed prior to the start of new work.

5. The structures shall be dismantled carefully and the resulting materials so removed as not to cause any damage to the serviceable materials to be salvaged, the part of structure to be retained and any other properties or structures nearby.

6. Unless otherwise specified, the superstructure portion of culverts / bridges shall be entirely removed and other parts removed to below the ground level or as necessary depending upon the interference they cause to the new construction. Removal of overlying of adjacent material if required in connection with the dismantling of the structures shall be incidental to this item.

7. Where existing culverts / bridges are to be extended or otherwise incorporated in the new work only such part or parts of the existing structure shall be removed as are necessary to provide a proper connection to the new work. The connecting edges, shall be cut, chipped and trimmed to the required lines and grades without weakening or damaging any part of the structure to be retained. Reinforcing bars which are to be left in place so as to project into new work as dowels or ties shall not be injured during removal of concrete.

8. Pipe culverts shall be carefully removed in such a manner as to avoid damage to the pipes.

9. Steelstructures shallunless otherwise provided be carefully dismantled in such a manner as to avoid damage to members thereof. If specified in the drawing or directed by the Engineer-in-charge that structure is to be

removed in a condition suitable for re-erection, all members shall be match marked by the contractor with white lead paint before dismantling. End pins, nuts, loose,plates, etc. shall be similarly marked to indicate their proper location. All pins,pin holes and machined surfaces shall be painted with a mixture of white lead and tallow and loose parts shall be securely wired to adjacent members or packed in boxes.

10. Timber structures shall be removed in such a manner as to avoid damages to such timber or lumber as is designated by the Engineer-in-charge to be salvaged.

11. In removing pavements, kerbs, gutters, and other structures, like guard rails, fences, manholes, catch, basins, inlets etc. where portions of the existing construction are to be left in the finished work, the same shall be removed to an exiting joint or cut and chipped to a true line with a face perpendicular to the surface of the existing structure. Sufficient removal shall be made to provide for proper grades and corrr7cc:tioo~ with the new work as directed by the Engineer-in-charge.

12. All concrete pavements base course in carriageway and shoulders etc. designated for removal shall be broken to pieces whose volumes shall not be. exceed 0.02 cubic meter and, stockpiled at designated locations if the material is to be used later or otherwise arranged for disposal as directed.

13. Where directed by the engineer-in-charge holes and depressions caused by dismantling operations shall be backfilled with excavated or other approved material and thoroughly compacted in line with surrounding area.

14. All materials obtained by dismantling shall be the property of Government. Unless otherwise specified, materials having any salvage value shall be placed in neat stack of like material within the right-of-way as directed by the Engineer-in-charge, for which contractor will remain responsible for its safe custody and preservation for 60 days after recording measurements of the salvaged material.

15. Pipe culverts that are removed shall be cleared and neatly piled on the right-of-way at points designated by the Engineer-in-charge.

16. Structural steel removed from old structure shall, unless otherwise specified or directed be stored in a neat and presentable manner on blocking in locations suitable for loading. Structures or portions thereof which are specified in the contract for re-erections shall be stored in separate piles.

17. Timber of lumber from old structures which is designated by the Engineer-in-charge as materials to be salvaged shall have all nuts and bolts removed from and shall be stored in neat piles in locations suitable for loading.

18. All the products of dismantling operations which in the opinion of the Engineer-in-charge cannot be used or auctioned shall be disposed as directed, within 100 meters.

19. The work of dismantling structure shall be paid for in units indicated below by taking measurement before and after, as applicable;

i) Breaking of pavement surface Square Meter

20. The contract unit rates for the various items of dismantling shall be for payment in full for carrying out the required operations including full compensation for all labor, materials, tools equipment, safeguard and incidentals necessary to complete the work. These will also include excavation and backfilling where necessary and for handling, salvaging, pilling and disposing of the dismantled material within all lifts as directed.

ITEM NO. 11: AIR VALVE (PN-1.0 Double Acting)

Providing and supplying ISI mark CI Air Valves of approved make & quality of following class and diameter incl. all taxes, insurance, transportation, freight charges, octroi, inspection charges,loading, unloading ,conveyance to departmental stores, stacking,etc completed (DS2) double acting air valve 80 mm

General

The contractor shall be covering manufacturing, supplying and delivery of:

Air valve conforming to IS: 14846 or its latest revision (Specification for Air valves with ISI certification).

- **Classification**
  - Air valve shall be of two types
    (a) Single Air valve
    (b) Double Air valve
  - Single air valve shall have single small or large orifice for releasing air during pipe filling and ventilating the pipe during emptying. Air valves up to 40 mm dia shall be directly screwed on the main.
  - Double air valve having two ball chambers on outlet of large capacity shall be provided for admission and release of bulk volume of air during emptying and filling of the main. Another of small outlet type for the escape of smaller quantities of air accumulating under pressure. They shall be of flanged type.

- **Materials**
  - **Cast Iron**

    Cast Iron for bodies' pressure covers, splash covers, glands, caps, joints support rings shall be best gray iron of selected grade, 20 of I-S-210-1978 specification for grey iron castings.
  - **Gun Metal**

    Gun metal shall be of mixture of 88% copper, 10% tin and 2% zinc having excellent hard wearing qualities, Ball guides of small orifice units and outlet bushes of large orifice valves shall be of gun metal.
  - **Forged Bronze**

    Nipples, spindles shall be machined from rolled, extruded or forged high tensile brass or aluminum bronze. The produce shall possess much greater strength than ordinary cast product.
  - **Mild Steel**

    Bolts, nuts, flanges etc. shall be of mild steel unless otherwise specified and shall confirm to IS: 226-1975 specification for structural steel.

- **Material for Balls**

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

- **Flange Jointing Materials**

  The jointing material used between the flanges of components part of the valve shall be compressed fiberboard or rubber of thickness between 1.5 mm to 3 mm. The rubber shall be as per I.S. 683:1965 specifications for rubber and Insertion jointing. The fiberboard shall be impregnated with chemically natural mineral oil and shall have a smooth and hard surface.

Dimension

Dimension of the Air Valves shall be as per relative item mentioned in Schedule B of the tender.

Characteristics

- Small orifice valves shall have rubber covered balls and nipples of forged bronze or special alloy in to brass plug.
- Large orifice valve shall have vulcanite-covered ball closing on rubber sealing backed with leather and gunmetal outlet bushes. They shall be screwed or flanged. The flanged shall be faces and drilled to ISS.
- Air valves shall be sound in all respect and uniformly forged so as to have uniform bore. They shall be free from any defects such as unwanted projection, holes or roughness and shall have inner and outer surface perfectly smooth.

Coating

- Immediately after casting and before machining, all cast iron parts shall be thoroughly cleaned and before rusting commences shall be coated by dipping in a bath containing a composition having a tar base.
- The coating shall be such that it shall not impose any test of small to water. The coating shall be smooth glossy and sufficiently hard. It shall not chipped when scratched lightly with the point of penknife.

Inspection and Testing

- The Engineer-in-charge or his authorized representative shall have free access to the works for inspection at any stage of manufacture and to reject any materials, which does not confirm to the specified requirements.

- The manufacturer shall arrange to supply all labour and appliance for the tests if the testing is to be done at his works. Each valve shall be subjected to the hydraulic test and shall show no sign of leakage under these tests, i.e. the balls shall function properly. The valve shall be tested to double the maximum working pressure.

Manufacturer's Guarantee

The manufacturers shall guarantee that if any defects chargeable to faulty workmanship, design or materials are found in the valves within a period of one year of dispatch be shall replace any part that prove defective, free of charge at the place of dispatch.

Information Required

The following information shall be cast on each valve body:

(a) Manufacturer's name or trademark.

(b) Size of valve

Tender Price

The tender price shall include all labour, material and machinery cost necessitated to be utilized for:

a) Proper manufacturing of the valves

b) All tests required to be undertaken at manufacturer's premises

c) Transportation of the valves either by rail and/or road services with all the covers duly and appropriately insured

d) Delivery of specials with proper loading, unloading, stacking at NAGAR PALIKA store as indicated by Engineer-in-charge

(e) Further towards proper discharge of all contractual obligations, the storage of all specials to be manufactured, supplied and delivered under the scope of contracts shall in general be made as described in Technical Specifications document

Marking

The methods of marking all the valves to be delivered under scope of contract shall ensure that all the information will remain legible even after transportation, storage in open space etc. In general the legible and indelible marking upon the valves shall indicate the followings:

a) Manufacture's brand name and/or trademark

b) Diameter and class of valves

c) Any other important matter that the manufacturer or purchase deems fit to be inscribed

Packing and Handling

- The materials shall always be packed separately dispatched from manufacturer's works with adequate protective measures to prevent damages deterioration while in transport or stored at any place. The packing shall always be so neat and tidy that may withstand any robust and rough handling.
- When the materials are transported at railway risk, special packing as per IRCA rules are absolutely necessary for which the extra cost, if any, shall be borne in total by supplier only.
- The supplier shall use proper handling instruments/equipment's and shall follow to a suitable method of handling pipes as may be approved by Engineer, while unloading and stacking material in the stores.

Materials and Workmanship

- General requirements of materials and workmanship shall mean any material or article either raw or finished one is required to be used in the manufacturing process of tanks.
- All the material shall be new and of high quality.
- In case, if material is not specified by relevant ISS for manufacturing part or the whole as item, the supplier shall prepare specifications in concurrence with manufacturer and shall seek an approval of Engineer prior to its use in the manufacture.

Test Certificate

- The supplier shall always provide manufacturer's test certificate in accordance with every batch/lot of goods so manufactured and supplied.
- The supplier shall also produce in addition to manufacturer's test certificate as mentioned under "inspection & testing above", the inspection certificate issued by the employer or his authorized person / agency appointed.

Inspection

This clause is applicable in general to all materials such as all types of valves, pre-cast chambers, other specials and materials etc. which are to be supplied by the contractor.

Inspection of materials will be carried out at factory site by NAGAR PALIKA or authorized person / agency appointed by NAGAR PALIKA

The inspection call for Air Valves should be given. Inspection will be carried out normally within one weeks time and on receipt of such intimation the inspecting agency will inspect the materials as per the specification and on satisfying itself,

will mark the inspection marks on all pipes and issued inspection note to the supplier and concerned consignee.

For inspection purpose the manufacture has to go in for stenciling for identifying size and class for proper segregation. The stock of offered material shall be in a manageable batch with adequate space like spreading the pieces etc. to permit proper inspection and inspection authority to be present during stamping so as to ensure that only actually cleared material is stenciled. Manufacturer does not load material after sunset to avoid inadvertent dispatch of wrong material.

Inspection note issued by the inspection agency to supplier as well as consignee (Concerned Executive Engineer) materials with inspection mark will be dispatched to stores stipulated in supply order and on receipt at stores the verification will be carried out by concerned Deputy Executive Engineer as regards quantity and quality. Here quality means physical soundness of materials as precaution against breakage during transit. The supplier has to submit the test certificate as well as detailed test results carried out by inspection authority to the consignee along with the dispatch documents of materials. The material shall be considered as received only on receipt given by the concerned Deputy Executive Engineer after verifying and satisfying the above requirements.

ITEM NO. 12 :

Lowering, laying and jointing in position following C. I. / D/F Reflux valves, Butterfly valves, Sluice valves and Air valves including cost of all labour, jointing material, including nut bolts and giving satisfactory hydraulic testing, etc. complete

ITEM NO. 20 :

Lowering, laying and jointing in position following C. I. / D/F Reflux valves, Butterfly valves, Sluice valves and Air valves including cost of all labour, jointing material, including nut bolts and giving satisfactory hydraulic testing, etc. complete {(PN-1 with hand/wheel cap operted (Alt-1 type long body)}

FIXING OF SLUICE VALVES:

Fixing double flange cast iron sluice valves including loading, unloading, carting from store to site including all jointing materials and testing etc, complete.

The sluice valves and tail pieces shall be examined before laying for cracks and other flows. They shall be undamaged in all respect.

The sluice valve shall be operated before laying.

All grits and foreign material shall be removed from the inside of the valves before placing.

All the four faces shall be thoroughly cleaned and coated with a thin layer of mineral grease.

The tightening of gland shall be checked with a pair of inside calipers. Clearance between the top of the stuffing box and the underside of the gland shall be uniform on all the sides.

Jointing materials:

The contractor shall provide all necessary jointing materials such as nuts bolts, rubber packing, white zinc, jute, lead, wool etc.

All tools and plant required for installation of sluice valve shall be provided by the contractor.

All jointing materials shall be got approved from the Engineer-in-charge before use.

The nut and bolts shall confirm to latest I.S.S.

The rubber packing shall be good quality and approved by the Engineer-in-charge of the work.

Installation:

The sluice valve shall be lowered into the trench carefully, so that no part is damaged during lowering operation.
If necessary tail pieces shall be fitted with sluice valve first outside the trench and then lowered into the trench.

The rubber packing shall be three ply and of approved thickness. The packing shall be of full diameter of the flange with necessary holes and the sluice valve bore. If shall be even at both the inner and outer edges.

The flange faces thoroughly greased.
If flange faces are not free, the contractor shall use thin fibers of lead wood.
After placing the placing nuts and bolts shall be inserted and tightened to make the joints.

The valve shall be tightly closed when being installed to prevent any foreign materials from getting in between the working parts of the valve.

Each flange bolts shall be tightened a little at a time taking care to tighten diametrically opposite bolts alternatively.

The sluice valve shall be installed in such a way that its spindle shall remain in truly vertical position.

The other end of tail piece shall be fitted with pipes so that continuous lines can work.

Extra excavation required for facility of lowering and fixing of sluice valve shall not be paid for.

Testing:

After installation of sluice valve the same is tested to 1 ½ times of its test pressure.

The joints of sluice valve shall withstand the test pressure of pipe line.

Defects noticed during test and operation of sluice valve shall be rectified by the contractor at his own cost without any extra claim to the entire satisfaction of the Engineer-in-charge.

Mode of measurement and payment:

The measurement shall be taken **per number of sluice valve** of specified size.

The rate will be **per number** fitted in a pipe line.

30 percent of amount shall be withheld for hydraulic test and same shall be released after satisfactory hydraulic test.

FIXING OF AIR VALVES:

Fixing of cast iron air valve including loading, unloading carting from store to site, drilling and treading, wherever necessary including all jointing materials testing etc. complete.

The air valve shall be opened out cleaned and greased and checked properly before fixing.

Before fixing the air valve shall be observed for any damage during transit.

Jointing Materials:

The contractor shall provide all jointing materials such as G.I. Nipple, M.S. Clamps, nuts, bolts grease white zinc, rubber packing etc.

All tools and plant required for fixing air valves shall be provided by the contractor.

All the jointing materials shall be got approved from the Engineer-in-charge before use.

The nuts and bolts shall conform to latest I.S.S

The rubber packing shall be of good quality and approved by the engineer-in-charge of the work. It shall be three ply of approved thickness. The packing shall be of full diameter of flange with necessary holes and control valve bore. It shall be of even thickness of both inner and outer edges.

M.S. clamps shall be in two semi-circular pieces out of two coupling welded, suitable to the threads and size of single acting air valve.

Fittings:

The air valve shall be lowered into the trench, carefully, so that no part is damaged during lowering operation.

Double acting air Valve

The flanges of the air valve and tail pieces or pipe shall be properly cleaned and greased or applied with white zinc.

The rubber packing of approved quality and of required size shall be inserted on faces of air valve.

If flange faces are not true the contractor shall use thin fiber of lead wool at his own cost.

After placing the rubber packing the nuts and bolts shall be inserted and tightened evenly on all sided properly.
Each bolt shall be tightened a little at a time taking care to tighten diametrically opposite holes alternatively.

Testing:

The air valve shall be tested during the tested during the testing of the pipe line.

The joints and air valve shall be water tight.

During test if the joint or air valve, found leaking, the same shall be re-done to the entire satisfaction of Engineer-in-charge.

Mode of measurement of payment:

The measurement shall be size wise per number and payment shall be made per number of air valve fitted.

30 percent of amount shall be withheld for hydraulic test and shall be released after satisfactory hydraulic test.

In case of zero velocity valves, Air cushion valves & pressure relief valves shall be tested while running of the pipe line.

The measurement shall be taken for number of valve of specified size 30%

Amount shall be withheld for hydraulic test and same shall be released after satisfactory hydraulic test.

ITEM NO. 13:

Construction of valves chamber in brick or bela stone masonary, locally available in C.M. 1:6 foundation concrete 150 mm thick in C.C. 1:4:8 of trap metal size 25 mm to 40 mm thick, inside cement plaster in C.M. 1:3 and cement pointing outside in C.M. 1:3 and top cover of MS plate 15 mm thick with MS angle frame with 50 x 50 x 6 mm size angle fixing in C.C. coping 1:1.5:3 with 23 cm thick brick masonary wall in C.M. 1:6. Size of chamber inside 0.9 x 0.9 up to 1.00 mt. depth, with excavation and lift of surplus material complite.

valve chambers 0.9x0.9x1.0

Materials:

Water shall confirm to M-1.

Cement:

Cement shall confirm to M-3.

Brick:

The bricks shall be hard or machine moulded and made from suitable soils and burnt. They shall be free from cracks and flaws and nodules of free lime. They shall have smooth rectangular faces with sharp corners and shall be of uniform colors.

The bricks shall be moulded with a frog of 100 mm x 40 mm and 10 mm to 20 mm deep on one of its flat sides. The bricks should not be broken when thrown on the ground from a height of 600 mm.

The size of modular bricks shall be 190 mm x 90 mm x 90 mm.

The size of the conventional bricks shall be as under:
(9" x 4.3/8" x 2,3/4") 225 x 110 x 75 mm

Only bricks of one standard size shall be used in one work. The following tolerances shall be permitted in the conventional size adopted in a particular work.

Length ±1/8" (3mm) width : ± 1/16" (1.5mm)

Height: ± 1/16" (1.5 mm)

The crushing strength of the bricks shall not be less than 35 kg/sq.cm. The average water absorption shall not be more than 20 percent by weight. Necessary tests for crushing strength and water absorption etc., shall be carried out as per IS: 3495 (Part I to IV) - latest edition.

Workmanship:
i) Proportion:
The proportion of the cement mortar shall be 1:6 (1-Cement, 6-Fine sand) by volume.

Wetting of bricks:
The bricks required for masonry shall be thoroughly wetted with clean water for about two hours before use or as directed. The cessation of bubbles, when the bricks are wetted with water is an indication of thorough wetting of bricks.

Laying:
Bricks shall be laid in English bond unless directed otherwise. Half or cut bricks shall not be used except when necessary to complete the bond; closer in such case shall be cut to required size and used near the ends of walls.

A layer of mortar shall be spread on full width for suitable length of the lower coarse. Each brick shall first be properly bedded and set frame by gently tapping with handle of trowel or wooden mallet. It's inside face shall be flushed with mortar before the next brick is laid and pressed against it. On completion of coarse the vertical joints shall be fully filled from the top with mortar.

The work shall be taken up truly in plumb. All coarses shall be laid truly horizontal and all vertical joint shall be truly vertical. Vertical joints in alternate coarse shall generally be directly one over the other. the thickness of brick coarse shall be kept uniform.

The brick shall be laid with frog upwards. A set of tools comprising of wooden straight edges, mason's spirit level, square half meter rub, and pins, string and plumb shall be kept on site of work for frequent checking during the progress of work.

Both the faces of walls of thickness greater than 23 cms shall be kept in proper place. All the connected brick work shall be kept not more than one meter over the rest of the work. Where this is not possible, the work shall be raked back according to bond (and not left toothed) at an angle not steeper than 45 degrees.

All fixtures, pipes, outlets of water, hold fasts of doors and windows etc. which are required to be built in wall shall be embedded in cement mortar.

Joints:
Bricks shall be so laid that all joints are quite flush with mortar. Thickness of joints shall not expose 12 mm. The face joints shall be raked out as directed by raking tools daily during the progress of work when the mortar is still green so as to provide key for plaster or pointing to done.

The face of brick shall be cleaned the very day on which the work is laid and all mortar dropping removed.

Curing:
Green work shall be protected from rain suitably. Masonry work shall be kept moist on all the faces for a period of seven days. The top of masonry work shall be kept well wetted at the close of the day.

Mode of measurement & Payment:
The measurement of this item shall be taken for the brick masonry fully completed in foundation upto plinth. The limiting dimensions not exceeding those shown on the plains or as directed shall be final. Battered tapered and curved position shall be measured net.
The rate shall be for a unit of one cubic meter.
The testing of material is to be carried out at the cost of the contractor.

- **Cement Plaster 12 mm thick using cement mortar in proportion 1:3 with Neeru Finishing, curing etc. complete**

Material:
Water shall confirm to M-1.
Cement Mortar shall confirm to M-11

Workmanship:
12 mm thick cement plaster in single coat in CM 1:3 (1-cement : 3-sand) with a floating coat of neat cement slurry.

Scaffolding:
Wooden bullies, bamboos, planks, treatles and other scaffolding shall be sound. These shall be proper examined before erection and use. Stage scaffolding shall be provided for ceiling plaster which shall be independent of the walls.

This kind of Plaster is normally for interior side or as specified location by Consultant to be applied as above. NORMAL CEMENT PLASTER and the surface shall be rubbed smooth after coating it with a thick coat of pure Portland cement slurry while the base coat is still fresh. If Neeru plus cement finish is specified floating with neat cement will not be required.

Mode of Measurement & Payment:
The rate shall include the cost of all materials labour and scaffolding etc. involved in the operations described under workmanship.

All plaster shall be measured in square meter unless otherwise specified length, breadth or height shall be measured correct to a centimeter.

Thickness of the plaster shall be exclusive of the thickness of the key i.e. grooves or open joints in brick work, stone work etc. or space between laths. Thickness of plaster shall be average thickness with minimum 10 mm at any point on this surface.

This item includes plastering up to floor two level.
The measurement of wall plastering shall be taken between the walls or partition (dimensions before plastering being taken) for length and from the top of floor or skirting to ceiling for height, depth of cover of cornices, if any, shall be deducted.

Soffits of stairs shall be measured as plastering on ceilings. Elowigns soffits shall be measured separately.

For jambs, soffits, sides, etc. for openings not exceeding 0.5 sq.mt. each in area for ends of joints, beams, posts girders, steps etc. not exceeding 0.5 sq.mt. each in area and for openings exceeding 0.5 sq.mt. and not exceeding 3.00 sq.mt. in each area deductions and additions shall be made in the following manner:

a) No deductions shall be made for ends of joints, beams, posts etc. and openings not exceeding 0.5 sq.mt. each and no addition shall be made for reverse, jambs, soffits, side etc. of these openings, for finish to plaster around ends of joints, beams, posts etc.

b) Deductions for openings exceeding 0.5 sq.mt. but not exceeding 3.00 sq.mt. each shall be made as following and no addition shall be made for reverse, joints, soffits, sides, etc. of these openings.

i) When both faces of all walls are plastered with same plaster. Deductions shall be made for one face only.

ii)

- For openings having door squares equal to or projecting beyond the thickness of wall. Full deduction for opening shall be made from each plastered face of the wall.
- In case of openings of area above 3 dq.mt. each deduction shall be made for opening but Jambs, soffits and slits shall be measured.
- The rate shall be for a unit of square meter.

Item No.14

Providing M-100 (C.C. 1:3:6) for encasing pipe using 10 to 20 mm size machine crushed metal incl. formwork, curing, consolidation etc. complete

1.0. Materials

1.1 Water shall conform to M-1. Cement shall conform shall conform to M-2. Sand shall conform to M-4. Stones aggregate 20 mm. nominal size shall conform to M-12.

2.0 Workmanship

2.1 General

2.1.1 Before starting concrete the bed of foundation trenches shall be cleared of all loose materials, leveled, watered and rammed as directed.

2.2 Proportion of Mix

2.2.1 The proportion of cement, sand and coarse aggregate shall be one part of cement, 2 parts of sand and 4 parts of stone aggregate; and shall be measured by volume.

2.3. Mixing

2.3.1. The concrete shall he mixed in a mechanical mixer at the site of work. Hand mixing may however be allowed for smaller quantity of work if approved by the Engineer-in-charge. When hand mixing is permitted by the Engineer-in-charge in case of break-down of machineries and in the interest of the work, it shall be carried out on a water tight platform and care shall be taken to ensure that mixing is continued until the mass is uniform in colour and consistency. However in such cases 10% more cement than otherwise required shall have to be used without any extra cost. The mixing in mechanical mixer shall be done for a period 1. 1/2 to 2 minutes. The quantity of water shall be justsufficient to produce a. dense concrete of required workability for the purpose.

2.4 Transporting & placing the concrete.

2.4.1 The concrete shall, be handed from the place of mixing to the final position in not more than 15 minute by the method as directed and shall be placed into its final position, compacted and finished within 30 minutes of mixing with water i.e. before the setting commences. .

2.4.2 The concrete shall be laid in layers of 15 cms to 20 cms.

2.5. Compacting:

2.5.1 The concrete shall be rammed with heavy iron rammers and rapidly to get the required compaction and to allow all the interstices to be filled with mortar.

2.6. Curing

2.6.1 After the final set, the concrete shall be kept continuously wet if required by ponding for a period of not less then 7 days from the date of placement.

2.7. Mode of measurements and payment:

2.7.1 The concrete shall he measured for its length, breadth, and depth, limiting dimensions to those specified on plan or as directed. ,

2.7.2 The rate shall be for a unit of one cubic metre.

Item No.15

Providing M-150 (C.C. 1:2:4) for thrust block using 10 to 20 mm size machine crushed metal incl. formwork, curing, consolidation etc. complete

1.0 Materials:

Water shall confirm to M-1, cement shall confirm to M-3, Sand shall confirm to M-6, Grit shall confirm to M-8. Graded stone aggregate 20 mm, nominal size shall confirm to M-12.

2.0 General:

2.1 The concrete mix is not required to be designed by preliminary tests. The proportion of concrete mix shall be 1:1:2 (1 Cement: 1 coarse sand: 2 graded stone aggregate 20 mm nominal size) and 1:2:4 (1 Cement: 2 coarse sand: 4 graded stone aggregate 20 mm nominal size)by volume.

Concrete work shall have exposed concrete surface or as specified in the item.

2.2 The designation ordinary M-100, M-150, M-200, M-250 specified as per IS correspond approximately to 1:3:6, 1:2:4, 1:$1^{1}/_{2}$:3 and 1:1:2 nominal mix of ordinary concrete by volume respectively.

2.3 The ingredients required for ordinary concrete containing one bag of cement of 50 Kg by weight (0.0342 Cu.M) for different proportions of mix shall be as under:

Grade of concrete	Total quantity of dry aggregate by volume per 50 kgs of cement to be taken as the sum of individual volume of fine and coarse aggregates, max.	Proportion of fine aggregate to coarse aggregate	Quantity of water per 50 Kgs of cement maximum
M-100 (1:3:6) M-150 (1:2:4) M-200 (1:$1^{1}/_{2}$:3) M-250 (1:1:2)	300 Litres 220 Litres 160 Litres 100 Litres	Generally 1.2 for fine aggregate to coarse aggregate by volume but subject to an upper limit of 1:1.1/2 and lower limit 1:3	34 Litres 32 Litres 30 Litres 27 Litres

2.4 The water cement ratio shall not be more than specified in the above table. The cement concrete of the mix specified in the Table shall be increased if the quantity of water in mix has to be increased to overcome the difficulties of placements and compaction so that water cement ratio specified on the table is not exceeded.

2.5 Workability of the concrete shall be controlled by maintaining a water cement ratio that is found to give a concrete mix which is just sufficient wet to be placed and compacted without difficulty with the means available.

2.6 The maximum size of coarse aggregate shall be as large as possible within the limits specified but in no case greater than one fourth of minimum thickness of the member, provided that the concrete can be placed without

difficulty so as to surround all reinforcement thoroughly and to fill the corners of the form.

2.7. For reinforced concrete work, coarse aggregates having a nominal size of 20 mm, are generally considered satisfactory.

2.8 For heavily reinforced concrete members as in the case of ribs main beams, the nominal maximum size of coarse aggregate should usually be restricted to 5 mm, less than the minimum the distance between the main bars, or 5 mm less than the minimum cover to the reinform or whichever is smaller.

2.9 Where the reinforcement is widely spaced as in solid slabs, limitations of size of the aggregate may not be so important, and the nominal maximum size may some times be as greater as or greater than the minimum cover.

2.10 Admixture may be used in concrete only with approval of engineer-in-charge based upon the evidence that with the passage of time, neither the compressive strength of concrete is reduced nor are other requisite qualities of concrete and steel impaired by the use of such admixtures.

3.0 Workmanship:

3.1 Proportioning:

Proportioning shall be done by volume, except cement which shall be measured in terms of bags of 50 kg. weight the volume of one such bag being taken as 0.0342 cu.metre. Boxes of suitable size shall be used for measuring sand aggregate. the size of boxes (internal) shall be 30 x 30 cms, and 38 cms deep while measuring the aggregate and sand the boxes shall be filled without shaking ramming or hammering. The proportioning of sand shall be on the basis of its dry volume and in case of damp sand, allowances for bulkage shall be made.

3.2 Mixing:

3.2.1 For all work, concrete shall be mixed in a mechanical mixer which along with other accessories shall be kept in first class working condition and so maintained throughout the construction. Measured quantity of aggregate, sand and cement required for each batch shall be poured into the drum of the mechanical mixer while it is continuously running. After about half a minute of dry mixing measured quantity of water required for each batch of concrete mix shall be added gradually and mixing continued for another one and a half minute. Mixing shall be continued till materials are uniformly distributed and uniform color of the entire mass is obtained and each individual particle of the coarse aggregate shows complete coating of mortar containing its proportionate amount of cement. In no case shall the mixing be done for less than 2 minutes after all ingredients have been put into the mixer.

3.2.2 When hand mixing is permitted by the engineer-in-charge for small jobs or for certain other reasons, it shall be done on the smooth water tight platform large enough to allow efficient turning over the ingredients of concrete before and after adding water. Mixing platform shall be so arranged that no foreign material gets mixed with concrete nor does the mixing water flow out. Cement in required number of bags shall be placed in a uniform layer on top of the measured quantity of fine and coarse aggregate, which shall also be spread in a layer of uniform thickness on the mixing platform. Dry coarse and fine aggregate and cement shall then be mixed thoroughly by turning over to

get a mixture to uniform color. Specified quantity of water shall then be added gradually through a rose can and the mass turned over till a mix of required consistency is obtained. In hand mixing quantity of cement shall be increased by 10 percent above that specified.

3.2.3 Mixers which have been out of use for more than 30 minutes shall be thorough cleaned before putting in a new batch. Unless otherwise agreed to by the engineer-in-charge the first batch of concrete form the mixture shall contain only two thirds of normal quantity of coarse aggregate. Mixing plant shall be thoroughly cleaned before changing from one type of cement to another.

3.3 Consistency:

3.3.1 The degree of consistency which shall depend upon the nature of the work and the methods of vibration of concrete, shall be determined by regular slump tests in accordance with IS 1199 - Latest edition. The slump of 10 mm to 25 mm shall be adopted when vibrators are used and 80 mm when vibrators are not used.

3.4 Inspection:

3.4.1 Contractor shall give the engineer-in-charge due notice before placing any concrete in the forms to permit him to inspect and accept the false work and forms as to their strength, alignment, and general fineness but such inspection shall not relieve the contractor of his responsibility for the safety of men, machinery, materials and for results obtained. Immediately before concreting, all forms shall be thoroughly cleaned.

3.4.2 Centering design and its erection shall be got approved from the engineer-in-charge. One carpenter with helper shall invariably kept present throughout the period of concreting. Movement of labor and other persons shall be totally prohibited for reinforcement laid in position. For access to different parts suitable mobile platforms shall be provided so that steel reinforcement in position is not disturbed. For ensuring proper cover, mortar blocks of suitable size shall be cast and tied to the reinforcement. Timber, kapachi or metal pieces shall not be used for this purpose.

3.5. Transporting and Laying:

3.5.1 The method of transporting and placing concrete shall be as approved. Concrete shall be so transported and placed that no contamination, segregation or loss of its constituent material takes place. All form work shall be cleaned and made free from standing water dust, show or ice immediately before placing of concrete. No concrete shall be placed in any part of the structure until the approval of the engineer-in-charge has been obtained.

3.5.2 Concreting shall proceed continuously over the area between construction joints. Fresh concrete shall not be placed against concrete which has been in position for more than 30 minutes unless a proper contraction joint is formed. Concrete shall be compacted in its final position within 30 minutes of its discharge from the mixer. Expert where otherwise agreed to by the engineer-in-charge concrete shall be deposited in horizontal layers to a compacted depth of not more than 0.45 meter when internal vibrators are used and not exceeding 0.30 meter in all other cases.

3.5.3 Unless otherwise agreed to by the engineer-in-charge, concrete shall not be dropped in to place from a height exceeding 2 meters. When trunking or chutes are used they shall be kept close and used in such a way as to avoid segregation. When concreting has to be resumed on a surface which has hardened it shall be roughened swept clean, thoroughly wetted and covered with a 13 mm thick layer of mortar composed of cement and sand in the same ratio as in the concrete mix itself. This 13 mm layer of mortar shall be freshly mixed and placed immediately before placing of new concrete. Where concrete has not fully hardened all laitance shall be removed by scrubbing the wet surface with wire of bristle brushes care being taken to avoid dislodgement of any particles of coarse aggregate. The surface shall then be thoroughly wetted all free water removed and then coated with neat cement grout the first layer of concrete to be placed on this surface shall not exceed 150 mm in thickness and shall be well rammed against old work particular attention being given to corners and close spots.

3.5.4 All concrete shall be compacted to produce a dense homogenous mass with the assistance of vibrators unless otherwise permitted by the engineer-in-charge for exceptional cases such as concreting under water where vibrators cannot be used. Sufficient vibrators in serviceable condition shall be kept at site so that spare equipment is always available in the event of breakdowns. Concrete shall be judge to be compacted when the mortar fills the spaces between the coarse aggregate and begins to cream up to form an even surface mixture. During compaction, it shall be observed that needle vibrators are not applied on reinforcement which is likely to destroy the bond between concrete and reinforcement.

3.6 Curing:

Immediately after compaction, concrete shall be protected from weather including rain running water shocks vibration traffic rapid temperature changes frost and drying out process. It shall be covered with wet sacking hassian or other similar absorbent material approved soon after the initial set and shall be kept continuously wet for a period of not less than 14 days from the date of placement. Masonary work over foundation concrete may be started after 48 hours of its laying but curing of concrete shall be continued for a minimum period of 14 days.

3.7 Sampling and testing of concrete:

3.7.1. Samples from fresh concrete shall be taken as per IS 1199 - Latest edition, and cubes shall be made cured and tested at 7 days of 28 days as per requirements in accordance with IS 516 - Latest edition. A random sampling procedure shall be adopted to ensure that each concrete batch shall have a reasonable chance of being tested i.e. the sampling should be spread over the entire period of concreting and cover all mixing units. The minimum frequency of sampling of concrete of each grade shall be in accordance with following:

Quantity of concrete in the work	No.of samples	Quantity of concrete in the work.	No.of samples
1-5 cmt	1	16-30 cmt	3
6-15 cmt	2	31-50 cmt	4
51 and above	4 ± one additional for each additional 50 m or part thereof		

NOTE:- At least one sample shall be taken from each shift. Ten test specimens shall be made from each sample five for testing at 7 days and the remaining five at 28 days. The samples of concrete shall be taken on each days of the concreting as per above frequency. The number of specimens may be suitably increased as deemed necessary by the engineer-in-charge when procedure of tests given above reveals a poor quality of concrete and in other special cases.

3.7.2. The average strength of the group of cubes cast for each day shall not be less than the specified cube strength of 150 Kg/Cm^2 for concrete 1:2:4 and 200 Kg/cm2 for concrete 1:$1^1/_2$:3 at 28 days. 20% of the cubes cast for each day may have value less than the specified strength. Such concrete shall be classified as belonging to the appropriate lower grade. Concrete made in accordance with the proportion given for a particular grade shall not, however, be placed in a higher grade on the ground that the test strength are higher than the minimum specified.

3.8 Stripping:

3.8.1. The engineer-in-charge shall be informed in advance by the contractor of his intention to strike the form work. While fixing the time for removal of form, due consideration shall be given to local conditions, character of the structure, the weather and other conditions that influence the setting of concrete and of the materials used in the mix. In normal circumstances (generally where temperatures are above 20^0C) and where ordinary concrete is used, forms may be struck after expiry of periods specified below for respective item of work.

Stripping Time:

In normal circumstances and where ordinary cement is used forms may be struck after expiry of following periods:

a) Side of walls, columns and vertical faces of beams - 24 to 48 hours.
b) Beam softish (props. left under) - 7 days
c) Removal of props slabs:
   i) Slabs spanning upto 4.5 m - 10 days
   ii) Spanning over 4.5 m - 14 days
d) Removal of props for beams and arches
   i) Spanning upto 6 m - 14 days
   ii) Spanning over 6 m - 21 days

3.8.2. All form work shall be removed without causing any shock or vibration as would damage the concrete. Before the soffit and struts and struts are removed, the concrete surface shall be gradually exposed, where necessary in order to ascertain that concrete has sufficiently hardened. Centering shall be gradually and uniformly lowered in such a manner as to permit the concrete to take stresses due to its own weight uniformly and gradually. Where internal metal ties are permitted, they or their removable parts shall be extracted without causing any damage to the concrete and remaining holes filled with mortar. No permanently embedded metal part shall have less 25 mm cover to the finished concrete surface. Where it is intended to re-use the form work, it shall be cleaned and made good to the satisfaction of the engineer-in-charge. After removal of work and shuttering, the City Engineer

(Sp.) shall inspect the work and satisfy by random checks that concrete produced is of good quality.

3.8.3. Immediately after the removal of forms, all exposed bolts etc. passing through the cement concrete member and used for shuttering or any other purpose shall be cut inside the cement concrete member to a depth of at least 25 m below the surface of the concrete and the resulting holes be filled by cement mortar. All fins cussed by form joints, all cavities produced by the removal of form ties and all other holes and depressions, honeycomb spots, broken edges or corners and other defects, shall be thoroughly cleaned, saturated with water and carefully pointed and rendered true with mortar of cement and fine aggregate mixed in proportions used in the grade of concrete that is being finished and of as dry consistency as is possible to use. Considerable pressure shall be applied in filling and pointing to ensure through filling in all voids. Surfaces which are pointed shall be kept moist for a period of 24 hours. If pockets / honeycombs in the opinion of the engineer-in-charge are of such an extent or character as to affect the strength of the structure materially or to endanger the life of the steel reinforcement, he may declare the concrete defective and require the removal and replacement of the portions of structure affected.

(a) the bars shall be kept in position by the following methods :

(i) In case of beam and slab construction, sufficient number of precast cover blocks in cement mortar 1 :2 (1 cement : 2 coarse sand) about 4 x 4 cms. section and of thickness equal to the specified cover shall be place between the bars and shuttering as to secure and maintain the requisite cover of concrete over the reinforcement. In case of cantilevered or doubly reinforce beams or slabs, the main reinforcing bars shall be held in position by introducing chain spacers or supports bars at 1.0. to 1.2 metres centers.

(ii) In case of columns and walls, the vertical bars shall be kept in position be means of timber templates slotes accurately out in them, the templates shall be removed after concreting has been done below it. The bars Ray also suitably tied by means of annealed steel wires to the shuttering to maintain .position during concreting.

1.2. All bars, projecting form pillars, Columns beams, slabs etc, to which other bars and concrete are to be attached or bounded to later on, shall be protected with a coat of thin neat cement grout, if the bars are not likely to be incorporated with succeeding mass of concrete within the following 10 days, This coat of thin neat cement shall be removed before concreting.

4.0. Mode of measurements & payment.

4.1. The consolidated cubical contents of concrete, work as specified in item shall be measured. The concrete laid in excess of sections shown on drawing or as directed shall not be measured. No deduction shall be made for l

(a) Ends of dis-simmilar materials such as joints, beams, posts, girders, rafters, purline trusses, corbels and steps etc. upto 500 sq.cm. in section,

(b) Opening upto 0.1 Sq. M.

4.2. The rate includes cost of all materials labour, tools and plant requited for mixing, placing in position, vibrating and compacting, finishing, as directed. curing and all other incidental expenses for producing concrete of specified strength. The rate excludes the cost of form work.

4.3 The rate shall be for a unit of one cubic meter.

ITEM NO. 16 and 17

Providing & supplying House connection from distribution main to property limit
½ ” (15mm) connection
1” (25mm) connection
11/2” (40mm) connection

(1) Providing Service saddle Rigid PVC (IS 4985-2000) threaded (simple) with packing & bolts-nuts1 no.

(2) Providing Brass Ferule Long Threaded ASTM-D-2466.-1 No.

(3) Providing Brass(metal) inserted Female thread adaptor as per ASTM-D-2466.- 1 No.

(4) u-PVC Union-Soc with EPDM O-ring seal SH-40 as per ASTM -D-2466.

(5) Providing u PVC white pipe of schedule-40 class confirming to ASTM-D-1785 in required length-5.0 m approx.

(6) Providing Coupling ASTM-D-2466 Sch-80 about 04 nos for jointing the pipes

(7) u Pvc Ball valve as per ASTM-D-2466

Specifications for Clamp Saddle for Service Connections

General Specifications:

Clamp saddles for service connection from water distribution mains shall be of wrap around design, wide skirt and wide straps support, which shall reinforce the pipe while providing excellent stability to the saddle. Clamp Saddles for service connections shall be of fastened strap type with threaded outlet for service connection.

The service connection threading sizes shall be conforming to IS: 554 Clamp saddles shall be suitable for DI pipes of nominal size 3” (NB 80) to 12” (NB 300) with nominal service connection size from ½” (NB 15), ¾” (NB 20), 1” (NB 25), 1 ¼” (NB 32), 1 ½” (NB 40) and 2”(NB 50).

The straps shall be elastomer coated (insulated) type for firm grip on pipe as well as to protect the coating on the pipe and to insulate the un-identical metals. The saddles shall be single strap type up to pipe sizes of NB 600 and service outlet of ½”, ¾” and 1”.

The saddles shall be double strap type for pipe sizes above NB 600 or when the service outlet is 1 ¼”, 1 ½” or 2”.

Fasteners shall be of threaded nut-bolt-washer type. Nut-bolts of size ½" (M12) shall be used for saddles of size up to 4" (NB 100) and Nut-bolts of size 5/8" (M16) shall be used for saddles of size 6" (NB 150) and above.

The sealing between the saddle and mains shall be obtained by using a profiled elastomer seal matching to the curvature of the pipe. The seal shall be of elastomer type, suitable for all potable water applications.

The Material of construction of the body, straps, fasteners etc. shall be of a non corrosive material such as engineering plastic (PE/PP) or stainless steel or a combination of both.

The design of the saddle body should be such that, the service connection outlet metal insert shall project out towards pipe side and align with the hole drilled on the pipe to ensure positive locking against rocking or creeping on the pipe, as might be caused by vibration, pressure or excessive external loading.

The clamp saddles shall be suitable for maximum working pressures up to 10 bars.

Material and Design Specifications:

Saddle Body: Non corrosive Engineering Plastic body moulded with Stainless steel threaded metal insert for tapping outlet. Also, the stirrup metal plate shall be duly embedded in the plastic body, except at the place of nut-bolt lugs. Threading size and dimensions shall conform to IS: 554. The body shall have retaining cavity housing for internal and external retention of the elasomeric seal. Sealing shall be achieved by pressure exerted by the body while fastening the saddle straps & body on the pipe. Saddle Strap: Saddle straps shall be made of stainless steel 304 grade to prevent corrosion over the long service life.

Strap Insulation: Elasomeric (rubber) insulation / lining shall be such that none of the Stainless Steel Strap is in direct contact with the pipe. It shall ensure a firm non slip grip mounting on the pipe to prevent
the saddle from rocking or creeping on the pipe, as might be caused by vibration, pressure or excessive external loading.

Saddle Seal: It shall be virgin rubber SBR Grade 30 / NBR (NSF 61 approved). It shall be of type pressure activated hydro-mechanical design. It shall be contoured gasket to provide a positive initial seal which increases with increase in the line pressure. Gasket shall be gridded mat, with tapered ends, with the outlet section having oring contacting the saddle body multiple o-rings contacting the pipe, preferably with a Stainless steel reinforcing ring insert moulded to prevent expansion under pressure.

Nuts-Bolts- washer: Stainless Steel Type 304, NC rolled thread, Tightening torque for ½" (M12) nut-bolt: 14-15 kg.m and for 5/8" (M 16) nut-bolt: 21-23 kg.m

Brass ferrule for ½ " (20mm OD) connection , 1" (32mm OD) connection , 11/2" (42mmOD) connection :

Shall be of brass material as per IS standard.

COMPRESSION FITTINGS :

Compression fittings used for House service connection comply as per ISO 14236

Material of Construction

Compression fittings material shall confirm to ISO14236.Clause -5.
A .Body-Polypropylene
b. Nut / Cap –Polypropylene.
c. Clip Ring-POM (Acetylic resin)
d. Packing bush- Polypropylene
e. "O" ring – NBR
f. Threaded metal inserts –SS 304 with BSP Threads

Pressure testing
The pressure rating of compression fittings as per clause 8 of ISO 14236 which shall be PN16

Dimensions:
The Dimension of compression fittings shall be as per clause 7.1 of ISO 14236

Performance requirements
The compression fittings shall be tested as per ISO 14236. Following Test methods shall be performed.

Clause 8.2.1	-Leak tightness under internal pressure.
Clause 8.2.2	-Resistance to Pull out.
Clause 8.2.3	-Leak tightness under Internal Vaccum.
Clause 8.2.4	-Long term Pressure Test for Leak tightness for assembled joint
Clause 8.3.2.1	-MRS Value as per ISO 9080
Clause 8.3.3.1	-Resistance to Internal pressure.

Effects on Quality of Water

The Compression fittings for intended for conveyance of Potable water for Human consumption to be tested to comply with BS 6920 specifications in any of the laboratories like DVGW / KIWA / SPGN / WRc –NSF and certificate of compliance to be produced for the following parameters :

a. Odour & Flavour of Water.
b. Appearance of Water.

c. Growth of Micro Organism
d.Extraction of substances that may be of concern to Public Health (Cyto Toxicity)
e. Extraction of Metals.

For clear identification of the water services, the nuts of the fittings should be coloured blue while the body to be black. All fittings with threaded ends should be with BSP threads.

MDPE/U PVC BALL VALVES(STOP COCKS)

Ball Valves used for House Service Connections comply with ISO 4422, Part 4.

Material of Construction:
Ball Valve material shall confirm to as per clause 4 of ISO 4422.

a. Body and Handle - UPVC
b .Seals - PTFE
c .O-rings – NBR/EPDM
d. Material of Construction for compression end will as per specifications for compression fittings.

Pressure Rating
The Pressure of the Ball Valve shall be as per ISO 4422 shall be PN 16.

Dimensions:
The Dimensions of the Ball Valve shall be as per Table 3 of ISO 4422.

Performance Requirements:
The Ball valves shall be tested as per ISO 4422.Folowing test methods will be performed.

Clause 7.1	- Resistance of Valve Bodies to internal pressure
Clause 7.2	- Crushing Test
Clause 7.3	- Endurance Test
Clause 7.4.2	- Seat and Packing Test
Clause 7.4.1	- Operating torque Test

The Ball Valves intended for conveyance of Potable water for Human consumption to be tested to comply with BS 6920 specifications in any of the laboratories like DVGW / KIWA / SPGN / WRc –NSF and certificate of compliance to be produced for the following parameters :

a. Odour & Flavour of Water.
b. Appearance of Water.
c. Growth of Micro Organism
d. Extraction of substances that may be of concern to Public Health (Cyto Toxicity)
e. Extraction of Metals.

ItemNo.18
Providing M S Special like bends, tees, angles,reducers. etc with male female end if required

Providing MS Specials as well as laying jointing at site with required extra welding & Gas cutting including inside epoxy lining and outside bituminous paint as per the standards prescribed in the relevant IS code of practice.

Specifications of Additional items of work may be required for some job works.

1.1 General
Specials, such as tees, Y-pieces, bends (single or composite), tapers, etc. shall necessarily be in steel and shall be manufactured from 6 to 10 mm thick steel plate as per standards and tested and laid in the same manner as the pipes. Small branches, single piece bends, etc. may be fabricated at site, care being taken to ensure that the fabricated fittings have at least the same strength as the pipeline to which they are to be jointed.

1.2 Bends

(a) Bends shall be fabricated taking into account the vertical and horizontal angles for each case.

(b) The bends shall have welded joints and the upstream and downstream ends of each bend shall have a straight piece of variable lengths as required.

(c) Bends shall be designed with deflection angle of maximum 10 deg. between segments.

(d) When the point of intersection of a horizontal angle coincides with that of a vertical angle, or when these points can be made to coincide, a single combined or compound bend shall be used, designed to accommodate both the angles. The combined bend should have a pipe angle equal to the developed angle, arrived at from appropriate formula.

(e) All joints in bends shall be thermally stress relieved as specified.

(f) Details of thrust collars anchor bolts, holding down straps, saddle plates should be furnished together with full specifications in Contractor's fabrication drawing.

1.3 Flanges

Flanges shall be provided at the end of pipes or special where sluice valves, blank flanges, tapers, etc. have to be introduced. The flanges received from the manufacturers will have necessary bolt holes drilled. The Contractor shall assemble the flanges in the exact position by marginal cutting, if necessary, so as to get the desired position of the sluice valves, etc. either vertical or horizontal and shall then fully weld the flanges from both sides in such a way that no part of the welding protrudes beyond the face of the flanges. In case the welding protrudes beyond the flanges and if the Engineer orders that

such protrusions shall be removed, the Contractor shall file or chip them off. If required and when ordered by the Engineer, the Contractor shall provide and weld gusset stiffeners, as directed on site. The drilling pattern shall be matching with the drilling pattern of flanges of valves.

1.4 Blank Flanges

Blank flanges shall be provided at all ends left unattended for the temporary closure of work and also for commissioning a section of the pipeline or for testing the pipeline laid. For temporary closures, non-pressure blank flanges consisting of mild steel plates, tack welded at the pipe ends may be used. For pipes subjected to pressures, the blank flanges or domes suitably designed as per Engineer's requirements shall be provided.

1.5 Stiffener Rings

The Contractor shall provide stiffener rings wherever required by design. The Contractor shall weld the same to the pipes with one circumferential run on each side. All fillet welds shall have a throat thickness of not less than 0.7 times the width of welding.

1.6 Field Hydraulic Test

After erection at site and after the concrete anchor blocks have been constructed, the section of the pipeline shall be subjected to a hydraulic test as follows, to the test pressure as mentioned below:

1.6.1 The pressure test shall be conducted in as per IS- 5822-1986.
1.6.2 During the test, the pipe shall be struck sharp blows with 1 Kg hammer. Water shall not spout, ooze or sweat either through joints-welded or bolted or the body of the pipe. If any leakage noticed shall be repaired by the Contractor, which shall include coating and repairing of the damaged portion. Repairs and replacements and further testing including the cost of the plates and other raw materials shall be carried out by the Contractor at his own cost. If any leakages are observed during the defects liability period due to defective workmanship or material supplied by the Contractor, he shall repair the same to the entire satisfaction of the Employer, at his own cost. **Wt. of pipe specials shall be carried out before guniting and shall be paid on weight per Kg bases.**

Item No. 19 :
CI sluice valve with IS-14846 & PN-1.0 marked "KIRLOSKAR" brand
100 mm dia Sluice valve, 150 mm dia Sluice valve, 200 mm dia Sluice valve, 300 mm dia Sluice valve

The Contractor has to prepare approved Quality Assurance Plan (QAP) as per Specification and latest IS Code provisions before manufacturing.

Sluice valve as per IS: 14846 or its latest revision.

- **General**

  The contractor shall be covering manufacturing, supplying and delivery of sluice valve conforming to IS: 14846 or its latest revision (specification for sluice valves, 50 to 900 mm size) with ISI certification.

- **Standards**

  The CI sluice valves to be manufactured, supplied and delivered under the scope of this contract shall be manufactured in accordance with and conforming to Indian standard specifications as given below with ISI certification mark on each sluice valve.

- **Temperature Variation**

  All sluice valves manufactured, supplied and delivered shall be subjected to drinking water under variable temperature condition ranging from 4°C to 45°C.

- **Marking**

  The legible and indelible marking upon each valve shall indicate the following:

  (1) ISI certification mark on each sluice valve
  (2) Manufacture's brand name and/or trade mark
  (3) Size of valve and nominal pressure of valve
  (4) Serial number of cast
  (5) Serial number in punch
  (6) Where a valve has been tested for only open-end-test, it should be marked 'O' distinctly and permanently
  (7) Any other important matter that the manufacturer deems fit to be inscribed embossed

- **Test Certificate**

  - The contractor shall provide manufacture's test certificate for every batch / lot of valves manufactured and supplied.
  - The contractor shall also produce, in addition to the manufacture's test certificate, the inspection certificate issued by the authorized person / agency appointed by employer for the same purpose. The inspection charges of the authorized person / agency as fixed by employer shall have to be borne by the contractor and the necessary payment to the inspecting agency shall be paid by the contractor as per the terms and condition of employer.

- **Nominal Pressure**

  Sluice valves shall be designed by nominal pressure (PN) defined as the maximum permissible gauge working pressure in Mpa as "PN-II" (1 Mpa = 10 kgf/m^2 approx.).

  The nominal size shall refer to the nominal bore at any point, and shall not be less than the nominal size required.

- **Material**

  The materials for different component / parts of the sluice valve shall conform to the requirements given in table below:

  Materials for Components / Parts of Sluice Valve

Sl. No.	Component	Material	Reference	Grade of Designation
1	Body, bonnet, wedge, stuffing box, gland thrust plate, cap	Grey cast iron	210-FG 1978(1)	
2	Stem	High tensile brass	320-1962(2)	Alloy 1 of 2
3	Wedge nut	Leaded tin bronze	318-1962(3)	2
4	Body seat ring, wedge facing ring	Leaded tin bronze	318-1962(3)	2
5	Bolts	Carbon steel	1367-1967(4)	Class 4.6
6	Nuts	Carbon steel	1367-1967(4)	Class 4
7	Bonnet gasket	Compressed fiber Board	2712-1971(5)	C
8	Gland packing	Jute & hemp	5414-1969(6)	-

(1) Specification for grey iron castings (third revision)
(2) Specification for high tensile brass roads and sections (revised)
(3) Specification for leaded tin bronze ingots and casting (revised)
(4) Specification for technical supply condition threaded fasteners (first revision)
(5) Specification for compressed asbestos fiber jointing (first revision)
(6) Specification for gland packing, jute and hemp

- **Manufacture**

  Sluice valve bodies for 80 mm to 900 mm size valves shall be provided with double-flanged-end connections.

- **Flanges**

  The flanges and their dimensions of drilling shall be in accordance with part IV and VI of IS: 1538 (Part I to XXII), 1976 (Specification for Cast Iron fittings for pressure pipes for water, gas and sewage) or its latest revision.

Constructional Features

1	Standard	IS: 2906 above 300 mm size and IS: 780 up to 300 mm size
2	Stem	Non rising
3	Ends	Flanged, flat faced flanges having off-center bolt holes
4	Bonnet	Bolted
5	Disc	Solid wedge
6	Operation	Manually operated
7	Seat	Body - Renewable Disc - Renewable
8	Other requirements	Valves shall close in clockwise rotation of the hand wheel
9	Body & bonnet	CI, IS: 210 GR 260
10	Disc	CI, IS: 210 GR 260
11	Stem	SS, AISI - 410
12	Body seat	SS, AISI - 316
13	Disc seat	SS, AISI - 316
14	Stem nut	Bronze, IS: 318 Gr LTB2
15	Stuffing box	CI, IS: 210 GR 260
16	Gland	CI, IS: 210 GR 260
17	Packing	Graphited Asbestos
18	Bolts, studs & nuts	Carbon Steel, IS: 1367 Class 4.6 / 4

- **Cleaning and Painting**

  Prior to factory inspection, all manufacturing waste such as metal chips, debris and all other foreign material shall be removed from the interior of the valve. All mill scale, rust, oil, grease, chalk and all other material shall be removed from the interior and exterior surfaces.

  Valves shall first be given two coats of zinc base primer after completely cleaning the surface and then it shall be coated with three coats of coal tar epoxy paint. The resulting coating shall be uniform and smooth and adhere perfectly to the surface.

The inside coating shall not contain any constituent soluble in water or any ingredient which could impart any taste or odor to the water.

- **Testing and Inspection**

  Valves shall be offered for visual inspection and dimensional check. The hydrostatic testing shall be witnessed by the Employer.

  Valves above 300 mm size shall be tested as per IS: 2906. Valves up to 300 mm size shall be tested as per IS: 780.

  Valve shall be dispatched only after NAGAR PALIKA approval for dispatch.

  Fixing of Valves

  Loading at store and unloading at site of works shall be done carefully using suitable mechanical handling devices such as crane, chain pulley etc. The chambers for housing the valves shall have stable and firm foundations. The chamber and top roof cover with removable lid shall be provided so that it shall be possible to remove or replace or recondition the valves seats and to remove the parts without removing the valves from the pipe work. For this, suitable flange adapters may be provided. Butterfly valves shall have high nitrile rubber seats, preferably metal reinforced, unless otherwise specified and shall be installed in the pipe work in such a manner that they can be removed from the line for dismantling and replacement of rubber seats.

  Where the valves are required to be operated electrically, actuators shall be sized to guarantee valves closures at maximum possible differential pressure across the valve. Each actuator shall be supplied with installation, instructions and wiring diagrams and sufficient spare parts.

  Valves used on pipeline shall be straight, through type, and non chokable. Each valve or its operation equipment shall bear an approved name plate stating its function. All operation spindles, gears and head stocks shall be provided with adequate points for lubrications.

  The tightening of nut and bolts shall be done smoothly in such a way that no excessive strain occurs on any one side. The nuts shall be tightened on diametrically opposite site at a time.

ADDITIONAL CONDITIONS:

1. The contractor shall have to provide his own level instrument for this work (if required).

2. Lowering, laying and jointing works of the DI pipelines shall have to be carried out by using Sight Rails and Boning Staves (if required).

3. Work is required to be carried out in residential area where all the services like water supply, sullage water pipeline, gas pipeline, telephone / electric cable are existing. Under the circumstances, prior to starting the work agency shall have to excavate the trenches **manually** for up to minimum **1.20 mt. depth**. During the course of execution, all the services shall have to be maintained by the agency and any damage to any services or property, the agency shall have to get it repair at their cost.

4. For excavation of trench, use of JCB machine will not be permitted directly on the top surface of the road. After excavation up to minimum 1.00 mt. depth from road surface or existing ground level, same shall have to be carried out manually or by using Breaker and after locating underground services like; water supply pipeline, gas pipeline, water connection lines, pipe gutters, telephone cables, electric cables etc., and thereafter upon taking the prior approval of the Engineer-In-Charge, the excavation can be carried out by using JCB machine.

5. Rajkot Municipal Corporation shall recommend to the competent authority to give Controlled Blasting License to the contractor for carrying out excavation in hard rock. In case of blasting license not permissible from the competent authority in some places then excavation is to be done by using wedges and hammers, chiseling, breakers, pneumatic tools, etc. Also in case where blasting license is permitted but even then if there is no possibility of carrying out the blasting for whatsoever reason, the excavation is to be done by using Wedges and hammers, chiseling, breakers, pneumatic tools etc. No extra payment shall be made for excavation to be carried out in any of the above mentioned both the situations.

6. Excavation in soft rock and hard rock shall have to be carried out only by Chiseling, Breaker (pneumatic tools) etc., as far as possible. If excavation is not possible in terms of above and if excavation is required to be carried out with the help of blasting then the same shall have to be carried out only after taking prior approval and necessary license for blasting from the competent authority.

7. In case of excavation not possible manually or by chiseling in certain place(s) as well as if blasting is also not possible due to various reasons i.e. to avoid damage to nearby water pipeline, pipe gutter, telephone cables / Duct, Raw houses / week buildings / narrow street etc., then the excavation by blasting will not be permitted. Under these circumstances, excavation shall have to be carried out only by Breaker (pneumatic tools) as per the instructions of the Engineer-In-Charge.

No extra payment will be made for such type of excavation done by using Breaker. The rate for excavation shall be paid as per the rate of related item mentioned in Schedule-B.

8. The safety of the trenches is the prime important factor. Along the trenches on both the side, a hump of excavated stuff of minimum height 3 to 5 ft shall have to be provided till the work is got completed. However, where there is no defined road, in such area, the fencing/ lighting etc., requires to be provided as per safety clause. Sign Board shall have to be provided at required locations, so that there will not be any fatal accident.

9. The quantity of various items mentioned in the schedule-B is liable to increase or decrease up to any extent. Under the circumstances, the contractor shall have to carry out the work accordingly without any rate escalation. Rajkot Municipal Corporation will not entertain any dispute in this regard.

10. In excavation, the decision regarding classification of strata shall rest with the Engineer-In-Charge and his decision in this regards shall be final and binding to the Contractor.

11. The rates are inclusive of dewatering, if required.

12. In case of any ambiguity found in specifications / drawings etc, the decision of engineer-in-charge shall be final and binding to the contractor.

13. The monsoon period will be considered as non-working period.

Asst. Engineer	**Dy. Executive Engineer**	**Additional City Engineer**
Rajkot Muni. Corporation	**Rajkot Muni. Corporation**	**Rajkot Muni. Corporation**

Signature of Contractor

APPROVED VENDOR LIST

SR. NO.	PARTICULARS	DESCRIPTION
1.0	DI Pipes & Specials/Fittings	Electrosteel, Jindal, Lenco–Khalasthi, Electrotherm, Jai Balaji industries Ltd., Tata, Kejriwal casting Ltd., Kiswok industries Ltd., R. G. Industries, Kartar Ltd.
2.0	uPVC Pipes ASTM Standards	Supreme, Phinolex, Jain, Astral, Waterflo,
3.0	uPVC - Fittings	Supreme, Phinolex, Jain, Astral, Waterflo,
3.0	Tapping Ferrules	As per IS standard but long body
4.0	Rigid PVC saddle	ISI marked & repute company,
5.0	SLUICE VALVE/BUTTERFLY VALVE ISI Marked only.	KIRLOSKAR / IVC / IVI / FOURESS / Singer Valves / DURGA VALVES .
6.0	AIR VALVE	UPADHAYAY / IVC / FOURESS / R&D MULTIPLE / BALAJI
7.0	MS PIPE SPECIALS	SAIL, WELSPUN, JINDAL, SAW, ESSAR STEEL & MANUFACTURERS IN GWSSB PRESENT VENDOR LIST.
8.0	PRESSURE GUAGE	H GURU / BELLS & CONTROL / GENERAL INSTRUMENT
9.0	FLOW METER	ACCUSONIC (U.S.A) / DANFOS / RITTMEYER (I,S,K, ENGG. MUMBAI) / E+H / KROHNE MARSHALL / ULTRAFLUX (FRANCE)
10.0	CHECK VALVE	KIRLOSKAR / IVC / IVI / FOURESS

Signature of contractor