



## RAJKOT MUNICIPAL CORPORATION



### : Name of Work :

Providing Suppluying, Lowering,Laying, Jointing, Testing and Commissioning of main DI Pipeline from Dhebar road one way to Revenue Society near Modi School in Ward No.7 and Kisanpara Chowk to Raiya road and Shree Mayor Banglow

### e-TENDER No. RMC/WW/CZ/19-20

:: Milestone dates of e-Tendering ::	
1 Downloading of e-TENDER documents	16/08.2019
2. Pre-bid Meeting	22/08/2018 at 17.00 Hours in the Office of the Addl. City Engineer at Central Zone.
3. Online submission of e-TENDER	31/08/2019 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.	01/09/2019 upto 18.00 Hours
5. Opening of online Primary Bid (Technical bid)	01/09/2019 at 18.00 Hours
6. Verification of submitted documents (EMD, Tender fee, Documents required for pre-qualification and other necessary documents.)	03/09/2019 at 11.00 Hours
7. Agency to remain present along with original documents for verification	03/09/2019 Between 16.00 to 17.00 Hours
8. Opening of online Commercial Bid (Price Bid) for Technically qualified bidders only (if possible)	04/09/2019 at 18.00 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 Providing Supplying, Lowering, Laying, Jointing, Testing and Commissioning of main DI Pipeline from Dhebar road one way to Revenue Society near Modi School in Ward No.7 and Kisanpara Chowk to Raiya road and Shree Mayor Banglow”.

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 vary 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 of paver road

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. Steel structures shall unless 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 existing 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 correction 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) Excavation of paver road 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.2 :**

**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:**

<b>Upto 1 To 1.5mt depth</b>
<b>(a)Excavation of trench for Pipes in Soft Murrum / Clay / Sand with all safety Provisions (with re-filling of trench)</b>
<b>(b)Excavation of trench for Pipes in Soft rock with all safty provisions .(with re-filling of trench)</b>

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 form 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 to 300mm 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.3**

**Ductile Iron Pipes with internal cement mortar lining and external Zinc coating with finishing layer of Bitumen; manufactured, tested and duly marked in strict accordance with and confirming to IS: 8329/2000 (as per latest amendment); suitable for push-on Jointing, along-with one number Rubber Gaskets for each length of pipe (EPDM Gasket as per IS: 5382/1985).(class k9)**

**450 mm dia D.I. Pipes**

**400 mm dia D.I. Pipes**

**300 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 conform 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-of-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 in 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 from 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 from 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 fail 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 : Mode of Payment: 70% payment will be released on completion of laying and jointing whereas 30% will be released after giving successful hydraulic tests.**



**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 :**

**Lowering, laying and jointing D. I.450mm dia K-9 Pipes of various classes with CI / MS specials of following diameters in proper position, grade and alignment as directed by Engineer-in-charge including transportation to site of work,labour, giving hydraulic testing as per IS code etc complete.**

**ITEM NO.5 :**

**Lowering, laying and jointing D. I.400mm dia K-9 Pipes of various classes with CI / MS specials of following diameters in proper position, grade and alignment as directed by Engineer-in-charge including transportation to site of work,labour, giving hydraulic testing as per IS code etc complete.**

**ITEM NO.6 :**

**Lowering, laying and jointing D. I.300mm dia K-9 Pipes of various classes with CI / MS specials of following diameters in proper position, grade and alignment as directed by Engineer-in-charge including transportation to site of work,labour, giving hydraulic testing as per IS code etc complete.**

**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 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 its 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 any where in the pipes joints specials valves etc. if 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.

**Mode of Payment: 70% payment will be released on completion of laying and jointing whereas 30% will be released after giving successful hydraulic tests.**

#### **Item No.7**

**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, insurance, inspection charges, octroi etc, complete.**

**As per worksheet DI 300 to 450(socket & spigot type)**

**As per worksheet DI 300 to 450(flanged ended)**

#### **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 conform 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-of-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 in 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 from 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 fail 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: 70% payment will be released on completion of laying and jointing whereas 30% will be released after giving successful hydraulic tests.**

### **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 specified 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: 70% payment will be released on completion of laying and jointing whereas 30% will be released after giving successful hydraulic tests.**

**Item No.8**

**Manufacture Supply and Delivery of M.S. Specials Plain and Flange end at Store or Site Anywhere in Gujarat State including All Taxes, Insurance, Transportation, Freight Charges, Octroi, Inspection Charge, Loading-Unloading Conveyance to Department Stores, Stacking Etc. Comp.**

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.9.**

**Providing and supplying ISI mark CI D/F Sluice valves , butterfly valves & Reflux valves of following class and diameter including all taxes, insurance, transportation, freight charges, octroi, inspection charges, loading, unloading, conveyance to departmental stores, stacking etc complete. {(PN-1 with hand/wheel cap operated ( Alt-1 type long body)}**

**450 mm dia Sluice valve(KIRLOSKAR BRAND)(with gear)**

**400mm dia Sluice valve(KIRLOSKAR BRAND)(with gear)**

**300 mm dia Sluice valve(KIRLOSKAR BRAND)**

**150 mm dia sluice valve (KIRLOSKAR BRAND)**

#### **SCOPE :**

This specification covers the design requirements, features of construction, inspection, testing, painting, delivery, installation and commissioning of sluice valves with gaskets, hardware etc.

#### **CODES AND STANDARDS :**

The design and manufacture of the valves shall comply with all currently applicable statutes, regulations and safety codes in the locality where the equipment will be installed. Nothing in this specification shall relieve the vendor of this responsibility. Valves shall conforming to **IS 14846 & ISI Marked only.**

#### **DESIGN REQUIREMENTS FOR SLUICE VALVES :**

Valve shall be provided with back seat arrangement. Renewable body and screwed wedge rings (riveted over and above) shall be provided.

Collared drain plugs of gunmetal shall be provided for all valves.

Valves shall be with non-rising spindle type and with indicator of valve opening-closing.

Valves shall be flanged and drilling shall conform to the standard as specified in data sheet.

Face to face dimension shall be as per IS 14846.

Gear operation when provided above 400 mm, the gear shall be packed enclosed (spur/worm) type. These gear boxes shall be sealed in such that there shall be no leakage of oil or grease even after long use.

Valves above 450 mm above shall be provided with a drain plug and air plug.

Valve of sizes 300 mm above shall be provided with machined shoe channel arrangement (with lining made of SS)

The face and seat rings shall be riveted over and above press fitted.

Valves shall be gear operated, manually hand wheel OR actuator operated.

Wherever specifically asked, valve shall be provided with actuators.

Appropriate bushing arrangement for replacement of packing without leakage for sizes above 300 mm and above shall be provided.

Stuffing box gland shall be of bolted type.

#### **CLEANING :**

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.

#### **PAINTING :**

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.

#### **HAND WHEEL:**

A hand wheel shall be provided for normal operation.

#### **DIRECTION OF FLOW:**

Direction of flow shall coincide with the flow direction indicated by “arrow” casted on the valve body.

#### **TESTS AND INSPECTION:**

Valves shall be offered for visual inspection and dimension check.

Valves shall be tested as per IS 14846 with latest amendments.

The hydrostatic testing shall be witnessed by the authorized representative of client.

Sluice valve shall be tested with and/or without actuator.

#### **NAME PLATE :**

All valves shall have permanent name plates indicating the services for which they will be used and the design temperature and pressure rating.

Measurement shall be per No bases.

**Item No.10 :**

**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 operated ( Alt-1 type long body)}**

**450 mm dia Sluice valve(KIRLOSKAR BRAND)(with gear)**

**400mm dia Sluice valve(KIRLOSKAR BRAND)(with gear)**

**300 mm dia Sluice valve(KIRLOSKAR BRAND)**

**150 mm dia sluice valve (KIRLOSKAR BRAND)**

**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 conform 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. It 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.

5% amount shall be withheld for hydraulic test and same shall be released after satisfactory hydraulic test.

**FIXING OF AIR VALVE:**

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.11 :**

**Job work for 600 mm dia. connecting new network for with excavation-filling in required length with traffic regulating, testing and all essential materials for repairing viz. Safedo, loose thread, Rubber Sheet, Nut-Bolt etc. for CI / DI /AC Pressure / RCC / GI / MS / Pipe with all required equipments etc comp.**

For this work, the cutting of the pipe should be done such that it should be suitable to the newly prepared pipeline to join the old pipe as per the type of pipe. The pipe should be joined and see that the pipeline is in working condition. This work is to be carried out and completed as per instructions of Engineer-in-charge.

The rate for this item will be paid per number basis

**Item No.12**

**Fitting and fixing of Long Collar C.I.Joint and Short Collar 10 Kg and 15 Kg Cast Iron Joint, Rubber Ring, Nut Bolt etc. complete. :**

The Long Collar, Short Collar, C.I. Detachable Joint necessary Rubber Ring, nut bolt etc. shall have to be supplied of different diameter and fitting and fixing work is to be done, as per required size etc given in the Schedule. The C.I. Joint as per I.S. Standard and weight shall be used only after prior approval of competent authority.

The rate for Item will be paid **per number** basis whereas

**Item No.13**

**De-watering work for excavation of trench during job work with diesel engine pump set 3 to 5 Hp with suction delivery pipe, fuel and all types of required material etc comp.**

The De-watering work for excavation of trench during job work with diesel engine pump set 3 to 5 Hp with suction delivery pipe, fuel and all types of required material etc complete shall have to be carried out as per requirement and instructions of engineer in charge to his satisfaction.

The rate will be paid for one Hour basis. No extra payment will be made for diesel, transportation etc. at site for this work.

**Item No.14**

**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.

**Signature of contractor**

### **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**  
**Rajkot Muni. Corporation**

**Dy. Executive Engineer**  
**Rajkot Muni. Corporation**

**Additional City Engineer**  
**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 & reputed 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 GAUGE	H GURU / BELLS & CONTROL / GENERAL INSTRUMENT
9.0	FLOW METER	ACCUSONIC (U.S.A) / DANFOS / RITTMAYER (I,S,K, ENGG. MUMBAI) / E+H / KROHNE MARSHALL / ULTRAFLUX (FRANCE)
10.0	CHECK VALVE	KIRLOSKAR / IVC / IVI / FOURESS

Signature of contractor