

RAJKOT MUNICIPAL CORPORATION

e - Tender No.RMC/ENGG/EZ/22-23/92



Bid Documents For
PROVIDING, SUPPLYING, LOWERING, LAYING, JOINTING,
TESTING AND COMMISSIONING OF VARIOUS DIA
DISTRIBUTION AND SERVICE DI PIPE LINE NETWORKS
FOR VARIOUS AREA OF WARD NO 04. OLD AREA
(BHAGVATIPARA) UNDER AMRUT 2.0

Volume-II

Technical Specifications & Drawings

Milestone Dates for e-tendering is as under

1. Downloading of e-Tender documents	02-03-23 To 21-03-23 upto 17.00 Hrs.
2. Pre-bid Meeting	14-03-23 at 11.00 Hrs.
3. Online submission of e – Tender	21-03-23 upto 18.00 Hrs.
4. Physical submission of EMD, Tender fee and other documents required as per Financial and Experience criteria. by Regd. Post. A.D. / Speed Post ONLY	24-03-23 upto 18.00 Hrs.
5. Opening of online technical bid	27-03-23 at 11.00 Hours onwards
6. Verification of submitted documents (EMD, e - Tender fee, etc.)	27-03-23 at 11.00 Hours onwards
7. Agency to remain present in person along with original documents for verification	28-03-23 between 11.00 to 12.00 Hours
8. Opening of Price Bid (If possible)	29-03-23 at 11.00 Hrs. onwards
9. Bid Validity	180 Days
For further details, pre-qualification criteria etc. visit www.rmc.nprocure.com	

2022-23

CITY ENGINEER
RAJKOT MUNICIPAL CORPORATION
SHRI ZAVERCHAND MEGHANI BHAVAN
EAST ZONE OFFICE, BHAVNAGAR ROAD,
RAJKOT - 360003 (GUJARAT)

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:: TECHNICAL SPECIFICATIONS ::

A. GENERAL

1. SCOPE OF CONTRACT :

The work entitled comprise of excavation of trenches with shoring and strutting wherever required bailing out water wherever necessary, laying of pipes, jointing including supply of material and material required for jointing, testing as per specifications, Construction of appurtenances such as brick Masonry / RCC chambers etc. as per the type design specified entirely of the specification of various works stipulated in the e- Tender. The work includes supply of sewer pipes ISI Marked and which shall have to be supplied at site or Municipal store by the contractor at specified and shown in schedule "B". Other material like cement etc shall have to supplied by the contractor from open market.

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.

2. e-TENDER PRICE:

The rates quoted in the bill of quantities shall cover everything necessary for the due and complete execution of the work according to the drawings and other condition and stipulations of the contract including specifications of the evident, intend and meaning of all or either of them or according to customary usage and for periodical and final inspection and test and proof of the work in every respect and for measuring, numbering or weighing the same, including setting out and laying or fixing in position and the provision of all materials, power, tools, rammers, labour, tackle, platforms with impervious lapped joints for scaffolding, ranging roads, straight edged, cantering and boxing, wedges, moulds, templates, posts, straight rods, straight edged, cantering and boxing, wedges, moulds, templates, posts, straight rails, boning staves strutting, barriers, fencing lighting pumping apparatus, temporary arrangement for passage of traffic access to premises and continuance to drainage water supply and lighting (if interrupted by contractor's work) temporary sheds, painting, varnishing, polishing establishment for efficient supervision and staging arrangements for the efficient protective of life and property and all requisite plant and machinery of every kind.

The contractor shall keep every portion of the work clear of accumulation from time to time and shall leave every portion of the work clean, clear, perfect and at the conclusion of whole, providing at their own cost all such material implement, appliances and labour as the Engineer in charge may require to prove if it to be so.

3. COMPLETION SCHEDULE:

The contract period shall be as prescribed in tender document, from the date of notice to proceed i.e Work Order. The Contractor shall submit his completion schedule and the program of works together with this e-Tender in conformity with completion schedule given in the documents.

4. Packing and Handling:

4.1. 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.

- 4.2. 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.
- 4.3. 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.
- 4.4. 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.

5. GENERAL TECHNICAL GUIDELINE:

- 5.1. 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 the written order of the Engineer in charge
- 5.2. 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
- 5.3. 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 instruction and orders given to the contractor representative on site shall be considered as it given to the contractor himself.
- 5.4. The work order book as prescribed shall be maintained on the site of the work by the contractor and the contractor shall sign the orders given by the inspecting officers and shall carry out them properly.
- 5.5. Quantities specified in the e-Tender may vary at the time of actual execution and the contractor shall have no claim for compensation on account of such variation
- 5.6. Unexcavated lengths shall be left wherever required and so directed by the Engineer in charge during the currency of the contract and shall be tackled. If required, before completion of work.
- 5.7. Diversion of road, if necessary, shall be provided and maintained during the currency of the contract by the contractor at his cost.
- 5.8. Figured Dimensions of drawing shall supersede measurements

by scale, special dimensions or directions in the specifications shall supersede all other dimensions.

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

5.10. If the arrangement of 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.

6. CLASSIFICATION OF STRATA:

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

6.2. Soils :

Soils of all sorts, silt, sand, gravel, soft murrum, stiff clay, kunkar and other soft excavation not covered in the items mentioned hereunder.

6.3. Hard Murrum :

Hard Materials comprising of all kinds of disintegrated rock or shale or indurate conglomerate interspersed with boulders, weathered and decomposed rock which could be removed with pick, bar, shove, wedges and hammers, though not without some difficulties.

6.4. Soft – 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 tools etc.

6.5. Hard Rock:

This shall include rock accusing in mass or boulders which need blasting, this will also include rock to be removed by chiseling or any other method where blasting is not permissible.

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

8. Regarding water supply for hydro testing, necessary water, power, labour, etc. required for necessary test shall be arranged by the contractor at his own cost.

9. During construction activity, proper care must be taken for labour safety and must follow the provisions of the Labour laws.

10. TMT bars of Fe-415 should be confirming to IS:1786. The approved makes shall be TATA, SAIL, Vizag, Gallent, Electrotherm or other equivalent make as approved by engineer-in-charge.
11. Cement shall be ordinary Portland cement conforming to IS:269, IS:8112 or IS:12269 for all the works as per the instructions of engineer-in-charge. The approved makes shall be Ambuja, Ultratect, LOTUS, Siddhi, Sanghi, Hathi or as per IS confirming.
12. Minimum Cement content for the work should be as per attached circular No.RMC/C/Vigi.(Tech)/231 dt. 11/03/2022.
13. Testing of the materials like Brick, Sand, Aggregate, Reinforcement steel, etc. should have to be tested periodically as suggested by the Engineer-in-charge at Government approved material testing Laboratory and testing charges for the same has to be borne by the contractor.
14. In case of any ambiguity found in inspections / drawings etc, the decision of engineer-in-charge shall be final and binding to the contractor.

DETAILED SPECIFICATIONS OF MATERIALS

M-1 WATER :

- 1.1 Water shall not be salty or brackish and shall be clean reasonably clear and free from objectionable quantities of silt and tract of oil and injurious alkalis, salts, organic mater and other deleterious materials which will either weaken the mortar or concrete or cause efflorescence in R.C.C.. The container for transport, storage and handling of water shall be clean. Water shall conform to the standards specified in I.S. 456-2000 (latest revision).
- 1.2 If required by the Engineer-in-charge it shall be tested by comparison with distilled water. Comparison shall be made by means of standard cement tests for soundness, time of setting and mortar strength as specified in I.S. 269-1976. Any indication of unsoundness, change in time of setting of 30 minutes either more or decrease of more than 10 percent in strength of mortar prepared with water sample **when compared with the results obtained with mortar prepared with distilled water** shall be sufficient cause **for rejection of water** under test.
- 1.3 Water for curing mortar, concrete or masonry should not be too acidic and also not too alkaline. It shall be free of elements which significantly affect the hydration reaction or otherwise interfere with the hardening of mortar or concrete during curing or those which produce objectionable stains or other unsightly deposits on concrete or mortar surfaces.
- 1.4 Hard and bitter water shall not be used for curing.
- 1.5 Potable water will be generally found suitable for curing mortar for preparing or concrete.

M-2 CEMENT :

- 2.1 Cement shall be Sulphate Resistant Cement conforming to IS : 12330, Ordinary portland cement as per I.S. 269-1976 or Portland slag cement as per I.S.455-1976.
- 2.2 Testing of Cement : It should be specifically noted that the cement brought by the contractor at site of work shall be used after the same is tested at the approved laboratory as per the direction of the Engineer-in-charge. Such approved laboratory may be located at Ahmedaba All the charges for transport and testing of the samples shall have to be borne by the contractor. The frequency of testing of such materials shall be in accordance to the relevant Indian standard as directed by the Engineer-in-charge.

M-3 SAND :

- 3.1 Sand shall be natural sand, clean, well graded, hard strong, durable and gritty particles free from injurious of dust, clay, kankar nodules, soft or flaky particles shale, alkali salts, organic matter, loam, mica or other

deleterious substances and shall be got approved from the Engineer-in-charge. The sand shall not contain more than 8 percent of silt as determined by field test. If necessary the sand shall be washed to make it clean.

3.2 COARSE SAND :

The fineness modulus of coarse sand shall not be less than 2.5 and shall not exceed 3.0. The sieve analysis of coarse shall be as under:

I. S. Sieve Percentage by Designation weight passing sieve through sieve.	I. S. Sieve Percentage by Designation weight passing sieve through sieve.
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4.75 mm	100	600	Micron	30 - 100
2.36 mm	90 - 100	300	Micron	5 - 70
1.18 mm	70 - 100	150	Micron	0 - 50

3.3 FINE SAND :

The fineness modulus shall not exceed 1.0. The sieve analysis of fine sand shall be as under :

I. S. Sieve Percentage by Designation weight passing through sieve through sieve.	I. S. Sieve Percentage by Designation weight passing through sieve through sieve.
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4.75 mm	100	600	Micron	40 - 85
2.36 mm	100	300	Micron	5 - 50
1.18 mm	75 - 100	150	Micron	0 - 10

M-4 STONE GRIT :

4.1 Grit shall consist of crushed or broken stone and be hard, strong dense, durable, clean, of proper gradation and free from skin or coating likely to prevent proper adhesion of mortar. Grit shall for as possible flaky elongated pieces shall be avoided

It shall generally comply with the provisions of I. S. 383-1970. Unless special stone of particular quarried is mentioned Grit special stone of particular quarries is mentioned Grit shall be obtained from the best black trap or equivalent hard stone as approved by the Engineer - in - charge. The grit shall have no deleterious reaction with cement.

4.2 The grit shall conform to the following gradation as per sieve analysis:

I. S. Sieve Percentage passing Designation through sieve	I. S. Sieve Percentage Passing Designation through sieve
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12.50 100% 4.75 0.20%
 10.00 85 - 100% 2.36 0.25%

4.3 The crushing strength of grit will be such as to allow the concrete in which it is used to build up the specified strength of concrete.

4.4 The necessary tests for grit shall be carried out as per the requirements of I. S. 2386 (Parts I to VIII) 1963, as per instruction of the Engineer-in-charge. The necessity of test will be decided by the Engineer-in-charge.

M-5A STONE COARSE AGGREGATE FOR NOMINAL MIX CONCRETE :

5A.1 Coarse aggregate shall be of machine crushed stone of black trap or equivalent and be hard, strong, dense, durable, clean and free from skin and coating likely to prevent proper adhesion of mortar.

5A.2 The aggregate shall generally be cubical in shape. Unless special stones of particular quarries are mentioned, Aggregates shall be machine crushed from the best black trap or equivalent hard stone as approve Aggregate shall have no deleterious reaction with cement. The size of the coarse aggregate for plain cement concrete and ordinary reinforced cement concrete shall generally be as per the table given below. However in case of reinforced cement concrete the maximum limit may be restricted to 6 mm less than the minimum lateral clear distance between bars or 6 mm. less than the cover whichever is smaller.

TABLE

I.S. Sieve Percentage Passing for		I.S. Sieve Percentage Passing for	
Designation single sized aggregates		Designation single sized aggregates	
		of nominal size of nominal size	
40 mm	20 mm	16 mm	40 mm
20 mm	16 mm	40 mm	20 mm
16 mm	40 mm	20 mm	16 mm
80 mm	- - -	12.5 mm	- - -
63 mm	100 - -	10.0 mm	0.5 0.20 0.30
40 mm	85-100 100 -	4.74 mm	- 0.50 0.50
20 mm	0-20 85-100 100	2.35 mm	- - -
16 mm	- - -	85-100	- - -

NOTE :- The percentage may be varied by the Engineer-in-charge when considered necessary for obtaining better density and strength of concrete.

5A.3 The grading test shall be taken in the beginning and at the change of source of materials. The necessary tests indicated in I.S. 383-1970 I. S. 456-1978 shall have to be carried out to ensure the acceptability. The aggregates shall be stored separately and handled in such a manner as to prevent the inter mixed on different aggregates. If the aggregates are covered with dust, they shall be washed with water to make them clean.

M-5B BLACK TRAP OR EQUIVALENT HARD STONE COARSE :

- 5B.1 Aggregate for Design Mix concrete : Coarse aggregate shall be of machine crushed stone of black trap or equivalent hard stone and be hard, strong, dense, durable clean and free from skin and coating likely to prevent proper adhesion of mortar.
- 5B.2 The aggregates shall generally be cubical in shape. Unless special stones of particular quarries are mentioned, aggregates shall be machine crushed from the best, black trap or equivalent hard stones as approve Aggregate shall have no deleterious reaction with cement.
- 5B.3 The necessary tests indicated in I. S. 383-1970 and I.S.456-1978 shall have to be carried out to ensure the acceptability of the material.
- 5B.4 If aggregate is covered with dust it shall be washed with water to make it clean.

M-6 CEMENT MORTAR:

- 6.1 Water shall conform to specification M-1. Cement shall confirm to specification M-2, sand shall confirm to M-3.

6.2 Proportion of Mix :

- 6.2.1 cement and sand shall be mixed to specified proportion, sand being measured by measuring boxes. The proportion of cement will be by volume on the basis of 50 Kg/bag of cement being equal to 0.0342 cum. The mortar may be hand mixed or machine mixed as directe

6.3 Preparation of Mortar:

- 6.3.1 In hand mixed mortar cement and sand in the specified proportions shall be thoroughly mixed dry on a clean impervious platform by turning over at least 3 times or more till a homogenous mixture of uniform colour is obtaine Mixing platform shall be so arranged that no deleterious extraneous material shall get mixed with mortar or mortar shall flow out. While mixing, the water shall be gradually added and thoroughly mixed to form a stiff plastic mass of uniform colour so that each particle of sand shall be completely covered with a film of wet cement. The water cement ratio shall be adopted as directed
- 6.3.2 The mortar so prepared shall be used within 30 minutes of adding water. Only such quantity of mortar shall be prepared as can be used within 30 minutes.

M-7 BRICK BATS AGGREGATE :

- 7.1 Brick bat aggregate shall be broken from well burnt or slightly over burnt and dense brick. It shall be homogeneous in texture roughly cubical in shape, clean and free from dirt of any other foreign material. The brick bats shall be of 40 mm to 50 mm size unless otherwise specified in the item. The underburnt or overburnt brick bats shall not be allowed
- 7.2 The brick bats shall be measured by volume by suitable boxes or as directed

M-8 BRICKS :

8.1 The bricks shall be hard or machine moulded and made from suitable soils and kiln 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 colour.

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 shall not break when thrown on the ground from a height of 600 mm.

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

8.3 The size of the conventional bricks shall be as under :

3" 3"
(9" x 4" x 2") 225 x 110 x 75 mm.
4 4

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

Length : = 1/8" (3.0 mm) Width : = 1/16" (1.50 mm)
Height : = 1/16" (1.50 mm)

8.5 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 I.S. 3495 (Part-I to IV) - 1976.

M-8A FLY-ASH LIME BRICKS :

The fly ash lime bricks shall conform to Grade-1 or Grade-2 of IS-3812-1981. The frog of the 80 to 100 mm x 40 mm x 10 to 20 mm size.

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

The size of conventional brick shall be 225 mm x 110 mm x 75 mm.

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

Length : + 3 mm
Width : + 3 mm
Height : + 2 mm

The physical characteristic of bricks shall be as follows.

The minimum compressive strength of fly ash lime bricks shall not be less than 75 Kg/Sq.Cm. and the test shall be conform to IS-3495 (Part-I):1992.

The average drying shrinkage of the brick when tested by the method described in IS 4139-1989 being shall not exceed 0.15 percent.

The averages water absorption not more than 20 percentage by mass and the test shall conform to IS-3495 (Part-3):1992.

M-9 MILD STEEL BARS :

- 9.1 Mild steel bars reinforcement for R.C.C. work shall conform to I.S. 432 (Part-II) 1966 and shall be tested quality. It shall comply with relevant part of I.S.456-1978.
- 9.2 All the reinforcement shall be clean and free from dirt, paint, grease, mill scale or loose of thick rust at the time of placing.
- 9.3 For the purpose of payment the bar shall be measured correct upto 10 mm length and weight payable worked out the rate specified below :
 1. 6 mm 0.22 Kg./Rmt. 8. 20 mm 2.47 Kg./Rmt.
 2. 8 mm 0.39 Kg./Rmt. 9. 22 mm 2.98 Kg./Rmt.
 3. 10 mm 0.62 Kg./Rmt. 10. 25 mm 3.35 Kg./Rmt.
 4. 12 mm 0.89 Kg./Rmt. 11. 28 mm 4.83 Kg./Rmt.
 5. 14 mm 1.21 Kg./Rmt. 12. 32 mm 6.31 Kg./Rmt.
 6. 16 mm 1.58 Kg./Rmt. 13. 36 mm 7.31 Kg./Rmt.
 7. 18 mm 2.00 Kg./Rmt. 14. 40 mm 9.86 Kg./Rmt.

M-10 TMT FE-500 STEEL BARS FOR REINFORCEMENT :

- 10.1 Reinforcement bars shall conform to IS-432, IS-226 or IS-1786 and welded wire fabrics to IS : 1566. Only TMT bars for reinforcement in RCC duct shall be used which shall be clean, free from pitting, oil, grease, paint, loose mill scale, rust, dirty dust or any other such substance that will destroy or reduce bon

It permitted by the Engineer-in-charge reinforcement shall be done in accordance with IS-2751 or IS-9147 as applicable.

- 10.2 Other provision and requirements shall conform to specification No. M-7 for mild steel bars.

M-11 MILD STEEL BINDING WIRE :

- 11.1 The mild steel wire size and quality shall conform to I.S. 280-1972.
- 11.2 The use of black wire will be permitted for binding reinforcement bars. It shall be free from rust, oil paint grease, loose mill scale or any other undesirable coating which may prevent adhesion of cement mortar.

M-12 STRUCTURAL STEEL :

- 12.1 All structural steel conform to I.S.226 - 1975. The steel shall be free from the defects mentioned in I.S. 226-1975 and shall have a smooth finish. The material shall be free from loose mill scale, rust pits or other defects affecting the strength and durability. Rivet bars shall conform to I.S. 1148-1973.
- 12.2 When the steel is supplied by the contractor test certificate of the manufacturers shall be obtained according to I.S. 226-1975 and other relevant Indian Standards.

M-13 SHUTTERING :

- 13.1 The shuttering shall be either of wooden planking of 30 mm. minimum thickness with or without steel lining or of steel plates stiffened by steel angles. The shuttering shall be supported on battens and beams and props of vertical ballies properly cross braced together so as to make the centering rigi In places of bullie props, brick pillar of adequate section built in mud mortar may be use
- 13.2 The form work shall be sufficiently strong and shall have camber, so that it assumes correct shape after deposition of the concrete and shall be able to resist forces caused by vibration of live load of men working over it and other incidental loads associated with it. The shuttering shall have smooth and even surface and its joints shall not permit leakage of cement grout.
- 13.3 If at any stage of work during or after placing concrete in the structure, the form sags or bulges out beyond the required shape of the structure, the concrete shall be removed and work redone with fresh concrete and adequately rigid form work. The complete form work shall be got inspected by and got approved from the Engineer-in-charge, before the reinforcement bars are placed in position.
- 13.4 The props shall consist of bullies having 100 mm minimum diameter measured at mid length and 80 mm at thin end and shall be placed as per design requirement. These shall rest squarely on wooden sole plates 40 mm thick and minimum bearing area of 0.10 Sq.m. laid on sufficiently hard base.
- 13.5 Double wedges shall further be provided between the sole plate and the wooden props so as to facilitate tightening and easing of shuttering without jerking the concrete.
- 13.6 The timber used in shuttering shall not be so dry as to absorb water from concrete and swell or bulge nor so wet to shrink after erection. The timber shall be properly sawn and planned on the sides and the surface coming in contract with concrete. Wooden form work with metal sheet lining or steel plates stiffened by steel angles shall be permitted.
- 13.7 As far as practicable, clamps shall be used to hold the forms together and use of nails and spikes avoided.

- 13.8 The surface of timber shuttering that would come in contact with concrete shall be well wetted and coated with soap solution before the concreting is done. Alternatively coat of raw linseed oil or oil of approved manufacture may be applied in place of soap solution. In case of steel shuttering either soap solution or raw linseed oil shall be applied after thoroughly cleaning the surface. Under no circumstances black or burnt oil shall be permitted.
- 13.9 The shuttering for beams and slabs shall have camber of 4 mm per meter (1 in 250) or as directed by the Engineer-in-charge so as to offset of subsequent deflection for cantilevers the camber at free end shall be 1/50 of the projected length or as directed by the Engineer-in-charge.

M-14 HARD DRAWN WIRE :

The Hard drawn steel wire should conforming to IS-432 (Part 2), Hard drawn steel wire shall be manufacture and its chemical composition should be as per para 3.0. The finished wire should be free from defects and finished in a workman like manner. Nominal sizes, Tolerances, Physical requirements are as per IS : 432 (Part-II) latest edition. Hard drawn steel wire should be tested as specified in IS : 432 (Part-II) latest edition.

DETAIL TECHNICAL SPECIFICATIONS

Item No.1 and 2:

Excavation for pipe line trenches for water supply, manhole etc. all with shoring and strutting if required as per required gradient and line including safety provisions using site rails and stacking excavated stuff including up to all required lead cleaning the site etc.complete for all lifts and strata as specific

0 to 1.5 mt depth.

- Excavation of Paver Road (except for Road works)
- ---do--- in all sorts of soil,soft murrum, hard murrum, boulders and mecadam road

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 directe 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 s hall 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 complete

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 watchman 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 complete

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 own 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 ascertain the best portion for the boreholes. Charges 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 ignite 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.

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 instruments 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.

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 than ½ tones as directed by the Engineer-in-charge.

The contractor shall maintain all refilling and surfaces until reinstate. The contractor shall be 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, s horing 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 s horing, excavation and removal of all material from trenches.

(a) Excavations up to depth of 1.5M

The trench section is to be provided with Max. width OD of pipe + 250 mm 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).

Refilling the pipeline trenches including ramming, watering, consolidating disposal of surplus stuff as directed within a radius of 3km.

On completion of the pipe laying operations in any section, for a length of about 100m and while further work is still in progress, refilling of trenches shall be started by the Contractor with a view of restricting the length of open trenches. Pipe laying shall closely follow the progress of Trench Excavation and the Contractor shall not permit unreasonably

excessive lengths of trench excavation to remain open while awaiting testing of the pipeline. If the Engineer considers that the Contractor is not complying with any of the foregoing requirements, he may prohibit further trench excavation until he is satisfied with the progress of laying and testing of pipes and refilling of trenches. The excavated material nearest to the trench shall be used filling. Care shall be taken during backfilling, not to injure or disturb the pipes, joints or coating. Filling shall be carried out simultaneously on both sides of the pipes so that unequal pressure does not occur. Walking or working on the completed pipeline unless the trench has been filled to height of at least 30cm over the top of the pipe except as may be necessary for tamping etc., during backfilling work.

The remaining portion of the trench may be filled in with a mixture of hard and soft material free from boulders and clods of earth larger than 150mm in size if sufficient quantity of good earth and murrum are not available. The trench shall be refilled so as to build up to the original ground level, keeping due allowance for subsequent settlement likely to take place. The top 300mm layer or fertile agricultural soil shall be kept aside during excavation and shall be laid in layers near ground level during refilling.

To prevent buckling of pipe shell of diameters 1200mm and above, pipes shall be strutted from inside while the work of refilling is in progress, for which no separate payment shall be made.

Strutting shall be done by means of strong spiders having at least 6 arms which shall be sufficiently stiff to resist all deformation. Spiders shall be provided at a maximum interval of 2m & shall be welded in such a way that internal coating does not get burnt.

The Engineer shall, at all times, have powers to decide which portion of the excavated materials shall be for filling and in which portion of the site and in what manner it shall be so use

If any material remains as surplus it shall be disposed of as directed by the Engineer, which includes loading, unloading, transporting and spreading as directed within all lea If the Contractor fails to remove the earth from site within 7 days after the period specified in a written notice, the Engineer may arrange to carry out such work at the Contractor's risk and cost or may impose such fine for such omission as he may deem fit. Particular care shall be taken to keep the trench dry during the entire refilling operation.

If suitable material for refilling is not available for excavation the Contractor shall bring earth, murrum of approved quality as directed by the Engineer.

No mechanical plant other than approved compacting equipment shall run over or operate within the trench until backfilling has reached its final level or the approval of the Engineer has been obtained Subsidence in filling in : Should any subsidence take place either in the filling of the trenches or near about it during the maintenance period of 24 months from the completion of the Contract Works, the Contractor shall make good

the same at his own cost or the Engineer may without notice to the Contractor, make good the same in any way and with any material that he may think proper, at the expense of the Contractor. The Engineer may also, if he anticipates occurrence of any subsidence, employ persons to give him timely notice of the necessity of making good the same, and the expenses on this account shall be charged to the Contractor.

Measurement and Payment

Payment of refilling shall be made on Cubic meter basis.

Removing Surplus earth and disposing it within city limit including spreading as directed by Engineer In-Charge. (Up to 15 km) (with carting)

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
3. TP Scheme No.10, FP-87, Dhebar Road (South), Atika Area, Nr. PGVCL Office
4. TP Scheme No.23, FP-23, Nr. IOC Godown, Morbi Road
5. TP reservation plot at Samrat industrial Area, Bh. ST Workshop
6. TP Scheme No.9, FP-5, Nr. Raiyadhar Garbage Station
7. TP Scheme No.20, FP-35, Bh. Pradhuman Green
8. TP Scheme No.28 (Mavdi), FP-46/A, Nr. GETCO Circle
9. TP Scheme No.12, FP-38/A and 39/B, Nr. Lijjat Papad, Kothariya Nationla Highway

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.

The excavated material of black cotton soil and other useful materials should be stacked at the location specified by the engineer in charge.

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

The payment will be made on cu.mt. basis of completed item.

Item No.3 to 6:

Providing & Supplying K-7 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

- (i) 100 mm to 300 mm Diameter

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 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.

- ✓ ISO: 10803-1997 Design method for ductile iron pipes
- ✓ IS:8329-2000 Centrifugally Cast (spun) ductile iron pressure pipes for water, gas and sewage
- ✓ ISO:2531-1991 Ductile iron pipes, fittings and accessories for pressure pipelines.
- ✓ ISO:4179-1985 Ductile iron pipes for pressure and non pressure-Centrifugal
- ✓ cement mortar lining - General requirements.
- ✓ IS:8112 Specification for 43 Grade ordinary Portland cement.
- ✓ BS:3416 Bitumen based coatings for cold application, suitable for use in contact with potable water.
- ✓ ISO:8179-1995 Ductile iron pipes-External coating-Part-1 Metallic Zinc with finishing layer.
- ✓ IS:638 Sheet rubber jointing and rubber insertion jointing.
- ✓ ISO:4633-1996 Rubber seals-Joint rings.
- ✓ IS:5382-1985 Specification for Rubber sealing rings for gas mains, water mains and sewers.
- ✓ 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

$$e = K(0.5 + 0.001 \text{ DN})$$

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 conform 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	-2.8
150	170	+1	-2.9
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
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 manufacturer. 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 aging 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.

MARKING :

The methods of marking all the pipes 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 goods shall indicate the followings;

- i) Certification mark on each pipe.
- ii) Manufacturers brand name and/or trademark.
- iii) Purchasers mark as "RMC" be inscribe
- iv) The outside diameter and pressure rating.
- v) Batch number or lot number.
- vi) Inspector's mark on each pipe

INSPECTION

Inspection of pipes and specials will be carried out by Executive engineer or his representative agency appointed by RMC. All the expenditure for inspection shall be borne by the contractor except inspection charges if any in case of inspection agency appointed by RMC shall be paid by RMC.

PAYMENT

The payment shall be on RMT basis.

Mode of Payment : Payment restricted to 70% on completion of laying & jointing & 30% on giving hydraulic test. Maximum 2.0 km of unlaidd pipe line will be given at the rate of 70% of tender rate.

Item No.7 to 10:

Lowering, laying and jointing D. I. K-7 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 flow testing as per IS code etc complete.

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 among 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 material section.

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 require 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 accumulate

The inside socket and outside of the spigot-shall be carefully cleane 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.

TESTING OF WATER PIPES:

After each section of the pipeline has been completed it shall be tested for water tightness before being covere The contractor shall at his own cost fill up water in pipe line and given necessary flow 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.

RMC/ OWNER 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 flow test shall be given again if considered necessary by the Executive 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 opening of 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 rate shall be per meter of pipe line laid including all specials and fitting jointly etc. Cutting and waste shall not be paid separately. The length shall be measured not on the straight line and curves along the center line over the pipe and specials correct up to 1 cm.

Method Of Measurement Of Pipes:

The measurement shall be recorded in running meter of pipe length laid along center line or axis of pipe line..

No payment shall be made for overlaps etc.

The payment shall be paid after completion of whole item as mentioned in price bid on Running Meter basis.

Mode of Payment: Payment restricted to 70 % on completion of laying & jointing & flow test.

Item No.11:

Providing and supplying ISI mark CI / D/F Sluice Valves as per IS:14846 (Latest Edition) of following class and diameter including all taxes. insurance. transportation, freight charges, octroi, inspection charges. loading, unloading, conveyance to departmental stores, stacking etc. Complete

- 150 mm to 300 mm dia Sluice Valve

Design Features

Sluice valve shall conform to IS 14846 (ISI Marked). Except pump house, these valves are to be installed in valve chamber. All valves of pump house and rising mains shall be non-rising stem type.

The valves shall be free from sharp projections, which are likely to catch and hold stringy materials. Valves shall close with clockwise rotation of the hand wheel. The direction of closing and opening shall be marked on the hand wheel.

Necessary joining materials viz. bolts, nuts, washers, packing etc. shall be provided by the contractor at his cost. The valves shall be fixed so as to have axis perfectly horizontal. If required the contractor shall also carry out

drilling of holes of appropriate diameter in flanges in required numbers. A hand wheel shall be provided for emergency operation. The hand wheel drive shall be mechanically independent. The valve design shall take care of the pressure drop across the valve disc in case of partial opening of the valve and shall take care of the erosion and cavitation effect on the body and disc during such operation. Valve(s) subjected to back pressure shall have the valve seat, disc and the operator suitably designed to ensure trouble-free operation. The shaft diameter shall take into consideration, the maximum torque required for the valve operation, the maximum differential pressure across the valve disc when the valve is closed and the shock load due to accidental closure of the valve disc. The disc shall be designed for maximum differential pressure across the valve as well as the shock load due to accidental closure of the valve. Disc design shall offer minimum head loss. Disc shall also offer minimum resistance to flow. Disc shape shall be contoured. Valve seats shall be of a design that permits removal and replacement at site and shall be securely clamped on the body or disc of the valve. Seat material shall be suitable for the operating conditions and handling fluid and may be suitably reinforced, if required. The seat design shall permit easy removal for replacement purposes without the need for removing the valve from the line. No deposited or welded seat rings permitted. The valve bearings shall be of 'self-lubricated' type and shall not have any harmful effect due to handling fluid. Adjustable thrust bearing(s) shall be provided to hold the valve disc securely in the center of the valve seat. Each Sluice Valve shall be provided with a hand wheel for manual operation. For the Valves located at inaccessible position, it shall be provided with extension spindle and floor stand or hand lever / round chain to facilitate manual operation.

Hydrostatic Test

Each valve body shall be subjected to hydrostatic test (Body and Seat) as per IS 14846. For valves subjected to back pressure condition, leakage test shall be carried out on both sides of the disc.

Performance Test

Each valve complete with operator shall be shop operated at least three (3) times from fully closed to fully open conditions and reverse, hold at intermediate positions under no flow condition, to prove the workability of the assembly.

Positive material Identification (PMI Test)

PMI test shall be checked at random for Stainless steel parts.

Test Certificates

When specified by Owner, the manufacturer shall issue a test certificate confirming that the valves have been tested in accordance with this standard and stating the actual pressures and medium used in the test.

Marking

Marking shall be cast integral on the body or on a plate securely attached to the body for 'DN' size, 'PN' rating, Heat Number and Serial number.

Painting

Each valve shall be drained, cleaned, prepared and suitable protected with 2 coats of red oxide and then black bituminous paint for minimum of 150 micron DFT on surfaces before dispatch.

Electric Actuator

Each actuator shall be adequately sized to suit the application and be continuously rated to suit the modulating control require The gearbox shall be oil or grease filled, and capable of installation in any position. All operating spindles, gears and head stocks shall be provided with adequate points for lubrication. The valve actuator shall be capable of producing not less than 1½ times the required valve torque and shall be suitable for at least 15 minutes continuous operation.

The actuator starters shall be integrally housed with the actuator in robustly constructed and totally enclosed weatherproof housing. The motor starter shall be capable of starting the motor under the most severe conditions. The starter housing shall be fitted with contacts and terminals for power supply, remote control and remote positional indication, and shall also be fitted with internal heaters so as to provide protection against damage due to condensation.

Each starter shall be equipped as follows: i. A.C. electric motor. ii. Reduction gear unit. iii. Torque switch mechanism complete with set of torque switches. iv. Limit switch mechanism complete with set of limit switches. v. Hand wheel for manual operation. vi. Hand-auto changeover lever with suitable locking arrangement. vii. Local control switch / push buttons viii. 415 V / 240 V AC control transformer.

The actuator shall be suitable for operation in the climate conditions and power supply conditions given in the specification. The actuator shall be capable of producing not less than 1½ time the maximum required torque and shall be suitable for at least 15 minutes continuous operation. All local controls shall be protected by a lockable cover.

Datasheet:

SLUICE VALVE/GATE VALVE					
Sr No	Component	PN-1.0/1.6	PN-2.0	PN-2.5	PN-4.0
1	Body	CI IS 210 Gr. FG260	ASTM A216 Gr. WCB	ASTM A216 Gr. WCB	ASTM A216 Gr. WCB/ ASTM A351 Gr. CF8
2	Bonnet	CI IS 210 Gr. FG260	ASTM A216 Gr. WCB	ASTM A216 Gr. WCB	ASTM A216 Gr. WCB/ ASTM A351 Gr. CF8

SLUICE VALVE/GATE VALVE					
Sr No	Component	PN-1.0/1.6	PN-2.0	PN-2.5	PN-4.0
3	Wedge	CI IS 210 Gr. FG260	ASTM A217 Gr. CA15	ASTM A217 Gr. CA15	ASTM A217 Gr. CA15
4	Gland	CI IS 210 Gr. FG260	ASTM A216 Gr. WCB	ASTM A216 Gr. WCB	ASTM A216 Gr. WCB/ ASTM A351 Gr. CF8
5	Stem	SS 410	SS 410	SS304	SS 316
6	Body Ring/Wedge Ring	IS 318 Gr LTB-2	ASTM A217 Gr. CA15	ASTM A217 Gr. CA15	ASTM A217 Gr. CA15
7	Gland Packing	Jute and Hemp	Graphoil Filler	Graphoil Filler with SS 304 wire winding	Graphoil Filler with SS 304 wire winding
8	Nut Bolts	Carbon steel	ASTM A320 Gr L7 and ASTM A194 Gr 4	ASTM A320 Gr L7 and ASTM A194 Gr 4	ASTM A320 Gr L7 and ASTM A194 Gr 4
9	Wedge Nut and Stem Nut	IS 318 Gr LTB-2	SS 304	SS 304	SS 304
10	Hand Wheel	Cast Iron	Cast Steel	Cast Steel	Cast Steel/SS
11	Flange End	IS 1538	ASME/ANSI B16.5 Class 150	ASME/ANSI B16.5 Class 300	ASME/ANSI B16.5 Class 400

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.

Item No.12:

Lowering, Laying and Jointing of Valves

- (i) Cast iron double flanged sluice valve/butterfly valves with two tail pieces suitable to pipe shall be supplied by the board and they shall be carted by the contractor at his own cost from the departmental store or any other store as directed. The rate shall include loading, unloading and stacking at site.
- (ii) The sluice valve/butterfly valves and tail pieces shall be examined before laying for cracks and other flows. They shall

- be undamaged in all respect.
- (iii) The sluice valves/butterfly valves shall be operated before laying.
 - (iv) All grits and foreign materials shall be removed from the inside of the valves before placing.
 - (v) All the four faces shall be thoroughly cleaned and coated with a thin layer of mineral grease.
 - (vi) The tightening of gland shall be checked with a pair of inside-calipers. Clearance between the top of stuffing box and the underside of the gland shall be uniform all the sides.

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 packing 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.

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 sides 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 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.

2.0 JOINTING MATERIAL

- 2.1 The contractor shall provide all necessary jointing materials such as nuts bolts, rubber packing white zinc jute lead wool etc.
- 2.2 All tools and plant required for installation of sluice valve shall be provided by the contractor.

- 2.3 All jointing materials shall be not approved from the engineer-in-charge before us
- 2.4 The nut and bolts shall conform to Item No MSP-19 of specification of materials.
- 2.5 The rubber packing shall confirm all specifications as narrated in Item No MSP-20 of specifications of materials.

3.0 INSTALLATION

- 3.1 The sluice valve/butterfly valve shall be lowered in to the trench carefully, so that no part is damaged during lowering operation.
- 3.2 If necessary tail pieces shall be fitted with sluice valve first outside the trench and then lowered in to the trench.
- 3.3 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/butterfly valve bore. It shall be even at both the inner and outer edges.
- 3.4 The flange faces thoroughly grease
- 3.5 If flange faces are not free, the contractor shall use thin fibers of lead wool.
- 3.6 After placing the packing, nuts and bolts shall be inserted and tightened to make the joint.
- 3.7 The valve shall be tightly closed when being installed to prevent any foreign materials from getting in between the working parts of the valve.
- 3.8 Each flange bolt shall be tightened a little at a time taking care to tighten diametrically opposite bolts alternatively.
- 3.9 The sluice valve/butterfly valve shall be installed in such a way that its spindle shall remain in truly vertical position.
- 3.10 The other end of tail piece shall be fitted with pipes so that continuous lines can work.
- 3.11 Extra excavation required for facility of lowering and fixing sluice valve shall not be paid for.

4.0 TESTING

- 4.1 After installation of sluice valve/butterfly valve the same is tested to 1 1/2 times of its test pressure.
- 4.2 The joints sluice valve/butterfly valve shall withstand the test pressure of pipelines.
- 4.3 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.

5.0 MODE OF MEASUREMENT AND PAYMENT

- 5.1 The measurement shall be taken per number of sluice valve/butter fly valve of specified size.
- 5.2 The rate shall be per number fitted in a pipe line as per schedule of payment.
- 5.3 For non-testing of valve 30% of the rate quoted shall be withheld till testing is given.

Item No.13:

Manufacture Supply and Delivery of M.S. Specials Plain and Flange end at Store or Site Anywhere in Rajkot 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.14:

Manufacture, Supply & Delivery of Ductile Iron Flange socket spigot bends, tees, reducers or any other specials as per BS-EN-545/1995 Class-A series K12 suitable for use with I. Pipes manufactured as per IS:8329/1994 delivery of specials is to be made to RMC/ OWNER store or site of works any where in Gujarat including all taxes, loading, unloading, carting, stacking, insurance, inspection charges, octroi etc. complete

A) Manufacture, supply and delivery of Ductile Iron Flange Socket spigot bends, tees, reducers or any other specials as per BS-EN-545 / 1995 class-A series K-12 suitable for use with DI pipes manufactured as per IS 8329/1994 delivery of specials is to be made to site of works including all taxes, loading, unloading, carting, stacking, insurance, inspection charges, Octroi etc.

- complete with internal cement mortar lining with EPDM rubber gaskets.
- B) Manufacture, supply and delivery of flanges, Tee, bends, tail piece, reducers, air valve raiser pipes or any other specials suitable for use with DI pipes and delivery of specials is to be made to site of works anywhere in Gujarat including all taxes, loading, unloading, carting, stacking, insurance, inspection charges, Octroi etc. complete.
 - C) Manufacture, supply and delivery of CID joints with Rubber Rings of Standard quality or any other specials suitable for use with I. pipes and delivery of specials is to be made to site of works anywhere in Gujarat including all taxes, loading, unloading, carting, stacking, insurance, inspection charges, Octroi etc. complete
 - D) DI Specials with all types of diameters suitable of K9 grade pipes with inner cement mortal lining. The necessary DI Specials required during the lowering & lying of Ductile Iron Pipe shall be supplied by the agency and shall be as per standard specification.
 - E) It shall be of best quality as per requirement Rate shall be including loading, unloading, carting, insurance and labour charge etc. complete.

PAYMENT

The payment shall be made on kg. basis.

Mode of Payment: Payment restricted to 70 % on completion of laying & jointing & 30% on giving hydraulic test.

Item No.15:

3 mm White Rubber Sheet

The white rubber sheet of 3 mm shall have to be provided and fitting and fixing work with all required material shall have to be carried out and executed as per the requirement and instructions of engineer in charge.

The rate shall be for a unit of one Kilogram.

Item No.16:

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.17:

Providing & Supplying 15 mm (ID) (½") Dia u PVC White pipe House Service Connection from distribution main to property limit, including following for each connection:

1. Providing and Supplying Clamp Saddle (DI Strap Saddle) for Service Connection from DI water distribution mains shall be of wrap around design
2. Providing Brass Ferule of good quality conforming to IS2692-1989 / Brass ferule ASTM-D-2466. - 1 No.
3. Providing Brass (metal) inserted Female Thread Adaptor as per ASTM- D- 2466 – 1 no.
4. Providing u PVC White pipe of Schedule-40 class Conforming to ASTM-D-1785 in required length – 5.0 m approx.
5. Providing Coupling ASTM-D-2466 Sch-80 about 02 nos for jointing the pipes
6. uPVC Ball valve as per ASTM-D-2466 with one side compression. and another side female threaded - 1 no.
7. Providing 90 degree Elbow - 2 No of standard ASTM-D-2466,
8. PVC Adhesive solution as per requirement

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 elastomeric 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: Elastomeric (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 , 1 1/2" (42mm OD) connection :

Shall be of brass material as per IS standard.

Saddle strap-for DI PIPES:

Strap Saddle 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. Saddles for service connections shall be of fastened strap type with threaded outlet for service connection.

The service connection threading sizes shall conform to IS: 554. Saddles shall be suitable for DI pipes of nominal size 4" (NB 100) with nominal service connection size from ½" (NB 15). The straps shall be elastomeric 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. Fasteners shall be of threaded nut-bolt-washer type. Nut-bolts of size ½" (M12) shall be used for saddles of size for 4" (NB 100). The sealing between the saddle and mains shall be obtained by using a profiled elastomeric seal matching to the curvature of the pipe. The seal shall be of elastomeric 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 upto 10 bars.

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 elastomeric 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: Elastomeric (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. The general arrangement of Strap Saddle with PP Compressive Male Thread Metal Insert Elbow is shown below; The joints in service connection between MDPE pipe and UPVC Ball Valve and the Water Meter shall be tamper proof / not easily dismantled by the Consumers as directed by the Engineer.

Ferrule Materials

Ferrule saddle straps shall be of gunmetal to BS EN 1982 grade (ISO R1338) or equivalent, with two or four bolts depending upon the width of the saddle. Bolts shall be of stainless steel to BS6105 grade A2 with grade A4 nuts, BS EN ISO 3506 and be resistant to corrosion. The strap shall preferably be designed to have locating recesses to prevent the bolt head(s) from turning when the upper nut is being tightened. Ferrule outlets shall be either of a metallic material complying with the specification for ferrule saddle straps above, or of a thermoplastics material that does not suffer from corrosion in potable water (pH range 6 to 8) or low resistivity soils (200 ohm.cm or less). Compression fittings for house service connections shall comply with ISO 14236, with materials of construction as per clause 5 in the Standard as follows:

Body	- polypropylene
Nut/cap	- polypropylene
Clip ring	- POM (acetylic resin)
Packing bush	- polypropylene
"O" ring	- NBR
Threaded metal inserts	- SS304 with BSP threads

For clear identification of water services, fitting nuts shall be coloured blue and the body black. All threads shall be BSP. The dimensions of compression fittings shall be in accordance with clause 7.1 of ISO 14236. The pressure rating of compression fittings shall be PN 10 as per clause 8 of ISO 14236. Performance testing shall be as follows:

- 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 vacuum
- 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

All materials or components coming into contact with water shall comply with the following:

Metallic components shall not constitute a toxic hazard, shall not support microbial growth and shall not give rise to unpleasant taste or odours or discoloration.

Non-metallic components shall be approved as being free from adverse health effects. Compliance with national or international standards shall be demonstrated by production of appropriate third party certification.

Compression fittings for conveyance of water for human consumption shall conform to BS 6920 for effects on water quality, and certificates demonstrating compliance with the following parameters shall be provided: odour and flavour of water, appearance of water, growth of micro-organisms, extraction of substances that may be injurious to public health (cyto toxicity), and extraction of metals.

TECHNICAL SPECIFICATION FOR uPVC Pipes (ASTM Standards)

ASTM D 1784 -Rigid Poly Vinyl Chloride (PVC) compounds.

ASTM D 1785 -Poly Vinyl Chloride (PVC) plastic pipes, SH 40 & SH80.

ASTM D 2466 -Socket type Poly Vinyl Chloride (PVC) plastic pipe fittings , SH 40.

ASTM D 2467 -Socket type Poly Vinyl Chloride (PVC) plastic pipe fittings , SH 80.

ASTM D 2564 -Solvent cements for plastic pipes & fittings.

ASTM F 1498 -Tapper pipe threads 60 deg. For thermoplastics pipe & fittings.

ASTM D 2774 - Underground installation of Thermoplastic pipes.

ISO7/1 -Pipe threads where pressure joints are made on threads-

part-1 : Designation, Dimension & tolerances.

(ASTM –American Society for Testing of Materials.)

PHYSICAL PROPERTIES :

Properties	ASTM Test Method	PVC	Unit
GENERAL :			
Cell classification	ASTM D1784	12454-B	-
Maximum Service Temperature (uPVC)	-	60	°C
Maximum Service Temperature (MPVC)	-	83	°C
Specific Gravity @73° F (uPVC)	ASTM792	1.44 + - 0.03	-
Water Absorption in 24hrs@77° F	ASTM D570	0.05	%weight increment
Hardness, Rockwell	ASTM D785	111-120	-
Hardness Durometer D	ASTM D2240	80+/- 3	-
Hazen-Williams Factor	-	C=150	-
MECHANICAL:			
Tensile Strength @73° F	ASTM D638	>45.3	MPa
Tensile Modulus of Elasticity @73° F	ASTM D638	>2758	MPa
Flexural Strength @73° F	ASTM D790	14450	psi
Compressive Strength @73° F (min)	ASTM D695	9600	psi
Izod Impact, notched @73° F	ASTM D256	<0.65	Ft-lb/in.

Hydrostatic Design Stress	ASTM D1785	2000	psi
THERMAL:			
Coefficient of linear Expansion	ASTM D696	2.9×10^{-5}	In/in/°F
Coefficient of Thermal Conductivity	ASTM C177	3.5×10^{-4}	(Cal)(cm)(cm ²)(sec)(°C)
Heat Deflection Temp under load, annealed@1.82MPa.	ASTM D648	>70	°C
Specific Heat	ASTM D2766	0.25	Cal/(gm °C)
Vicat Softening Temperature (uPVC)	IS 4985	>80	°C
Vicat Softening Temperature (MPVC)	IS4985	>90	°C
FIRE PERFORMANCE :			
Limiting Oxygen Index (L.O.I)	ASTM D2863	43	%
Average Extent of Burning	ASTM D635	<25	Mm
Average Time of Burning	ASTM D635	<10	sec

These

ASTM Plumbing ASASTM Plumbing Systems (Solvent Weld)					
DIMENSION AND WATER PRESSURE RATING AT 23 °C FOR SOLVENT WELD PIPES AS PER ASTM D-1785					
		SCH 40		SCH80	
Nominal Bore	Outside Diametre	Wall Thickness	Working Pressure	Wall Thickness	Working Pressure
(inch)	(mm)	(mm)	Kg/cm ²	(mm)	Kg/cm ²
1/2"	21.34 ±	2.77 +	41.4	3.73 +	58.6

	0.10	0.51		0.51	
3/4"	26.67 ± 0.10	2.87 + 0.51	33.1	3.91 + 0.51	47.6
1"	33.40 ± 0.13	3.38 + 0.51	31.0	4.55 + 0.53	43.4
1 1/4"	42.16 ± 0.13	3.56 + 0.51	25.5	4.85 + 0.58	35.9
1 1/2"	48.26 ± 0.15	3.68 + 0.51	22.8	5.08 + 0.61	32.4
2"	60.32 ± 0.15	3.91 + 0.51	19.3	5.54 + 0.66	27.6

Fittings :

Size (inch)	1/2	1	1.1/2
Thickness 't'min.	0.109	0.133	0.145
Length 'S/L' (min)	0.688	0.875	1.094
Net I.D. (min)	0.832	1.305	1.888
Net I.D. max)	0.832	1.330	1.918
Thread (TPI)	14	11	11

UPVC BALL VALVES(STOP COCKS)

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

Material of Construction:

Ball Valve material shall conform 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. Following 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 :

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

Mode of Payment : Payment restricted to 100 % on completion of laying and jointing and on giving hydraulic test.

Item No.18:

Labor for fixing DI sheddle ,Tapping ferrule, fixing of UPVC pipe HSC with Compression fittings up to Consumer House for Sizes 15 mm (ID) (½") Dia

Labor for fixing DI sheddle ,Tapping ferrule, fixing of UPVC pipe HSC with Compression fittings up to Consumer House for Sizes 15 mm (ID) (½") Dia

For each house connection, contractor shall have to procure all items as specified in above item and it shall be fitted as per the drawing /sketch enclosed including all testing etc complete.

- Excavation in Soil, SM & HM & Refilling = Average 3.0 M³, including paver road excavation
- Drilling the hole suitable size in plinth/Wall with drill machine.
- Drilling the required hole with special tool in DI pipeline including threading in the DI pipe body taking care of in side lining.
- Fixing the Ferrule with service saddle on street DI pipe including all fitting like washer packing and bolt-nuts.

5. Dismantling Floor in the courtyard of house with removal of excavated stuff.
6. Laying jointing & fixing all UPVC standard pipes approx 5.00 m & Fittings as per Standard Drawing.
7. Testing the HC for leakage test

Method of jointing :

Cutting the pipe : Cut the pipe square using hand saw with suitable guide or by pipe cutter.

Joint preparation : Chamfer or deburr pipe or both, approximately at 10 - 15 . Remove burrs from inside and outside diameters with a knife, file or abrasive paper.

Test dry fit of the joint : Insert the pipe into the fitting and check that the interference occurs about 1/3rd to 2/3rd of the socket depth. Too tight or too loose fitment may lead to leak, hence should be avoided.

Cleaning : Remove any dirt, moisture, or grease from pipe end and fitting sockets with a clean dry rag.

Application of solvent cement : Apply cement lightly but uniformly to inside of socket and outside of pipe end with a natural bristle nylon brush or suitable applicator. Apply a second coat of cement to the pipe end. Apply cement quickly to prevent it from drying and be sure to completely cover all jointing surface area of the pipe and fitting. Do not apply excessive cement in bell socket

Assembly of joint : Immediately after applying the last coat of cement to the pipe and while cement is still fluid or wet (within 20 second), forcefully bottom the male end of the pipe in the socket, giving pipe or fitting ¼ turn (but not after pipe is bottomed) to distribute the cement evenly. Remove excess cement from the pipe at the end of the fitting socket. The joint must not be disturbed immediately after cementing, so that joint can properly cure. Allow cement to cure before pressurizing the system. Recommended curing time is 12 hours.

Mode of Payment : Payment restricted to 100 % on completion of laying and jointing and on giving hydraulic test.

Item No.19:

Earth work in cutting including preparing the slope and stacking or utilizing the cutting stuff in bans as directed up to RMC limit from the end of cutting with all leads and lift.

The land with required for the road way shall be cleared of all trees having a girth of 30 cms and less, loose stones, vegetation, bushes, stumps and all other objectionable materials. The roots of trees and stumps shall be removed to a depth of 30 cms below the grade of formation and slope of excavation filled up with excavated materials and compacted. All the materials cleared will be the property of Rajkot Municipal Corporation.

After clearing the site, the alignment of the road shall be properly set out true to lines, curves, grades and sections as shown on plan or directed by the engineer-in-charge. The contractor shall provide all labour and materials such as lime, strings, pegs, nails, bamboos, stone mortal, concrete etc. required for setting out alignment establishing bench marks and giving profiles. The contractor will be responsible for maintaining BM alignments, and other stakes and marks.

The excavation shall be finished neatly smooth and evenly to correct lines, curves, grades if loose shall be scarified watered and compacted. The contractor shall on no account excavate beyond the slope or below the specified level or outside the section. It shall not be paid for and the contractor shall be required to fill up at his own cost with good and approved material by engineer in charge.

All necessary traffic arrangement is to be done by contractor. No extra will be paid for this.

The balance of the excavated quantity shall be removed by the contractor from the site of work to a place as directed within RMC limit and all lift.

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

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 payment shall be made at Rs.12.00 per square meter basis for excavation up to 20 cm depth. Beyond 20 cm depth, the payment shall be made at Rs.0-50 per square meter per every 5 cm additional depth for additional excavation upto 45 cm.

Item No.20:

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

Surplus earth shall have to cart by the contractor within specified limit including loading, transporting, unloading, spreading, etc.

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
3. TP Scheme No.10, FP-87, Dhebar Road (South), Atika Area, Nr. PGVCL Office
4. TP Scheme No.23, FP-23, Nr. IOC Godown, Morbi Road
5. TP reservation plot at Samrat industrial Area, Bh. ST Workshop
6. TP Scheme No.9, FP-5, Nr. Raiyadhar Garbage Station
7. TP Scheme No.20, FP-35, Bh. Pradhuman Green
8. TP Scheme No.28 (Mavdi), FP-46/A, Nr. GETCO Circle
9. TP Scheme No.12, FP-38/A and 39/B, Nr. Lijjat Papad, Kothariya Nationla Highway

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.

The excavated material of black cotton soil should be stacked at the location specified by the engineer in charge.

Mode of Measurement and Payment:

The measurement of excavation in trenches for foundation shall be made according to the sections of trenches shown on the drawing or as per sections given by the engineer-in-charge.

No payment shall be made for surplus excavation made in excess of above requirement or due to stopping and sloping back as found necessary on account of conditions of soil and requirements of safety.

The rate shall be for a unit of one cubic Meter.

Item No.21 and 22:

Supply of graded Field metal of following size:

- i) **Hand broken Field metal 4 cm to 10 cm / 10 cm to 15 cm size (15 cm layer each).**
- ii) **Spreading the Field metal for rolling and W.B.M. including filling interstices to required camber.**

The Field metal shall be obtained from quarries approved by the **CITY ENGINEER (SPECIAL)** prior to collection. The Field metal shall be of approved quality with all leads and lift. The Field metal shall be obtained from hard tough, sound, durable, Field metal of close texture as is locally available and reasonably free from decay and weathering pieces of the Field metal shall be angular and roughly cubical in shape and round. Elongated or flaky material shall be rejected. The size of Field metal shall be 4 cm to 10 cm and 10 cm to 15 cm and shall be hand broken.

The payment shall be in cubic meter basis without deduction for voids. The rate also includes labour cost of level, Surveying and soft and hard copy of cross section and longitudinal section for measuring quantity supplied by contractor.

The rate includes cost of collection, conveyance to the site with all lead and lift and filling the boxes including all labours, tools, equipment and other incidental expenses. The rate quote are inclusive of all such tools, duties, fees, royalties, taxes etc.

- ii) Field Metal shall not be spread without permission of the engineer-in-charge. Field Metal should be spread under careful supervision by trained collies. The required quantity of material stacks at the site. The Field metal shall be screened and rubbish, dust, grass shall be removed and spread evenly on the prepared surface in grade and camber by using camber boards so as to ensure that the surface is true to cambers and grade. At least two camber board shall be in use at site. The surface shall be brought to required camber shall be checked at every 50 ft. (15 m) by means of templates of while the necessary of the camber in between shall be tested by strings and corrected as required to ensure that the material is spread to required thickness. At the time of rolling all surfaces irregularities, hollows, depression, humps etc shall be set right. The rate for this item shall be paid on cubic meter basis includes all the above operations with all lead and lifts.

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

Item No.23:

- A) **Supplying of hard murrum binding material.**
- B) **Spreading bindage or road crust filling the gaps in metal and leveling to camber and gradient and directed murrum.**
- A) Material for the purpose shall be approved quality. Any material which is found inferior shall be rejected and contractor shall remove such rejected material from the site at his own cost.

The material shall be got approved by the CITY ENGINEER (SPECIAL) prior to collection on the site. It shall be free from all rubbish, dust and any organic materials as well as clouds of black cotton soils.

For road work, complete stocking of materials as per requirements shall be carried out 200 m length or as per condition of site or as per instructions of site incharge before spreading. The stacks of materials shall be got cross checked by Dy.Ex.Engineer as per rules before spreading.

Where any doubt exists as whether quantity of stacking of murrum corrected by contractor, no extra payment shall be claimed by contractor. If the quantity of murrum in any stack found less than standard measurement viz; 1.5 cmt. The entire shall be paid on the basis of the quantity so found.

The payment shall be on cubic meter basis without deduction for voids. The contractor shall maintain all stacks in regular and proper size till whole material shall not measure and finally accepted by the department.

The rates includes cost of collection, conveyance to the site with all lead and lift and filling the boxes including all labours, tools, equipment and other expenses. The rates quoted are inclusive of all such tools, duties, royalties, taxes etc.

- B) Spreading of material shall be started after the full supply in particular length is collected, measured and recorded. Permission of Engineer in-charge shall be obtained before spreading. It shall be seen that formation is dressed to required camber and grade. If the murrum is to be spread over the metaled surface then the spreading shall be uniform and as it has to act as binding surface. It shall be used for filling the interstices of metal and forming a smooth running surface as far as possible. Murrum bindage shall be spread evenly with a twisting motion of

the baskets. No more murrum shall be used than specified as bindage. The contractor shall do good all unevenness, depression, projection etc. during consolidation work. Rate of these items includes all these operation except consolidation. **Also, the work is to be carried out with Mini Roll / Road Roller / Hand Roll as may be required for the work as per the requirement and instructions of engineer in charge.** The payment shall be made on cubic meter basis.

The testing of material is to be carried out by the Agency at his own cost.

Item No.24:

Rolling and consolidation water bound macadam (except latrite and kankar) including watering, not exceeding 150 mm thickness main layer including binding material including filling in depression which occur during the process (B) with roller 8 tonne and not exceeding 12 tonne.

Immediately following the spreading of the coarse aggregates rolling shall be started with three wheeled roller of 8 to 10 ton capacity. The rolling and except watering includes of work for two separate layer of mtalling.

Except on super elevated portions where the rolling shall proceed from inner edge to outer, rolling shall from the edges gradually progressing towards the center. First the edges shall be compacted with roller running forward and backward. The roller shall then more inwards parallel to center line of the road in successive passes uniformly lapping preceding tracks by at least one half the width. The total work includes four times of rolling in two layers of metalling.

Rolling shall continue until the aggregate is thoroughly keyed and creeping of the aggregate ahead of the roller is no longer visible.

The rolled surface shall be checked transversely and longitudinally with templates and any irregularities corrected by loosening the surface, adding or removing necessary amount of aggregate and rolling until the entire surface conforms to desired camber and grade.

The bondage material where it is to be used shall be applied successively in two or more than layers of a slow and uniform rate after each application, the surface shall be copiously sprinkled with water, which water shall be applied to the wheels of rollers if necessary to wash down the binding material sticking to them. These operations

shall continue until the resulting slurry after filling of voids forms a wave ahead of the moving roller.

After the final compaction of water bound macadam course, the load shall be allowed to any overnight. Next morning hungry spots shall be filled with screenings of binding materials as directed lightly sprinkled with water if necessary and rolled.

Payment will be made at Rs.7.00 per square meter basis of the finished work for single layer and shall include water, rent of machinery, cost of fuel, wages of drivers and cleaners and murrum bund etc. for both.

Item No.25:

Supply and fixing of R.C.C. Pricast Valve Chamber of 75 mm Thick Wall and Depth of 400 mm and Dia of 500 mm clear opening of M-30 Grade Concrete and Steel

RCC Pricast Valve Chamber of 72 mm Thick wall and Depth of 400 mm and Dia of 500 mm clear opening of M-30 Grade Concrete and steel, of approved quality shall be brought and fixed in line and level and as per the instructions fo Engineer-in-Charge.

Payment shall be made on No of Pricast Valve Chamber.

Item No.26:

Job work for 300 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.

Pipeline repairing work (in existing network / 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 / PVC / HDPE / AC Pressure / RCC / GI / MS / PS Pipe (excluding valve, joints, specials etc. materials, de-watering work, cutting & welding of DI / MS / CI pipes as required) with all required equipments, in case of PL chowk up, like Steel rod / Hard rubber pipe for line cleaning to be provided by Contractor for 900 mm dia PL

CIVIL WORKS

1.1. GENERAL:-

- i. The site on which the pipelines are to be laid and shown on plan and the area required for setting out other operation cleared and all obstruction loose stones and materials. rubbish of all kinds slumps brushwood as well as trees shall be removed as directed the roots shall be entirely grubbed up.
- ii. The products of the clearing to be stacked in such a place and in such a manner. as directed by the engineer.
- iii. In jungle clearing all trees not specially marked for preservation bamboos jungle wood and brushwood shall be out down their roots grubbed up. All wood and materials from the clearing shall be the property of the Board shall be arranged as directed by the Board Engineer or his authorized agent the materials pronounced as useful by the engineer will be conveyed and properly stacked as directed within the specified limit. Useless materials will be burnt or otherwise disposed off as directed

1.2 SETTING OUT:-

The centre lines of all pipe trenches etc. shall be given by the Engineer-in-charge. and it will be the responsibility of the contractor to install substantial reference marks. Bench marks etc. and maintain them as long as required true to line. level curve and slopes. The Contractor shall assume full responsibility for alignment and dimension of each trench.

The labor materials etc. required setting cut and establishing bench marks and other reference marks shall be arranged by the Contractor at his own cost.

1.3 EXCAVATION:-

The excavation incl. dewatering for the pipe trenches shall incl. removal of all materials of whatever nature and whether wet or dry condition necessary for laying of pipe lines exactly in accordance with alignment levels grades and curves shown on the plans or as directed by the Engineer-in-charge. Trenches shall be excavated to the exact width and depth according to the size of pipe and the sides shall be left vertical as per as possible or according to the angle of response various soils. Unless there is a specific extra provision in the contract for shoring and strutting for cutting side slopes the contractor shall at his own do the necessary shoring and strutting or cutting of slopes to a safe of repose or both approved by the Engineer-in-charge when the state need such treatment. The Contractor shall notify the Engineer before starting excavation to enable him to take cross sectional levels for purpose of measurements before the ground is disturbed. The bottom of the trenches shall be leveled both longitudinally and transversely or sloped as directed by the Engineer. The Contractor shall, at his own cost to remove such portions of boulders of rocks. as

are rectified to make the bottom of the trench level. No. filling shall be allowed to bring the trench to level. If by Contractor's mistake excavation is made deeper than shown on the plans and if ordered by the Engineer the extra depth shall have to be made with selected excavated stuff only with watering, ramming etc. as directed by the Engineer and at the cost of contractor. Other hard excavation shall be cleared of all sort and loose material and cut to a firm surface. Either level stepped as directed by the Engineer. The Engineer may order such charges in the dimensions and alignment of pipe trench as may be deemed necessary to secure satisfactory cover over pipeline. The Contractor shall, at his own expense, make provision for all pumping, dredging bailing out of draining water and the trenches shall be kept free of water during laying work. After each excavation is completed, the contractor shall notify the Engineer to that effect and no laying of pipe line will be allowed to laid until Engineer has approved the depth and dimensions of trenches level and measurements.

1.4 SHORING AND STRUTTING:-

Unless specifically mentioned in the contract, excavation of slopes to prevent falling in of sides or providing, fixing maintaining and removing, shoring, bracing etc. shall not be paid for. The Contractor shall be properly upheld. The Contractor shall got approval of design of shoring. The shoring shall be of sufficient strength of resist side pressure and ensure safety from slope and blows and to prevent to work and property injury persons. If shall be removed as directed after all the items for which it is required are completed. During excavation if water connections, sewerage connection, telephone lines etc. are damaged by the contractor. The same shall have to be restored by the Contractor without any extra payment.

1.5 PROTECTION:-

The trenches shall be strongly fenced and red light single shall be kept at night in charge of watchman to prevent accidents sufficient care protective measure shall be taken to see that the excavation shall not affect or damage the adjoining structure. 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, caution boards etc. shall be provided by the Contractor.

1.6 Thrust Blocks

Anchorage in the form of a thrust block at each deflection in the horizontal and/or in vertical alignment of the pipeline shall be provided as per the design requirements to resist any unbalanced pressure at the bends. Gravity type thrust blocks shall be provided at horizontal and vertical deflections in the pipeline, which shall be designed according to the test pressure and the soil conditions at the site of the thrust block. Before designing the thrust blocks the Contractor shall

assess the stability of the soil considering erosion due to wind and water. The general guidelines to be followed for providing and designing of thrust blocks shall be as under:

- The thrust blocks may not be required for bend angles up to 5%. However, necessary calculations shall be submitted by the Contractor for approval by Employer to establish that the thrust shall be taken care by pipe itself and that it is safe not to have the thrust block.
- The thrust shall be designed according to the field test pressure of the pipe.
- For above ground pipelines, thrust blocks shall be designed to take 100% thrust.
- For buried pipelines, thrust blocks on continuous pipe line sections shall be designed considering 50% thrust to be taken by block and balance by pipe as per CPHEEO manual.
- For buried pipelines, thrust blocks near valve chambers and/or any other dismantling joints shall be designed to take 100% thrust.
- In rock the passive pressure of rock shall be considered for thrust block design
- The thrust blocks shall be of concrete M20, cast in-situ, with minimum surface reinforcement of 5 kg/m². No formwork is required to be used for construction of thrust blocks in buried conditions, unless desired by the Contractor. The calculations for the dimensioning and the shape of the thrust blocks shall be approved by the Employer.
- Anchor blocks shall also be located wherever there is a transition between above ground and buried pipelines. All such anchor blocks shall have flexible joints at either end to allow for small amounts of settlement to occur.
- The Contractor shall construct the thrust blocks as early in the program of work as is practical, and at least six months prior to installation of the above ground pipeline in order to reduce the risk of settlement imposing additional loads on the pipeline supports. All thrust blocks are to be completed on each section before the sectional hydraulic testing is conducted.
- Where possible, the base of the thrust block shall be cast against solid rock in order to prevent any settlement. Any material overlying the rock shall be excavated and replaced with class M15 mass concrete. In the event of no rock being encountered, the base of the thrust block shall be cast against undisturbed ground. Any ground, which in the Employer opinion is unsuitable, shall be excavated and replaced with class M15 mass concrete.

1.7 Backfilling

Backfilling of trenches for pipes shall be commenced after the pipes have been successfully tested. The backfilling material shall be

properly consolidated by watering and ramming, taking due care that no damage is caused to the pipes.

All fill material shall be subject to the Engineer's approval. If any material is rejected by the Engineer, the Contractor shall remove the same forthwith from the site. Surplus fill material shall be deposited/disposed of as directed by Engineer after the filling work is completed.

Back fill material

To the extent available, selected surplus soils from excavations shall be used as backfill provided that it complies to IS 12288 and such material consists of loam, clay, sand, fine gravel or other materials which are suitable for backfilling. All backfill material shall be free from clods, salts, sulphates, cinders, ashes, slag, refuse, rubbish, lumps, vegetable or organic material, lumpy or frozen material, boulders, rocks or stone or other foreign material. All lumps of earth shall be broken or removed. If fill material is required to be imported, the Contractor shall make arrangements to bring such material from outside borrow pits. The material and source shall be subject to the prior approval of the Engineer.

Backfilling of Pipe Trenches

For the purpose of back filling of the trenches shall be carried out simultaneously on both sides of the pipe to avoid unequal pressure on the pipe.

Where the excavation is made through permanent pavements, curbs, paved footpaths, or where such structures are undercut by the excavation, the entire back-fill to the subgrade of the structures shall be made with sand in accordance with IS 12288.

The Contractor shall take proper precautions against the risks of floatation. Should any section of the pipeline be affected by floatation shall be removed and reinstalled to the satisfaction of the Engineer

The Contractor shall carry out field tests that on each layer to confirm that the specified density has been obtained.

All excavations shall be backfilled to the level of the original ground surfaces unless otherwise shown on the drawings or ordered by the Engineer, and in accordance with the requirements of the specification. The material used for backfill, the amount thereof, and the manner of depositing and compacting shall be subject to the approval of the Engineer, but the Contractor will be held responsible for any displacement of pipe or other structures, any damage to their surfaces, or any instability

of pipes and structures caused by improper depositing of backfill materials.

Trenches crossing a road shall be backfilled with selected material placed in layers not exceeding 15 cm in thickness after compacting, wetted and compacted to a density of not less than 90 percent of the maximum dry density at optimum moisture content of the surrounding material. Any deficiency in the quantity of material for backfilling the trenches shall be supplied by the Contractor at his expense.

The Contractor shall at his own expense make good any settlement of the trench backfill occurring after backfilling and until the expiry of the defects liability period.

On completion of pressure and leakage tests exposed joints shall be covered with approved selected backfill placed above the top of the pipe and joints in accordance with the requirements of the above specifications. The Contractor shall not use backfilling for disposal of refuse or unsuitable soil.

1.8 Inspection and Testing

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. If, at any time, it is found that the procedure of applying the paint or defects noticed, all such painting work done shall be rectified or redone by the Contractor at his own cost, as directed by the Engineer. Samples of the paint brought by the Contractor shall be sent to the testing laboratory for testing, as directed by the Engineer,. If any sample is found to be not conforming to the specifications, the entire consignment to which the sample may pertain shall be rejected. Samples shall be taken at intervals at the option of the Engineer. The entire cost incidental to such testing shall be deemed to be included in the rates quoted by the Contractor.

1.9 Clearing of Site

All surplus materials, all tools and temporary structures shall be removed from the site as directed by the Employer and the construction site left clean to the satisfaction of the Employer.

1.10 Dynamic commissioning

The dynamic commissioning shall commence after the work has been physically completed to the satisfaction of the Employer- in -Charge. It shall simulate the design and operation conditions which are as follows:

- Water being put into the system through overhead tank or direct pumping as the case maybe.
- Closing of the valves against full static or dynamic pressure.
- Operation of all valves including scour valves (open-close-open).

- Operation of all air valves.

Payment shall paid on Nos. of Job bases.

Addl/Asst. Engineer
R.M.C.

Dy.Ex.Engineer
R.M.C.

CITY ENGINEER
R.M.C.

Signature of Contractor

ADDITIONAL CONDITIONS

1. The contractor shall have to provide his own level instrument for this work.
2. Lowering, laying and jointing works of all the pipelines shall have to be carried out by using Sight Rails and Boning Staves.
3. Work is required to be carried out in residential area where all the services like water supply, sullage water 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 1 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 roa 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, 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 complete. However, where there is no defined road, in such area, the fencing/ lighting etc., requires to be provided as per clause 1.1.15. Sign Board shall have to be provided at required locations, so that there will not be any fatal accident.
9. Regarding the width of excavation, as (a) it is difficult to carry out the vertical trench excavation, (b) possibility of sliding the soil, and (c) uneven excavation trench width in case of blasting. In this connection, for every 1.5 mt lift if there is less width upto 5 cm at the bottom then the top width of excavated trench, it shall be considered as per the specified trench width or actual trench width carried out at the ground level by the contractor whichever is less. If excavation is carried out more than the specified width then the payment will be made only for the specified width of excavation. For mode of measurement for excavation, the width of excavation will be considered as given at the time of line out by engineer-in-charge or actual width done whichever is less.
10. The pipes shall be with ISI mark whereas that of manhole frame and cover shall be confirming to relevant IS.
11. After entering into an agreement, the agency shall have to finalize the agency for supply of the material like pipes, manhole / house connection chamber frame and covers etc., and the name of manufacturer / supplier should immediately be informed to Rajkot Municipal Corporation so that Rajkot Municipal Corporation can also expedite the manufacturer / supplier for the material. If necessary, Rajkot Municipal Corporation will visit and inspect the factory. During the inspection, if Rajkot Municipal Corporation is not satisfied then the contractor shall have to procure the material from other manufacturer(s).
12. While the work in progress, there is possibility of change in

drainage line routes according to the site conditions. Under these circumstances, the contractor shall have to carry out the work accordingly, for which, no extra payment shall be made in such situations. Over and above, the decision of Engineer-in-charge for change in drainage line routes shall be final and binding to the contractor.

13. 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
14. In excavation, the decision regarding classification of strata shall rest with the Engineer-In-Charge and his decision in this regard shall be final and binding to the Contractor.
15. The rates are inclusive of dewatering, if require
16. Regarding water supply for hydro / flow testing, necessary water, power, labour etc. required for the necessary test shall be arranged by the contractor at his own cost.
17. During construction activity, proper care must be taken for labour safety and must follow the provisions of the Labour Laws.
18. Testing of the material like; Brick, Sand, Aggregate etc. should have to be tested periodically as suggested by the engineer- in-charge at Government approved material testing Laboratory and testing charges for the same has to be borne by the contractor.
19. In case of any ambiguity found in specifications / drawings etc. the engineer-in-charge is empowered to take necessary decision for rectification and same shall be final and binding to the contractor.
20. The contractor shall have to get registered under ESI (Employer's State Insurance)
21. Act and obtain ESI Registration number if the number of workers are 10 Nos. or more. Also, the agency shall have to give all the benefits to the workers as available under the ESI Act. The agency should follow all the rules and regulations of ESI Act as per prevailing norms.
22. The contractor will be responsible to avail P F Code as per the prevailing Circular of Government for the employees on work. The required documents regarding deduction of P F shall have to be

submitted by the contractor to the competent authority.

23. For this project works Third Party Inspection (TPI) is mandatory. The TPI agency will be appointed by Rajkot Municipal Corporation and remittance of charges @ 0.70% of contract value for the same is to be borne by the agency, which will be deducted from the contractor's bill.
24. Rajkot Municipal Corporation at its discretion employs services of PMC / Third party inspection agency for quality control. The contractor shall fulfill the entire requirement related to quality control as instructed by TPI / RMC at no extra cost.
25. The restoration work for the excavation done is to be carried out immediately as per the instructions of engineer in charge. The excess material shall have to be disposed with no extra cost at the site specified by engineer-in-charge.

CITY ENGINEER
Rajkot Municipal Corporation

Signature of Contractor

BILL OF QUANTITIES AND PRICE

The Bill of quantities consists of following sections :

CIVIL WORKS:

Civil works requires following:

Excavation of Trenches

- ✓ Providing, supplying, lowering, laying, jointing, testing and commissioning of various dia. distribution & street service DI pipeline with DI Specials network as per the detailed specifications shown in Vol-II.
- ✓ Bedding for pipes with selected murrum
- ✓ Support of piping system, Thrust blocks of RCC in various concrete etc.
- ✓ Refilling the pipeline trenches with proper ramming
- ✓ All required necessary items as directed by engineer in charge.

The bill of quantities forms the most important part of the e-tender documents. The supply, lowering laying jointing, erection testing and commissioning of pipeline which form a part of total works are indicated in the schedules separated include in the documents. The e-tendering contractors shall price of this document.

Performance testing and commissioning:

The bill of quantities, general conditions of contractor and the specifications which form an integral part of this contractor shall be read in conjugation.

The bill of quantities, general conditions of contractor and the specifications which form an integral part of this contractor shall be read in conjugation.

Payment for different items shall be paid on % (percentage) above or below quoted by the contractor online in the given price bid. However for any extra items to be carried out with permission of engineer in charge rates will be decided by the Rajkot Municipal Corporation as per GC-70 wherever not specified in the tender.

Whenever manufacturer is separate and contractor for lowering, laying, joining and testing is separate, the principal contractor shall enter in to an agreement with DI pipes & DI Specials manufacturer for satisfactory manufacturing as per the relevant code of practice, testing, transporting, stacking & testing after laying at site as per RMC requirement.