



**VADODARA MUNICIPAL CORPORATION**

## **Item Wise Specification**

## **DETAILED SPECIFICATIONS FOR MAINTENANCE OF WATER PIPELINE WORK**

### **Item No. 1 : Excavation:**

Excavation in all types of soils, soft and hard soil up to 1.5 m depth and from 1.5 m to 4.5 m depth (keeping the clear cover of soil on the top of the pipe 1.0 m)

Line out along the alignment of the pipe using lime getting it approved from Dy. Executive Engineer (WW), breaking the surface and excavating up to the required depth. The contractor shall provide at his own cost, red light and a watchman during the night hours, and provide fencing using ropes on both the edges of the trench before starting of work. The contractor shall keep a sign board with "Road Closed – Work in Progress" written on it.

Along the alignment of pipe, the excavated material shall be kept 1.0 mtr. away from the trench and protecting the excavated material till the work is complete.

Excavation will be allowed to be carried out up to maximum 100 m length at a time. Further excavation shall be permitted only after laying of the pipe line is complete in the excavated trench.

The work shall be executed in such a way that the water connections, drainage connection, telephone, electric cables, gas line / water line / chamber / manhole etc. met during excavation are not damaged. If required, these cables and poles shall be supported properly, even then these lines and cables are damaged, and the contractor shall be held responsible. In case of damage to the water and drainage lines, electric poles etc. during the excavation the contractor shall repair the same at his own cost immediately. In case such repair work is not attend immediately, it will be executed through other agency or department at the risk and cost of contractor and the entire repair expenditure shall be deducted from his running bill or from the amount payable to him.

Any diversion required in existing service lines / house connections coming in the line of work shall have to be diverted by the contractor at his cost & risk, as per the instructions and directions of Engineer-in-charge.

Excavation shall be carried out in all types of soil, dry, moist or water logged. If required the contractor shall procure his own pump and carry out the de-watering. The places where the soil is soft or made-up (refilled) the contractor shall provide wooden planks and supporting structure to the trench, to avoid any mishap or accident.

The excavated stuff shall be dumped at about 1 m away from the trench (within 90 meter lead), properly in the line and approach shall be provided across the trench at a suitable interval for the public to cross over. The contractor's rate shall including breaking brickwork, concrete etc. No extra rate shall be payable for this work. The rate shall be per cubic meter.

#### **Item No. 2: Breaking existing asphalt road :**

Before starting the work, the contractor shall provide proper traffic diversion arrangement and place the board “Road Closed, “Work in Progress”, also provide red lighting arrangement during night time. The place shall be cordon by rope & vertical post the road shall be cut to required width and depth through asphalt, metal, rubble and earthen embankment to form a trench for the crossing of the road by main pipeline as directed by Engineer-In-Charge.

- a) Cutting the road for forming a trench as mentioned above.
- b) Storing excavated material properly so as not to disturb the passing traffic.
- c) Refilling of trench and consolidation of refilled material.

The rate shall be on Sq. mtr. basis.

#### **Item No.3 Excavation by JCB machine**

Excavation for pipe line trenches in sorts of soil and soft murrum/tar road etc. including all safety provisions using site rails and stacking excavated stuff up to a lead of 90 M cleaning the site etc. complete as per the instruction of engineer-in-charge for lifts and strata as specified with the help of hiring JCB machine.

#### **Item 4 : Lowering, Laying and jointing of valves SV/AV/BFV/RV :**

The valve shall be fixed with pipe line as per the instruction of engineer-in-charge.

The valve and the tail pieces will be jointed using rubber packing, nuts, bolts, washers etc. after properly cleaning the tail pieces & the flanges of valve. The valve shall be lowered using the chain pulley block and fixed keeping vertical axis perfectly vertical and placed on cement concrete block at bottom for proper leveling. The contractor shall be responsible for protecting the valve, tail piece etc. The contractor will be responsible for protecting the sluice valve spindle, cap till the pipe line is handed over to the corporation.

The rate shall be paid per Number.

#### **Item No. 5 : Lowering & Laying of C.I. Pipe & Specials with Lead Joint**

The C.I. Pipes and specials are laid in line and level in the trench. The spigot shall be properly fixed in the socket in line & level using chain pulley block or such approved method. If required the pipes shall be cut using appropriate equipment before laying.

The required jute, lead tools etc. shall be supplied by the contractor. To make the lead joint and to facilitate the cocking the area around the joint shall be excavated to 0.5 m as directed by the corporation's engineer to make available the working space. No payment shall be made for such excavation. The socket and spigot shall be properly cleaned using wire brush. The contractor shall supply the approved quality of jute and inserting it with required tools and filling the joint with lead as per the details given below or as per

IS 3114:1994. The joint shall be kept open from all the sides and got checked from the site overseer.

**Table**

<b>Sr. No.</b>	<b>Details</b>	<b>Lead required (Kg)</b>	<b>Depth of Lead Joint (mm)</b>	<b>Remark</b>
1	100 mm C.I.Pipe	2.2	45	As per IS 3114:1994
2	150 mm C.I.Pipe	3.4	50	
3	200 mm C.I.Pipe	5.0	50	
4	250 mm C.I.Pipe	6.1	50	
5	300 mm C.I.Pipe	7.2	55	
6	350 mm C.I.Pipe	8.4	55	
7	400 mm C.I.Pipe	9.5	55	
8	450 mm C.I.Pipe	14.0	55	
9	500 mm C.I.Pipe	15.0	60	
10	600 mm C.I.Pipe	19.0	60	
11	700 mm C.I.Pipe	22.0	60	
12	750 mm C.I.Pipe	25.0	60	

Maintaining the gaps as mentioned above, pouring lead into the joints using lead, wool, etc. at site and after heating the lead making the joint in presence of the corporation's engineer. The joint made in absence of the engineer shall not be considered and the contractor shall remove the joints and the lead at his own expense and re do the joint in presence of the engineer. The Contractor shall see that in no case the lead come out of the joint and in no circumstances he would be allowed to cut the same.

The Contractor has to give Hydraulic Pressure test as per hydraulic testing described in pipe laying work. If leakage is found, it must be repaired by contractor at his own cost.

The item shall be paid per number

#### **Item No. 6 (A) : Cutting of CI pipes**

The contractor shall bring required tools at site of work for cutting the existing pipeline. The pipe shall be cut as per instructions of the engineer-in-charge. The pipe should be cut in such a way that it may not damage the existing pipe and develop extended crack in the pipe. The materials, debris and waste obtained shall be deposited in stores of the corporation. For dewatering from excavated pit, the contractor shall provide pumping equipment, machinery, fuel, labour, temporary platform and proper disposal of water to nearby storm water drain or drainage manhole as far as possible as per the instructions and requirement to the satisfaction of engineer-in-charge.

The rates shall be per running cm.

**Item No. 6 (B) : Cutting of DI pipes**

Contractor have to bring required tools & machinery like cutter, grinder, labor and power for cutting the existing DI pipe line on site. The pipe shall be cut as per the instruction of Engineer-in –charge. Pipe shall be cut in proper manner that the lining shall not be damaged.

The rates shall be per running cm.

**Item No. – 7 Eascaping of C.I. Caps.**

The cap of existing line shall be removed by appropriate method, care shall be taken that existing line shall not be damaged or cracked. This item includes dewatering, pump set, diesel, labour etc complete.

Rate of payment shall be on Number basis.

**Item No.8 : Removing of existing CI/DI pipe line.**

Existing DI pipe line shall be removed from the excavated trench in such a way that pipe and specials shall not be damaged on work. Pipe shall be cut as spigot and by cutter. All pipes, specials, valves etc shall be deposited in the departmental stores, as per the instruction of Executive Engineer(WW). The item includes cutting, pulling, removing, cleaning, loading, unloading (if necessary by crane) cutting & stacking of the line. Specials & material from site to store as per the instruction, of Engineer-in-charge.

Rate of payment shall be per running meter.

**Item No. 9 : Fixing of D.I. Pipe with Specials with Tyton Joint**

D.I. Pipe and specials like Tee, Bend, reducer etc shall be laid in line & level in the trench. If required DI pipe shall be cut using appropriate cutting equipment, after cutting pipe edge shall be grind by grinding machine suitable to tyton joint. Rate is inclusive of cutting, grinding, labour, power, SBR rubber ring, chain pulley block, rope etc necessary for laying DI specials in line & level.

The rate shall be paid per number.

**Item No. 10 Lowering, Laying, Jointing & Testing of D.I. / C.I. Pipes & Specials**

**1. Laying of Pipes**

Laying of pipe shall be done as per IS 12288-1987

- 1.1** Laying Underground – Pipes should be lowered into the trench with tackle suitable for the weight of pipes, for smaller sizes, up to 250 mm nominal bore, the pipe may be lowered by

the use of ropes but for heavier pipe, either a well designed set of shear legs or mobile crane should be used. When lifting gear is used, the positioning of the sling to ensure a proper balance, should be checked when the pipes is just clear of the ground, if sheathed pipes are being laid, suitable wide slings or scissor dogs should be used.

All construction debris should be cleared from the inside of the pipe either before or just after a joint is made. This is done by passing a pull through in the pipe or by hand, depending on the size of the pipe, when laying is not in progress, a temporary end closure should be securely fitted to the open end of the pipeline. This may make the pipe buoyant in the event of the trench becoming flooded, in which case the pipes should be held down either by partial refilling of the trench or by temporary strutting. All persons should vacate any section of trench into which the pipe is being lowered.

- 1.2 On gradients of 1:15 or steeper, precautions should be taken to ensure that the spigot of the pipe being laid does not move into or out of the socket of the laid pipe during the jointing operations. As soon as the joint assembly has been completed, the pipe should be held firmly in position while the trench is backfilled over the barrel of the pipe. The backfill should be well compacted.
- 2 **Cutting of Pipes** – The cutting of pipe if necessary shall be done in neat and workman like manner without damage to the pipe or lining so as to leave a smooth end at right angles to the axis of the pipe, methods of cutting ductile iron pipes are given in 2.1 to 2.3.
  - 2.1 **By Hacksaw** – Hand or power operated hacksaw should be used with blades having teeth at a pitch of 1mm.
  - 2.2 **By Manually Operated Wheel Cutter** – The type of cutting wheel used for cast iron pipes is not suitable for ductile iron pipe. special wheels, as used for Cutting steel pipes shall be used and cut ends are trimmed with a file.
  - 2.3 **By Pipe Cutting Machine** – Machines with cutter heads or abrasive wheels shall be used. Cutter head should have a front rake angle of 7 degree as used for steel pipes.
- 3 **End Preparation of Cut Pipes for Jointing-**  
The burr left after cutting should be trimmed off by light grinding or by filing.
- 4 **Wrapping** - When ductile iron pipes are to be laid in aggressive soils the pipes should be wrapped externally with protective coatings, such as bitumen or coal tar sheathing, or in

certain bends and valves, precautions should be taken to provide sufficient overlap of the wrapping sleeve so that no pipeline is exposed to the aggressive soil.

- 5 **Pipeline Anchorage** - All pipelines having unanchored flexible joints require anchorage at changes of direction and at dead ends to resist the static thrusts developed by internal pressure. Dynamic thrusts caused by flowing water act in the same direction as flowing water and is of sufficient magnitude at high velocities of the surrounding soil.

Anchorage to resist the thrust should be designed taking into account the maximum pressure the main is to carry, in service or on test, and the safe bearing pressure of the surrounding soil.

Where possible, concrete anchor blocks should be of such a shape as to allow sufficient space for the remaking of the joints.

Pipeline should be securely anchored at dead ends, tees, bends, tapers and valves to resist thrust arising from internal pressure and thrust blocks should be designed in accordance with IS : 5330-1984.

## 6 Joints and Jointing

6.0 Two main types of joints are used with ductile iron pipes and fittings.

a) Socket and spigot flexible joints :

- 1) Push on joints and
- 2) Mechanical joints.

b) Rigid Flanged joint.

6.1 **Flexible Joint** : - The spigot and socket flexible joint should be designed to permit angular deflection in direction and axial movement to compensate for ground movement and thermal expansion and contraction. They incorporate gasket of elastomeric materials and the joints may be of the simple push – on - type or the type where the seal is effected by the compression of a rubber gasket between a seating on the inside of the socket and the external surface of spigot. Joints of the latter type are referred to as mechanical joints. Both push in and mechanical joints are flexible joints . Flexible joints require to be externally anchored at all changes in direction such as at bends, etc. and at blank end to resist the thrust created by internal pressure and to prevent the withdrawal of spigots.

**6.2 Flanged joint** – Flanged joints are made on pipes having a machined flexible at each end of the pipe. The seal is usually effected by means of a flat rubber gasket compressed between two flanges by means of bolts which also serve to connect the pipe rigidly. Gaskets of other materials, both metallic and non metallic, are used for special applications.

**6.3 Jointing Procedure** – Procedure for jointing will vary according to the type of joint being used. Basic requirements for all type are:

- a) Cleanliness of all parts,
- b) Correct location of components,
- c) Centralization of spigot within socket, and
- d) Strict compliance with manufacture's jointing instructions.

The inside of sockets and the out side of spigots should be cleaned and wire brushed for a distance 150 to 225 mm. Glands and Gaskets should be wiped clean and inspected for damage. When lifting gear is used to place the pipe in the trench, it should also be used to assist in centralizing the spigot in the socket.

When the pipeline is likely to be subjected to movement due to subsidence or temperature variations, the use of flexible joints is recommended. A gap should be left between the end of the spigot and the back of the socket to accommodate such movement.

## **7 Transportation, Handling and Inspection**

**7.1 General** - Ductile iron pipes are less Susceptible to cracking or breaking on impact but the precaution set out should be taken to prevent damage to the protective coating and brushing or damage of the jointing surfaces.

**7.2 Transportation** - Pipes should be loaded in such a way that they are secured and that no movement should take place on the vehicle during transit.

The Pipes should be loaded on vehicles in pyramid or straight sided formation. In case of pyramid loading, the pipes in the bottom layer should be restrained by the use of broad wooden wedges secured to the vehicle being loaded. . The pyramid is to be formed by resting pipes between the pairs of pieces in the preceding layer with the sockets in layers reversed. Straight sided loading may be used with supports along the sides of the vehicles. The use of straight side loading is advantageous for utilizing full capacity of the vehicle.



- 7.3 Off –Loading** – Cranes should be preferred for off loading. However , for pipes up to 400 mm nominal bore, skid timbers and ropes may be used.

When using mechanical handling equipment, it is necessary to employ sufficient personnel to carry out the operation efficiently with safety. The pipes should be lifted smoothly without any jerking motion and pipe movement should be controlled by the use of guide ropes in order to prevent damage caused by pipes bumping together or against surrounding objects.

Where the crane operator does not have a clear view, he should be guided by the personnel supervising the operation. When cranes are used, the whole sequence of operation should be carried out smoothly and without snatch. Properly designed hooks and adequate stead ropes are essential. The hooks should be of suitable shape, to ensure positive engagement when entered into the ends of the pipes and then should pass over any protective packing fitted around the pipe ends.

The use of slings passed around bundles of pipes is not recommended because bundles become unstable as the sling is drawn tight or released. However, when it is necessary to use the central slinging method for lifting single pipe, a board webbing sling is recommended which minimizes the risk of the pipe slipping. Chain slings may slip and are dangerous.

- 7.4 Stacking** - Pipes being taken to a stock ground for storage and held pending further distribution should be arranged into stacks. The first layer of pipes should be laid on a firm foundation level on the ground. Subsequent layers should be placed according to the method of stacking adopted. Care should be taken so that the pipes do not rest on their sockets. The height of any stack should not exceed 2 m.

- 7.5 Stringing** - Stringing consists of placing pipes on the ground in line ready for laying. Care should be taken to prevent damage during this operation.

## **8 Hydraulic Testing**

- 8.1** After a new pipe line is laid and jointed, testing shall be done for:

- a) Mechanical soundness and leak tightness of pipes and fittings;
- b) leak tightness of joints; and
- c) Soundness of any construction work in particular that of the anchorages.

**8.2 Hydrostatic Testing** - The completed pipe line may be tested either in one length or in sections. The length of section depending upon :

- 1) availability of suitable water,
- 2) number of joints to be inspected, and
- 3) difference in elevation between one part of the pipeline and another.

Where the joints are left uncovered until after testing, sufficient material should be back filled over the center of each pipe to prevent movement under the test pressure.

It is prudent to begin testing in comparatively short length of test section. Progressively as experience is gained, lengths of about 1.0 km or more, are tested in one section, subject to consideration of length of trench which can be left open in particular circumstances.

Each section should be properly sealed off, preferably with special stop ends secured by adequate temporary anchors. The thrust on the stop ends should be calculated and the anchors designed to resist it. All permanent anchors should be in position and, if of concrete, should have developed adequate strength before testing begins. The section under test should be filled with water, taking care that all the air is displaced either through vents at the high points or by using a pig or a sphere.

### 8.3

- A test shall not be more than 1000m. initially on straight or curved line.
- All air shall be expelled from the test segment by making air vents at the highest point of test section and or both of testing segment.
- The first part of the testing shall be stabilize the section at a lower pressure of 1-2 kg/sq. cm at the highest point for adoration of at least 4 hours. On satisfactory completion of this joints shall be tested against leakage by increasing the test pressure to 5.50 Kg/Cm<sup>2</sup> and holding it for 15 minutes.
- If the pressure drop is less than 0.2 kg/sq. cm. over this period, the test shall be deemed satisfactory.
- For the purpose of the test, either power-driven or manual reciprocating pumps shall be used with clean water. The contractor has to arrange water for testing.
- The pressure gauges shall be in good condition and of suitable ranges and least count of at least 0.2 kg/cm<sup>2</sup>.
- The air vent holes shall be properly plugged and sealed with coupling/nut on completion of the test. The suitable water sealing chemical shall be used in case of any leakage.

- At the end of testing section temporary concrete thrust block shall be casted of sufficient size and strength to resist the testing pressure. The cost of such thrust block, jacks, wedge etc are inclusive in the rate.

A pipe segment once tested shall not be used as a support to anchor the end blocks used for testing the next segment.

The length of this period of time depends on many factors such as slight movement of the pipeline under pressure whether air is trapped in the pipeline has concrete lining which absorbs water.

The pipeline is then pressurized up to the full test pressure and the section under test completely closed off. The test should be maintained for a period of not less than 15 minutes to reveal any defects in the pipes, joints or anchorages.

The test pressure should be measured at the lowest point of the section under test or alternatively, an allowance should be made for the static head between the lowest point and the point of measurement , to ensure that the required test pressure is not exceeded at the lowest point.

For the test section required end cap at both the end for testing purpose shall be arranged by the contractor at his own cost. It includes jointing & removing after testing, including all cost of jointing materials & labour etc comp.

- 8.4** If the test is not satisfactory the fault should be found and rectified. Where there is difficulty in locating a fault, the section under test should be sub divided and each part tested separately.

**Methods employed for finding leaks include :**

- a) Visual inspection of each joint if not covered by the backfill;
- b) Use of a bar probe to detect signs of water in the vicinity of joints, if backfilled;
- c) Aural inspection using a stethoscope or listening stick in contact with the pipeline;
- d) Use of electronic listening device which detects and amplifies the sound or vibration due to escaping of water, actual contact between the probe and the pipe is not essential.
- e) Injection of a dye into the test water particularly suitable in water logged ground.
- f) Introduction of nitrous oxide in solution into the test water and using an infra-red gas concentration indicator to detect the presence of any nitrous oxide that has escaped through the leak.

- 8.5** After all sections have been joined together on completion of section lasting a test on the complete pipe line should be carried out . This test should be carried out at a pressure not less than the maximum sustained operating pressure or the maximum static pressure of the pipeline and during the test , inspection made of all work which has not been subject to

section tests. During the test, the pressure at the lowest point in the pipeline should not exceed the maximum given Table 1.

- 8.6** It is important to ensure that proper arrangement are made for the disposal of water from the pipeline after completion of hydrostatic testing and that all consents which may be required from authorities have been obtained. In some cases, for example, heavily chlorinated water some treatment may be necessary before final disposal.

## **9 FLUSHING MAINS BEFORE COMMISSIONING**

- 9.1.1** The main intend of flushing the pipe line is to remove any foreign material before commissioning them for use.

After pressure testing the main, it should be flushed with water of sufficient velocity to remove all dirt and other foreign materials.

## **10 REMOVAL, RESTORATION AND MAINTENANCE OF PAVED FOOTPATHS, ETC, AFTER LAYING OF PIPE**

- 10.1** Allowable Removal of Pavement – Pavement and road surfaces may be removed as a part of the trench excavation , and the amount removed shall depend upon the width of trench specified for the installation of the pipe and the width and length of the pavement area required to be removed for the installation of gets valves, specials , manholes or other structures. The width of pavement removed along the normal trench for the installation of the pipe shall not exceed the width of the trench specified by more than 150 mm on each side of trench. The width and the lengths of the area of pavement removed from the installation of gate valves, specials, manholes or other structures should not exceed the maximum linear dimensions of such structures by more than 150 mm on each side, wherever, in the opinion of the authority, existing conditions make it necessary or advisable to remove additional pavement, it shall be removed as directed by the Engineer-in-charge.

### **10.2 Restoration of Damaged Surface and Property :**

Where any pavement, shrubbery, fences poles or other property and surface structures have been damaged, removed or disturbed during the course of work such property and surface structures shall be replaced or repaired after completion of work. All pavements, paved footpaths, curbing gutters, shrubbery fences, poles, sod or other property and surface structures removed or disturbed as a part of the work shall be restored to a condition equal to that before the work began, furnishing all labor and materials incidental there to, in restoring the pavement, sound stone blocks, sound bricks or asphalt paving blocks may be

re-used. No permanent pavement shall be restored unless and until, in the opinion of the authority, the condition of the back fill is such as to properly support the pavement.

- 10.3** Cleaning Up – All surplus materials, and all tools and temporary structures shall be removed from the site as directed by the authority. All dirt, rubbish and excess earth from the excavation shall be halved to a dump and the construction site left clean to the satisfaction of the engineer-in-charge.

The rate shall be per running meter including loading, unloading & transportation of pipe from store to site.

**Item No.11 : Cutting of H.S./M.S.OF pipe thickness up to 5to 10 mm.**

For connection with HS/MS pipe contractor has to cut the existing HS/MS pipe by necessary equipment like Gas cutting set, cutter etc. complete as per instruction of the engineer-in-charge.

Rate shall be paid per cm.

**Item No.12 : Welding of HS/MS pipe**

Welding of HS/MS pipe in all position with required number runs from M.S. pipes internally and/or externally including gauging wherever necessary, fixing appurtenances and other accessories in connection with pipe laying work as per specification. Butt joint plate thickness 5 mm to 8 mm.

For the connection of proposed line with existing HS/MS line contractor has to provide all equipments like D.G. set, cable holder, rod etc. complete and has to weld the joint as required on site as per the instruction of engineer-in-charge.

Rate shall be paid per cm

**Item no. 13 Dewatering**

Dewatering by pumping set of required capacity including temporary platform carting pumping at site and fixing same in position including all accessories and fuel, labour, etc. complete as per instruction by engineer in charge.

Rate shall be paid per HP/hour.

**Item No.14 Hiring of D.G. Set.**

Hiring of Diesel Generator Set for welding of M.S. pipe at site with transportation.

Rate shall be paid per day(8 hours)

**Item No. 15 : Back filling:**

Refilling the pipe line trenches incl. ramming, watering, consolidation, disposal of surplus stuff as directed within radius of 3 km. After the pipe line is laid, jointed and tested and proved to be water tight the trenches shall be refilled in the manner described below:

The first foot of filling material immediately above and around every pipe shall consist of finest selected earth been protected in the manner described above. After the first foot of material has been placed in position the remainder of the material is to be filled up to 9" below surrounding ground level at a time and sufficient water i.e. min. 150 lit./m<sup>3</sup> of excavation shall be used and flooded the trench in addition to aid consolidation of filling material. After this having been done, the trenches or the excavation shall be left for one day to allow consolidation and on the next day it should be restored to its original condition and opened to use. Contractors have to produce evidence for using water for consolidation. After trenches having been filled to their original surface all surplus material shall be removed by contractor. Some of the earth may be kept for use to restore and subsequent settlements but it shall be stacked properly and protected at convenient points so as not to cause any interference to traffic or nuisance to the public. Before the final bill is paid, the contractor shall make good promptly at his expense any settlement that have occurred even in the vicinity of excavation. He shall also repair and set right at his own expense any damage caused to property and such works shall be carried out to the full satisfaction in all respects of the owner thereof.

**Restoration of Surfaces**

All berms and other paved surfaces shall be restored in as good condition as before disturbance or the execution of work and any deficiency in the filling material resulting from theft or any other case what so ever shall be made good by the contractor at his own cost.

In case of roads the operation may be done in the two portions to facilitate the traffic.

The rate shall be per Cu. Mtr.

**Item 16 Providing & laying compacted machine crushed black stone aggregates 250mm thick wet mix macadam in two layers / thickness suggested by engineer incharge** in the material with water to OMC in mechanically mix (pug mill) carriage of mix material tipper to site laying, spreading and compacting in sub base, base course on well prepared under base of compacting power vibrater roller to achive the desired density (mechanically laid). Rate shall be paid per cu.meter.

**આયટમ નંબર :૧૬ : સબગ્રેડ પર રોલીંગ વોટરીંગ કરી મેટલ સોલીંગ કરવાનું કામ(૧૧સે.મી લેયર કોમ્પેક્ટેડ):**

(અ) મેટલ સોલીંગ:-

૧. મેટલ સોલીંગ કરતા પહેલા સબગ્રેડ લાઇન લેવલ તથા કેમ્બરની કરે આઇ.એસ ૨૭૨૦ (પાર્ટ -૮)

- ના ધોરણો જળવાય તે મુજબ રોલીંગ/ વોટરીંગ કામગીરી કરી સબગ્રેડ અત્રેથી ચેક કરાવવાની રહેશે ત્યારબાદ સ્થળ પર સપ્લાય કપચા/ મેટલ સબગ્રેડ ઉપર મટીરીયલ સ્પેશીફિકેશન પાર્ટ –A ના આ.નં ૬ (A) પ્રમાણે સુચિત જાડાઈ, સાઈઝ તથા જથ્થામાં પ્રથમ ૧૧ સે.મી કોમ્પક્ટેડ જાડાઈમાં કપચા પાથરવાના રહેશે.
૨. કપચા ગોઠવ્યા બાદ જે પોલાણ રહે તે તોડેલો કપચો (ટુકડા) થી પુરી ફીટોફીટ કરવાનું રહેશે. બાકી રહેલા નાના છિદ્રો (પોલાણ) અત્રેથી સુચવેલ મટીરીયલ (રેતી) થી ભરવાના રહેશે. જેનો જથ્થો મટીરીયલ સ્પેશીફિકેશન પાર્ટ –A ના આ.નં ૬ (B) માં દર્શાવેલ જથ્થા મુજબ રહેશે.
૩. ત્યારબાદ અગાઉ દર્શાવેલ આ.નં ૪ માં જણાવ્યા મુજબ આઈ.એસ ૨૭૨૦ (પાર્ટ –C) ના ધોરણો જળવાય તે પ્રમાણે રોલીંગ/ વોટરીંગ સંતોષપૂર્વક કરી આપવાનું રહેશે.
૪. રોલીંગ/ વોટરીંગ સંતોષપૂર્વક કરી આપવાનું રહેશે.

## Item No. 20: Wet mix macadam sub-base/base

### Scope

This Work shall consist of laying and compacting clean crushed, waded aggregate mid granular material, premixed with water, to a dense mass on a prepared sub grade/sub base / base or existing pavement as the case may be in accordance with the requirements of these Specifications. The material shall be laid in one or more lairs as necessary to lines, grades and cross –sections shown on the approved drawings or as directed by the Engineer.

The thickness of a single compacted Wet Mix Macadam layer shall not be less than 75 mm. When vibrating or other approved types of compacting equipment are used, the compacted depth of a single layer of the sub-base course may be increased to 200 mm upon approval of the Engineer.

### 406.2. Materials

#### 406.2.1. Aggregates

**406.2.1.1.** Physical requirements : Coarse aggregates shall be crushed stone. I crushed stone. If crushed gravel/single is used, not less than 90 per cent by weight of the gravel/shingle pieces retained on 4.75 mm sieve shall have at least two fractured faces. The aggregates shall conform to the physical requirements set forth in Table 400 – 10 below.

**Table 400-10 Physical represents of cease aggregates for wet mix macadam for sub – base / base courses**

Test	Test Method	Requirements
1. *Loss Angeles Abrasion value or * Aggregate Impact value	IS 2386 (Part-4) IS:2386 (Part -4) or	40 per cent (Max) 30 per cent (Max.)
2. Championed Flakiness and Elongation indices (Total)	IS:5640 IS : 2386 (Par – I)	30 per cent (Max)**

\* Aggregate may satisfy requiremorits of either of the two tests.

\*\* To determine this combined proportion, the flaky stone from a representative sample should first be separated out. Flakiness index is weight of flaky stone metal divided by weight of stone sample. Only the elongated particles be separated out from the remaining (non flaky) stone metal. Elongation index is weight of elongated particles divided by total non-flaky particles. The value of flakiness index and elongation index so found are added up.

If the water absorption value of the coarse aggregate is greater than 2 per cent, the soundness test shall be carried out on the material delivered to site as per IS: 2386 (Part-5). **406.2.1.2. Grading requirements:** The aggregates shall conform to the grading given in Table 400-11,

**TABLE 400-11. GRADING REQUIREMENTS OF AGGREGATES FOR WET MIX MACADAM**

IS Sieve Designation	Per cent by weight passing the IS sieve
53.00 mm	100
45.00 mm	95-100
26.50 mm	—
22.40 mm	60-80
11.20 mm	40-60
4.75 mm	25-40
2.36 mm	15-30
600.00 micron	8-22
75.00 micron	0-8

Materials finer than 425 micron shall have Plasticity Index (PI) not exceeding 6.

The final gradation approved within these limits shall be well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve or vice versa.

### **406.3. Construction Operations**

**406.3.1. Preparation of base :** Clause 404.3.1. shall apply.

**406.3.2. Provision of lateral confinement of aggregates :** While constructing wet mix macadam, arrangement shall be made for the lateral confinement of wet mix. This shall be done by laying materials in adjoining shoulders along with that of wet mix macadam layer and following the sequence of operations described in Clause 407.4.1.

**406.3.3. Preparation of mix:** Wet Mix Macadam shall be prepared in an approved mixing plant of suitable capacity having provision for controlled addition of water and forced/positive mixing arrangement like pummel or pan type mixer of concrete batching plant. For small quantity of wet mix work, the Engineer may permit the mixing to be done in Concrete mixers.

Optimum moisture for mixing shall be determined in accordance with IS:2720 (Part-8) after replacing the aggregate fraction retained on 22.4 mm sieve with material of 4.75 mm to 22.4 mm size. While adding water, due allowance should be made for evaporation losses, However, at



the time of compaction, water in the wet mix should not vary from the optimum value by more than agreed limits, The mixed material should be uniformly wet and no segregation should be permitted.

**406.3.4. Spreading of mix :** Immediately after mixing the aggregates shall be spread uniformly and evenly upon the prepared subgrade/sub- base/base in required quantities In no case should these be dumped in heaps directly on the area where these are to be laid nor shall their hauling over a partly completed stretch be permitted,

The mix may be spread either by a paver finisher or motor grader. For portions where mechanical means cannot be used, manual means as approved by the Engineer shall be used, The motor grader shall be capable of spreading the material uniformly all over the surface, Its blade shall have hydraulic control suitable for initial adjustments and maintaining the same so as to achieve the specified slope and grade.

**The paver finisher shall be self-propelled having the following features**

- i. Loading hoppers and suitable distribution mechanism
- ii. The screed shall have tamping and vibrating arrangement for initial compaction to the layer as it is spread without rutting or otherwise marring the surface profile
- iii. The paver shall be equipped with necessary control mechanism so as to ensure that the finished surface is free from surface blemishes,

The surface of the aggregate shall be carefully checked with templates and all high or low spots remedied by removing or adding aggregate as may be required. The layer may be tested by depth blocks during construction. No segregation of larger and fine particles should be allowed. The aggregates as spread Should be of uniform gradation with no pockets of fine materials.

**406.3.5. Compaction:** After the mix has been laid to the required thickness, grade and cross fall/camber the same shall be uniformly compacted, to the full depth with suitable roller. If the thickness of single compacted layer does not exceed 100 mm, a smooth wheel roller of 80 to 100 kN weight may be used. For a compacted single layer upto 200 mm, the compaction shall be done with the help of vibratory roller of minimum static weight of 80 to 100 kN or equivalent capacity roller. The speed of the roller shall not exceed 5 km/h,

In portions having unidirectional cross fall/super elevation, rolling shall commence from the lower edge and progress gradually towards the upper edge. Thereafter, roller should progress parallel to the centre line of the road, uniformly over-lapping each preceding track by at least one third width until the entire surface has been rolled. Alternate trips of the roller shall be terminated in stops at least 1 m away from any preceding stop.

In portions in camber, rolling should begin at the edge with the roller running forward and backward until the edges have been firmly compacted. The roller shall then progress gradually towards the centre parallel to the centre line of the road uniformly overlapping each of the preceding track by at least one-third width until the entire surface has been rolled.

Any displacing occurring as a result of reversing of the direction of a roller or from any other cause shall be corrected at once as specified and/or removed and made good.

Along forms, kerbs, walls or other places not accessible to the roller, the mixture shall be thoroughly compacted with mechanical tampers or a plate compactor. Skin patching of an area without scarifying the surface to permit proper bonding of the added material shall not be permitted.

Rolling should not be done when the subgrade is soft or yielding or when it causes a wave-like motion in the sub-base/base course or subgrade. If irregularities develop during rolling which exceed 12 mm when tested with a 3 meter straight edge, the surface should be loosened and premixed material added or removed as required before rolling again so as to achieve a uniform surface conforming to the desired grade and cross fall. In no case should the use of unmixed material be permitted to make up the depressions.

Rolling shall be continued till the density achieved is at least 98 per cent of the maximum dry density for the material as determined by the method outlined in IS: 2720 (Part..8)

After completion, the surface of any finished layer shall be well- closed, free from movement under compaction equipment or any compaction planes, ridges, cracks and loose material. All loose, segregated or otherwise defective areas shall be made good to the full thickness of the layer and recomputed.

**V 406.3.6. Setting and drying:** After final compaction of wet mix macadam course, the road shall be allowed to dry for 24 hours.

#### **406.4. Opening to Traffic**

Preferably no vehicular traffic of any kind should be allowed on the finished wet mix macadam surface till it has dried and the wearing course laid.

#### **406.5. Surface Finish and Quality Control of Work**

**406.5.1. Surface evenness :** The surface finish of construction shall conform to the requirements of Clause 902.

**406.5 .2. Quality control :** Control on the quality of materials and works shall be exercised by the Engineer in accordance with Section 900.

#### **406.6. Rectification of Surface Irregularity**

Where the surface irregularity of the wet mix macadam course exceeds the permissible tolerances or where the course is otherwise defective due to subgrade soil getting mixed with the aggregates, the full thickness of the layer shall be scarified over the affected area, reshaped with added premixed material or removed and replaced with fresh premixed material as applicable and recomputed in accordance with Clause 406.3. The area treated in the aforesaid manner shall not be less than 5 m long and 2 m wide. In no case shall depressions be filled up with unmixed and ungraded material or fines.

#### **406.7, Arrangement for Traffic**

During the period of construction, arrangement of traffic shall be done as per Clause 112.

#### 406.8 Measurements for payment

Wet mix macadam shall be measured as finished work in position in cubic meters.

#### 406.9 Rates

The contract unit rate for wet mix macadam shall be payment in full for carrying out the required operations including full compensation for all components listed in clause 401.8

Testing Frequency :-

Sr.no.	Test	Frequency(Minimum)
1	Aggregate impact value	One test per 200m <sup>3</sup> of aggregate
2	Grading	One test per 100 m <sup>3</sup> of aggregate
3	Flakiness and elongation index	One test per 200 m <sup>3</sup> of aggregate
4	Atterberg limits of portion of aggregate passing 425 micron sieve	One test per 100 m <sup>3</sup> of aggregate
5	Density of compacted layer	One test per 500 sqmt.

This item should be carrying out as per the specifications of Morth (latest revision).

**આયટમ નંબર : ૧૬ : માટી પુરાણ કામ (એમ.ઓ.આર.ટી.એચ/સપ્ટેમ્બર-૨૦૦૪, ટેબલ ૩૦૦-૧ તથા સેક્શન ૩૦૫ મુજબ)**

૧. પુરાણ કરતા પહેલા સ્થળે ઉગી નીકળેલુ ઘાસ છોડ વિગેરે કાઢી સાઇટ ચોખ્ખી કરવાની રહેશે. અત્રેથી સુચવ્યા મુજબ બહારથી નીચે દર્શાવેલ ગુણવત્તાવાળી માટી લાવી ખાતરી કરાવી બતાવવામાં આવે તે પ્રમાણે રસ્તાની ધારો વિગેરેમાં લાઇન લેવલ તથા કેમ્બરમાં પુરાણ કરવાનું રહેશે.

#### As Per Morth Table No. 300.1

Sr. No	Type work	Max.lab.Dry.Unit weight when tested as per IS:2720 (part 8)
1	Embankments up to 3 meter height not subjected flooding	Not less than 15.2 Kn/cu.m
2	Embankments exceeding 3 meter height or Embankments of any height subject to long period of inundation	Not less than 16.0 Kn/cu.m
3	Sub grade ad earthen shoulder/verges/backfill	Not less than 17.5 Kn/cu.m

૨. પુરાણની જાડાઈ વધુમાં ૧૫ સે.મી ના થરમાં રહેશે તથા આ.નં ૪ (ખોદાણ/ કામનુ રોલીંગ/ વોટરીંગ) મુજબ દરેક ૧૫ સે.મી જાડાઈમાં લેયર માટે રોલીંગ વોટરીંગ કરવાનું રહેશે.
૩. બીજા ઘરનું પુરાણ કરતા પહેલા ઇજારદારે જરૂરી રોલીંગ વોટરીંગની કામગીરી આઇ.એસ.૨૭૨૦ (પાર્ટ ૮) ના ધોરણ જળવાય તે પ્રમાણે સંતોષકારક રીતે પુરી કરવાની રહેશે.
૪. માટી પુરાણમાં ઢેફા હશે તો ભાંગીને સરખા કરી પુરાણ કરવાનું રહેશે. અથવા થયેલા કામ બાદ વધારાના પુરાણ કરવાનું હોય તો સંજોગોવસાત ઉગી નીકળેલું ઘાસ, છોડ વિગેરે ઇજારદારે દૂર કરવાનું રહેશે. અને તે માટે અલગ ચુકવણુ આપવામાં આવશે નહીં.
૫. સદર કામનું માપ ઘનમીટર ધોરણે અથવા લેવલથી આપવામાં આવશે.

**આયટમ નંબર : ૧૬ : મેટલ ગ્રાઉટીંગ કરવાનું કામ (૧૦ સે.મી લેયર કોમ્પેક્ટેડ) (ડામર સાથે) :**

**મેટલ ગ્રાઉટીંગ કરવાનું કામ : (એમ.ઓ.આર.ટી.એચ/સપ્ટેમ્બર -૨૦૦૪ સેક્શન ૫૦૦ કલોઝ નં ૫૦૬ મુજબ)**

૧. ગ્રાઉટીંગ કરતા પહેલાં ૧૫/૧૧/૧૭.૫ સે.મી કોમ્પેક્ટેડ જાડાઈનું સોલીંગ લાઇન લેવલ તથા કેમ્બરમાં કરી અત્રેથી ચેક કરાવવાનું રહેશે.
૨. ઇજારદારે પોતાના રોલરથી રોલીંગ પુરતા પ્રમાણમાં કરાવ્યા બાદ લાવેલ VG -૩૦ ગ્રેડ ડામર ૧૬૦ ડીગ્રી સેન્ટીગ્રેડ થી ૧૭૦ ડીગ્રી સેન્ટીગ્રેડ , ઉષ્ણાતામાન સુધી ગરમ કરી અત્રેની સુચના મુજબ ૦.૫ કીલો/ ચો.મી ના દરે વ્યવસ્થિત રીતે સરખા પ્રમાણમાં વપરાય તે પ્રમાણે છાંટી ટેક કોટ કરી આપવાનો રહેશે.
૩. ત્યારબાદ ઇજારદારે પ્રથમ લેઅર માટે ૫૩ થી ૨૨.૪ મી.મી સાઇઝના મશીનકટ મેટલ કોમ્પેક્ટેડ ૫૦ મી.મી જાડાઈમાં મટીરીયલ સ્પેશીફિકેશન પાર્ટ –(A) ના આ.નં ૬ (A) પ્રમાણે સુચિત જથ્થામાં પાથરી ૮ થી ૧૦ ટન વજન રોલરથી આઇ.એસ. ૨૭૨૦ પ્રમાણે સંતોષપૂર્વક રોલીંગ કરી આપવાનું રહેશે.
૪. ગ્રાઉટીંગ કરતા પહેલાં મેટલ ઉપરની ધુળ, ડસ્ટ , માટી વિગેરે સાફ કરી રોલીંગ કરવાનું રહેશે.
૫. ત્યારબાદ સ્વખર્ચે લાવવા VG -૩૦ ગ્રેડ ડામર ને ૧૬૦ ડીગ્રી થી ૧૭૦ ડીગ્રી સે. સુધીના ઉષ્ણાતામાન ને ગરમ કરી ૧.૫ કીલો/ ચો.મી ના એક્સરખા દરે છાંટવાનો રહેશે.
૬. ત્યારબાદ ઇજારદારે બીજા લેઅર માટે ૫૩ થી ૨૨.૪ મી.મી સાઇઝના મશીનકટ મેટલ કોમ્પેક્ટેડ ૫૦ મી.મી જાડાઈમાં મટીરીયલ સ્પેશીફિકેશન પાર્ટ –(A) ના આ.નં ૬ (A) પ્રમાણે સુચિત જથ્થામાં પાથરી ૮ થી ૧૦ ટન વજન રોલરથી આઇ.એસ. ૨૭૨૦ (પાર્ટ -C) ના ધોરણો જળવાય તે પ્રમાણે સંતોષપૂર્વક રોલીંગ કરી આપવાનું રહેશે.
૭. ત્યારબાદ સ્વખર્ચે લાવવા VG -૩૦ ગ્રેડ ડામર ને ૧૬૦ ડીગ્રી થી ૧૭૦ ડીગ્રી સે. ઉષ્ણાતામાન ને ગરમ કરી ૧.૫૦ કીલો/ ચો.મી ના એક્સરખા દરે છાંટવાનો રહેશે.
૮. ત્યારબાદ મટીરીયલ સ્પેશીફિકેશન પાર્ટ – (A) ના આ.નં ૪ મુજબની ગ્રીટ ૧.૩૦ ઘ.મી/૧૦૦.ચો.મીના એક્સરખા દરે છાંટી /ફરકાવી મેટલની સપાટી છાંટી ૮ થી ૧૦ ટન વજન રોલરથી સંતોષપૂર્વક રોલીંગ કરી જરૂરી બ્રશીંગ કરી આપવાનું રહેશે. ઉપરાંત બાકી રહેલ છીદ્રો બ્રીશીંગ/ ગ્રાઉટીંગ થી સંતોષપૂર્વક પુરવાના રહેશે.
૯. સદર કામનું માપ ચોરસ મીટરમાં આપવામાં આવશે.
૧૦. આ આયટમ ડામર સાથેની છે.

**આયટમ નંબર ૧૨:- GSB મટીરીયલ સ્થળ પર લાવી લાઇન લેવલ કેમ્બરમાં પાથરી આપવાના કામના**

**સ્પેશીફિકેશન:-**

ગ્રેન્યુઅલ સબ બેઝમટીરીય બરકાલ લીઝમાંથી લાવવાનું રહેશે જેની CBR Value ૩૦ થી ઓછી હોવી ન જોઈએ. GSB મટીરીયલ અત્રેની સુચના મુજબ લાઇન લેવલ તથા કેમ્બરમાં પાથરી આપવાનું રહેશે. જેનું ગ્રેડીંગ નીચે મુજબનું રહેશે.

Grading for Coarse Graded Granular Sub- Base Material ( As per Most -2001 Table 400-2)

IS Sieve Designation (M.M)	Percent by weight Passing the IS Sieve (G-1)
૭૫	૧૦૦
૫૩	-
૨૬.૫	૫૫-૭૫
૯.૫	
૪.૭૫	૧૦-૩૦
૨.૩૬	
૦.૪૨૫	
૦.૦૭૫	<૧૦

GSB મટીરીયલ અત્રેથી પાસ કરાવીને જ વાપરવાનું રહેશે.

GSB મટીરીયલનું અત્રેથી સુચવ્યા મુજબ ટેસ્ટીંગ કરાવી આપવાનું રહેશે.

GSB મટીરીયલ પર જરૂરી રોલીંગવોટરીંગ કરી આપવાના કામનું સ્પેશીફિકેશન:

GSB મટીરીયલ પર અત્રેથી સુચવ્યા મુજબ વોટરીંગ કરી ૮-૧૦ ટન વજનના વાઇબ્રેટર રોલરથી રોલીંગ કરી આપવાનું રહેશે.

સામાન્ય સંજોગોમાં એક પાસમાં ૧૦૦ મીટરથી વધુ લંબાઈ ન થાય તે રીતે રોલીંગ કરવાનું રહેશે.

સદર કામમાં ઇજારદારે પોતાના ખર્ચે પાણી છંટકાવ કરવાનો તથા રોલીંગ કરવાના કામનો સમાવેશ થાય છે.

સદર કામનું માપ ઘન મીટરના ધોરણે આપવાનું રહેશે.

આયટમ નં ૨૪: ડ્રાય રોડા લાવી, પાથરી, વોટરીંગ, રેમીંગ કોન્સોલીડેશન કરી આપવાનું કામ :

મટીરીયલ :-

૧. રોડા સારી પકવેલી લાલ કલરની ઇંટોના ડસ્ટ વગરના લાવવાના રહેશે. જો રોડા સારી ગુણવત્તાના ન મળે તો ઇજનેર ઇન ચાર્જ મશીન કટ મેટલ ૫૩ મી.મી થી ૨૨.૪ મી.મી નો ઉપયોગ કરવા સુચના આપી શકશે. આ માટે કોઇ ભાવ ફેરફાર આપવાનો રહેશે નહીં.

મજૂરી કામ :-

૧. રોડા ૪૦ થી ૫૦ મી.મી સાઇઝના ક્યુબીકલ આકારના સુચના મુજબ જાડાઇમાં પાથરવાના રહેશે. ત્યારબાદ જરૂરી કોમ્પેક્શન કરવાનું રહેશે.
૨. જુના બિલ્ડીંગના તુટેલા જુના રોડા ચલાવવામાં આવાશે નહીં.
૩. • કામગીરી દરમિયાન જરૂરીયાત મુજબ ના જ ટ્રાફિકને તેમજ અવર-જવરમાં નડતરરૂપ ન થાય તે રીતે ઉતારવાના રહેશે.
૪. સુચના મુજબની જાડાઇમાં ડ્રાયરોડા ક્યુબીકલ આકારના પાથરી આપવાના રહેશે
૫. ડ્રાયરોડા પાથર્યા બાદ કોમ્પેક્શન માટે જરૂરી વોટરીંગ, કુંબો મારી પુરતુ કોમ્પેક્શન કમ્પલીટ કરી આપવાનું રહેશે. જ્યાં સર્વિસ ટ્રેકની પહોળાઇ પુરતી હોય કે મશીનકટ મેટલ ×૦ઉપયોગ લેવામાં આવેલ હોય ત્યારે રોલરથી કોમ્પેક્શન કરવાનું રહેશે

આયટમ નં ૨૬: ૫૦ એમ.એમ.જાડાઈના ઇન્ટરલોકીંગ રબર મોલડેડ કલર પેવર બ્લોક લાવી બેસાડવાનું કામ મટીરીયલ :-

૧. ઇન્ટરલોકીંગ કલર પેવર બ્લોક આઇ.એસ.મુજબ ખાતાની જરૂરીયાત મુજબ ૫૦.૦ મી.મી જાડાઈના M25 ગ્રેડના ડીઝાઇનના બનાવવાના રહેશે. જેની કોમ્પ્રેશીવ સ્ટ્રેન્થ નીચે જણાવ્યા મુજબની રહેશે. (AS PER DOC: CED5(6064)/November 2003 of Bureau of Indian Standards

**Compressive strength requirements of concrete paver blocks.**

**(Clauses 6.2.5.2 and 9.1.4 of Ref. Doc.)**

Sr.NO.	Grade of Paver Block	Minimum Average 28 days Compressive Strength (N/mm <sup>2</sup> )	Minimum Compressive Strength of Individual Paver Block (N/mm <sup>2</sup> )
i	M-25	25	21
ii	M-30	30	26
iii	M-35	35	30
iv	M-40	40	34
v	M-45	45	38
vi	M-50	50	43
vii	M-55	55	47

૨. ઇન્ટર લોકીંગ કલર પેવર બ્લોક માં તુટેલી ધારો વગરના સ્મુથ સરફેસ તેમજ ફીનીશીંગવાળા રહે તે મુજબના બનાવવાના રહેશે.

૩. ઇન્ટર લોકીંગ કલર પેવર બ્લોક અત્રેની સુચના મુજબના કલરના બનાવવાના રહેશે.

૪. કલર પેવર બ્લોક માં એક જ કલરના જથ્થામાં કલર અલગ અલગ ન આવે તે મુજબની કાળજી રાખવાની રહેશે.

૫. ઇન્ટર લોકીંગ પેવર બ્લોક એક જ ડીઝાઇનમાં એક સરખી ડીઝાઇનમાં એકસરખી સાઇઝના જ બનાવવાના રહેશે.

૬. ઇન્ટર લોકીંગ પેવર બ્લોક આઇ.એસ. પ્રમાણેના સ્પેશીફિકેશન મુજબ બનાવવાના રહેશે. જરૂર પડે સરકાર માન્ય/સંસ્થા સરકારી સંસ્થામાં અથવા વડોદરા મહાનગરપાલિકા દ્વારા સુચવવામાં આવે તેવી લેબોરેટરીમાં કચુબ તથા ઇન્ટર લોકીંગ પેવર બ્લોક ટેસ્ટ કરી આપવાના રહેશે. ટેસ્ટીંગનું ચુકવણુ ઇજારદારે કરવાનું રહેશે.

૭. ટેસ્ટીંગની કાર્યવાહી દર ૨૫૦૦૦ નંગ પેવર બ્લોક ૧ ટેસ્ટ (૩ નંગ) પ્રમાણે કરવાની રહેશે. (AS PER DOC: CED5(6064)/November 2003 of Bureau of Indian Standards. Clause 8.2 & 8.5)

**મજૂરી કામ**

૧. ઇન્ટર લોકીંગ પેવર બ્લોક સ્થળ ઉપર અત્રે જાણ કરી ઉતારવાના રહેશે.

૨. પેવર બ્લોક ટ્રાફિકને તેમજ અવર- જવરમાં નડતરરૂપ ન થાય તે રીતે કામના સ્થળે ઉતારવાના રહેશે.

૩. સર્વિસ ટ્રેક માટેના ૫૦ એમ.એમ.જાડાઈના પેવર બ્લોક માટે ૫૦ એમ.એમ.જાડાઈની રેતીની ગાદી કરવાની રહેશે. પેવર બ્લોક ની વચ્ચેના સાંધા યાળેલી રેતીથી કરવાની રહેશે.

૪. ઇન્ટર લોકીંગ પેવર બ્લોક બેસાડ્યા બાદ આજુબાજુની જગ્યામાં કર્બીંગ / ધારો વિગેરે તરફના સાંધા M૨૦ ગ્રેડ કોક્રીટમાં ભરી દેવાના રહેશે.

5. ઇન્ટર લોકીંગ પેવર બ્લોક થી પેવીંગ કર્યા બાદ બેસી જવા ન જોઈએ. કોઈ પણ સંજોગોમાં પેવર બ્લોક બેસી જશે તો તેને ઇજારદારે પોતાના ખર્ચે ફરીથી લાઇન લેવલમાં બેસાડી આપવાના રહેશે તુટેલા બ્લોક પોતાના ખર્ચે લાવવાના રહેશે.
6. પેવર બ્લોક બેસાડ્યા બાદ વાયબ્રેટીંગ મીકેનિકલ કોમ્પેક્ટર મશીન ફેરવવાનું રહેશે. તુટેલા , ખરાબ થયેલા પેવર બ્લોક બદલી આપવાના રહેશે.
7. વાયબ્રેટીંગ મીકેનિકલ કોમ્પેક્ટર મશીન માટે જરૂરી ઇલેક્ટ્રીક સપ્લાય/ જનરેટરની વ્યવસ્થા ઇજારદારે સ્વખર્ચે કરવાની રહેશે.
8. શરતોમાં જણાવ્યા પ્રમાણે પરફોમન્સ બેંક ગેરંટીની વ્યવસ્થા કરવાની રહેશે .

## **PART-B**

### **Item No. 1(a) : Providing & Supplying D.I. Flanged /Socket & Spigot Specials :**

Providing & Supplying at store or site of work D.I. Flange, Socket & Spigot specials like bends, tees, reducers, caps etc. as per I.S. 9523 class A, series K-12 with ISI mark suitable for push on joint or mechanical joint.

The rate inclusive of all taxes, loading, unloading, carting, stacking, insurance, inspection charge, octroi, weighing etc. complete with internal cement mortar lining.

The rate shall be per Kilogram basis as per actual weight. The contractor shall produce weight slip for each specials..

### **(b) Supply of DI Tail Pieces**

Providing and supplying of DI Socket & Spigot tail pieces.

Providing & supplying at site of work D.I. Flange socket & Spigot tail pieces as per IS 9523 class-A series K-12 and with ISI mark along with test certificates suitable for push on joint or mechanical joint, incl. of all taxes loading, unloading, carting, stacking, insurance inspection charges, octroi etc. complete with internal cement mortar lining.

The rate shall be per kilogram weighing as per actual weight. The contractor shall produce weight slip of approved weighing balance for each special.

The rates shall be per kilogram weight basis.

### **Item No. 2 : (a)Providing and supplying of C.I. Specials :**

Supplying Flange / Spigot – Socket type specials of required dia, to suit the site conditions and as required on the site or store, specials viz; bends of any degree, tail piece, reducer, collars, cap, tees, puddles etc. C.I. fitting shall be as per IS 1538-1993 specifications and with ISI mark, along with test certificate. The rates shall include loading, unloading, carting, stacking, insurance, taxes, octroi, freight, weighing etc. complete.

The rate shall be per kilogram weighing as per actual weight. The contractor shall produce weight slip of approved weighing balance for each specials.

**(b) Supply of C.I. Tail pieces :**

The C.I. tail pieces shall be as per I.S. specification 1538/1993 and with ISI mark, along with test certificate. The rates shall include loading, unloading, stacking, insurance, taxes, octroi, freight etc. complete. Tail piece having flanged and spigot or socket ends.

The rates shall be per kilogram weight basis.

**Item No. – 3 Providing & Fitting of GI pipe**

Providing, supplying B class G.I. pipe & fitting and laying in trench of 1.0 mt. Depth as directed.

For connection transfer and for laying of GI pipe line, excavation shall be made of 0.50 mt in width & 1.0 mt in depth in straight line, laying the “B” class GI pipe and necessary fittings which shall be brought by the contractor at his own cost, cutting and threading it in the necessary length, coating with tar coat, warping of jute and recoating with tar coat and make sand filling around the pipe 6” X 6” making connection as directed.

After making the connection water is flowing or not shall be checked & verified and than refilling the trench with earth in layer of 9 inch necessary watering and ramming shall be done properly.

This item will payable only when it is necessary to shift or relay the existing pipeline in unavoidable site situation. The prior approval/ permission from Dy. Ex. Engineer is necessary for the work. This item will not payable for restoration or to repair existing pipeline damaged by contractor during excavation or laying work.

The rate shall be as per Rmt.

**Item 4 : Providing & Supplying Sluice valve :**

**“Specification for Ductile Iron Resilient Seated Sluice valves”**

(DN 80 mm to DN 600 mm)

**1.0 General** Features required for Sluice valves suitable to water work application for continuous operation up to 70 degree Celsius are as follows or otherwise the standard BS 5163/EN 1074-1&2

**Ductile Iron / Spheroidal Graphite (S.G.) Iron Double flanged resilient seated Sluice Valves** Full bore in accordance with BS 5163/EN 1074-1&2 of PN-10 /16 rated, with Body and Bonnet of Ductile Iron confirming to GGG-50/40 or IS 1865 Gr. (SG 500/7 or SG 400/15), Wedge of WRAS or DVGW approved EPDM rubber (approved for drinking water), Integral Wedge nut, Shaft of S.S. AISI 420, O rings of NBR. Body & Bonnet coated with electrostatically applied epoxy powder coating to DIN 30677-2 & GSK guidelines or equivalent to GSK Guideline. Blue colour RAL 5005/5017 with a coating thickness of 250



microns both inside & outside. Sluice valve shall be compatible for buried applications without valve chamber. Face-to-face dimensions as per BS 5163/EN558 and Flange drilling as per IS 1538. 100% tight shut-off. Manual operation by Hand wheel. Motorized operation by Electrical Actuator suitable for SCADA system.

## 2.0 Testing

All Sluice valves must undergo hydraulic testing to BS 5163/EN 1074-1&2

- Seat test 1.1 x PN rating
- Body test 1.5 x PN rating

## 3.0 Materials

Summary of materials used are as follows:

ITEM	COMPONENT	MATERIAL	GRADE	Standard
1	Body, Bonnet	Bonnet Ductile Iron	500-7 or 400-15	BS EN5163/ IS1865
2	Wedge core	Ductile Iron	500-7 or 400-15	BS EN5163/ IS1865
3	Wedge nut	Brass	CZ 132	BS 2872/4
4	Rubber (vulcanized on wedge)	EPDM	EUW 70	WRAS or DVGW Approved
5	Stem	Stainless steel	A276-420	EN 10088-1
6	Stem collar	Dezincif. res. Brass	CZ 132	BS 2872/4
7	Bonnet bolts	Stainless steel	A2	ISO 3506
8	Bonnet gasket	EPDM	EUW 70	WRAS or DVGW Approved
9	O-ring	NBR	-	-
10	Dust seal ring	NBR	-	-
11	Hand wheel	Grey cast iron	250	EN 1561
12	Actuator (Rotork/Auma)	Mfg. Std.	-	-

## 4.0 Markings and labelling

Valves shall have the following marking in raised letters: -

- a. The nominal size (i.e. DN)
- b. The nominal pressure designation (i.e. PN)

- c. The body material identification (i.e. GGG)
- d. The manufactures name/trademark
- e. Year of manufacturing
- f. Direction of closing markings (i.e. in cast direction arrow)
- g. Traceable serial number for each valve, - either as engraved tag plate or bar code labelling of aluminium or equivalent durable material.

### **5.0 Certification**

- a. Manufacture or supplier is requested to provide a copy of the certificate and testing report from recognized certification body.
- b. The Manufacture's quality system ISO 9001:2008 certified by authorized body and copy of certification submitted on request.
- c. Manufacture should give minimum 10 Years of Warranty. The rate shall be paid on number basis.

### **Item 6 D.I. Pipe K-7**

Providing and supplying D. I. K-7 grade pipes for following nominal bore diameter with internal cement mortar lining including the cost of EPDM rubber ring, all taxes, insurance, transportation, freight charges, octroi, inspection charges, loading, unloading etc.

The rate shall be as per Rmt.

### **Item 7 C.I. Pipe Class- LA**

Providing and supplying ISI mark C.I. S & S spun pipe for following nominal bore diameter with rubber gaskets of Class-LA including the cost of EPDM rubber ring, all taxes, insurance, transportation, freight charges, octroi, inspection charges, loading, unloading etc.

The rate shall be as per Rmt.

### **Item No. 8 M.S. Pipes & Specials :**

The M.S. specials shall be manufactured as per IS 3589-1991 & 7322-1985 from 8 mm thick M.S. Plate. Specials shall be coated with 2 coats of epoxy paint from inside & outside. The specials shall be fixed in position in the existing or new line and jointed with welding joint, lead joint and/or flange joint. The specials shall have either socket or flange end. The cost of the plate flange and required nut bolts, washers, rubber packing etc. is included in this item.

The rate shall be per Kilogram.

## **PART-C MDPE WATER CONNECTION**

### **➤ TECHNICAL SPECIFICATION for MDPE Pipes**

These specifications are for MDPE Blue PE 80 Pipes for House Service Connections of Dia 20 mm to 50 mm OD.

#### **Raw Material**

Raw material used to Manufacture MDPE Blue Pipes shall be Virgin Natural Resin PE 80 containing that anti – oxidants, UV Stabilizers & Pigments necessary for Manufacturing of pipes. The Density of Pipes shall be confirming to ISO 4427-2007 Standard. The PE 80 Resin shall have MRS of 8 Mpa.

#### **Effects on Water Quality:**

The MDPE PE 80 Blue Pipes shall confirm to clause 3.5 of ISO 4427 for conveyance of Water for Human Consumption. Also the pipes 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 & Flavor 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

#### **Pressure Rating:**

The Pressure rating of MDPE Blue PE 80 Pipes shall be confirming to Clause 4.1 of ISO 4427 : 1996.

#### **Colour of Pipes:**

The Colour of MDPE PE 80 Pipes shall be BLUE confirming to Clause 3.2 of ISO 4427 : 1996.

#### **Dimensions:**

The pipe dimensions shall be as per latest revisions of Clause 4.1 of ISO 4427 : 1996 and pipes shall be supplied in Coils of 100 mtrs. The internal diameter, wall thickness, length and other dimensions of pipes shall be as per relevant tables of ISO 4427:1996. Each pipe shall be of uniform thickness throughout its length.

The wall thickness of the PE 80 Pipes shall be as per the table given below:

Nominal Dia of MDPE Pipe (mm)	PR rating	Wall thickness	
		Minimum	Maximum
20	PN 16	2.3	2.8

25	PN 12.5	2.3	2.8
32	PN 12.5	3.0	3.5

The dimension tolerances shall be as per ISO 4427 clause 4.1.3

### **Performance requirements**

The Pipe supplied should have passed the acceptance test as per ISO 4427. The manufacturer should provide the test certificates for the following tests.

Melt Flow Rate

Density,

Oxidation and Induction test,

Hydrostatic Test ,

Pigment dispersion Test,

Longitudinal Reversion Test.

These tests should be performed in the in-house laboratory of the pipe manufacturer. The Employer will depute Third Party Inspection Agency to the pipe manufacturing facility of the manufacturer to inspect the pipes as per QAP approved by Engineer In charge. The cost for the inspection and tests shall be borne by bidder/operator.

### **• Compression Fittings :**

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

Material of Construction

Compression fittings material shall confirm to ISO14236.Clause -5.

A .Body-Polypropylene

Nut / Cap –Polypropylene.

Clip Ring-POM (Acetylic resin )

Packing bush- Polypropylene

“O” ring – NBR

Threaded metal inserts –SS 304 with BSP Threads

Pressure testing

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

Dimensions:

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

#### Performance requirements

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

Clause 8.2.1 -Leak tightness under internal pressure. Clause 8.2 -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.

#### **Effects on Quality of Water**

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

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.

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

#### **UPVC Ball Valves (Stop Cocks)**

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

Material of Construction:

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

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.

Specifications for Clamp Saddle For House Service Connections

General Specifications:

Clamp saddles for service connection from water distribution mains shall be of wrap around design, wide skirt and wide straps supports, 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 upto pipe size 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 thread 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" (M 16) 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 upto 10 bars

#### **Material and Design Specifications:**

Saddle Body: Non corrosive Engineering Plastic body molded 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 a contoured gasket to provide a positive initial seal which increases with increase in the line pressure. Gasket shall be a gridded mat, with tapered ends, with the outlet section having 'o' ring contacting the saddle body multiple o-rings contacting the pipe, preferably with a Stainless steel reinforcing ring insert molded to prevent expansion under pressure.

**Nut-Bolts –washer:** Stainless Steel Type 304, NC Rolled thread, Tightening torque for ½” (M12) nut –bolt: 14-15 Kg.m and for 5/8” (M16) nut-bolt : 21-23 Kg.m

#### **Technical Specifications For Electro fusion Fittings For MDPE Distribution Mains :-**

All the electro fusion fittings included in this document should be designed for use in water distribution systems and be manufactured/supplied by manufacturers having ISO 9001: 2000 certification for their quality systems. The products should comply with the following specific requirements.

The products shall comply with the requirements of BS EN 12201-3: 2003, BS EN 1555-3 or ISO 8085-3.

All the fittings shall be of SDR 11 rating.

The product group used for drinking water applications should have undergone type test by WRc- NSF, U.K according to BS 6920 in any of their Certified Laboratories like WRc – NSF/DVGW/KIWA/SPGN 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

All the products shall be manufactured by injection moulding using virgin compounded PE 80 (MDPE) polymer having a melt flow rate between 0.5 – 1.1 grams/10 minutes and shall be compatible for fusing on either PE 80 or PE 100 distribution mains manufactured



according to the relevant national or international standards. The polymer used should comply with the requirements of BS 3412 and/or BS EN 12201-1.

The fittings intended for water distribution applications shall be coloured blue for the clear identification of the services.

All the electro fusion products should be individually packed so that they can be used instantaneously at site without additional cleaning process. The protective packing should be transparent to allow easy identification of the fittings without opening the bags..

The electro fusion products should be with only a single heating coil to fully electrofuse the fitting to the adjoining pipe or pipe component as applicable. The heating coils shall be terminated at terminal pins of 4.0 or 4.7 mm diameter, protected with terminal shrouds. Each terminal shroud should be additionally protected with polyethylene shroud caps.

No heating element shall be exposed and all coils are to be integral part of the body of the fitting. The insertion of the heating element in the fitting should be part of the injection moulding process and coils inserted after the injection moulding process or attached to the body of the fitting as a separate embedded pad etc. are strictly not acceptable.

The pipe fixation shall be achieved by external clamping devices and integral fixation devices are not acceptable.

The brand name, size, raw material grade, SDR rating and batch identification are to be embedded as part of the injection moulding process. Each fitting should also be supplied with a barcode sticker for fusion parameters attached to the body for setting the fusion parameters on an automatic fusion control box. The barcode sticker should also include the fusion and cooling time applicable for the fitting for the manual setting of a manual fusion control box.

The fittings should be V-regulated type designed to fuse at a fusion voltage of 40 volts AC. The heating elements should be designed for fusion at any ambient temperatures between - 5 to

+40 degree centigrade at a constant fusion time i.e. without any compensation of fusion time for different ambient temperatures.

A limited path style fusion indicator acting for each fusion zone as visual recognition of completed fusion cycle should be incorporated into the body of each fitting near the terminals. The fusion indicators should not allow the escape of the molten polymer through them during or after the fusion process.

All the sockets in the electrofusion fittings should include a method of tapping controlling the pipe penetration (pipe positioner/stopper).

## **Flanged MDPE Pipe / Stub Ends**

MDPE Stub ends shall be square ended with extra spigot length for Electro fusion coupler jointing, conforming to IS: 8008 Part I & VII Specifications. Stub ends will be welded on the pipe by Electro fusion jointing only. Flange will be of slip on flange type as described below.

### **Slip-On Flanges**

Slip-on flanges shall be metallic flanges covered by epoxy coating or plastic powder coating. Slip-on- flanges shall be conforming to standard mating relevant flange of valves, pipes etc. Nominal pressure rating of flanges will be PN10 and thickness as per relevant IS standard..

Jointing of MDPE Pipes shall be made by qualified/certified welders only.

All specials/ fittings such as Valves. Flange adopters, Cast Iron (CI)/Mild Steel (MS) specials, Galvanised Iron (GI) pipes and GI specials, Brass Tap etc., will be supplied by the Contractor. Contractor shall install these specials/fittings as per the standards specifications and as per the instructions of the Engineer in charge.

The MDPE pipes shall be laid in accordance with the latest IS 7634 Part- 1 and 2 and BS EN 12201- 3.

After laying and jointing of the MDPE pipes, after partial refill and before final refill a blue plastic sheet shall be laid at a depth of 0.6m above the crown of the pipe as per the standards and as per the instructions of the Engineer in charge.

GI (light duty)/concrete (Non Pressure) casing pipe shall be provided for MDPE pipe for the particular section line plus required bearing where the alignment of pipe line crossing major roads, natural/side/cross drains, as instructed by engineer in charge.

Layer of concrete of required grade shall be provided over the particular section the pipe line where contractor is not able to achieve the specified depth of excavation due to natural hard strata as instructed by engineer in charge.

Contractor has to submit detailed as built drawing of work done in latest Auto Cad version, showing the details of pipe line, specials/fittings, valves and joints in Six hard copies and one soft copy.

Minimum two working teams, one in slum area and other in out of slum area OR as per engineer in charge shall be deputed by the contractor for excavation, Laying & jointing, Testing.

- **Technical Specifications For Electrofusion Tapping Saddle For House Service**

### **Connection**

All the electro fusion fittings included in this document should be designed for use in water distribution systems and be manufactured/supplied by manufacturers having ISO 9001: 2000 certification for their quality systems. They should have supplied to government water boards for their water supply projects. The products should comply with the following specific requirements.

1. The products shall comply with the requirements of BS EN 12201-3: 2003, BS EN 1555-3 or ISO 8085-3.
2. All the fittings shall be of SDR 11 rating.
3. The EF Tapping Saddle used for drinking water applications should have undergone type test by WRc-NSF, U.K according to BS 6920 in any of their Certified Laboratories like WRc – NSF/DVGW/KIWA/SPGN and certificate of Compliance to be produced for the following parameters::
  - a. Odour & Flavour of Water
  - b. Appearance of Water
  - c. Growth of Micro Organism
  - d. Extraction of substances that may be of concern to Public Health (Cytotoxicity)
  - e. Extraction of Metals
4. All the EF Tapping Saddle shall be manufactured by injection moulding using virgin compounded PE 80 (MDPE) polymer having a melt flow rate between 0.5 – 1.1 grams/10 minutes and shall be compatible for fusing on either PE 80 or PE 100 distribution mains manufactured according to the relevant national or international standards. The polymer used should comply with the requirements of BS 3412 and/or BS EN 12201-1.
5. The Electro fusion Tapping Saddle intended for water distribution applications shall be coloured blue for the clear identification of the services.
6. All the electro fusion Tapping Saddle should be individually packed so that they can be used instantaneously at site without additional cleaning process. The protective packing should be transparent to allow easy identification of the fittings without opening the bags..
7. The electro fusion Tapping saddle should be with only a single heating coil to fully electro fuse the fitting to the adjoining pipe or pipe component as applicable. The heating coils shall be terminated at terminal pins of 4.0 or 4.7 millimetre diameter, protected with terminal shrouds. Each terminal shroud should be additionally protected with polyethylene shroud caps.
8. No heating element shall be exposed and all coils are to be integral part of

the body of the fitting. The insertion of the heating element in the fitting should be part of the injection moulding process and coils inserted after the injection moulding process or attached to the body of the fitting as a separate embedded pad etc. are strictly not acceptable.

9. The pipe fixation shall be achieved by external clamping devices and integral fixation devices are not acceptable.

10. The brand name, size, raw material grade, SDR rating and batch identification are to be embedded as part of the injection moulding process. Each fitting should also be supplied with a barcode sticker for fusion parameters attached to the body for setting the fusion parameters on an automatic fusion control box. The barcode sticker should also include the fusion and cooling time applicable for the fitting for the manual setting of a manual fusion control box.

11. The fittings should be V-regulated type designed to fuse at a fusion voltage of 40 volts AC.

12. The heating elements should be designed for fusion at any ambient temperatures between -5 to +40 degree centigrade at a constant fusion time i.e. without any compensation of fusion time for different ambient temperatures.

13. A limited path style fusion indicator acting for each fusion zone as visual recognition of completed fusion cycle should be incorporated into the body of each fitting near the terminals. The fusion indicators should not allow the escape of the molten polymer through them during or after the fusion process.

14. All the sockets in the electro fusion fittings should include a method of tapping controlling the pipe penetration (pipe positioner/stopper).

15. The Electro fusion Tapping saddle should be the top loading type which are to be clamped on the mains for fusion using the custom made top loading clamps exerting 1500N (150 kilograms approximately) top load. Saddles with wrap around clamps made of polyethylene, nylon or any such other material will not be acceptable.

16. The tapping EF Tapping Saddle should be supplied with suitable adaptors for proper positioning of the top loading clamp into the saddle.

17. The torque required to operate the cutter after fusion on the PE mains should not exceed 45 N-m.

18. The common cutter provided by the manufacturer should be designed in such a way that the cut coupon is not allowed to fall into the pipeline and is retained inside the body of the cutter providing a positive sealing of the hole in the cutter head for pressure testing.

19. The EF tapping Saddle, will have female threaded outlet to connect

Compression Metal insert Male thread adaptor fitting for further extension of connection.

**20. The threaded outlet should be from sizes ½” to 2” BSP to suit the required House service connections.**

**21. The outlets should be reinforced with female threaded metal inserts of SS 304.**

The tapping on the PE mains shall be achieved by a custom built metal cutter supplied by the manufacturer one each for the standard packing box.

**SEAL & SIGN OF CONTRACTOR**

**S/D**

**EXECUTIVE ENGINEER**

**WATER WORKS**

**VADODARA MUNICIPAL CORPORATION**