

trenches 450 mm width x 760 mm, average depth, with brick protection on the top of the cable with 16 nos. bricks parameter and filling up the trenches with sifted soil, leveling up and restoring the surface to the satisfaction of the Engineer-in-charge. Where cable is laid in masonry trench/metal trays, the cable trenches (when applicable) shall be filled up with sand or covered with secured plate RCC slab according to the direction of Engineer in charge. Where necessary cables shall be supported on clamps of approved type and shall be properly protected with GI conduit or other protective covering as per direction of Engineer in-charge.

Suitable marking showing indications along the cable route are to be fixed at proper intervals as per directions of Engineer-in-charge and the cost thereof shall be included in the tender price.

All jointing should be of dry type to be done with hydraulic crimping machine where applicable & done in accordance with the provision of IE rules, All jointing materials, compound other accessories should be included in the tender price .

#### LAYING AND JOINTING OF H.Y. CABLE

The HT cable should be 11 KV grade, XLPE, armoured Alluminium, 3 core, 300 sq. mm to be laid in ground! masonry trench/metal trays etc, as per requirement and instruction of EIC. The contractor shall have to supply and install necessary metal trays, hooks, suitable mechanical protection as required for laying the cable. After the cables have been laid slowly and carefully in standard manner, all cable trenches will be filled up by sifted soil, leveling in a standard manner, all cable trenches will be filled up "by sifted soul, leveling & restoring properly or covered with secured plate of RCC slab according to the direction of EIC and the cost of such installation shall be included in the tender prices. Suitable metal flags showing indicating along the cable route are to be fixed at proper distances as per direction of the EIC & the cost shall be included in the tender price. All electrical joints should be done with socket of suitable size so as to prevent undue heating. All jointing materials, compound and other accessories shall be included in the tender price and all such jointing must be done by the contractor in accordance with the provisions of IE rules. All responsibilities for holding the statutory High pressure Test to be conducted witnessed by the power supply Authorities (ASSAM ELECTRICITY BOARD) and demonstrating the layout/other test to the satisfaction of the Govt. Electrical Inspector before commissioning rest entirely with the contractor. Tender shall have to make all necessary arrangements for all and inspection within the quoted period.

#### EARTHING

The total installation shall be effectively earthed by providing a ring earthing. Each earthing set shall consist of twin GIO pipes, Class B medium, of dia 50/65 mm placed sufficiently away from the building structure. The distance between each individual earthing should not be within 3 mm to 6mm. The top of the electrode shall be fitted by cast iron cap and shall be provided with suitable cable lugs. The top 300 mm part of the earth electrode shall be properly brick pitched and shall be fitted by cast iron cap and shall be provided with suitable cable lugs. The top 300 mm part of the earth electrode shall be properly brick pitched and shall be fitted with water proof bituminous compound. The connection lead shall to copper bus 50 mm wide and 6 mm thick and shall be laid at a depth of not less than 100 cm from GI and shall be properly brick covered. The leads shall be connected to copper earth inside the sub station by means of washers nuts bolts etc.

A copper busbar 50 mm wide and 6mm thick shall be provided so that the frames of switchgear, transformer and other electrical accessories and installation are connected to the above copper bus by two separate copper bar of adequate dimension to the full satisfaction of the Engineer in charge. The earthing and bonding shall be according to I>E rules 1956 with amendment of 1990 and must meet the approval by the Government Electrical Inspector and should pass the statutory tests.

All non current carrying metal parts associated with HV installation shall be effectively earthed to a ground system as mat which will.

- a) Limit the touch and step potential to tolerable values
- b) Limit the ground potential rise to a tolerable value so as to prevent danger due to transfer of potential

Signature of the Authorised Person

Page M - 21

Chief Executive Officer

Guwahati Metropolitan Development Authority

Chief Executive Officer  
Guwahati Metropolitan Dev Authority

340

187

through ground earth cable.

- c) Maintain the resistance of the earth connection to such a value as to make operation of the protecting device effective.
- d) There shall be three separate earthing systems, one set for M V, one for HV & one for neutral earthing of each of the transformers. The electrodes for HV & LV system should be connected in separate rings.

The successful tenderer shall have to submit adequate copies of the detailed and fully dimensioned drawing of the whole electrical system showing the earthing arrangement interalia and have these duly approved by the Government Electrical Inspector before commencement of the actual installation work.

#### 10. ELECTRICALLY OPERATED OVERHEAD CRANE

The EOT crane will be of 10 MT capacities that electrically operated traveling crane along with a electrically operated hoist 01'3 MT capacity suitable for inching operation with a lift up to the unloading bay / unloading platform level. The long travel and the cross travel of the crane would be maximum possible within the pump house area including unloading platform and unloading bay. The EOT cranes and its accessories shall be as per the approved vendor list. Suitable type of crane rails, girders and all other accessories as necessary for installation and operation of the crane are to be designed and provided by the Contractor within a lump sum quoted amount. The two travels of the main hoist, i.e., long, cross and the hoisting operation must be electrically operated. Limits switches for long, cross travel and hoisting are to be provided for protection. The braking arrangement should be electro-hydro-thrust or brake for the hoisting operation and may be disc type of travel. The buffers must be spring loaded operation. The speed and other parameters are as follows,

Speed of hoisting	4 to 5 mm/ minute
Speed of cross travel	10 to 12 mm/ minute
Speed of long travel	12 to 15 mm/ minute
Type of brake	Electro-hydro-thruster brake for hoist and disc for the travel
Motor	Crane duty, squirrel cage, duty category - S4, Class-F insulation

#### 11. TRIAL RUN AND OPERATION UPTO DEFECT LIABILITY PERIOD

After completing the work by the Contractor, the plant will be put under trial run with no-load an load condition for one month. Contractor will inform the Engineer about completion of successful trial run who with the approval of the Employer fix up the date of commissioning of the entire system. The contractor has to open the system upto defect liability period. The Employer will arrange supply of all chemicals and pay the electricity authority the cost of energy charges for this period.

Chief Executive Officer  
Guwahati Metropolitan Development Authority



Signature of the Authorised Person  
of the contractor

Page M - 22

Chief Executive Officer

Guwahati Metropolitan Development Authority

341  
Chief Executive Officer  
Guwahati Metropolitan Dev. Authority

SECTION - N

TECHNICAL SPECIFICATION FOR PIPELINES

1 SPECIFICATION FOR PIPES, FITTINGS & ACCESSORIES

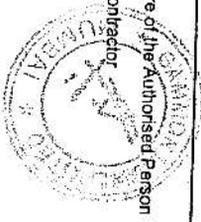
All pipes upto diameter DN 600 shall be ductile iron (DI) as specified in IS: 8329 - 2000 and IS 9523 or its equivalent / international standards and shall bear such marks. Necessary fittings and accessories of this type of pipe shall be as per standards of the same Code of Practice. Iron used in these ductile iron materials shall have graphitic primarily in spheroidal form. The pipe sizes above DN 900 shall be of M.S spirally welded of grade Fe 410 manufactured by Steel Authority of India. Some quantity of smaller sizes of pipes (DN 100) shall be of HDPE/PVC (As per IS: 4984, PN6 rating, PE100 grade material) manufactured by 'national/ international companies' with special kind of locking joint by inserting specially made PVC Spilne into the groove of the socket for PVC pipes. Major DI pipes will be of Socket & Spigot ends of push ends joints. There may be requirements of some flanged end DI pipes for fitting with the DI valves & other fittings. DI pipe shall be Class K9. All components in the piping system shall not be less than PN 16 pressure rating. Pipes and components are required to be designed including surge pressure.

All DI pipes and fittings as specified hereunder are to be procured preferably from same manufacturer.

General Specification:

	Pipe (IS 8329 - 2000)	Fittings (IS 9523)	Accessories	
			Gaskets	Others
Size	DN 100 - DN 900	DN 100 - DN 900		
Class	K9	K9		
Material of construction	Ductile Iron. Presence of graphite in Spheroidal form with minimum tensile strength of 420 MPa and minimum elongation 10%	Ductile Iron. Presence of graphite in Spheroidal form	Natural Rubber or SBR	
Pressure Rating	Not less than PN 16	Not less than PN 16	As per IS 5382 or IS 638	As per IS 8532 - 2000
Joints	<ul style="list-style-type: none"> <li>• Socket and Spigot</li> <li>• Flexible Push-on joints in general</li> <li>• Mechanical Flexible joint/and or</li> </ul>			

Signature of the Authorised Person of the Contractor



Chief Executive Officer  
Guwahati Metropolitan Development Authority

	Pipe (IS 8329 - 2000)	Fittings (IS 9523)	Accessories	
			Gaskets	Others
Hydrostatic site Test pressure and Hydraulic working pressure	As per table 1 given in Annexure-E of IS8329-2000	As per IS 9523-2000		
Coatings	D.I. pipes shall be externally zinc coated not less than 130g/m <sup>2</sup> and shall be applied by spray guns when surface is cleaned. After zinc coating blue epoxy coating shall be applied by spraying. DFT of this finishing layer shall not be less than 70 µm and no where below 50 µm	Same as in case of Pipes		
Lining	As per clause 16.3 given in Annexure B of IS 8329-2000	As per clause 13.1.2 given in Annexure B of IS 9523-2000		

Coating of MS pipes greater than DN 900 shall be both inside and outside by 100% solid polyurethane to be made in factory under control humidity of DFT-800-600µm both for outside & inside respectively coating should be applied after surface cleaning as per Sg 2.5

Signature of the Authorised Person  
of the Contractor

Chief Executive Officer  
Gwahati Metropolitan Development Authority  
Chief Executive Officer  
Gwahati Metropolitan Development Authority

**2 Pipe Line Accessories**

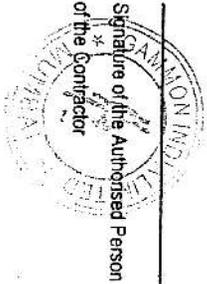
(a) **Valves** : Different kind of valves will be necessary in the water supply system to stop and regulate flows. Some valves may have to be provided with sensors to close the valves in case of bursting or snapping of pipe lines. Pipes uphill and downhill should have suitable valve with such provision and air inlet devices. Bidders are required to design the same. Successful bidder will be given tentative network analysis for positioning and sizing of all kinds of valves. But they have to design the system including surge analysis for proper protections. There will be -

- Line valves
- Isolation valves
- Pump suction and Discharge valves
- Scour valves
- Automatic admission and venting valves
- Check valves
- Pressure relief valves
- Pressure reducing valves
- Automatic burst control and shut off valves

(b) **Air vessels & Surge Tanks** : For water hammer protection, these accessories are to be provided. Successful bidders are required to do the surge analysis and provide suitable means for the same.

(c) **Inspection Manholes in M.S. Pipes** : In large diameter M.S. pipes provision of manholes in the form of saddle with blank flange are to be made. These access manholes shall be provided at summits, discharges and downstream of main valves as would be decided by the Engineer. Usually 1.0 km apart inspection man holes for MS pipes larger than 900 mm dia shall have to be provided.

Signature of the Authorised Person  
\* of the Contractor



DIAMETER-WISE DETAILS OF VALVES

Diameter of Pipe (mm)	Diameter of Valve (mm)	No. of Valves							Total			
		Raw/Plastic	Copper	Gravity	Filter	Miscellaneous	Particulars	Others				
100	100						32	45	200	321	312	
150	150						15	22	45	50	56	
200	200						4	6	18	58	25	
250	250						2	3	6	10	17	
300	300			1	64	50	2	4	9	5	20	
350	300			1			2	3	3	9	5	
400	300			1			1	2	0	2	4	
450	400						1	3	2	1	2	
500	400			1			1	3	3	1	3	
600	500			2			1	1	1	1	1	
700	600	18		1					2		1	
750	700			1							1	
800	700											
900	700		12	2					1			
1000	900		6									
1200	900											
1400	1200	4	6									
<b>Total</b>		<b>22</b>	<b>24</b>	<b>10</b>	<b>64</b>	<b>50</b>	<b>14</b>	<b>81</b>	<b>92</b>	<b>290</b>	<b>458</b>	<b>447</b>

625  
122  
071

2

Signature of the Authorised Person  
of the Contractor

#### 4 SPECIFICATION FOR PIPE LAYING & JOINTING WORK

##### 4.1 Contractor to Supply Pipe and Fitting Materials

Unless otherwise indicated on the Drawing or stated in the Specification or Bill of Quantities, all pipes, fittings, joints, valves, specials and jointing materials required for the works shall be supplied by the contractor at his own cost. DI pipes and fittings shall have to be procured from same manufacturer.

##### 4.2 Handling of Pipes and Specials General

Pipes specials shall be received, transported, stored installed and handled in accordance with the manufactures recommendations subject to this specification and the approval of the engineer. Handling operations shall be carried out with care.

##### 4.3 Transport of Pipes and Specials

During transport, loading and unloading, pipes and specials shall not be allowed to come into contact with any sharp projections which may cause damage. During transit, pipes and specials shall be well secured, supported and protected.

The ends of all pipes and specials shall be suitably covered, and protected against damage during transit with straw contained in Hessian secured to the pipe ends. All flanges shall have be wrapped or cushioned so that no load is taken directly on the sheathing.

##### 4.4 Preparation of Stockpile Areas

Pipes and specials shall be delivered to and stacked singly at stockpile areas arranged by the contractor and approved by the Engineer. Prior to the arrival of any pipes or fittings, the contractor shall prepare each of these areas by:

- (i) Setting out firm, well-drained and level areas for pipe stacking, and for vehicle access and turning;
- (ii) Installing supervisory staff to register the arrival of deliveries, supervise off-loading and guard the Stockpile Areas and Contents;
- (iii) Erecting cover storage (Part 1) for joint rings and other materials susceptible to damage by weather.
- (iv) Installing approved bearers for pipes and specials, which shall keep pipes and specials at least 150mm clear of the ground and support them securely without damage to the external sheathing.

##### 4.5 Handling of Valves and Accessories

Valves and pipe laying accessories such as joint gaskets shall be delivered securely packed in crates except that the Engineer may approve delivery in sacks or cartons and storage on shelves of small items such as bolts, nuts, washers and small-diameter gaskets.

All materials other than pipes, fittings and specials shall be stored inside the Temporary Storage Building described in Section. Except for purposes of inspection, materials shall remain inside their crates, cartons or sacks until required for installation. The full permanent protective coating system shall be applied as soon after installation as possible.

Signature of the Authorised Person  
of the Contractor

Page N - 7

326

Chief Executive Officer

Guwahati Metropolitan Development Authority

199



Before any pipe, special or valve is laid in position, ready for jointing, its internal surface shall be thoroughly wiped, clean and free of dirt, stones etc to ensure that no debris, sticks, stones, rags or other foreign matter is left in the pipeline. The pipes shall be laid true to alignment and gradient as in the drawing or as indicated by the Engineer. Each pipe being boned between sight rails so that except where otherwise specified or ordered by the Engineer the finished pipeline shall be in a straight line both in horizontal and vertical planes. In no case shall the pipeline be laid to a gradient flatter than 1 in 500. Care shall be exercised to ensure that the barrel of every pipe is evenly bedded throughout the whole length. The pipes shall be gently lowered into the trench by means of a crane or suitable shear legs and chain blocks, with rope or canvas slings. Hooks shall not be used. No pipe shall be rolled and dropped into a trench, or allowed to assume an inclination of more than 5 degrees to the horizontal while on the slings.

To prevent the entry of foul water, earth and other foreign matter into the pipelines the contractor shall provide and fix suitable stops for efficiently closing all open ends of the pipelines in the trench at all times when work is not actually being carried out at such open ends.

In certain instances, subject to the arrangement of the Engineer, air valve, tees and washout tees may be installed at the pipe joints nearest to the specified position provided that the approach gradients are amended to ensure that the air valve tees and washout tees are installed at the highest and lowest points respectively of the sections of the pipelines concerned.

The contractor shall made available at each pipe laying location the backfill samples and performing in-situ tests. He shall use this requirement to the extent necessary to control the trench bedding and backfill to the specification as per IS 5822-1994 or as may be required by the Engineer, and shall also test the samples in a laboratory as required. For over ground pipe line works pipe support shall have to be designed to take all possible load and supports shall be not more than 6.0 m c/c.

#### Open Cut Road Crossings

Maximum precaution shall be taken so that there is no damage to the pipeline at these crossings. These crossings shall be provided with one additional coat of blue epoxy. All precautions shall be taken so that the coating in this length is not damaged while backfilling.

#### Pipe cutting and Closure Units

The use of closure units shall be avoided as far as possible by laying each pipeline in a continuous length. However, where this proves impossible at any point, the contractor shall form the closure units by cutting sized pipes to the exact lengths required, allowing a tolerance for insertion. No pipe shall be cut for any closure without the prior consent of the Engineer

Where it is necessary to cut pipes to provide closing lengths or for laying pipe specials or in the repair of damaged or chipped pipes, the cutting shall be neatly and accurately performed so as to have the end of the pipe truly normal to the axis of the pipe.

Where it is necessary to cut steel pipes to provide closing length the damaged concrete lining near the cut shall be repaired and shaped for jointing and the external coal tar enamel shall be stripped over a sufficient distance from the end to accommodate the collar joint or flexible mechanical coupling.

4.12 **Assembling Flanged Joints**

Flanged joints shall be properly laid true to line and level before bolting and on no account shall drifts or podgers be used in the bolt holes. Flanged bolts shall be carefully and evenly tightened in such sequence that diametrically opposite nuts are tightened together to ensure even pressure on the joint ring.

For tightening of all bolts in pipe joints, the contractor shall provide and use torque spanners of the "break back" type set to give the tightening torque recommended by the manufacturer.

After flange bolts have been fully tightened, the final coating shall be applied.

Washers shall be included below all bolt heads and nuts.

Joint rings and gaskets shall be stored until needed in a cool place free from direct sunlight.

4.13 **Thrust and Anchor Blocks**

The contractor shall build thrust and anchor blocks. Class "M 20" concrete shall be used.

The bearing faces of all thrust and anchor blocks shall be cast against the vertical bearing sides of the excavation defined in the drawings or by the Engineer.

The tops of buried blocks shall in general be 250 mm below finished ground level.

4.14 **Installation of Pipes on Saddle Supports, New and Old Bridges**

Saddle supports shall be built of concrete Class "M 20". Pipe shall be held onto saddle by the Pipe straps which shall be accurately formed so that when securely bolted down they conform closely to the pipe circumstances. Straps on saddles where the pipe is to have free axial movement shall be so arranged that bolts are full tightened there is no restraint of axial movement of the pipe. The pipe strap shall be clear of the pipe by not more the 3 mm around the arc of upper semi circumference.

Where axial restraint is required, the saddle shall embrace the pipe totally.

Pipes laid on saddle shall be straight pipes only and shall be laid true to line and level so that the entire length on any one set of saddles is on a straight alignment and constant slope. Change of slope shall be permitted only at fittings.

While laying pipes on bridges already constructed the saddles and axial movements shall be designed.

At all saddles axial movement between pipe and saddle shall be permitted. This shall be achieved by incorporation of a roller bearings. The contractor shall submit his own design for the sliding arrangements with sliding coefficient less than 0.1 and showing arrangement for lubrication.

Pipe straps and the pipe beneath them shall be fully protected with primer and Aluminum paint before they are fixed in place.

The Pipe straps shall be placed correctly about the pipe and the rag-bolts and nuts of pipe straps shall be set hand tight in the lugs of the Pipe straps with the nut at about mid-thread before the final lift of concrete is poured. When the concrete has set, the nuts shall be removed and the Pipe straps reset with sufficient spacing washers to obtain the correct positioning of the pipe straps when the nuts are fully tightened. After tightening, the nuts shall be secured by the locking-tab washers, and the whole assembly of nuts, bolt and washers given a liberal coating of zinc paint in dry conditions.

Signature of the Authorised Person  
of the Contractor

### Pipe Straps

Pipe straps shall be fabricated of mild steel to B.S. 1712 and shall be a close nut, but not bending fit on the pipes & should not restrain the pipeline. The nuts of the rag-bolts shall be galvanized. The rag bolts shall be encased at least 100 mm. The nuts on this rag bolts shall be galvanized hexagonal nuts equipped with galvanized locking tap washers galvanized plain circular washers shall be provided.

### Welding

All electric arc welding equipment shall be to the approval of the Engineer and shall comply with BS 638. The contractor shall submit for the Engineer's approval details of the welding procedure which he proposes to adopt.

Care shall be taken to avoid starting fire.

The contractor shall make test specimens on bare steel shells or pipes of the same size and thickness as the pipelines to be welded. The joints shall be tested in the presence of the Engineer for each procedure in accordance with requirements of A.P.I. Standard 1104.

The contractor shall obtain radiography of the welds as required by the Engineer and shall radiograph not less than 2% of the welding carried out in pipelines. Only procedure approved in writing by the Engineer shall be adopted for welding on the pipelines, and change from one procedure to another will not normally be permitted without submitting the new procedure for retesting.

### Painting of exposed Steel Pipelines

Exposed portions of steel pipelines shall be protected by a paint system of which the primer coat shall have been applied in the manufacturer's works.

Damaged primed surfaces shall be repaired in the field by cleaning and further priming with the same primer to at least the thickness of the works-applied primer coat.

After the completion of pipe assembly in the field, damaged areas of the primed surface shall be fully repaired and the whole surface shall be cleaned of foreign matter. The finishing coat shall then be applied.

The finishing coat shall be aluminium heat-resisting finish applied in sufficient layers (at least 2) to give a minimum dry film thickness as would be designed. Coating shall be with zinc primer and two coats tar based epoxy coating.

The primer and finishing coats shall be mutually compatible and shall be from the same approved manufacturer.

The approval of the Engineer shall be obtained to all details of paint and coating system application, including surface preparation, works environment, application techniques, intermediate drying times and repair of coatings.

Coating shall not be applied to wet surfaces or during rain. The contractor shall be deemed to have made full allowance in his Tender for the effects of weather.

4.18 Valve Chambers

Pipeline valve chambers to be provided under the contract shall be constructed in accordance with the details designed by the contractor.

The pipes, specials and valves in the chamber shall be set on Class 15/20 concrete blocks to exact line and level prior to the construction of the chamber walls and all parts of the steel pipes and specials which are to be encased in concrete shall be brushed clean to bare metal.

4.19 Sampling Points

Where shown on the Drawings or directed by the Engineer, the contractor shall fix 2 inch BSP toppings and blanking plugs into pipe work in chambers for the purpose of sampling and metering.

4.20 Testing Pipelines

Pipelines shall be tested in the presence of the Engineer in lengths between valve chambers or in such shorter lengths as the Engineer may direct or permit.

Fittings required for temporarily closing the openings in pipelines to be tested shall be properly designed for this purpose and shall be adequately strutted to withstand the test pressure specified.

Permanent valves may be included in the tested length but shall be opened during the tests and shall not be used to isolate the test section.

The arrangements for testing a pipeline shall include provision for the purging of air from the pipeline prior to a water test.

\* The contractor shall keep a record of all tests and shall be available for inspection and handed over to the Engineer on demand.

Each pipeline shall be tested after completion with the exception of any backfilling not necessary for the stability and safety of the work.

Prior to the testing of a pipeline, permanent valves included shall be checked and sealed in their fully-open positions. The pipeline shall then be filled with potable water and the air released. After having been filled the pipeline shall be left under operating pressure for at least 24 hours so as to achieve conditions as stable as possible for testing.

The pressure in the pipeline shall then be raised steadily until the specified test pressure is reached and the same shall be maintained at this level by pumping if necessary for a period of one hour. The pump shall then be disconnected and no further water shall be allowed to enter to pipeline for a period of one hour. At the end of this period the original test pressure shall be restored by pumping and the loss measured by drawing off water from the pipeline until the pressure as at the end of the one-hour test period is again reached.

The permissible loss from pipelines under test shall not exceed 0.02 litres per day per millimeter of nominal bore per kilometer of pipeline per bar of pressure (calculated as the average pressure applied to the length of pipeline being tested)

Gauges used for testing pressure pipelines shall have a dial diameter of not less than 100 mm and a full-scale reading not greater than twice the specified test pressure. Before any gauge is used the contractor shall arrange for it to be checked independently and a dated certificate of its accuracy shall be provided for the Engineer. The Engineer shall be permitted to order his own independent test of the contractor's gauges. The test pressure shall be as per IS code.

Signature of the Authorised Person  
of the Contractor

35  
[Handwritten signature]

Chief Executive Officer

Guwahati Metropolitan Development Authority  
Guwahati Metropolitan Dev. Authority

The contractor shall at his own expense provide all water required for filling, testing and retesting pipelines (if necessary), and any pumps, pipework fittings, pressure gauges and personnel required for the purpose.

#### 4.21 Disinfecting and Flushing of Pipeline

After all the pipelines have been tested to the satisfaction of the Engineer, and final connection made, they shall be thoroughly disinfected and flushed in sections by the contractor. Water for this purpose will be supplied by the Employer however; the contractor is to submit one week in advance for the Engineer's approval a works schedule to allow the Engineers to make available the quantity of water required for the contractor for the purpose of disinfecting and flushing the main. Where there is shortage of water due to whatever reasons, the Engineer reserves the right to alter the contractor's tentative schedule and if the Engineer deems necessary, may permit the contractor to draw water for this purpose only during periods of low demand. No claims for extra whatsoever shall be allowed in this respect and no claim.

The operation of all valves including scour and air valves shall be checked by the contractor and any necessary adjustments made to ensure correct operation.

The method used for chlorine injection shall be the following subject to any changes ordered or approved by the Engineer.

The section of the pipeline to be disinfected shall first be emptied and then filled with a solution of chloride of lime (or other approved chemical) containing at least 20mg/l of chlorine.

The length of pipeline which is being disinfected shall be completely isolated from existing supply mains. The chlorine solution shall remain in the pipeline for at least 24 hours during which period all valves in the treated pipeline shall be operated so as to be thoroughly disinfected. After the required disinfection period the chlorine solution shall be drained from the pipeline which shall then be thoroughly flushed out with potable water before being put into service.

On completion of chlorination and flushing the pipeline shall not be put into service until the contractor has demonstrated by means of approved bacteriological tests that the water delivered at the outlet end of the pipe length under test is to a satisfactory potable water standard. The water shall be considered bacteriologically acceptable when it is shown to contain no detectable coli-form organisms.

The commissioning of the pipeline including completion of all connections to existing apparatus shall be fully studied by the contractor who shall submit for the Engineer's prior approval a programme for the commissioning operations. The contractor shall amend the programme as necessary to take account of all comments and requirements of the Engineer and shall then undertake all commissioning works in accordance with the approved programme.

#### Jointing of DI pipes on hill slopes:

On hill slopes due to axial tension (hydrostatic or hydrodynamic origin) may result in joint separation with standard push on joints unless restrained by concrete thrust block. Mechanical restraint joints are to be used in all DI pipe line works on hill slopes. Joint separation may also occur in this earthquake zone -V area for mild tremors also when mechanical restraint joints are used. But in every deviation provided by specials should also have mechanical restraint joints a few lengths before and after the special fittings on hill slopes.

Signature of the Authorized Person  
of the Contractor

Page N - 13

Chief Executive Officer

Guwahati Metropolitan Development Authority

Chief Executive Officer  
Guwahati Metropolitan Development Authority

352

192

**Special Coating:**

M.S. Spirally welded pipes shall be internally lined with one coat of coal tar epoxy primer followed by two coats of coal tar epoxy to build a minimum thickness of 406 micron and outside to be coated with one coat of coal tar epoxy primer followed by 3 coats of coal tar epoxy to build a minimum thickness of 800 micron after the pipes are cleaned and sand/grit blasted as per relevant code of practice at factory premises within an enclosure. Humidity check shall be maintained during coating process. Coating shall be in conformity with AWWA C-210/ IS-14948.

  
Chief Executive Officer  
Guwahati Metropolitan Development Authority  
Guwahati Metropolitan Development Authority

  
Chief Executive Officer  
Guwahati Metropolitan Development Authority

  
Signature of the Authorised Person  
of the Contractor