

VOLUME – IIB
TECHNICAL SPECIFICATION - CIVIL

SECTION 8 : ITEMWISE SPECIFICATIONS

ITEM WISE SPECIFICATION

Schedule-B1 PROVIDING, SUPPLYING, LOWERING LAYING AND JOINTING OF PIPELINE

➤ **ITEM NO- 1**

- Providing and supplying in standard length ISI mark rigid unplasticized PVC pipes suitable for potable water with ring fit joint including cost of rings, as per IS specification no. 4985/1988 including all local and central taxes, transportation, freight charges, octroi, inspection charges, loading, unloading, conveyance to the departmental stores and including cost of jointing material and special etc. complete. Note : (1) One coupler / ring shall be provided with each full length pipe cost of which is included in rates below. (2) 3% (Three) Discounted rate to be consider for Coupler jointed pipe. (3) Rate for PVC Resin as Rs. 91739/MT (Price Without GST)

UNPLASTICIZED PVC PIPES

90 mm Dia. P.V.C Pipe-6 Kg/Sqcm

110 mm Dia. P.V.C Pipe-6 Kg/Sqcm

140 mm Dia. P.V.C Pipe-6 Kg/Sqcm

160 mm Dia. P.V.C Pipe-6 Kg/Sqcm

200 mm Dia. P.V.C Pipe-6 Kg/Sqcm

Nominal outside Diameter	Min. outside diameter in mm		Outside diameter at any point in mm	
	Minimum	Maximum	Minimum	Maximum
63	63	63.3	62.2	63.8
75	75	75.3	74.1	75.9
90	90	90.3	88.9	91.1
110	110	110.4	108.6	111.4
140	140	140.5	138.3	141.7
160	160	160.5	158.0	162.0
180	180	180.6	177.8	182.2
200	200	200.6	197.6	202.4
250	250	250.8	247.0	253.0
225	225	225.7	222.3	227.7
280	280	280.9	276.6	283.4
315	315	316	311.2	318.8

STANDARDS:

- The UPVC Pipes to be manufactured, supplied and delivered under the scope of this contract shall be manufactured in accordance and confirming to IS:4985-2000 or its latest revision or amendments or other authoritative

standard that ensure at least a substantially equal quality to the IS:4985-2000 or its latest revision or amendments

Electrometric sealing ring shall be as per specification of IS – 5382-1985, and ISO: 4633-1996 or it shall be EPDM rubber ring. The dimensions, material compositions, tests etc. shall be as per IS: 4985-2000 or with its latest revision or amendments.

- The minimum wall thickness weight shall be as per Appendix I of the tender.
- The color of pipes shall be as per IS 4985-2000
- Bureau of Indian Specifications (BIS) / Indian Standard (IS) shall mean the Latest version issued by BIS.

The material from which the pipes are made shall consist substantially of unplasticized poly vinyl chloride conforming to IS: 10151, to which may be added only those additives that are absolutely needed to facilitate the manufacture of the polymer, and the

production of sound, durable pipes of good surface, finish, mechanical strength and opacity.

The bulk density of the UPVC compound shall be 0.50 to 0.53 and the density of UPVC pipe shall be 1.40 to 1.46 g / cm³.

The additional of the manufactures own rework material shall comply to clause 4.2 of IS: 4985.

PVC resin of suspension grade K-66/K-67 shall be used for extrusion of UPVC pipe. In line with BIS 4985-2000 the tolerance on outside diameter of the pipe shall be as under:

- “The pipes shall be transported to the store by flat floored trucks in pre packed wooden crate. The height of crate should not be exceeding more than 2 meters. The both ends of packaging unit (crate) shall be covered with plastic sheet to ensure adequate protection during transport. At the time of packing and stacking of pipes, the sockets shall be alternated within the pipe of pipes and shall project sufficiently for the pipes to be correctly supported along their whole length. The pipes shall rest uniformly on the vehicle bed over their whole length during transport to avoid sagging or deformation.
- The packing material like wooden crate, plastic sheet etc. shall be the properly of tendered and he is permitted to reuse the packing material for transporting next batch of pipes”.
- The pressure rating of pipes shall be in accordance with IS 4985 with a maximum continuous working pressure at 27⁰ C. of 6 & 10 kg/cm². This working pressure shall be downgraded for ambient underground soil temperature of 45⁰ C. as per the figure given in IS 4985 for design purposes.
- The pipes when subjected to internal hydrostatic pressure in accordance with IS: 12235-1986 (part – 8) shall not burst during the prescribed test duration.

The temperature, duration and test and induced internal stress shall conform to the parameters given below:

Sr. No.	Test	Temp. (°C)	Min. duration (h)	Induced Stress (Mpa)	Requirements
1	Type test	60	1000	10	No failure
2	Acceptance Test	27	1	36	No failure

The integral socket of the pipe shall be tested for internal hydrostatic pressure in accordance with ISO: 3603 and ISO 1167.

The UPVC pipe shall not contain vinyl chloride monomer (VCM) exceeding 1 ppm when determined by means of gas phase chromatography using the "headspace" method according to IS: 10151.

The wall of the socket and the wall of the plain pipe shall not transmit more than 0.2% of visible light falling on them when tested in accordance with IS:12235 (part -3).

The pipes shall be supplied in straight length of 6 mtr with tolerance of +20mm and -0mm. The effective length of socket pipe shall be considered as shown in figure 2 of IS 4985.

All plastic and non-plastic material for components of the UPVC piping system e.g. Electrometric sealing ring, lubricants, when in permanent or in temporary contact with water which is intended for human consumption, shall not adversely affect the quality of the drinking water.

Concentrations of chemicals, biological agents or other substance leached from pipe materials in contact with drinking water and the values of the relevant physical parameters, shall not exceed the maximum values recommended by IS: 10500.

The pipe material shall be in accordance with IS 4985, clause 6.3.

The quality control system and sampling model shall be as under:

Quality Control System and Sampling Model				
Order of Tests to be conducted	By Manufacturer	By Third Party Inspection / PMC representative	Codes/Standards to be followed	Remark
Raw Material 1) Resin K-valve Particle size dis. Bulk density 2) PVC compound	Laboratory test certificates from the original manufacturer of resin and confirmation of the same by the pipe manufacturer in	Verification of test certificates and witness of sample test at pipe manufacture's laboratory at discretion	IS: 4669	For every batch of PVC resin used prior to formulation of compound

Quality Control System and Sampling Model				
Order of Tests to be conducted	By Manufacturer	By Third Party Inspection / PMC representative	Codes/Standards to be followed	Remark
density	their laboratory. Both test certificates have to be presented during inspection			
Process Check Degree of fusion of extruded UPVC pipe by Acetone immersion test.	Minimum one specimen per extrusion condition or molding condition per day	May witness test during inspection	ASTM D 2152	Test shall be conducted on samples from each machine
On line Check Quality Outside diameter Wall thickness Length of pipe surface finish Socket dimensions	Each & every pipe shall be checked by the manufacturer during extrusion of pipe	Sample testing shall be done for acceptance of the lot as per sampling procedure given Appendix – A, Table -5 of IS 4985	IS: 4985 ISO: 2045 Specification	Wall thickness shall also be checked by cutting the pipe at any place by the inspector
Finished product check. Reversion test Stress relief test	Min. 2 samples per machine per shift shall be tested	Sample testing shall be done as per IS 4985, Table 6&7	IS: 4985 IS: 12235 Part 5&6	Test records shall be submitted to PMC on request
Drop impact test Internal Hydrostatic pressure test. Pressure test for integral joint	Min. 1 samples per machine per shift	Sample testing shall be done as per IS 4985, Table-8	IS: 4985 IS: 12235 Part 8&9 ISO 3603 ISO 1167	Whenever the pipe is cut for hydrostatic test, the inspector will also verify the pipe thickness
Capacity Effect on water	Min. one sample for every change in compound formulation	One sample per 100 km of length of supply at the discretion of inspector	IS: 4985 IS: 12235 Part 3,4&10	Test records shall be submitted to PMC on request
Long term hydrostatic test	Min. 3 samples of different diameter from the regular production lot.	May witness test during inspection	IS: 4985 IS: 12235	Test records shall be submitted to PMC on request
Density	Min. one sample per machine per	Min 5 samples per	IS: 8543 part 1/	Reconfirmation may be done at

Quality Control System and Sampling Model				
Order of Tests to be conducted	By Manufacturer	By Third Party Inspection / PMC representative	Codes/Standards to be followed	Remark
	shift	lot	sec 2	store by checking the samples at the approved laboratory
Ash content	Min. one sample per machine per shift	Min 5 samples per lot	MTNL Standard/ ISO: 3451-5	Reconfirmation may be done at store by checking the samples at the approved laboratory
Vicat softening temp.	Min. one sample per machine per shift	Min. one sample per lot.	ISO : 2507	

TEMPERATURE VARIATIONS:

All the pipes to be manufactured, supplied and delivered shall be subjected to weather conditions like sun, dust, rain, and wind as available in State of Gujarat. They shall be also subjected to carry and convey drinking water under variable temperature conditions ranging from 4 C⁰ to 45 C⁰.

MARKING:

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

- i) Certification mark on each pipe.
- ii) Manufacturers brand name and/or trademark.
- iii) Purchasers mark as “ GWSSB ” is inscribed.
- iv) The outside diameter and pressure rating.
- v) Batch number or lot number.
- vi) Inspector’s mark on each pipe

Any other important matter that the manufacturer or purchaser deems fit to be inscribed.

Elastomeric sealing ring

This Sealing Ring Shall Be Sturine Butadin In Red Color As Specified In Is. The Lubricant Applied For Jointing Of Elastomeric Rubber Ring Shall Be Of Good Quality And Comply The Following Specifications:

- a) Must have paste like consistency and be ready for use, preferably soap jelly.
- b) Has to adhere wet and dry surfaces of UPVC pipes and rubber ring.
- c) Must be non-toxic.
- d) Must be water-soluble.
- e) Must non-affecting physic-chemical and organoleptic properties of drinking water carried on the pipe.
- f) Must not have an objectionable odor.
- g) Must not harmful to the skin.

Elastomeric sealing ring shall be in accordance with one of the types (Type - 1 to Type – 6) as per ISS 5382. These sealing rings shall be EPDM rubber ring. The sealing ring shall be with ISI mark.

In case of imported EPDM Ring, such rings shall conform to relevant International Standards or the Standards of country of origin, which are equivalent or higher than the Bureau of Indian Standard Specifications. In case of manufacturers who have applied for getting a BIS certification mark, it would be mandatory for such bidders to produce the BIS certification license on or before the date of opening of the price bids. An undertaking in this regard shall have to be provided along with the technical bid.

The rubber sealing rings shall be vulcanized from Ethylene Propylene (EPDM) with strengths as per table 2 of IS 5382-1985.

TYPE TEST:

- a) Type test capacity, test for effect on water, test for resistance to Sulfuric Acid, internal Hydrostatic pressure test for 1000 Hrs. shall be carried out at least once at any time during the contract. Or shall be taken at least once during every six months irrespective of the ordered quantity.
- b) The said type test shall be taken by the “GWSSB” representative or third party inspection agency at the in-house laboratory of the manufacturer.

COLOR OF PIPES:

- The color of the pipes shall be as per IS 4985-2000.
- The pipes shall bear ISI mark confirming to IS: 4985-2000 or its latest amendment/revision if any.

TEST FOR PVC RESIN & PIPE:

Test for PVC Resin

It shall be sufficient to show the certificate of chemical test (in accordance with IS 4669) to the inspecting authority to confirm the 'K' value to be 64 to 67 as per clause No. 6.1.2. of IS 4985-2000

Tests for PVC Pipes as per IS: 4985-2000

A) Density

These tests shall be carried out by the inspection agency as per the IS:4985-2000 OR its latest revision OR amendments. The value shall be between 1.40 and 1.46 as per the ISS clause No. 10.6

B) Sulphate Ash Content

When tested as per Annex B, of IS 4985-2000, the sulphate ash content in the pipe shall not exceed 11 percent.

C) Reversion Test

When tested by the immersion method a length of pipe 200 +/- 20 mm long shall not alter in length by more than 5 %. In case of socket end pipes this test shall be carried out on the plain portion of the pipe taken at least 100 mm away from the root of the socket.

D) Vicat softening temperature

When tested by the method prescribed in IS 6307, the Vicat softening temperature of the specimen shall not be less than 80 degree Celsius.

E) Resistance to external bows

When tested by method, the pipe shall have a true impact rate of not more than 10 %. In case of socket ended pipes this test shall be carried out on the plain portion of the pipe taken at least 100 mm away from the root of the socket.

F) Opacity

The wall of the plain pipe shall not transmit more than 0.2 % of the visible light falling on it when tested in accordance with IS 12235 Part-3

G) Effect on water

The pipe shall not have any detrimental effect on the composition of water flowing through them. When tested by the method described in IS 12235 part 4, toxic substances extracted from the internal wall of pipe shall not exceed the following concentrations in the solution.

H) Dimensions of pipe as per IS: 4985: 2000

Tolerance as per IS: 4985: 2000

Quality Assurance

The manufacturer shall have a laid down Quality Assurance Plan for the manufacture of the products offered which shall be submitted along with the tenders.

weight and minimum wall thickness of unplasticized ring fit type PVC pipes are as per IS 4985-2000.

Inspection:

Inspection of pipe will be carried out at factory site by inspecting agency to be

fixed and authorised by GWSSB. The inspecting agency will inspect the material as per the specification and on satisfying itself will mark the inspecting mark on all pipe and issued inspection note to the supplier and concerned consignee.

The bidder shall have to arrange for random testing of pipes brought on site, in CIPET/GIRDA in the presence of GWSSB's representative and on satisfactory report from the CIPET/GIRDA the payment of pipes will be made. Testing charges shall be borne by Agency.

Pipes supplied must be purchased from the latest vendors approved by GWSSB at the time of purchase of pipes.

The condition will be operative from the date of work order. No escalation shall be granted beyond stipulated time. However, in case of work carried after original time limit, only decrease in prices shall be adjusted.

Mode of Measurement is As per Schedule - B & Payment As per Schedule Of Payments.

Price variation for UPVC pipes are as per Clause 59 of Volume-IB.

- **ITEM NO. 2 Providing and supplying D. I. K-7 grade pipes for following nominal bore diameter with internal cement mortar lining including all taxes, insurance, transportation, freight charges, octroi, inspection charges, loading, unloading, conveyance to departmental stores, stacking etc. complete. (IS 8329-2000). Rate for DI pipe based on Wholesale Price index of Pig Iron as 157.60 for the month of December-2022).**

Note: Wherever International Standards or Indian standards / specifications are acceptable

DI K7 350 mm

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

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

- 1) ISO: 10803-1997 Design method for ductile iron pipes
- 2) IS:8329-2000 Centrifugally Cast (spun) ductile iron pressure pipes for water, gas and sewage

- 3) ISO: 2531-1991 Ductile iron pipes, fittings and accessories for pressure pipelines.
- 4) ISO: 4179-1985 ductile iron pipes for pressure and non-pressure-Centrifugal cement mortar lining – General requirements.
- 5) IS: 8112 Specification for 43 Grade ordinary Portland cement.
- 6) BS: 3416 Bitumen based coatings for cold application, suitable for use in contact with potable water.
- 7) ISO: 8179-1995 ductile iron pipes-External coating-Part-1 Metallic Zinc with finishing layer.
- 8) IS: 638 Sheet rubber jointing and rubber insertion jointing.
- 9) ISO: 4633-1996 Rubber seals-Joint rings.
- 10) IS: 5382-1985 Specification for Rubber sealing rings for gas mains, water mains and sewers.
- 11) AWWA C600 Installation of ductile iron water mains and their appurtenances.

1.0 INTERNAL DIAMETER

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

2.0 Length

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

3.0 Thickness

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

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

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

4.0 EPDM Rubber Gasket

Rubber Gasket shall be suitably for Push-on-Joint.

The spigot ends shall be suitably chamfered or rounded off to facilitate smooth entry of pipe in the socket fitted with the rubber gasket

Rubber Gasket shall confirm to IS 5382-1985 and ISO: 4633-1996 its latest revision or amendments if any

5.0 Sampling Criteria

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

6.0 Tolerances on External Diameter

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

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

7.0 Tolerance on Orality

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

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

8.0 Tolerance in thickness

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

Dimensions	Tolerance in mm
Wall thickness (e)	$-(1.3 + 0.001 \text{ DN})^{(1)}$
Flange thickness (b)	$+(2+0.05b) \text{ \& } -(2+0.05b)$

9.0 Coating

Pipe shall be delivered internally and externally coated.

External Coating:

Pipe shall be metallic zinc coated and after that it shall be given a finishing layer of bituminous paint as per IS - 8329-2000

Zinc coating shall comply with IS: 8329/EN 545/ ISO 8179. Only molten zinc spray coating shall be acceptable. The average mass of sprayed metal shall not be less than 130 g/sqm with a local minimum of 110 g/Sqm.

Bitumen overcoat shall be of normal thickness of 70 microns unless otherwise specified. It shall be a cold applied compound complying with the requirements of BS 3416 Type II suitable for tropical climates factory applied preferably through an automatic process.

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

Internal lining:

Internally pipe shall be Portland cement mortar lined (as per IS - 8329-2000). The mortar shall contain by mass at least one part of cement to 3.5 part of sand.

All pipes and fittings shall be internally lined with cement mortar using high speed centrifugal process in accordance with IWO 4179/IS 8329. Cement mortar lining shall be applied at the pipe manufacturing shop in conformity with the aforesaid standards. No admixtures in the mortar shall be used without the approval of the Engineer. The quantity to cement proportion of sand if justified by the sieve analysis.

Pipe lining shall be inspected on site and any damage or defective areas shall be made good to the satisfaction of the Engineer.

Lining shall be uniform in thickness all along the pipe. The minimum thickness of factory applied cement mortar lining shall be as per IS: 8329 Annex-B or ISO 4179. This is given below.

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

10.0 Joint

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

Push-on-joints

The Contractor shall source the push-on-joint gaskets only from the pipe manufactures. In turn the pipe manufacturer shall supply at least 10%

additional quantity of gaskets over and above the requirement to the Contractor at no extra cost.

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

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

Hardness

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

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

11.0 Testing of Pipe:

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

[a] Mechanical Tests

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

[b] Brinell Hardness Test

For checking the Brielle hardness the test shall be carried out on the test ring or bars cut from the pipes used for the ring test and tensile test in accordance with

IS:1500. The test shall comply with the requirements specified in IS: 1500/ISO 6506.

[c] Re-tests

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

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

12.0 Quality Assurance

The manufacturer shall have a laid down Quality Assurance Plan for the manufacture of the products offered which shall be submitted along with the tenders.

13.0 Mode of measurement and payments

Mode of Measurement is As per Schedule - B & Payment As per Schedule Of Payments.

14.0 Lowering and joining DI K-7 pipes of various classes with ISI specials of following diameters in proper position grade and alignment as directed by engineer - in- charge including conveyance.

GENERAL:

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

The trenches shall be well leveled so that pipes are laid evenly among them. The pipes shall be fixed within two rubber rings to be supplied by department at

the place shown in schedule A, if directed by the Engineer-in-charge or mentioned in item of schedule B.

The contractor shall make his own arrangement for obtaining permission for storing & stacking of pipes etc. from land boards whether they are Government, Municipal Local Bodies or Private land owner.

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

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

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

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

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

Notes:

- 1 If any damage is caused to the pipeline during the execution of work or while cleaning / testing the pipeline as specified, contractor shall be held responsible for the same and shall replace the damaged pipeline and retest the same at his own cost to the full satisfaction of Owner / Engineer In-Charge.
2. After for testing of pipeline shall be arranged by contractor at his own cost.

Payment: - As Per Payment schedule in Vol.III Price Bid

Price variation for Ductile Iron Pipes are as per Clause 59 of Volume-IB.

ITEM NO. 3 MS Pipe

Manufacture, Supply & Delivery of Electric Resistance Welded (Up to 400mm)/Submerged Arc Welded(Above 400mm) M.S.Pipe having beveled ends plate or coil conforming to IS-3589-2001 or its latest revision/ammendment for following thickness outside diameter at GWSSB store or site anywhere in Gujarat State including all taxes, insurance, transportation, freight charges, octroi, inspection charges, loading, unloading conveyance to Departmental stores, stacking etc. all complete. (Rate for MS Pipe based on the ex. works price of HR Coil as Rs.58500 per MT - withouth GST (Above 3.15 mm to 10 mm) & Rs. 59000.00 per MT without GST (Above 10 mm) as on Jan-23.(WPI Index of H. R Coil of Dec-22 is 144)

I/S Solvent free Liquid Epoxy Lining (406 Micron) & O/S 3 LPE coated M.S. pipe

323.9mm dia 5.6 thick

610mm dia 6.3 thick

914mm dia 8.0 thick

This specification covers the general requirements for supply, fabrication, delivery at stores of welded M.S. pipes, including loading, unloading, carting and stacking etc. complete.

The pipes manufactured with Submerged Arc Welding both longitudinal and spirally welded will be acceptable provided welding is done by automatic welding machines.

3.1 APPLICABLE CODES & SPECIFICATIONS

The following specifications, standards and codes are made a part of the specification. All standards, tentative specifications, specifications, codes of practice referred to herein shall be the latest editions including all applicable official amendments and revisions.

In case of discrepancy between this specification and those referred to herein, this specification shall govern.

1. IS : 2062 Steel for general structural purposes.
2. IS : 808 Dimensions for hot rolled steel beam, column, channel and angle sections.
3. IS : 814 Covered Electrodes for manual Metal Arc Welding of carbon and C-Mn steel.
4. BS EN 499 Welding Consumables. Covered Electrodes for Manual Metal Arc Welding of Non Alloy and Fine Grain Steel. Classification
5. AWS : A-5.1 Specification for Mild Steel Covered Arc Welding Electrodes.
6. IS : 3613 Acceptance Tests for Wire Flux combinations for Submerged - Arc Welding.
7. AWS : A-5.17 Specification for Bare Mild Steel Electrodes and Fluxes for Submerged Arc Welding. IS : 1367 - Technical Supply Conditions for Threaded Fasteners

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8. IS : 1367 Technical Supply Conditions for Threaded Fasteners (Parts 1 to 3).
 9. IS : 2016 Plain Washers.
 10. IS : 2074 Ready Mixed Paint, Red Oxide Zinc Chrome and Priming.
 11. IS : 102 Ready Mixed Paint, Brushing, Red Lead, nonsetting, Priming.
 12. IS : 816 Code of practice for use of Metal Arc Welding for General Construction in mild steel.
 13. IS : 4353 Submerged Arc Welding of Mild Steel & Low Alloy Steels – Recommendations.
 14. IS : 817 Code of practice for Training and Testing of Metal Arc Welders.
 15. IS : 5334 Code of practice for Magnetic Particle Flaw Detection of welds.
 16. IS : 3600 Methods of Testing Fusion Welded Joints and weld metal in steel (Parts 1 to 9)
 17. IS : 3589 Seamless or Electrically welded steel pipes for Water Gas and Sewage (168.3 to 2032 Outside Diameter)
 18. IS : 7343 Code of practice for ultrasonic Testing of Ferrous Welded Pipes and Tubular Products
 19. IS : 1608 Mechanical testing of Metals.
 20. IS:5504 & IS:3589 Code for SW PIPES
 21. IS:10748 Requirement for Weldable Hot Rolled Carbon Steel Strip in Coils.
 22. API-1104 Welding of pipeline & related facilities

3.2 MATERIALS

- 3.2.1 Mild Steel Plate conforming to IS : 2062, Fe410. Grade B. and M.S. Coil conforming to IS 10748 with Fe410 grade B Welding Consumables - such as electrodes, filler rods and wires shall conform to IS : 814, IS 3613, IS : 6419 and IS : 7280.
- 3.2.2 When requested by the Purchaser, the Bidder shall supply free of charge to the Employer, for testing suitable samples of the materials to be used/used in the Works. The cost of such tests shall be borne by the Bidder and shall be included in his item rates.

3.3 INSPECTION

- 3.3.1 GWSSB will appoint a third party agency for quality testing and quality assurance of pipes to be supplied under this contract. The agency so appointed by GWSSB shall have access, right and authority to inspect and test the pipes, both at the place of manufacturer and also post delivery at the locations mentioned in the tender. Pipes conforming to such test requirements will only be accepted.
- 3.3.2 All works and material under specification will be rigidly inspected during all phases of manufacture and testing and such inspection shall not relieve the Bidder of his responsibility to furnish materials and performed work in accordance with this specification.
- 3.3.3 The Bidder shall notify the Purchaser, in advance of the production of materials and fabrication thereof, in order that the Employer may arrange for mill and shop inspection.
- 3.3.4 The Purchaser may reject any or all materials or work that do not meet with any of the requirements of this specification. The Bidder shall rectify or replace such rejected material/performed work at his own cost, to the satisfaction of the Purchaser.
- 3.3.5 The Purchaser shall have free access to those parts of all plants or any other premises and sites that are concerned with the furnishing of materials or the performance of work under this specification.

- 3.3.6 The Bidder shall furnish to the Employer's inspector reasonable facilities and space without charge for inspection, testing and obtaining of any information he desires in respect of the character of material used and the progress and manner of the work.
- 3.3.7 The Bidder shall supply free of cost and required specimen of materials for testing by the Owner at any time during the progress of work and shall bear the cost of all such tests or retests to the satisfaction of Purchaser.
- 3.3.8 The Bidder shall provide 2 (two) sets of accurate 'Go' and 'No Go' ring gauges to measure the diameter of pipes specials and fitting for the use of the Purchaser at no extra cost.

3.4 FABRICATION OF PIPE

3.5.1 General

- 3.5.1.1 All pipes and specials shall be manufactured out of new mild steel plates, which shall be free from any cracks, surface flaws, laminations, excessive pitting or any other defects. The pipes shall be truly cylindrical, and straight in axis. The ends shall be accurately cut and prepared for field welding. The external circumference of the pipe pieces, which are to be fixed adjacent to flange adapter with fixed outer diameter, shall not deviate from theoretical one by more than 1 mm. To obtain this accuracy the pipe shall be rolled several times, if necessary, as pipe pieces should be truly cylindrical. The external longitudinal welding of this pipe shall be ground smooth flush with surface to the satisfaction of the Purchaser, for a length of 200 mm. No extra cost shall be charged by the Bidder for this grinding work..
- 3.5.1.2 Minor repair by welding or otherwise shall be permitted at the discretion of the Purchaser, but such repairs shall be done only after obtaining the previous permission of the Purchaser. Any pipe or part thereof, which develops injurious defects during shop welding or other operations, shall be rejected.
- 3.5.1.3 Permissible Stress
The permissible stress in the pipe shell shall be related to yield stress (f_y) of pipe material making due allowance for weld efficiency of the joint.

- i) working stress for combined bending and direct tensile stress shall not exceed 60% of yield stress of the material making due allowance for efficiency of welded joint (as per IWWA M-1).
- ii) working stress for combined bending and direct compressive stress shall not exceed 50% of yield stress making due allowance for weld efficiency (as per IWWA M-1).
- iii) it is also necessary to check the shell thickness for adequate factor of safety against failure by buckling (as per IWWA M-11).

For field-welded joint, efficiency factor of 80% is generally adopted, whilst for shop welding joint 90% efficiency is allowed (as per IS 5822 – 1994).

3.5.2 Fabrication

3.5.2.1 The Bidder shall get the fabrication work done in a duly valid licensed factory of his own or that of an approved nominated Sub-Contractor. This factory meant for fabrication of pipes, specials etc. should also be involved with testing etc., machining as well as painting. For completing the work under the present contract within the contract period, the factory shall be equipped with adequate number of various equipment and plant such as :

- i) Plate bending machines for rolling of pipe drums
- ii) Automatic welding machines (suitable for circumferential as well as longitudinal welding)

- iii) Hydraulic Testing Machines
- iv) Traveling gantry or crane of capacity 10 Tonnes or above.
- v) Mobile cranes for loading/unloading of plates, pipes etc. 15 tonnes capacity each
- vi) Lathe for machining of the flanges rings, plates etc.
- vii) Equipment for sand blasting and applying paint by spray gun.
- viii) Equipment for cold pressing of plates up to 25 mm thick to the required curvature (specials, plug plates etc.)
- (IX) Bending machine of adequate capacity for manufacturing ring girders and other necessary equipments.

3.5.2.2 The factory shall have adequate area, and shall also have stacking yard for the stacking of plates, structural, fabricated pipes etc. and the scrap.

3.5.3 Cutting Plates or from plates rolled as coil to the required sizes

- 3.5.3.1 The plates shall be indented in such length as to have minimum wastage and so as to make the pipe as far as possible with one longitudinal joint.
- 3.5.3.2 Before cutting, all the edges of the plates shall be cleaned by brushing/grinding on both the sides.
- 3.5.3.3 After the plates are cut, the edges shall be made smooth and even by polishing with an electrical or pneumatic grinder to remove all inequalities. Care shall be taken to see that the cut edges of the plate are perfectly straight. Jigs to be used for this purpose shall depend upon the types of cutting machine used. The plates cut to the required shape shall be checked for correctness before they are rolled into pipe drums. If any corrections are required, the Bidder shall do the same by re-cutting, if necessary. If any plate or flat is found to be warped, to have corrugations, the defects shall be removed by putting the plate or flat into a roller press, and no extra payment for this rectification work shall be made. The laminated or heavily corroded plate shall not be used in the manufacturing of the pipe.

3.5.4 Rolling of Plates

The plates prepared as mentioned above are cut to the exact size shall be put into a rolling machine to form a pipe of the required diameter as under:

- The Bidder shall adjust the rolling machine so as to give a uniform curvature to the pipe throughout its circumference.
- The curvature obtained shall be checked by the Bidder's foreman during the process of rolling and if proper curvature is not obtained at any place including the ends, the rolling operation shall be repeated at this stage or even after the longitudinal welding of the drum where directed.
- Heating of plates to obtain the desired curvature shall not be permitted.

3.5.5 Tacking the Drums

- 3.5.5.1 The rolled drums shall be kept on an assembly platform for tacking, care being taken to ensure that the tacked drums have their end faces at right angles to the axis of the pipe. While tacking the drum, a gap of 2mm to 4mm shall be maintained, where hand welding is permitted. However, where the welding is to be done on automatic welding machine, there is no need of maintaining such gap depending on the penetration through complete thickness of the welding required. To achieve these objective, clamp spiders, tightening rings and or any other approved gadgets shall be used. Each such drum, before being taken to the assembly platform, shall be numbered on the inside with oil paint, stating the plate thickness as well.

3.5.6 Assembly of Drums Into Pipes

- 3.5.6.1 The tacked drums shall then be transported to an assembly platform where they shall be tack-welded together to form suitable pipe-lengths. Plate shall

be bent in the maximum possible width to reduce the number of circumferential joints.

- 3.5.6.2 The longitudinal joints shall be staggered at 90 deg. The drums when tacked together shall have no circumferential gap when the welding is done on automatic welding machine. But when hand welding is adopted as gap of 2mm to 4mm shall be maintained to obtain a good butt-welded joint.

- 3.5.6.3 The assembly shall be truly cylindrical and without any kinks. The faces shall be at right angles to the axis of the cylinder. A suitable arrangement for testing the correctness of the face shall be provided by the Bidder at the assembly platform.

3.5.7 Welding

- 3.5.7.1 All components of a standard shell, either straight or bent etc. shall be welded, wherever possible by use of automatic arc welding machine by Submerged Arc welding process with alternating current. Generally hand welding shall not be permitted except specific cases, where it is absolutely necessary. This should be done in consent with client's representative. Hand welding shall also not be permitted except for sealing runs and such other minor works at the discretion of the Purchaser. The strength of the joint shall be at least equal to that of the parent material.

- 3.5.7.2 The Bidder shall use electrodes of standard make bearing ISO 9001 – 2000 certification. The size of electrodes depending on the thickness of plate and the type of joint. It shall also be used with standard current and arc voltage required for the machine in use with such modifications as may be found necessary after experimental welding. For this purpose, samples of welded joints shall be prepared and tested in the presence of the Purchaser. The values once determined shall be maintained throughout the work and if any modifications are to be made, a written permission of the Purchaser shall be obtained. In the case of thin sheets, electric arc welding may not give satisfactory results and gas welding shall be resorted to. Gas welding shall be subject to the same specifications and tests as those for electric welds. Welding should be carried out inside as well as outside.

- 3.5.7.3 All the shop and field joints shall be welded, all welding shall conform to the requirements of IS 9595 and IS 4353.

- 3.5.7.4 All longitudinal and circumferential joints shall be double welded butt joints. End preparation for such welding shall conform to IS : 2825.

- 3.5.7.5 All circumferential welds involving plates of unequal thickness shall be so kept that the inside surfaces of plates match to provide stream lined joints without alteration in the internal diameter. As far as practicable, welding of dissimilar thickness of shells shall be carried out in the shops.

- 3.5.7.6 The welding shall be of the best workmanship free from flaws, burns, etc. and the Bidder shall provide for his own electrodes and equipments, ovens to keep the electrodes at the desired temperatures and dry. In order to maintain a good standard in welding, welders shall be tested by the Bidder with prior intimation to the client before they are entrusted with the job. Qualification standard for welding procedures, welders and welding operation shall conform to the requirements of IS : 7307 and IS : 7310 (latest). Periodical tests as regards their efficiency shall also be taken at intervals of about 6 months and those found inefficient shall be removed from the job. Only those who pass the test, shall be posted on the job. If an incompetent welder has already welded some pipes, all welding done by him previously shall be fully checked by X-ray in addition to the regular X-ray inspections. The defects if any, shall be set right to the satisfaction of the Purchaser. All such check tests and rectification of defects shall be entirely at the cost of the Bidder. No

pipes or steel sections shall be erected unless the work of the welder concerned has been proved to be satisfactory. Specially selected welders shall do site welds.

- 3.5.7.7 A record shall be maintained showing the names of welders and operators who have worked on each individual joint. Hand welding shall preferably be carried out by a pair of welders (parallel welding putting two welders at a time both will be working in diametrically opposite side of the curvature. Welding shall be divided into 4 quadrants shall be welded simultaneously, so that by observing proper sequence, distortion can be avoided. A joint entrusted to a particular individual or a pair shall be as far as possible, completed by them in all respects, including sealing run. No helper or other unauthorized person shall be permitted to do any welding whatsoever. In case of infringement of above, the persons shall be punished as directed by the Purchaser.
- 3.5.7.8 The welded joint after welding should not become brittle or sensitive to blows and there should be no loss of toughness due to welding or heat treatment. The material after welding and heat treatment is to be tougher than the base metal and is to retain its original ductility. No allowance will be made for thinning of weld and the weld should in no point be less than the nominal thickness of plate.
- 3.5.7.9 Upon receipt of the order and prior to the start of fabrication, the Bidder shall submit to the Purchaser for his approval the "welding procedure" he intends to use in the shop work. Similarly, prior to the start of the field welding, procedure for the field welding must be submitted to the Purchaser for his approval. Manual welding shall be adopted only when machine welding is not possible.

3.5.8 Ultrasonic and Radiographic tests of Welded Joints

- 3.5.8.1 For the mild steel pipes manufactured in site factory/workshop, fabricated from mild steel plates / coil, **15 % of the welded joints shall be subjected to ultrasonic test.**

3.5.9 Tolerance

- 3.5.9.1 The shell in the completed work shall be substantially round. The difference between maximum and minimum inside diameters at any cross section shall not exceed 1% of the nominal diameter of the cross section under consideration subject to a maximum of 10 mm.
- 3.5.9.2 Machined parts shall be within the limits specified by IS 3589.
- 3.5.9.3 Straight pipes shall have their faces perpendicular to the axis of the section with a maximum deviation of 2 mm on either side of the plane. Pipe ends shall be beveled as per IS : 3589.
- 3.5.9.4 For the shell thickness, no negative tolerances are acceptable:
- 3.5.9.5 The length of each pipe shall not be less than 11.5 mtr.
- 3.5.9.6 Prior to starting manufacturing of pipes, the Quality Assurance and 3.5.9.7 Quality Controls plan shall have to be got approved from purchaser. The pipes shall have to be manufactured and supplied in accordance with the BIS specification No 3589 – 2001. In case of International manufacturers, manufacturing pipes out side India, the pipes conforming to the International Standards or the standards of the country of origin, which are equivalent or higher, the BIS specification will be accepted. For Indian manufacturers certification marks issued by BIS standard is mandatory requirement.

For the entire Indian as well as foreign supplier the international ISO 9001 – 2000 certification is also mandatory.

For manufacturers out side India, quality mark of applicable quality institutions will be required.

3.5.10 Shop Testing

- 3.5.10.1 After fabrication, but before application of protective coatings all pipes and specials shall be subjected to a shop hydraulic test. Standard lengths of pipes shall be directly subjected to test and non-standard pipe and elbows can be tested as standard pipe before being cut to size.
- 3.5.10.2 The test pressure shall ensure that the plate material works is stressed to 40% of the specified minimum tensile strength, which will give test pressure as per IS-3589.
- 3.5.10.3 Each pipe shall be filled with water and the pressure slowly and uniformly increased until the required test pressure is reached.
- 3.5.10.4 The pipe to be tested shall be given a serial no. which shall be painted on its inside together with details such as pipe No. Shell thickness, diameter, length etc. as directed. It shall be entered in the register to be maintained by the Bidder.
- 3.5.10.5 Prior to testing, the pipe shall be inspected thoroughly and all the apparent defects in welding such as jumps, porosity etc. shall be repaired by gouge and re-welding.
- 3.5.10.6 The hydraulic test shall be carried out under cover at the fabrication shop, in the presence of and to the satisfaction of the Purchaser or the inspection agency appointed by the Employer.
- 3.5.10.7 For indicating the pressure inside the pipe an accurate pressure gauge of approved make duly tested and calibrated for the accuracy of readings shall be mounted on one of the closures which close the pipe ends.
- 3.5.10.8 The pressures shall be applied gradually by approved means and shall be maintained for at least 10 seconds or till the inspection of all welded joints is done during which time the pipe shall be hammered throughout its length with sharp blows, by means of a 1 kg. hand hammer.
- 3.5.10.9 The pipe shall withstand the test without showing any sign of weakness, leakage, oozing or sweating. If any leak or sweating is observed in the welded joints, the same shall be repaired by gouging and re-welding after dewatering the pipe. The repaired pipe shall be re-tested to conform to the specified pressure.
- 3.5.10.10 If any leak or sweating is observed in pipe shell the pipe under test shall be rejected temporarily. The Bidder shall stack such rejected pipes separately in his yard. The Purchaser, shall inspect the same and after taking cuts if necessary, shall determine the nature of repairs to be carried out thereon and shall then decide as to how and where they shall be used. No payment shall be made for handling or carrying out repairs, but, payment for the fabrication and hydraulic testing of the pipe shall be released only after acceptance of the pipe with necessary repairs and subsequent testing etc. are carried out by the Bidder to the satisfaction of the Purchaser. **The Purchaser shall be supplied with two copies of the results of all the tests carried out.**

3.5.11 Destructive Test of Welded Joints

- (i) The welded joints shall be tested for Tensile test, Bend test & Tre-panned plug in accordance with procedure laid down in as per the latest edition of IS No. 3600 "code of procedure for testing of fusion welded joints and weld metals in steel".
- (ii) Test pieces shall be taken by the Bidders from the welded joints at the position on fabricated pipes pointed out by the Purchaser in-charge.
- (iii) The sample so taken shall then be cut to the exact shape and dimensions and machined as described below and handed over to the Purchaser for testing. All the work unto and including machining and arranging for test shall be done by the Bidders.

3.5.12 Submission of Daily Progress Report

- 3.5.12.1 The Bidder shall submit to the Purchaser a daily progress report in the proforma approved by the Purchaser, wherein all the details of the work carried out in the factory shall be fully recorded. Similarly, works done in the various units in the factory shall be separately mentioned. The Bidder shall maintain a register of all the finished materials giving dates of carrying out important operations such as testing, transport, etc. The register shall be presented at least once a week to the Purchaser who shall initial the entries after verification.**

3.6 TRANSPORTING OF PIPES.

- 3.6.1 All pipes and specials fabricated in the site factory / workshop and temporarily stacked in the Bidder's yard shall be transported to the site of laying after cleaning them internally etc. The loading in the factory shall be carried out by means of either a crane, gantry or shear legs, so as not to cause any damage to the finished material. Similarly, while unloading and stacking, great care shall be taken to ensure that the material is not damaged or dented. The contrivances to be used for unloading will be different in different situations and in each case the one approved by the Purchaser shall be adopted. The material stacked at site shall be jointly inspected by the Purchaser and the Bidder and defect or damage noticed shall be repaired to the satisfaction of the Purchaser before payment is admitted.**
- 3.6.2 Props of approved designs for maintaining circularity having wooden planks at both ends to avoid metal to metal contact shall be fixed to the pipes during transit to avoid undue sagging and consequent distortion. After the pipes are carefully stacked, props should be retained till pipes are joined in trenches and then props are re-used for subsequent similar operations. The stacking ground, both in the Bidder's yard and at the site of laying shall be selected in such a way as not to get waterlogged during monsoon. If this cannot be done, the pipes shall be supported on sleepers to avoid contact with wet earth and subsequent rusting. In order to prevent sagging during transit, savings of steel plates can be utilized by cutting to the required length and tacking the same to the pipe ends, in place of props, if approved by the Purchaser.**
- 3.6.3 As explained in earlier paragraphs, materials such as pipes, tapers, etc. may be transported to the site of laying as soon as the material is finished in all respects with the permission of the Purchaser to avoid congestion in the Bidder's yard. However, materials such as expansion joints, composite bends, 'T' branches and other complicated materials shall be stacked in the Bidder's yard until they are required for laying in the field. In view of this, the work of fabrication of such materials shall be properly synchronized as far as possible with the laying operations.**

- 3.6.4 Fabricated materials such as specials, appurtenances, bolts, nuts, distance pipes, flanges, saddles, collars bypass arrangements etc. shall be transported to the site of laying from the fabrication shop according to the needs of the laying operations only. In regards access roads, the Bidder shall note that access road may lead up to some points on the alignment the Bidder shall have to make his own arrangement for connecting approaches to transport the pipes cross country to the actual site of laying at his own cost. Whatever may be the mode of transport he uses it shall be incumbent on the Bidder to carry and stack the pipes and specials along the alignment as close as possible to the site of laying.

3.7 PROCEDURE FOR RECEIVING STEEL PIPES

3.7.1 General

- 3.7.1.1 To ensure that the work of erecting pipes is not held up at any stage and place, the Bidder shall maintain an adequate stock of standard specials, flange rings, plug plates, manhole covers, etc. and short length of smaller diameter pipelines, etc. at site in his field stores, in consultation with the Purchaser. Wherever possible, the Bidder shall arrange one full month's requirement of pipes, specials, etc. stacked along the alignment.

3.7.2 Stacking of pipes, etc. and inspection

- 3.7.2.1 The Bidder shall keep in each section a responsible representative to take delivery of the pipes, specials and appurtenances, etc. transported from the fabricating stockyard or received from any other work site to the site of laying and to stack along the route on timber skids. Padding shall be provided between coated pipes and timber skids to avoid damage to the coating. Suitable gaps in the pipes stacked shall be left at intervals to permit access from one side to the other. The pipes, specials, appurtenances so received on site shall be jointly inspected and defects recorded, if any, such as protrusions, grooves, dents, notches, damage to the internal coating etc. shall be pointed out immediately to the Purchaser at the site and in the acknowledgement challans. Such defects shall be rectified or repaired to the satisfaction of the Purchaser entirely at the Bidder's risk and cost.

3.7.3 Handling of Pipes.

- 3.7.3.1 It is essential to avoid damage to the pipes at all stages during handling. The pipes shall be handled in such a manner as not to distort their circularity or cause any damage to their surface treatment. Pipes shall not be thrown down from the trucks nor shall they be dragged or rolled along hard surfaces. Slings of canvas or equally non-abrasive materials of suitable width of special attachment shaped to fit the pipe ends shall be used to lift and lower coated pipes to prevent damage to the coating.
- 3.7.3.2 Great care shall be taken in handling the pipe right from the first operation of manufacture until they are laid and jointed. The Bidder will provide temporary props as described earlier in order to prevent any sagging of the pipes while they are stacked in their yard and while transporting to the site of delivery, i.e. laying. The props shall be retained until the pipes are laid and welded. If at any time these props are found to be dislodged or disturbed, the Bidder shall immediately reinstate them in such a way that the true shape of the pipe shell or specials is maintained to the satisfaction of the Purchaser. No defective or damaged pipe or special shall be allowed to be used in the work without rectification to the satisfaction of the Purchaser. Any damage to the

coating shall be repaired by the Bidder at his own cost to the satisfaction of the Purchaser.

3.7.4 Dents

- 3.7.4.1 Whenever any dent, i.e. a significant alteration of the curvature of the pipe shell is noticed, the depth of the dent shall be measured between the lowest point of the dent and the pipe shell curvature line. All dents exceeding 2 percent of the outer diameter of the pipe shall be removed by cutting out a cylindrical portion of the pipe and replacing the same by an undamaged piece of the pipe. The Purchaser may permit insert patching if the diameter of the patch is less than 25 percent of the nominal diameter of the pipe. Repairs by hammering with or without heating shall not be permitted. Any damage to the coating shall also be carefully examined and rectified.

3.7.5 Marking

- 3.7.5.1 The component parts of the pipes shall be carefully marked for identification in the field. The marking shall be on the side, which will be the inside of the pipe after bending.
- 3.7.5.2 The marking operation shall be conducted with full size rulers and templates. Only blunt nose punches should be used.
- 3.7.5.3 The plates used for fabrication of pipes shall be laid out in such a way that when the shells are completed one set of original identification markings for the material will be plainly visible. In case these markings are unavoidably cut out, they shall be accurately transferred by the Bidder to a location where these markings will be visible on the completed work.
- 3.7.5.4 The method of marking all the pipes to be delivered under scope of contract shall ensure that all the information will remain legible even after transportation, storage in open space etc. In general the legible and marking upon the goods shall indicate the followings:
- i) Certification mark on each pipe, if any (like ISI).
 - ii) Manufacturer's brand name and/or trade mark.
 - iii) Purchaser's mark as "GWSSB-VARIIV" be embossed on each pipe.
 - iv) Diameter and wall thickness.
 - v) Inspector's mark on each pipe.

Mode of Measurement is As per Schedule - B & Payment As per Schedule Of Payments.

ITEM NO. 4

- **Providing and supplying at store or site of work including freight, loading, unloading, stacking, insurance & all taxes etc. complete Above 300 mm dia. M. S. Specials flanged ends**

The thickness and materials specification for M S Specials shall be same as that of MS pipe. The specials shall be painted with 3 coats of approved make epoxy paint inside and outside

The necessary MS Specials required during the lowering & laying of MS/AC/DI & PVC Pipe shall be supplied by the agency and shall be as per standard specification.

MS specials include Air valves risers, flanges, tailpiece, bends, reducers etc.

If MS specials are fabricated at site, the quality of work shall be same as specified for jointing of MS pipes.

The Rate shall be including loading, unloading, carting, insurance etc. complete.

Mode of Measurement is As per Schedule - B & Payment As per Schedule Of Payments.

➤ **ITEM NO- 5**

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

For D.I.Specials, Socket and Spigot type, 80 to 300 mm dia.

For D.I. Specials, Socket and Spigot type, type, Above 350mm dia.

DI Specials:

DI Specials with all types of diameters suitable of K-7 grade pipes with inner cement mortal lining. The necessary DI Specials required during the lowering & lying of Ductile Iron Pipe shall be supplied by the agency and shall be as per standard specification. And per IS specification.

It shall be of best quality as per requirement Rate shall be including loading, unloading, carting, insurance and labor charge etc. complete.

The payment shall be made on kg. Basis.

Technical Specification for Double Chamber Restrained Joints Ductile Iron (DI) Pipes

Restrained joints DI pipes and fittings shall be utilized where pipelines have DI Fittings (such as bends, Tees, reducers etc.), needs to crossroads through existing ducts or in areas with restricted accessibility or in case of heavy thrust forces or as directed by engineer – in- charge. The use of concrete anchor/thrust blocks shall be submit with his bid, the full details of the type of restrained joint propose to use.

The manufacturer will have to demonstrate the allowable operating pressure of the proposed restrained joints by type test duly approved by third party

inspection agency such as Bureau VERITAS India / Italy, BSI UK or DVGW Germany. The allowable operating pressure & permissible angular deflection for various size range shall be as mentioned given below:

DN	DE, mm	Allowable operating Pressure * (PFA), bar	Allowable Angular Deflection,(Degree)
100	118	40	5
150	170	40	5
200	222	40	4
250	274	40	4
300	326	40	4
350	378	40	3
400	429	40	3
500	532	40	3
600	635	40	2
700	738	25	1.5
800	842	25	1.5
900	945	25	1.5
1000	1048	25	1.5
1100	1152	25	1
1200	1255	25	1

Calculation of the number of pipe lengths with restrained joint required, shall be as per the manufacture's recommendation and shall be subject to Engineer- in-Charge approval.

Restrained joints shall be designed to resist the axial thrust forces maintain flexibility and angular deflection mentioned in the above Table. Restrained joints shall be designed in accordance with ISO 10804. The thrust resisting mechanism shall be separated from the sealing action of the gasket and shall not be in contact with portable water in the pipeline.

The Double chamber restrained DI Pipes and Fitting shall be supplied with internal OPC lining and external zinc coating with finish layer of Blue Epoxy conforming to IS 8329:2000/IS 9523:2000 with latest amendment.

Mode of Measurement is As per Schedule - B & Payment As per Schedule Of Payments.

➤ **ITEM NO- 6 Temper Proof Air Valves**

Providing and supplying C. I. Temper proof air valves with SS 304 Float gun metal- nozzle of approved make & quality of following class and

diameter including all taxes, insurance, transportation, freight charges, octroi, inspection charges loading, unloading, conveyance to departmental stores, stacking etc. complete. Temper proof Air valves, With Isolating Sluice Valve PN 1.6 size 150MM Dia & Without Isolating Sluice Valve PN 1.6 size 50MM Dia.

The Temper Proof Air Valve Shall be provided 50 mm size having pressure rating PN-1.0 at site of work/store as per instruction of Engineer in charge.

The valve should be free from any manufacturing / visual defects like Dents, Damage mark etc The Valve should be as per approved QAP and as per approved drawing The concern Executive Engineer Will approved the drawing and QAP with consultation of TPI.

Material:-

The Material of construction/manufacturing of valve should be as follows.

Body:- IS 210 F.G.R. 22

Ball:- S.S.304

Gasket :-Rubber IS 638

L.P. Seat Ring:-Natural Rubber IS 11855

Nozzle:- Gun Metal IS 318 LTB-2

Bolts:- Carbon Steel Pressure Testing: - 10 kg/cm² for 5 minutes and no leakage should be found. Marking:-Dia of valve ,Sr No of valve and flow direction should be marked on body o valve.

Preparation for Dispatch: -

Valve shall be complete in all respect when dispatched. Valve shall be drained, cleaned, prepared and suitable protected with 2 coats of red oxide on un machined surface and rust preventive coats on machined and flanged surface for dispatch in such a way as to minimize the possibility of damage and deterioration during transit and storage. Painting shall be done as required by purchaser. Guarantee: Contractor should either repair the air valve or replace the air valve if any fault occurs in Air Valve Functioning. Guarantee should be of 2 years and its Period will be considered from the date of installing at Site.

Measurement & Payment: -

Mode of Measurement is As per Schedule - B & Payment As per Schedule Of Payments.

➤ **ITEM NO- 7**

- **Excavation for pipe line trenches for water supply, sewerage line, manhole etc. all with shoring and strutting if required as per required gradient and line including safety provisions using site rails and stacking excavated stuff including up to all required lead cleaning the site etc. complete for all lifts and strata as specified..**
- **0.0 to 1.5 mt depth. a) In all sorts of soil and soft murrum
b) In hard murrum, boulders incl. macadam road.
c) In Soft rock**

1.1 GENERAL

- 1.1** The excavation for trenches will generally, refers to open excavation for trenches in wet / dry conditions for pipe laying work.

2.0 CLEARING OF SITES:

- 2.1** The site on which the pipelines are to be laid and shown on plan and the area required for setting out and other operations shall be cleared and all obstruction loose stones and materials, rubbish of all kinds, stumps, brushwood as trees shall be removed as directed the roots shall be entirely grubbed up.
- 2.2** The products of the clearing to restocked in such a place and in such a manner, as directed by the engineer in charge.
- 2.3** In jungle clearings, all trees not specially marked for preservation, bamboo's jungle wood and brushwood shall be cut down their roots grubbed up. All wood and materials from the clearing shall be the property of the Board shall be arranged as directed by the Engineer-in-charge or his authorized agent; the material pronounced as useful by the Engineer will be conveyed and properly stacked as directed within the specified limit. Unless materials will be burnt or otherwise disposed off as directed.
- 2.4** All holes or hollows whether originally existing or produced by digging up roots, shall be carefully filled up with earth, well earth, well rammed leveled off, as may be directed.

3.0 SETTING OUT:

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

The labor materials etc. required for setting out and establishing benchmarks and other reference marks shall be arranged by the contractor at his own cost.

4.0 EXCAVATION

- 4.1** The excavation incl. Bailing out of water for the pipe trenches shall also incl. Removal of all materials of whatever nature and whether wet or dry condition

necessary for laying of pipelines exactly in accordance with alignment, levels grades and curves shown on the plans or as directed by the Engineer-in-charge. Trenches shall be excavated to the exact width and depth according to the size of pipe and the sides shall be left vertical as far as possible or according to the angle of repose of various soils. Unless there is a specific extra provision in the contract for shoring and strutting or for cutting side slopes the contractor shall at his own cost do the necessary shoring and strutting or cutting of slopes to a safe angle of repose or both approved by the Engineer-in-charge. The contractor shall notify the Engineer before starting excavation to enable him to take cross sectional levels for purpose of measurements before the ground is disturbed. The bottom of the trenches shall be leveled both longitudinally and transversely or sloped as directed by the Engineer. The contractor shall at his own cost remove such portions of boulders or rocks, as are rectified to make the bottom of the trench level. No filling shall be allowed to bring the trench to level. If by contractor's mistake excavation is made deeper than shown on the plans and if ordered by the Engineer the extra depth shall have to be made with selected excavated stuff only with watering, remedying etc. as directed, by the Engineer and at the cost of the contractor. Other hard excavation shall be cleared of all sorts and loose materials and cut to firm surface, either level, stepped as directed by the Engineer. The Engineer may order such changes in the dimensions and alignment of pipe trench as may be deemed necessary to secure satisfactory cover over pipeline. The contractor shall, at his own expense, make provision for bailing out of draining water and the trenches shall be kept free of water, during laying work.

After each excavation is completed, the contractor shall notify the Engineer to that effect and no laying of pipeline will be allowed to lie until Engineer has approved the depth and dimensions of trenches level and measurements.

Excavation by the use of Explosives

Unless otherwise stated herein, I.S. Specification "IS: 4081: Safety Code for Blasting and related Drilling Operations" shall be followed. As far as possible all blasting shall be completed prior to commencement of construction. At all stages of excavation, precautions shall be taken to preserve the rock below and beyond the lines specified for the excavation, in the soundest possible condition. The quantity and strength of explosives used shall be such as will neither damage nor crack the rock outside the limits of excavation. All precautions, as directed by Employer's Representative, shall be taken during the blasting operations and care shall be taken that no damage is caused to adjoining buildings or structures as a result of blasting operations. In case of damage to permanent or temporary structures, Contractor shall repair the same to the satisfaction of Employer's Representative at his cost. As excavation approaches its final

lines and levels, the depth of the charge holes and amount of explosives used shall be progressively and suitably reduced.

The contractor shall obtain a valid Blasting License from the authorities concerned. No explosive shall be brought near the work in excess of quantity

required for a particular amount of firing to be done; and surplus left after filling the holes shall be removed to the magazine. The magazine shall be built as a way as possible from the area to be blasted. Employer's Representative's prior approval shall be taken for the location proposed for the magazine.

In no case shall blasting be allowed closer than 30 meters to any structure or to locations where concrete has just been placed. In the latter case the concrete must be at least 7 days old. Blasting for excavation in hard rock will only be allowed if permitted by competent authority otherwise shall be done with chiseling only.

For blasting operations, the following points shall be observed.

- i) Contractor shall employ a competent and experienced supervisor and licensed blaster in-charge of each set of operation, which shall be held personally responsible to ensure that all safety regulations are carried out.
- ii) Before any blasting is carried out, Contractor shall intimate Employer's Representative and obtain his approval in writing for resorting to such operations. He shall intimate the hours of firing charges, the nature of explosive to be used and the precautions taken for ensuring safety.
- iii) Contractor shall ensure that all workmen and the personnel at site are excluded from an area within 200 m radius from the firing point, at least 15 minutes before firing time by sounding warning whistle. The area shall also be given a warning by sounding a distinguishing whistle.
- iv) The blasting of rock near any existing buildings, equipments or any other property shall be done under cover and Contractor has to make all such necessary muffling arrangements. Covering may preferably be done by MS plates with adequate dead weight over them. Blasting shall be done with small charges only and where directed by Employer's Representative; a trench shall have to be cut by chiseling prior to the blasting operation, separating the area under blasting from the existing structures.
- v) The firing shall be supervised by a Supervisor and not more than 6 (six) holes at a time shall be set off successively. If the blasts do not tally with the number fired, the misfired holes shall be carefully located after half an hour and when located, shall be exploded by drilling a fresh hole along the misfired hole (but not nearer than 600 mm from it) and by exploding a new charge.
- i) A wooden tamping rod with a flat end shall be used to push cartridges home and metal rod or hammer shall not be permitted. The charges shall be placed firmly into place and not rammed or pounded. After a hole is filled to the required depth, the balance of the hole shall be filled with stemming, which may consist of sand or stone dust or similar inert material.

- vii) Contractor shall preferably detonate the explosives electrically.
- viii) The explosives shall be exploded by means of a primer, which shall be fired by detonating a fuse instantaneous detonator (F.I.D) or other approved cables. The detonators with F.I.D. shall be connected by special nippers.
- ix) In dry weather and normal dry excavation, ordinary low explosive gunpowder may be used. In damp rock, high explosive like gelatin with detonator and fuse wire may be used. Underwater or for excavation in rock with substantial accumulated seepage electric detonation shall be used.
- x) Holes for charging explosives shall be drilled with pneumatic drills, the drilling pattern being so planned that rock pieces after blasting will be suitable for handling without secondary blasting.
- xi) When excavation has almost reached the desired level, hand trimming shall have to be done for dressing the surface to the desired level.

Any rock excavation beyond an over break limit of 75 mm shall be filled up as instructed by Employer's Representative, with concrete of strength not less than M10. Stopping in rock excavation shall be done by hand trimming.

- xii) Contractor shall be responsible for any accident to workmen, public or Employer's property due to blasting operations. Contractor shall also be responsible for strict observance of rules, laid by Inspector of explosives, or any other Authority duly constituted under the State and / or Union Government as applicable at the place of excavation.

Stripping loose Rock

All loose boulders, detached rocks partially and other loose material which might move therewith not directly in the excavation but so close to the area to be excavated as to be liable, in the opinion of Employer's Representative, to fall or otherwise endanger the workmen, equipment, or the work shall be stripped off and removed from the area of the excavation. The method used shall be such as not to render unstable or unsafe the portion, which was originally sound and safe.

Any material not requiring removal in order to complete the permanent works, but which, in the opinion of Employer's Representative, is likely to become loose or unstable later, shall also be promptly and satisfactorily removed.

Classification of Strata:

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

All the materials encountered in the excavation shall be classified as under :-

Ordinary soil and soft murrum:

These will include all materials of an earthy or sandy nature, which can be easily ploughed or small shingle, and gravel, which can be easily removed.

Hard murrum:

This shall include all kinds of disintegrated rock or shale or inundated clay which can be removed with a shovel without difficulty and which do not require blasting.

Soft rock:

This shall include all materials which is rock or hard conglomerate, all decomposed and weathered rock, highly fissured rock old masonry and also soft rock boulders bigger than 1/2 cubic meter and other varieties of rock. Which do not require blasting and which can be removed with the pie crowbars wedges and hammer.

Hard rock & Bhat rock

This shall include rocks, occurring in masses, which could best be removed by chiseling.

5.0 SHORING AND STRUTTING:

5.1 Shoring & strutting and dewatering if required shall have to be carried out by the contractor, for which any extra charge will not be paid

5.2 During excavation if water connections, sewage connections, telephone lines, khal kuva (soak pits) all other utility services like gas pipe line, Oil pipe line, drainage lines, Storm water line etc. are damaged by the contractor, the same shall have to be restored by the contractor without any extra payment.

6.0 PROTECTION

6.1 The trenches shall be strongly fenced and red light signal shall be kept at night and arrangement of watchman to prevent accidents should be done, sufficient care protective measure shall be taken to see that the excavation shall not affect or damage the adjoining structure. The contractor shall be entirely responsible for any injury to life and damage to the properties etc. Necessary protection work such as guide ropes, crossing places, barricades, caution boards etc. shall be provided by the contractor.

7.0 The excavation in all sorts of soil, hard murrum, soft rock or hard rock or any type of soil shall have to be carried out up to the required depth by the agency.

8.0 DISPOSAL OF EXCAVATED STUFF

8.1 No excavated stuff from trench are to be placed even temporarily nearer than 1.5 meter or greater distance up to 90 meter or as prescribed by the Engineer from the outer edge of trench. All excavated material will be the property of the board. The rate of excavated includes sorting out of useful materials and stacking then separately as directed within

specified lead. The excavated stuff suitable and useful for refilling or for other use shall be stacked at convenient places. The materials not useful in any wet shall be disposal off as directed by the Engineer from the outer edge of trench.

8.2 The site should be cleared off on completion of work.

9.0 ADDITIONAL REQUIREMENTS

- 9.1** At the joints of pipes, the trench shall be excavated to an additional depth of 15 cm. and width of 30 cm. And length of 15 cm. beyond the edge of collar on both the sides or as directed. The rate include for such extra excavation made at the joints. The trenches shall be excavated perfectly in straight line. The bottom of the trench shall be kept as per invert level or as directed. To maintain the proper slop the usual method of site rails and boning rods shall be adopted. The contractor shall have to provide and fix and maintain sight rails and boning rod without any extra cost.

If the contractor fails or makes delay to give hydraulic test of the pipe line laid in any of the section, without any genuine reason, he shall be responsible to get any part of the length trenches refill in such case i.e. before tasting for safety of pedestrian and/or vehicular traffic as found necessary by the engineer-in-charge without any extra cost. If found necessary any directed by the Engineer-in-charge. The contractor shall have to excavate the refilled trenches, during hydraulic test without any extra cost. At all road crossings, trenches shall be excavated only for half width of the road and pipe shall be laid. The other half shall be excavated only after back filling over the laid pipeline is done so as to make it suitable for the traffic. The contractor shall provide direction when the pipeline is to be laid along the road as required and shall maintain the diversion or any part of it, without any extra cost. At all road crossings, the pipe shall be laid below the crest of read.

- 9.2** The contractor shall break the road surface by excavation chiseling to the exact width and length as shown on the drawing or as directed by the Engineer-in-charge.

The excavated stuff shall be deposited in uniform layers to avoid mixing with other kind of materials at non-objectionable place or as directed by the Engineer-in-charge.

10.0 MEASURMENT AND PAYMENT

- 10.1** The payment of excavation shall be made at the unit rate per cubic meter for the quantity actually excavated and accepted by the Engineer in charge limited to dimensions shown in the sanctioned plans or as directed by the Engineer. Excavation in excess of the sanctioned dimensions shall not be measured not paid for and if an ordered by the Engineer the contractor shall have to fill up the excess depth with excavated stuff with watering ramming etc. (Completed as specified) for trench without any extra payment to the contractor.
- 10.2** Dimension shall be correct to two places of decimals of a meter and individual quantity shall of decimals of a meter and individual quantity shall be calculated to two places of decimals of a cubic meter.
- 10.3** The rate for the item of excavation shall include unless and otherwise mentioned.
- (a)** Clearing of site
 - (b)** Setting out work including all materials and labor.

- (c) Providing and subsequently removing, shoring and strutting outing Slopes etc.
- (d) Excavation and removal and staking of all excavated stuff as directed.
- (e) Necessary protection including labor materials equipment etc. to ensure safety and protection against risk or accident.
- (f) Providing facilities for inspection and damage to property if caused during progress of work.
- (g) Compensation for injury to life and damage to property if caused during Progress of work.
- (h) Restoring of water supply connections, sewer connections, telephone Lines, khalkuva soapiest etc. if damaged by contractor without extra Payment.
- Dewatering of excavated pit trench during the progress of work.
- (j) Clearing the site on completion of works directed by the Engineer.

Mode of Measurement is As per Schedule - B & Payment As per Schedule Of Payments.

ITEM NO- 8

- **Lowering, laying, fixing and jointing PVC/uPVC/c PVC pipes and specials of following class and diameter including cost of conveyance from stores to site of works including cost of labour, material, cement solvent, giving satisfactory hydraulic testing as per ISI code.**

90 mm Dia. PVC
110 mm Dia. PVC
140 mm Dia. PVC
160 mm Dia. PVC
180 mm Dia. PVC
200 mm Dia. PVC
250 mm Dia. PVC

PVC Pipes

- The excavation for trenches shall be done before laying of the pipes as per required depth and width so that adequate space can be made available for joint.
- The pipes & joints shall be procured, supplied by the Contractor at work site at his own cost. Every care shall be taken in carting them to site. During transportation any damage shall be occurring to pipes for fittings the replacement of pipes given by the contractor at his own cost.
- Before laying the pipes it shall be brushed throughout length so that the dust and soil can be removed.
- Reducer bends tees, and adopter etc. to be supplied by the contractor as per requirement.

- All the specials such as bends, tees, reducer, etc. shall be fixed as per instruction of engineer-in-charge in the pipeline.
- The pipe shall be hydraulically tested during the testing no leakage shall be observed. If, leakage observed, it shall be set rightly by the contractor at his own cost as per the instruction of engineer-in-charge. The payment shall be as per payment schedule.
- **The Scope For The Item Cover**
- Cost of additional excavation required for jointing clearing the site of all scrubs, bushes, and trees and dewatering where necessary.
- Labour for laying pipes in trenches to correct alignment at required depth with tools, including cutting of pipes and specials if required for laying of pipes including connecting pipes to specials and appurtenances. Cost of the scaffolding, tools and plants, ropes etc.
- Protection of existing works from damage and cost of repair to the damages carried out to the existing structure, sewer line telephone/electricity cables, electric cables, electric lines, gas pipe line, irrigation pipe line etc.
- Providing, supplying and fixing all PVC specials required for laying.
- The pipe laying across the state highways, national highways etc. will have to be done either through open cut method or through push through method depending upon the requirement to be prescribed by the sanctioning authority. However, mostly it would be push through method.
- GWSSB will not be able to provide water for testing of the pipelines & water containers of the project. This shall have to be managed by the contractor at his cost and risk.
- Labour for making joints including jointing material for joints, tools as well as tests. Testing of pipes for leakage under water pressure and flushing the pipes after testing and construction work shall have to be arranged by the contractor at his own cost.
- After each section of the pipeline has been completed it shall be tested for water tightness before being covered. The contractor shall at his own cost fill up water in pipe line and given necessary hydraulic test section by section and the pipe line shall stand the pressure which shall stand the pressure which shall exceed the working pressure by (a) 50% of the highest pressure in the section. (b) 30m whichever is less without showing any leakage or sweating anywhere in the pipes joints specials valves etc. if any defect are found the contractor shall be made good the same at his own cost.
- Any leaking joints shall be made good and above test pressure in to be lowered gradually after satisfactory test is & over.

- GWSSB will not be able to provide water for testing of the pipelines & water containers of the project. This shall have to be managed by the contractor at his costs and risk.
- The hydraulic test shall be given again if considered necessary by the Executive Engineer or his representative to show that no further leakages or sweating is there. The contractor shall have to make necessary arrangements for water testing as well as plugging the opening of pipes etc. as directed without claiming any extra cost. The pipelines shall be kept filled with water for a work lines shall be kept filled with water for a week or till it is situated for testing is done.
- If the pipe lines are laid in detached sanctioned & not in continuous length due to any reasons such as non-availability of specials or due to obstacle etc. The contractor shall see that no end of pipes length is kept open-ends are immediately covered up either by suitable blank flange or cap slug or by means of double layer gunny bags clothes tied properly by mild steel wire without any claim for extra-cost.
- **Mode of Measurement And Payment :**
- Mode of Measurement is As per Schedule - B & Payment As per Schedule Of Payments.

ITEM NO- 9

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

DI K-7 150 mm

DI K-7 200 mm

DI K-7 250 mm

DI K-7 300 mm

DI K-7 350 mm

DI K-7 400 mm

DI K-7 600 mm

DI K-7 450 mm

- **GENERAL:**

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

- The trenches shall be well leveled so that pipes are laid evenly among them. The pipes shall be fixed within two rubber rings to be supplied by department at the place shown in schedule A, if directed by the Engineer-in-charge or mentioned in item of schedule B. The specification for titan joints i.e. Rubber Rings shall be as per details specification material section.
- The contractor shall make his own arrangement for obtaining permission for storing & stacking of pipes etc. from land boards whether they are Government, Municipal Local Bodies or Private land owner.
- Every pipes before lowering into the trenches shall be got checked and thoroughly cleaned and the beds of the trenches shall be properly graded and leveled as required on the line, without any claim for extra cost whether it is required. The pipe shall be carefully lowered into the trenches with the help of a suitable type of chain pulley blocks, which shall first be approved by the Engineer-in-Charge. Each pipe shall be properly jacked and the spigot perfectly fixed into the socket. No jointing operation shall be started unless the gradients levels are approved by the Engineer-in-Charge or his representatives.
- The pipes shall be laid complete in centerline ranged accurately by means of a string attached to both marked center of site rails and no deviation shall be permissible without the permission of Engineer-in-Charge. The pipe shall be laid in reasonably dry trenches and no circumstances on slushy bedding.
- The pipes shall be brushed before lowering any laying or remove any soil or dirt etc. that may have accumulated.
- The inside socket and outside of the spigot-shall be carefully cleaned. The pipe shall be lowered carefully with socket and toward and the flow of water or up till or as directed and spigot and should be carefully inserted into the socket and the space shall be filled with the joint.
- The excavation for trenches shall be done before laying of the pipes as per required depth and width so that adequate space can be made available for joint.
- The pipes & joints shall be procured, supplied by the Contractor at work site at his own cost. Every care shall be taken in carting them to site. During transportation any damage shall be occurring to pipes for fittings the replacement of pipes given by the contractor at his own cost.
- Before laying the pipes it shall be brushed throughout length so that the dust and soil can be removed.
- Reducer bends tees, and adopter etc. to be supplied by the contractor as per requirement.

- All the specials such as bends, tees, reducer, etc. shall be fixed as per instruction of engineer-in-charge in the pipeline.
- The pipe shall be hydraulically tested during the testing no leakage shall be observed. If, leakage observed, it shall be set rightly by the contractor at his own cost as per the instruction of engineer-in-charge. The payment shall be as per payment schedule.
- **TESTING OF WATER PIPES:**
- After each section of the pipeline has been completed it shall be tested for water tightness before being covered. The contractor shall at his own cost fill up water in pipe line and given necessary hydraulic test section by section and the pipe line shall stand the pressure which shall exceed the working pressure by (a) 50% of the highest pressure in the section.
- (b) 30m whichever is less without showing any leakage or sweating anywhere in the pipes joints specials valves etc. if any defect are found the contractor shall be made good the same at his own cost.
- Any leaking joints shall be made good and above test pressure in to be lowered gradually after satisfactory test is & over.
- **GWSSB will not be able to provide water for testing of the pipelines & water containers of the project. This shall have to be managed by the contractor at his costs and risk.**
- The hydraulic test shall be given again if considered necessary by the Executive Engineer or his representative to show that no further leakages or sweating is there. The contractor shall have to make necessary arrangements for water testing as well as plugging the opening of pipes etc. as directed without claiming any extra cost. The pipelines shall be kept filled with water for a work lines shall be kept filled with water for a week or till it is situated for testing is done.
- If the pipe lines are laid in detached sanctioned & not in continuous length due to any reasons such as non-availability of specials or due to obstacle etc. The contractor shall see that no end of pipes length is kept open-ends are immediately covered up either by suitable blank flange or cap slug or by means of double layer gunny bags clothes tied properly by mild steel wire without any claim for extra-cost.
- The rate shall be per meter of pipe line laid including all specials and fitting jointly etc. Cutting and waste shall not be paid separately. The length shall be measured not on the straight line and curves along the center line over the pipe and specials correct up to 1 cm.

➤ **Mode of Measurement And Payment :**

Mode of Measurement is As per Schedule - B & Payment As per Schedule Of Payments.

ITEM NO- 10

- **Lowering, laying, jointing & welding in position to correct line & level M.S. Pipe with outside 3 LPE coating & inside solvent free liquid epoxy lining on pedestal or chairs upon prepared formation or prepared bedding in trenches the rates include conveyance from store to site of work loading, unloading, heat shrink sleeve jointing hydrotesting etc.complete.**

323.9 mm dia 5.6 thick

610 mm dia 6.3 thick

914 mm dia 8.0 thick

The item includes following operations:

Lowering and laying pipes and specials in trenches.

Welding of pipes and specials as per IS 5822: 1994

Testing of welding joint as specified in the IS 5822 : 1994 para 6.2.

Hydraulic testing of the pipes

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

SPECIFICATIONS FOR WELDING:

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

Fillet weld with swaging of one end of pipe

OR

But weld without swaging of one end of pipe.

WELDING UNDER RAIN AND STRONG WIND:

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

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

The following does are applicable for welding:

IS: 814 code for covered electrode for metal Arc welding for mild steel.

IS: 815 CLASSIFICATION AND CODING OF COVERED ELECTRODES FOR METAL Arc WELDING OF MILD STEEL AND LOW ALLOY HIGH TENSILE STEEL.

IS: 1663 Part – 1 / part – II regarding method of tensile testing of steel sheets and stripes.

IS: 3600 codes of procedure for testing of fusion welding joints and weld metal in steel.

ELECTRODES:

The contractor shall use preferably Advani Orelkon overcord S.S. Greecon (Blue) or other electrodes as approved by Engineer-in-Charge depending upon the thickness of the plate and type of joint. They shall use standard current and Arc Voltage required for the machine in use as per manufacturer's directions. Welding electrode shall conform to test procedure of IS:814 and IS:815. The contractor shall submit manufacturer's test certificate for each batch of electrode use by him. Electrodes shall be stored unopened in original containers. Electrodes when used shall be free of rust, oil, grease and all other matter which could be harmful for the good quality of welding.

QUALIFICATION OF WELDERS:

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

WELDING PROCESS:

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

END PREPARATION:

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

CLEANING:

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

ALIGNMENT AND SPACING:

Pipes to be welded shall be aligned and fitted with external line up clamp and spaced in a suitable manner, so as to hold ends during welding at a distance to ensure full penetration. Root opening shall not be more than as specified.

Internal offset shall not exceed 1.5 mm. The pipe piece to be butt welded shall be coupled by means of pipe couplers or by yokes or bridge "c" clamps. Owner's inspector may check and approve the joint fit-up and alignment prior to the commencement of welding.

WELDING TECHNIQUE:**ROOT PASS:****FOR BUTT JOINTS:**

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

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

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

FOR FILLET WELDS:

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

JOINT COMPLETION:

Electrode size of more than 8 SWG (4 mm) shall not be allowed for filling of the weld upward

Technique shall generally be used for pipe in horizontal and vertical position welding. At each interruption of welding and after each run of welding is completed, chipping and slag removal shall be done. When the welding is completed, butt joints shall have a cover pass. It shall be slightly convex and fuse into the surface of the base metal in such a manner as to have a gradual notch free finish and good fusion at the joint edges. Welds shall have a regular appearance and shall be free from defects. Welder number shall be stamped alongside each weld whenever required by the Engineer-in-Charge / consulting engineer.

WELDING EQUIPMENT, TOOLS AND SUPPLIES:

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

PREPARATION OF PIPE FACE FOR WELDING:

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

WELDED JOINTS:

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

GAS CUTTING:

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

BLANK FLANGES:

Blank flanges shall be provided at all ends left unattached for temporary closure of work and also for commissioning a section of pipeline for testing the line laid. For temporary closure non pressure blank flanges consisting of M.S. plate tack welded at the pipe ends may be used. The blank flanges or domes designed as per requirement shall be provided. Separate payment will not be made for the flanges or domes.

STRAPS:

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

HYDRAULIC TEST:

The final high pressure test on the completed sections over ground or in the trench shall be performed before back filling. The testing shall be carried out in strict compliance with the testing procedure that shall be specified by the Engineer-in Charge / consultant. The final hydro-static pressure test on the pipe line shall be performed with water. All arrangement required for testing shall be made by the contractor and after testing they shall be removed to the entire satisfaction of the contractor and after testing they shall be removed to the entire satisfaction of the Engineer-in-Charge. Water to be used for testing should be clean, arranged and supplied by the contractor. While the line is full,

hydro-static pressure shall be applied at 1.5 times the internal design pressure and maintained on the line without significant loss. The testing shall be at least for 24 hours. Failure of the line disclosed by loss of pressure shall be located and reported by the contractor. Cost of required repairs shall be borne by the contractor. Before taking delivery and commencement he should inspect the pipes and if any defect is noticed at the time of taking over he should bring it to the Engineer-in-Charge.

LOWERING:

- 1) After the application and inspection of coating, the entire welded pipes shall be normally lowered into the finished trench next day after completion of the coating where ever required.

The trenches shall be of sufficient width, to enable lowering of pipe without difficulty. The trench bottom shall not be uneven.

15 Cm thick bedding be provided using the selected excavated soil/murum without any extra cost. The bedding shall be watered, rammed, and well consolidated before laying of pipes.

Water present in the trench at the time of lowering shall be bailed out by the contractor without any extra cost.

- 5) the pipes shall be brushed before lowering and laying or remove any soil or dirt etc. that may have accumulated".

CONTRACTOR'S SCOPE:

Cutting of pipes required for fabricated specials or for completing the gaps should be cut in such a way that the wastage shall be minimum.

THE SCOPE FOR THE ITEM COVERS:

Cost of additional excavation required for jointing, clearing the site of all shrubs, bushes and trees and dewatering whenever necessary.

Cost of all materials like steel, cement, aggregate, bolts, nuts, washers, white lead, grease, rubber packing etc. necessary for pipe lowering, laying and jointing.

Labor for laying pipes in trenches to correct alignment at required depth with tools including cutting of pipes and specials if required for laying the pipes, including connecting pipes, including connecting pipes to specials and appurtenances.

Cost of scaffolding, tools and plants, ropes etc.

Protection of existing works from damage and cost of repairs to the damages carried out to the existing structures, poles, sewer, pipe line, telephone/electricity cables, and electric lines. Pass pipe line, etc.

Labor for making joints including welding with all materials for joints, tools as well as test for welds including testing of welded joint as per IS 5822 : 1994 para 6.2 etc.

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

Re welding defective joints:

Providing temporary arrangements to keep the pipe clean and in position.

Labor for cutting pipes by gas cutting or any other method and laying and fixing the same. Labor for fabricating necessary specials such as bends, tees, reducers, enlarges, branch, flange etc. Using M. S. Plates including drilling holes in flanges as may be required.

Carting surplus pipes, pieces, scrap etc. to stores at plant site, head work or sub head work sites.

Supply of any other material or labor not mentioned above but required to complete the work.

➤ **Mode of Measurement And Payment :**

Mode of Measurement is As per Schedule - B & Payment As per Schedule Of Payments.

ITEM NO- 11

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

i) Temper Proof Air Valve 150 mm Dia. Pipe

ii) Reflux Valve

iii) Butterfly Valve

iv) Sluice Valve

1.0 JOINTING MATERIAL

- 1.1 The contractor shall provide all necessary jointing materials such as nuts bolts, rubber packing white zinc jute lead wool C. I. tailpiece etc.
- 1.2 All tools and plant required for installation of sluice valve shall be provided by the contractor.
- 1.3 All jointing materials shall be approved from the engineer-in-charge before use
- 1.4 The nut and bolts shall conform to Item No MSP-19 of specification of materials.
- 1.5 The rubber packing shall conform all specifications as narrated in Item No MSP-20 of specifications of materials.

2.0 INSTALLATION

- 2.1 The sluice valve/ butterfly valve shall be lowered in to the trench carefully, so that no part is damaged during lowering operation.

- 2.2 If necessary tailpieces shall be fitted with sluice valve first outside the trench and then lowered in to the trench.
- 2.3 The rubber packing shall be three ply and of approved thickness. The packing shall be of full diameter of the flange with necessary holes and the sluice/butterfly valve bore. It shall be even at both the inner and outer edges.
- 2.4 The flange faces thoroughly greased.
- 2.5 If flange faces are not free, the contractor shall use thin fibers of lead wool.
- 2.6 After placing the packing, nuts and bolts shall be inserted and tightened to make the joint.
- 2.7 The valve shall be tightly closed when being installed to prevent any foreign materials from getting in between the working parts of the valve.
- 2.8 Each flange bolt shall be tightened a little at a time taking care to tighten diametrically opposite bolts alternatively.
- 2.9 The sluice valve/butterfly valve shall be installed in such a way that its Spindle shall remain in truly vertical position.
- 2.10 The other end of tailpiece shall be fitted with pipes so that continuous lines can work.
- 2.11 Extra excavation required for facility of lowering and fixing sluice valve shall not be paid for.

3.0 TESTING

- 3.1 After installation of sluice valve/ butterfly valve the same is tested to 1 1/2 times of its test pressure.
- 3.2 The joints sluice valve/butterfly valve shall withstand the test pressure of pipelines.
- 3.3 Defects noticed during test and operation of sluice valve shall be rectified by the contractor at his own cost without any extra claim to the entire satisfaction of the Engineer-in-charge.

4.0 Mode of Measurement And Payment :

- ☐ **Mode of Measurement is As per Schedule - B & Payment As per Schedule Of Payments.**

AIR VALVE FIXING:

Suitable size of air valve will be installed on HDPE pipe with the help of metallic saddle. Metallic flange for air valve will be provided on upper part of saddle for fixing air valve. Valve chamber of suitable size with top cover will be made for each air valve.

1.0 INSTALLATION

- 1.1 The air valve shall be lowered in to the trench carefully, so that no part is damaged during lowering operation.
- 1.2 The rubber packing shall be three ply and of approved thickness. The packing shall be of full diameter of the flange with necessary holes and the air valve bore. It shall be even at both the inner and outer edges.
- 1.3 The flange faces thoroughly greased.
- 1.4 If flange faces are not free, the contractor shall use thin fibers of lead wool.
- 1.5 After placing the packing, nuts and bolts shall be inserted and tightened to make the joint.
- 1.6 The valve shall be tightly closed when being installed to prevent any foreign materials from getting in between the working parts of the valve.
- 1.7 Each flange bolt shall be tightened a little at a time taking care to tighten diametrically opposite bolts alternatively.
- 1.8 Extra excavation required for facility of lowering and fixing air valve shall not be paid for.

2.0 Mode of Measurement And Payment :

Mode of Measurement is As per Schedule - B & Payment As per Schedule Of Payments.

ITEM NO- 12

- **Providing C.C.M.:100 for encasing pipes using trap metal size 12 mm to 50 mm incl. form work curing consolidation etc. complete for various location on pipe line Using Trap Metal 20mm nominal Size**
- For all practical purpose and in absence of proportioning of concrete on base of preliminarily tests, C.C. 1:3:6 may be provided as a leveling course i.e. one part of cement three parts of sand and six parts of black trap kapachi. Specification for various ingredients of concrete such as sand, cement, kapachi, water shall be as these given in specification for C.C. M 100.
- 2.2 While laying base concrete for leveling course the concrete shall not be dumped from above but shall be carried out to the bottom and gently placed from a height not exceeding 1.5 meter. If concrete is transported by chutes, then the same shall be remixed at bottom of chutes to overcome any segregation that might have occurred.

1. General

The concrete shall consist of one part of ordinary Portland cement confirming to IS 269-1976 Three parts of well graded angular best quality river sand free of dust and organic matter and size 1 mm. To 3 mm and Six parts of

approved quality black trap kapachi of size 12 mm to 25 mm. All C.C. work shall be carried out as per I.S.S. regulations and as per standing practice and ordered prevailing in PWD. All the items are to be carried out as per details supplied and as required and directed by the engineer in charge or his authorized agencies. The work will have to be strictly as per approved design and as directed by the engineer in charge.

2. Aggregate

The course aggregate and the fine aggregate for the concrete shall be hard, clean, tough & durable and shall be free from all deleterious matter such as dust, lump of clay, soft & flaxy pieces, shale alkali, organic matter.

The materials shall be got approved by the Engineer-In-Charge or his agent.

3. Proportion

The proportion of course and fine aggregate shall be that one part of cement, three parts of fine aggregates & Six parts of course aggregates by volume. The proportion of cement & water of the water cement ratio shall be as specified, having regard to the nature of work & strength to be developed.

4. Mixing

Whether the concrete is mixed by hand or in a mechanical mixture. it shall be thoroughly mixed and the concrete placed in its final position with the minimum of delay. every pieces of aggregate shall be uniformly coated by cement paste.

5. Laying & Consolidation

The concrete must be laid gently (Not dumped) from height so as not to pent segregation of aggregates .after placing it shall be well compacted by tampl and/or mortar to cream up. in no case ramming shall be prolonged after the cement has begun to take its initial set. In no case, more water be added in order to reduce the work of completion.

6. Curing.

As soon as the concrete has set sufficiently the surface shall be protected from rapid during by being covered with wet sand, wet gunny bags or where possible by foaming shallow pools water on the top. the setting shall be continued for at least 10 days & usually two to three weeks.

7. Workmanship

Water stops shall be cleaned before placing them in position. Oil or grease shall be removed thoroughly using water and suitable detergents. Water stops shall be procured in long lengths as manufactured to avoid joints as far as possible. Standard L or T type of intersection pieces shall be procured for use

depending on their requirement. Any non-standard junctions shall be made by cutting the pieces to profile for jointing. Lapping of water stops shall not be permitted. All jointing shall be of fusion welded type as per manufacturer's instructions. Water stops shall be placed at the correct location/level and suitably supported at intervals with the reinforcement to ensure that it does not deviate from its intended position during concreting and vibrating. Care shall also be taken to ensure that no honey-combing occurs because of the serrations/end grips, by placing concrete with smaller size aggregates in this region. Projecting portions of the water stops embedded in concrete shall be thoroughly cleaned of all mortar/ concrete coating before resuming further concreting operations. The projecting water stop shall also be suitably supported at intervals with the reinforcement to maintain its intended position during concreting so as to ensure that it does not bend leading to formation of pockets. In addition, smaller size aggregates shall be used for concreting in this region also

➤ **Mode of Measurement And Payment :**

Mode of Measurement is As per Schedule - B & Payment As per Schedule Of Payments.

➤ **ITEM NO- 13**

- **Providing and casting in situ C. C. in grade M-20 (proportions as per mix design or as per table 9 of IS 456 - 2000 in masses by weigh batching) using granite, quartzite trap metal of size 6 mm to 20 mm for RCC work, including scaffolding centering, form work, needle vibrated consolidation, curing complete up to 6 M depth or height (excluding cost of reinforcement and neat finishing) with centering and shuttering etc. complete for structure other than water retaining.**

➤ **i) Thrust Block**

➤ **ii) For Column footing**

➤ **iii) For Column**

General Specification Should be follow as per Material Section

Thrust Block of pipe shall be carried out in cement concrete M-20 using trap metal as per instructions of the engineer in charge. Materials and workmanship shall be as per specification of concrete. Reinforcement shall be minimum 80 Kg/cum of concrete. Payment shall be made of Cum. basis.

PROVIDING AND PLACING IN POSITION STEEL REINFORCEMENT:

- 13.1 Reinforcement bars to be used in RCC work shall have to be supplied by the contractor. The rates include providing, cutting, bending, binding, hooking and placing in position including cost of binding wire. The bars shall be fusion bonded and epoxy coated.

- 13.2 Depending upon the type of reinforcement steel proposed in design (i.e. M.S. or deformed etc.) the steel shall conform to relevant ISS codes in practice. Contractor shall produce necessary test certificate in absence of which the steel bars shall be get tested by the Department at the contractor's cost.
- 13.3 Steel bars shall be cut, bent up, hooked bound with wires and then placed in position as per approved drawing. The steel shall be got checked through Engineer-in-charge. Before any concrete is placed in formwork advance intimation shall be given to the Engineer-in-charge for this purpose. The steel shall be cleared of any dust or rust that might have been deposited on bars.
- 13.4 Reinforcement shall be accurately fixed and maintained firmly in the correct position by the use of blocks, spacers, chairs, binding wire etc. to prevent displacement during placing and compaction of concrete. The tied in place reinforcement shall be approved by the Executive Engineer prior to concrete placement. Spacers shall be of such materials and designs as will be durable, not lead to corrosion of the reinforcement and not cause scaling of the concrete cover. Binding wire shall be 16 gauge soft annealed wires. Ends of the binding wire shall be bent away from the concrete surface and in no case encroach into the concrete cover. Substitution of reinforcement, laps/splices not shown on drawing shall be subject to Executive Engineer's approval.

➤ **Mode of Measurement And Payment :**

Mode of Measurement is As per Schedule - B & Payment As per Schedule Of Payments.

ITEM NO- 14

- **Refilling the pipeline trenches including ramming, watering, consolidation, disposal of surplus stuff as directed within a radius of 3 KM**
- **REFILLING OF TRENCHES:**
- On completion of the pipe laying operations in any section, for a length of about 100m and while further work is still in progress, refilling of trenches shall be started by the Contractor with a view of restricting the length of open trenches. Pipe laying shall closely follow the progress of Trench Excavation and the Contractor shall not permit unreasonably excessive lengths of trench excavation to remain open while awaiting testing of the pipeline. If the Engineer considers that the Contractor is not complying with any of the foregoing requirements, he may prohibit further trench excavation until he is satisfied with the progress of laying and testing of pipes and refilling of trenches. The excavated material nearest to the trench shall be used filling. Care shall be taken during backfilling,

not to injure or disturb the pipes, joints or coating. Filling shall be carried out simultaneously on both sides of the pipes so that unequal pressure does not occur. Walking or working on the completed pipeline unless the trench has been filled to height of at least 30cm over the top of the pipe except as may be necessary for tamping etc., during backfilling work.

- The remaining portion of the trench may be filled in with a mixture of hard and soft material free from boulders and clods of earth larger than 150mm in size if sufficient quantity of good earth and murrum are not available. The trench shall be refilled so as to build up to the original ground level, keeping due allowance for subsequent settlement likely to take place. The top 300mm layer or fertile agricultural soil shall be kept aside during excavation and shall be laid in layers near ground level during refilling.
- To prevent buckling of pipe shell of diameters 1200mm and above, pipes shall be strutted from inside while the work of refilling is in progress, for which no separate payment shall be made.
- Strutting shall be done by means of strong spiders having at least 6 arms which shall be sufficiently stiff to resist all deformation. Spiders shall be provided at a maximum interval of 2m & shall be welded in such a way that internal coating does not get burnt.
- The Engineer shall, at all times, have powers to decide which portion of the excavated materials shall be for filling and in which portion of the site and in what manner it shall be so used.
- If any material remains as surplus it shall be disposed of as directed by the Engineer, which includes loading, unloading, transporting and spreading as directed within all lead. If the Contractor fails to remove the earth from site within 7 days after the period specified in a written notice, the Engineer may arrange to carry out such work at the Contractor's risk and cost or may impose such fine for such omission as he may deem fit. Particular care shall be taken to keep the trench dry during the entire refilling operation.
- If suitable material for refilling is not available for excavation the Contractor shall bring earth, murrum of approved quality as directed by the Engineer.
- No mechanical plant other than approved compacting equipment shall run over or operate within the trench until backfilling has reached its final level or the approval of the Engineer has been obtained.
- Subsidence in filling in : Should any subsidence take place either in the filling of the trenches or near about it during the maintenance period of 24 months from the completion of the Contract Works, the Contractor shall make good the same at his own cost or the Engineer may without notice to the Contractor, make good the same in any way and with any material that he may think proper, at the expense of the Contractor. The Engineer may also, if he anticipates occurrence of any subsidence, employ persons to give him timely notice of the necessity of making good the same, and the expenses on this account shall be charged to the Contractor.
- Filling in trenches

- Filling in trenches for pipes and drains shall be commenced as soon as the joints of pipe and drains have been tested and passed. The backfilling material shall be properly consolidated taking due care so that no damage is caused to the pipes.
- Where the trenches are excavated in soil, the filling from the bottom of the trench to the level of the center line of the pipe shall be done by hand compaction with selected approved earth in layers not exceeding 8 cm; backfilling above the level of the center line of the pipes shall be done with selected earth by hand compaction, or other approved means in layers not exceeding 15 cm.
- In case of excavation of trenches in rock, the filling up to a level 30 cm above the top of the pipe shall be done with fine materials such as earth, murrum, etc. The filling up to the level of the centerline of the pipe shall be done by hand compaction in layers not exceeding 8 cm whereas the filling above the centerline of the pipe shall be done by hand compaction or approved means in layers not exceeding 15 cm. The filling from a level 30 cm above the top of the pipe to the top of the trench shall be done by hand or other approved mechanical methods with broken rock filling of size not exceeding 15 cm mixed with fine material as available to fill up the voids.
- Filling of the trenches shall be carried out simultaneously on both sides of the pipe to avoid unequal pressure on the pipe.
- **Mode of Measurement And Payment :**
Mode of Measurement is As per Schedule - B & Payment As per Schedule Of Payments.

ITEM NO- 15

Drilling of horizontal bore hole for water main pipeline under the railway /road tracks in all strata with required length including fixing of M.S. (or as specified by railway / road authority) casing pipe of suitable size and thickness. rate includes the cost of drilling of bore hole, casing pipe & welding pushing etc. complete. but excluding the cost of water main, valves and other items. entire work should be as per approved drawing and as per instruction of railway / road authority for following diameter of bore hole, for MS pipe.

Horizontal drilling -900mm:& MS Casing Pipe-800mm, thick:12mm

Horizontal drilling -300mm & MS Casing Pipe -250mm, thick:5mm

Horizontal drilling -250mm & MS Casing Pipe -200mm, thick:5mm

Providing and executing horizontal boring for laying water main pipeline crossing under railway track / road track in all types of strata, including soft soil, murum, gravel, hard soil, boulders and mixed strata, by approved manual/mechanical boring method, HDD method or auger boring method as approved by the Engineer-in-Charge and concerned Railway/Road Authority.

The work shall include setting out alignment, excavation of launching and receiving pits of required size and depth, dewatering, barricading, traffic safety

arrangements, drilling of horizontal bore hole of required diameter and length, supplying, lowering, welding, pushing and fixing in position M.S. casing pipe of suitable diameter and thickness as specified in approved drawing or as directed by Railway/Road Authority, including cutting, edge preparation, jointing, welding by approved welding process, testing of welds if required, anticorrosive treatment to welded joints, alignment correction, lubrication, pushing arrangement and all lead and lift complete.

The rate shall also include providing all labour, machinery, equipment, tools and plants, cranes, compressors, boring machine, welding set, consumables, fuel, electricity, safety measures, shoring, strutting, disposal of excavated material, restoration of pits and surrounding area to original condition, obtaining required permissions, complying with conditions of Railway/Road Authority, complete as directed by Engineer-in-Charge.

The item includes all incidental works necessary for successful completion of bore crossing complete, but excludes the cost of carrier/water main pipe, specials, valves and other appurtenances.

Entire work shall be carried out strictly as per approved drawings, relevant IS specifications, Railway standards / IRC specifications and instructions of Railway/Road Authority and Engineer-in-Charge.

➤ **Mode of Measurement And Payment :**

Mode of Measurement is As per Schedule - B & Payment As per Schedule Of Payments.

Note:

- Casing pipe thickness shall be as approved by Railway/Road Authority.
- Payment shall include successful completion of bore crossing irrespective of strata encountered.
- Any damage to railway/road property shall be made good by contractor at his own cost.
- Safety norms and statutory requirements shall be strictly followed during execution.

ITEM NO- 16

Drilling of 600mm dia Horizontal borehole for watermain pipeline under the railway tracks incl all strata with required length incl fixing of 500mm dia M.S.casing pipe of minimum 8mm thick Or IRS Casing Pipe with welding pushing etc complete Providing & fixing various size of pipe for 273.1mm / 323.9mm / 355.6mm dia watermain of G.I/M.S pipe of minimum 6.3mm thick for railway premises as per instruction & regulations of Railway authority & under supervision of Railway authority incl Providing, supplying & fixing of spacer at specified interval if required between Casing pipe and water main, ISI make sluice valve of required size at both side of railway boundary nt incl C:C encasing 1:3:6 in 10mtr length of pipe at both side. Incl providing & fixing of M.S/Iron Manhole frame with cover for valve chamber with loacking arrangement etc. complete with all material labor fabrication, hydraulic testing of pipe & valve etc complete

for 45mt Length. Which includes horizontal pushing and with open excavation, MS Casing Pipe + Water Main Size-355.6mm (for 45 M Length)

1. At railway, road crossing, highways, as such other crossings as are shown in the construction drawings issued by the company the pipeline shall be installed in M.S. casing pipes conforming to the specifications given herein.
2. The casing pipes shall be installed in accordance with the details given in drawing and the casing, bushing and insulators, etc., shall be installed on the carrier pipe as detailed in drawings. Casing pipe size shall be about 100 mm (Hundred millimeters) larger than the carrier pipe to facilitate the insertion of the later without disturbing the casing pipe and to provide adequate drainage, Casing shall be installed with even bearing throughout its length and shall slope towards one end, as specified or desired by the engineer-in-charge. The ends of the casing shall be sealed to outside of carrier pipe in accordance with the details given in drawing.
3. Before installation, holes for installing vent pipes shall be cut and burrs if any shall be removed. The welding of both carrier pipe and casing pipe shall be done in accordance with the welding specifications, given herein. Before installing the casing pipe, it should be cleaned of all internal obstructions and during installation care should be taken to keep the inside clean.
4. The section of carrier pipe to be placed in any casing shall be closed at each end, hydrostatically tested preferably with dead weight tester for at least two hours. Only on successful completion of this test, shall the carried pipe section be inserted in the casing pipe. The installation of casing may open cut as circumstances may permit or require as directed by the engineer-in-charge.
5. The installation of casing in bended section of the carrier pipe shall be performed by meter bends of the casing pipe provided that the length of each meter cut out of casing pipe shall be such as to provide a clearance of at least 1-1/2" between the inside of the casing pipe and the outside of the coated carrier pipe.
6. Excavation for casing installation shall be immediately backfilled at the completion of the work with suitable solid matter and packed thoroughly to prevent seepage of water into the excavation.
7. At railway, road crossings the work shall be performed to the specifications of local authorities or such public bodies as may be in charge (S) of roads, to be crossed.
8. In case, however the minimum requirements of the governing agencies are less than those set out in the drawing or the specifications given herein, then the requirements given in the drawings and the specifications given for encased line shall be followed.
9. Whereas the casing pipe in the case of encased line to be laid normal by boring, tunneling, engineer-in-charge may at his discretion permit open-cuts to be made for the installation of casing provided, however, that the TENDERER shall procure the necessary permit / license for the same from competent authority. At locations wherein the open cut methods are permitted, the TENDERER shall pass the carrier pipe through the casing located in the trench

- after the approval of the engineer-in-charge in writing and care shall be exercised to avoid damage to pipe coating and wrapping during this operation. The TENDERER shall produce a certificate in writing from concerned authorities for its satisfactory restoration and payment therefore.
10. At all crossings the carrier pipe shall be laid straight without bends so that if necessary the pipe at a later date may be replaced without cutting the casing. The carried pipe shall extend at least 2 meters beyond the end of casing pipe at either end.
 11. At road crossings the TENDERER shall eliminate unnecessary bending of pipe to conform to the contour of ground by gradually deepening the ditch at such approaches as directed by the engineer-in-charge. Where the installation of the casing has been made by open cut TENDERER shall install suitable temporary bridge work ensuring the safety of the traffic aids and safeguards for protection of the public safety, or he shall provide suitable diversions as desired by the engineer-in-charge.
 12. At all road pipeline crossings shall be bored with horizontal boring machine.
 13. The method of carrying out a cased crossing by boring for various crossings on this pipeline route shall be jointly inspected by the representative of the COMPANY and TENDERER for each category of work prior to commencement of actual work.
 14. Pipeline under Road applicable portion of the right-of-way shall be encased in accordance with the specification. This item of work shall include, necessary clearing and grading required therefore, trenching to the depths and widths required, welding of casing and carrier pipes, testing, lowering in, installation of vent assemblies, end seals, insulator and all other fittings that may be required, backfilling, clean up, complete restoration to the original condition and further strengthening and protective works as may be required. The work shall be carried out in accordance with the drawings and as directed by the engineer-in-charge. For various operations mentioned above, the specifications pertaining to these operations shall apply in addition to the specifications given herein.
 15. The TENDERER shall be permitted to use William Sons type Neoprene seals in place of concrete end seals for the crossings. The item shall be procured by the TENDERER himself as per the provisions under the appropriate head of work in case TENDERER so desires. The representative of the COMPANY may also be associated to determine the quality of the material and its delivery schedule from the open market. However, the particular work defined under the proper head shall not be delayed on account of non-availability of Neoprene end seals. In such case, concrete seals may be provided.
 16. On both ends of pushing concrete supports are to be provided as per direction of engineer-in-charge.
 17. Drilling of 600 mm dia. horizontal bore hole for water main pipeline under Road in all strata with required length. The work is to be carried out under the supervision of Road authority after taking necessary permission from railway department. As per drawing given by the Road Department.

18. Necessary permission from Road authority shall have to arrange by agency. Necessary help will be given by GWSSB.
19. The drilling of horizontal bore work is to be carried out by necessary augur and by mechanized method.
20. 500 mm. dia M.S Casing Pipe (both side epoxy painting) shall have to be brought by the agency incl. necessary pushing, welding etc. complete. The specification of M.S. Pipe is same as per schedule. Cost of M.S. pipe & specials are included in this work.
21. 2 Nos. of Sluice valve of suitable dia. shall have to be supplied and fixed at the both ends of Road Crossing. The specification of Sluice Valve is as per similar item of this tender.
22. Construction of B.B. Masonry chamber sizes 1.30 x 1.30 x 3.00 Mt. At the both end of the Road Crossing for Sluice Valve. The work is to be carried out as per Specification of Item for tender including providing & fixing M.S. manhole frame & cover with locking arrangement etc. complete.
23. Necessary Excavation and C.C. M-100 block at the ends of road crossing work shall have to be carried out by agency without any extra cost. As per approved drawing & Requirement from R & B Department.
24. Necessary brick edge pavement in C.M. 1:6 and cement pointing work shall have to carried out for damaged pavement on both side of Highway.
25. Necessary refilling work shall have to carried out after completion of Road Crossing Work.

The rates are inclusive of required length of M.S. casing pipe including Sluice valves and chambers on both side.

➤ **Mode of Measurement And Payment :**

Mode of Measurement is As per Schedule - B & Payment As per Schedule Of Payments.

ITEM NO- 17

Drilling of 1300mm dia Horizontal borehole for watermain pipeline crossing under the road incl in all strata with required length incl fixing of 1200mm dia M.S/RCC casing pipe with pushing etc complete various size of pipe for 559 to 711mm dia watermain. (for 45 M Length)

Ms casing pipe +water main -610mm

1. At road crossing, highways, as such other crossings as are shown in the construction drawings issued by the company the pipeline shall be installed in M.S. casing pipes conforming to the specifications given herein.

2. The casing pipes shall be installed in accordance with the details given in drawing and the casing, bushing and insulators, etc., shall be installed on the carrier pipe as detailed in drawings. Casing pipe size shall be about 100 mm (Hundred millimeters) larger than the carrier pipe to facilitate the insertion of the later without disturbing the casing pipe and to provide adequate drainage, Casing shall be installed with even bearing throughout its length and shall slope towards one end, as specified or desired by the engineer-in-charge. The ends of the casing shall be sealed to outside of carrier pipe in accordance with the details given in drawing.
3. Before installation, holes for installing vent pipes shall be cut and burrs if any shall be removed. The welding of both carrier pipe and casing pipe shall be done in accordance with the welding specifications, given herein. Before installing the casing pipe, it should be cleaned of all internal obstructions and during installation care should be taken to keep the inside clean.
4. The section of carrier pipe to be placed in any casing shall be closed at each end, hydrostatically tested preferably with dead weight tester for at least two hours. Only on successful completion of this test, shall the carried pipe section be inserted in the casing pipe. The installation of casing may open cut as circumstances may permit or require as directed by the engineer-in-charge.
5. The installation of casing in bended section of the carrier pipe shall be performed by meter bends of the casing pipe provided that the length of each meter cut out of casing pipe shall be such as to provide a clearance of at least 1-1/2" between the inside of the casing pipe and the outside of the coated carrier pipe.
6. Excavation for casing installation shall be immediately backfilled at the completion of the work with suitable solid matter and packed thoroughly to prevent seepage of water into the excavation
7. At road crossings the work shall be performed to the specifications of local authorities or such public bodies as may be in charge (S) of roads, to be crossed.
8. In case, however the minimum requirements of the governing agencies are less than those set out in the drawing or the specifications given herein, then the requirements given in the drawings and the specifications given for encased line shall be followed.
9. Whereas the casing pipe in the case of encased line to be laid normal by boring tunneling, engineer-in-charge may at his discretion permit open-cuts to be made for the installation of casing provided, however, that the TENDERER shall procure the necessary permit/license for the same from competent authority. At locations wherein the open cut methods are permitted, the TENDERER shall pass the carrier pipe through the casing located in the trench after the approval of the engineer-in-charge in writing and care shall be exercised to avoid damage to pipe coating and wrapping during this operation The TENDERER shall produce a certificate in writing from concerned authorities for its satisfactory restoration and payment therefore.
10. At all crossings the carrier pipe shall be laid straight without bends so that if necessary the pipe at a later date may be replaced without cutting the casing. The

carried pipe shall extend at least 2 meters beyond the end of casing pipe at either end.

11. At road crossings the TENDERER shall eliminate unnecessary bending of pipe to conform to the contour of ground by gradually deepening the ditch at such approaches as directed by the engineer-in-charge. Where the installation of the casing has been made by open cut TENDERER shall install suitable temporary bridge work ensuring the safety of the traffic aids and safeguards for protection of the public safety, or he shall provide suitable diversions as desired by the engineer-in-charge.
12. At all road pipeline crossings shall be bored with horizontal boring machine.
13. The method of carrying out a cased crossing by boring for various crossings on this pipeline route shall be jointly inspected by the representative of the COMPANY and TENDERER for each category of work prior to commencement of actual work.
14. Pipeline under Road applicable portion of the right-of-way shall be encased in accordance with the specification. This item of work shall include, necessary clearing and grading required therefore, trenching to the depths and widths required, welding of casing and carrier pipes, testing, lowering in, installation of vent assemblies, end seals, insulator and all other fittings that may be required, backfilling, clean up, complete restoration to the original condition and further strengthening and protective works as may be required. The work shall be carried out in accordance with the drawings and as directed by the engineer-in-charge. For various operations mentioned above, the specifications pertaining to these operations shall apply in addition to the specifications given herein.
15. The TENDERER shall be permitted to use William Sons type Neoprene seals in place of concrete end seals for the crossings. The item shall be procured by the TENDERER himself as per the provisions under the appropriate head of work in case TENDERER so desires. The representative of the COMPANY may also be associated to determine the quality of the material and its delivery schedule from the open market. However, the particular work defined under the proper head shall not be delayed on account of non-availability of Neoprene end seals. In such case, concrete seals may be provided.
16. On both ends of pushing concrete supports are to be provided as per direction of engineer-in-charge.
17. Drilling of 1300 mm dia, horizontal bore hole for water main pipeline under Road in all strata with required length. The work is to be carried out under the supervision of Road authority after taking necessary permission from railway department. As per drawing given by the Road Department.
18. Necessary permission from Road authority shall have to arrange by agency. Necessary help will be given by GWSSB.
19. The drilling of horizontal bore work is to be carried out by necessary augur and by mechanized method.

20. 1200 mm. dia M.S Casing Pipe (both side epoxy painting) shall have to be brought by the agency incl. necessary pushing, welding etc. complete. The specification of M.S. Pipe is same as per schedule. Cost of M.S. pipe & specials are included in this work.
21. 2 Nos of Sluice valve of suitable dia shall have to be supplied and fixed at the both ends of Road Crossing. The specification of Sluice Valve is as per similar item of this tender.
22. Construction of B.B. Masonry chamber sizes 1.30 x 1.30 x 3.00 Mt. At the both end of the Road Crossing for Sluice Valve. The work is to be carried out as per Specification of Item for tender including providing & fixing M.S. manhole frame & cover with locking arrangement etc. complete
23. Necessary Excavation and C.C. M-100 block at the ends of road crossing work shall have to be carried out by agency without any extra cost. As per approved drawing & Requirement from R & B Department.
24. Necessary brick edge pavement in C.M. 1:6 and cement pointing work shall have to carried out for damaged pavement on both side of Highway.
25. Necessary refilling work shall have to carried out after completion of Road Crossing Work.

The rates are inclusive of required length of M.S. casing pipe including Sluice valves and chambers on both side.

➤ **Mode of Measurement And Payment :**

Mode of Measurement is As per Schedule - B & Payment As per Schedule Of Payments.

ITEM NO- 18

Drilling of 600mm dia Horizontal borehole for watermain pipeline crossing under the road ind in all strata with requned length incl fixing of 500mm dia M.S/RCC casing pipe with pushing etc complete various size of pipe for 273 1 to 355 3mm dia watermain (For 45 m Length)

Ms casing pipe +water main -323.9mm

1. At road crossing, highways, as such other crossings as are shown in the construction drawings issued by the company the pipeline shall be installed in M.S. casing pipes conforming to the specifications given herein.
2. The casing pipes shall be installed in accordance with the details given in drawing and the casing, bushing and insulators, etc., shall be installed on the carrier pipe as detailed in drawings. Casing pipe size shall be about 100 mm (Hundred millimeters) larger than the carrier pipe to facilitate the insertion of the later without disturbing the casing pipe and to provide adequate drainage, Casing shall be installed with even bearing throughout its length and shall slope towards one end,

as specified or desired by the engineer-in-charge. The ends of the casing shall be sealed to outside of carrier pipe in accordance with the details given in drawing.

3. Before installation, holes for installing vent pipes shall be cut and burrs if any shall be removed. The welding of both carrier pipe and casing pipe shall be done in accordance with the welding specifications, given herein. Before installing the casing pipe, it should be cleaned of all internal obstructions and during installation care should be taken to keep the inside clean.
4. The section of carrier pipe to be placed in any casing shall be closed at each end, hydrostatically tested preferably with dead weight tester for at least two hours. Only on successful completion of this test, shall the carried pipe section be inserted in the casing pipe. The installation of casing may open cut as circumstances may permit or require as directed by the engineer-in-charge.
5. The installation of casing in bended section of the carrier pipe shall be performed by meter bends of the casing pipe provided that the length of each meter cut out of casing pipe shall be such as to provide a clearance of at least 1-1/2" between the inside of the casing pipe and the outside of the coated carrier pipe.
6. Excavation for casing installation shall be immediately backfilled at the completion of the work with suitable solid matter and packed thoroughly to prevent seepage of water into the excavation
7. At road crossings the work shall be performed to the specifications of local authorities or such public bodies as may be in charge (S) of roads, to be crossed.
8. In case, however the minimum requirements of the governing agencies are less than those set out in the drawing or the specifications given herein, then the requirements given in the drawings and the specifications given for encased line shall be followed.
9. Whereas the casing pipe in the case of encased line to be laid normal by boring tunneling, engineer-in-charge may at his discretion permit open-cuts to be made for the installation of casing provided, however, that the TENDERER shall procure the necessary permit/license for the same from competent authority. At locations wherein the open cut methods are permitted, the TENDERER shall pass the carrier pipe through the casing located in the trench after the approval of the engineer-in-charge in writing and care shall be exercised to avoid damage to pipe coating and wrapping during this operation The TENDERER shall produce a certificate in writing from concerned authorities for its satisfactory restoration and payment therefore.
10. At all crossings the carrier pipe shall be laid straight without bends so that if necessary the pipe at a later date may be replaced without cutting the casing. The carried pipe shall extend at least 2 meters beyond the end of casing pipe at either end.
11. At Railway and road crossings the TENDERER shall eliminate unnecessary bending of pipe to conform to the contour of ground by gradually deepening the ditch at such approaches as directed by the engineer-in-charge. Where the installation of the casing has been made by open cut TENDERER shall install

suitable temporary bridge work ensuring the safety of the traffic aids and safeguards for protection of the public safety, or he shall provide suitable diversions as desired by the engineer-in-charge.

12. At all road pipeline crossings shall be bored with horizontal boring machine.
13. The method of carrying out a cased crossing by boring for various crossings on this pipeline route shall be jointly inspected by the representative of the COMPANY and TENDERER for each category of work prior to commencement of actual work.
14. Pipeline under Road applicable portion of the right-of-way shall be encased in accordance with the specification. This item of work shall include, necessary clearing and grading required therefore, trenching to the depths and widths required, welding of casing and carrier pipes, testing, lowering in, installation of vent assemblies, end seals, insulator and all other fittings that may be required, backfilling, clean up, complete restoration to the original condition and further strengthening and protective works as may be required. The work shall be carried out in accordance with the drawings and as directed by the engineer-in-charge. For various operations mentioned above, the specifications pertaining to these operations shall apply in addition to the specifications given herein.
15. The TENDERER shall be permitted to use William Sons type Neoprene seals in place of concrete end seals for the crossings. The item shall be procured by the TENDERER himself as per the provisions under the appropriate head of work in case TENDERER so desires. The representative of the COMPANY may also be associated to determine the quality of the material and its delivery schedule from the open market. However, the particular work defined under the proper head shall not be delayed on account of non-availability of Neoprene end seals. In such case, concrete seals may be provided.
16. On both ends of pushing concrete supports are to be provided as per direction of engineer-in-charge.
17. Drilling of 600 mm dia, horizontal bore hole for water main pipeline under Road in all strata with required length. The work is to be carried out under the supervision of Road authority after taking necessary permission from railway department. As per drawing given by the Road Department.
18. Necessary permission from Road authority shall have to arrange by agency. Necessary help will be given by GWSSB.
19. The drilling of horizontal bore work is to be carried out by necessary augur and by mechanized method.
20. 500 mm. dia M.S Casing Pipe (both side epoxy painting) shall have to be brought by the agency incl. necessary pushing, welding etc. complete. The specification of M.S. Pipe is same as per schedule. Cost of M.S. pipe & specials are included in this work.
21. 2 Nos of Sluice valve of suitable dia shall have to be supplied and fixed at the both ends of Road Crossing. The specification of Sluice Valve is as per similar item of this tender.

22. Construction of B.B. Masonry chamber sizes 1.30 x 1.30 x 3.00 Mt. At the both end of the Road Crossing for Sluice Valve. The work is to be carried out as per Specification of Item for tender including providing & fixing M.S. manhole frame & cover with locking arrangement etc. complete
23. Necessary Excavation and C.C. M-100 block at the ends of road crossing work shall have to be carried out by agency without any extra cost. As per approved drawing & Requirement from R & B Department.
24. Necessary brick edge pavement in C.M. 1:6 and cement pointing work shall have to carried out for damaged pavement on both side of Highway.
25. Necessary refilling work shall have to carried out after completion of Road Crossing Work.

The rates are inclusive of required length of M.S. casing pipe including Sluice valves and chambers on both side.

➤ **Mode of Measurement And Payment :**

Mode of Measurement is As per Schedule - B & Payment As per Schedule Of Payments.

ITEM NO- 19

Construction of valves chambers in brick or bela stone masonry, locally available in C. M. 1:6. Foundation concrete 150 mm thick in C. C. 1:4:8 of trap metal size 25 mm to 40 mm thick, inside cement plaster in C. M. 1:3 and cement pointing outside in C. M. 1:3 and top cover of precast RCC slab 100 mm thick (with key hole in two parts, each with handles or MS Bar etc. complete as given size) Up to 1 Mt. depth from G. L. to pipe invert level incl. complete civil works but excl. cost of excavation and refilling. With cast in situ RCC slab in one single piece with fixing of CI-MH Frame and cover (excl. cost of CI-MH Frame and cover) with 23 mm thick brick masonry wall in C.M.1:6 With precast slab in two parts

Size of chamber 0.60 m x 0.60 m and 1.0 mt. deep

Size of chamber 0.90 m x 0.90 m and 1.0 mt. deep

Size of chamber 1.30 m x 1.30 m and 1.0 mt. deep

For 1 Mtr. Extra Depth

Size of chamber 0.90 m x 0.90 m and 1.0 mt. deep

Size of chamber 1.30 m x 1.30 m and 1.0 mt. deep

1. General Description

Construction of valve chamber in brick or bela stone masonry using cement mortar (C.M.) 1:6, complete with foundation, plastering, finishing, and RCC top cover, excluding excavation and refilling.

2. Dimensions

- Internal size: 0.60 m × 0.60 m
- Depth: 1.0 m (from ground level to pipe invert level)

3. Foundation

- Type: Plain Cement Concrete (PCC)
- Thickness: 150 mm
- Mix: C.C. 1:4:8
- Aggregate: Trap metal, size 25 mm to 40 mm
- Purpose: Provide stable base for masonry walls

4. Masonry Work

- Material: Brick masonry or locally available bela stone
- Mortar Mix: Cement mortar 1:6
- Wall Thickness: 230 mm (23 cm)
- Workmanship: Proper bonding, joints filled completely, vertical alignment maintained

5. Internal Finishing

- Plaster:
 - Thickness: 12–15 mm (typical)
 - Mix: Cement mortar 1:3
 - Finish: Smooth, watertight

6. External Finishing

- Cement Pointing:
 - Mix: C.M. 1:3
 - Finish: Neat, weather-resistant joints

7. Top Cover Options

Option A: Precast RCC Slab

- Thickness: 100 mm
- Type: Two-piece slab
- Features:
 - Keyhole opening
 - Each piece fitted with MS bar handles
- Placement: Properly seated on chamber walls

Option B: Cast-in-Situ RCC Slab

- Single-piece RCC slab
- Includes provision for:
 - Fixing CI (Cast Iron) Manhole Frame and Cover (cost excluded)
- Proper reinforcement and curing required

8. Additional Features

- Chamber constructed up to 1 m depth from ground level
- Includes all civil works:
 - Masonry
 - Concrete

- Plastering
- Finishing
- Exclusions:
 - Excavation
 - Backfilling/refilling
 - Cost of CI manhole frame and cover

9. Materials Summary

- Cement: As per IS standards
- Sand: Clean, well-graded
- Aggregate: 25–40 mm trap metal
- Bricks/Stones: Locally available, sound and durable
- Steel (if RCC): As per design

10. Workmanship & Quality Control

- Mortar mixed uniformly
- Proper curing (minimum 7 days for masonry, 14 days for RCC)
- Alignment, level, and dimensions strictly maintained
- Watertight finishing ensured

➤ **Mode of Measurement And Payment :**

Mode of Measurement is As per Schedule - B & Payment As per Schedule Of Payments.

➤ **ITEM NO- 20**

- **Purchasing & Supplying at site of works, with Railway freight, loading, unloading, carting, etc. complete such as joints, channels, angels, iron rails etc. including cost of labour charges for lowering laying, erection,fixing , various size of M.S section such as joits channel, angles plates etc. Complete For Steel Bridge**

1. The work shall consist of purchasing and supplying at site all required mild steel (M.S.) structural sections for a steel bridge, including joists, channels, angles, plates, iron rails, and other specified rolled steel sections, conforming to relevant Indian Standards such as IS 2062. The steel shall be of approved quality, free from defects, laminations, cracks, or corrosion, and shall be procured from authorized manufacturers.
2. The scope shall include all incidental charges such as railway freight, loading at source, unloading at site, carting, and transportation to the exact location of work. Proper care shall be taken during handling and transport to prevent damage or distortion of members.

3. All steel sections shall be accurately measured, cut, drilled, and prepared as per approved drawings and design requirements. Fabrication shall be carried out with precision, ensuring correct dimensions, alignment, and fit-up of components. Edges shall be properly finished, and holes shall be cleanly drilled without distortion.
4. The work shall include lowering, laying, erecting, and fixing of all structural steel members in position, including the use of cranes, hoists, scaffolding, staging, and all necessary equipment. Members shall be assembled, aligned, and connected using appropriate methods such as bolting, riveting, or welding as specified in the design. All connections shall be strong, true to line and level, and capable of safely transmitting loads.
5. Temporary supports, bracing, and alignment arrangements shall be provided during erection to ensure stability and safety until the structure is fully secured. Proper tightening of bolts, quality welding, and checking of alignment shall be ensured at every stage.
6. The work shall include all labor, materials, tools, plants, and equipment required for complete execution, including erection and fixing of various sizes of M.S. sections, complete in all respects as per drawings and specifications. All safety measures shall be strictly followed during handling and erection works.
7. The finished structure shall be true to line, level, and grade, structurally sound, and ready for further treatment such as painting or protective coating, if specified separately.

➤ **Mode of Measurement And Payment :**

Mode of Measurement is As per Schedule - B & Payment As per Schedule Of Payments.

➤ **ITEM NO- 21**

- **Erection of airvalve riser by installing new GI pipe of 6mm thick and 3.2mt length with necessary fittings such as flange of appropriate size, nut bolts and embed the pipe in R CC M15 with offset of 10 cm around pipe with necessary steel etc complete**

Erection of Air Valve Riser with GI Pipe and RCC Encasement

1. Scope of Work

The work shall include providing, fabricating, erecting, fixing, testing, and commissioning of air valve riser assembly using G.I. pipe complete with all accessories, fittings, RCC encasement, excavation, concreting, alignment, and

2. Materials

2.1 G.I. Pipe

- The riser pipe shall be heavy class Galvanized Iron (G.I.) pipe conforming to relevant IS standards.
- Pipe thickness shall be 6 mm.
- Length of pipe shall be 3.20 m.
- Pipe diameter shall be as specified in BOQ/drawing.
- Pipe shall be free from cracks, bends, laminations, and manufacturing defects.

2.2 Flanges

- Flanges shall be MS/GI drilled flanges of suitable pressure rating and matching pipe diameter.
- Flanges shall conform to relevant IS specifications.
- Flanges shall be machine faced and properly aligned.

2.3 Nuts, Bolts & Gaskets

- Nuts and bolts shall be galvanized high tensile steel of approved make.
- Suitable rubber insertion gasket/neoprene gasket shall be provided between flange joints.

2.4 Reinforcement Steel

- Reinforcement steel for RCC encasement shall conform to IS 1786.
- Steel shall be cleaned, cut, bent, and tied as per approved drawing.

2.5 Cement Concrete

- RCC shall be of M15 grade using design mix/nominal mix (1:2:4 equivalent).
- Cement shall conform to IS 269/8112.
- Coarse aggregate shall be hard broken stone of approved quality.

3. Execution

3.1 Installation of Riser Pipe

- The G.I. riser pipe shall be erected vertically at the specified location.
- Proper alignment and plumb shall be maintained during installation.
- The pipe shall be connected with the existing pipeline/air valve arrangement using necessary flanges and fittings.

3.2 RCC Encasement

- The pipe shall be embedded in RCC M15 concrete.
- RCC encasement shall be provided with minimum 100 mm offset all around the pipe.
- Necessary shuttering, centering, curing, and compaction shall be carried out.
- Reinforcement steel shall be placed as required for structural stability.

3.3 Jointing & Fixing

- All flange joints shall be leak-proof.

- Nuts and bolts shall be tightened uniformly.
- Anti-corrosive coating/zinc-rich paint shall be applied on exposed MS surfaces if required.

3.4 Testing

- The completed riser assembly shall be tested for leakage and stability under operating pressure.
- Any leakage or defect observed during testing shall be rectified by the contractor at no extra cost.

➤ **Mode of Measurement And Payment :**

Mode of Measurement is As per Schedule - B & Payment As per Schedule Of Payments.

➤ **ITEM NO- 22**

Expansion Bellows

Supply, installation, testing & commissioning of flange ends Expansion Bellow as per EJMA standards of overall length of minimum 300 mm, designed for 15 mm axial compression and 5 mm axial extension with tie rods etc. of following MOC & pressure ratings. MOC: Bellows: SA 240 Gr. 304; Internal Sleeve: SA 240 Gr. 304; Weldends: IS 2062 Gr. B; Flanges: IS 2062 Gr. B (Drilling as per IS 1538 / IS 6392) & Limit Rods & Nuts: CS - IS 1367.

Technical Specification – Expansion Bellows

Size And Quantity : As Per BOQ

1. Scope of Work

Providing, supplying, installing, testing and commissioning of **flanged end metallic expansion bellows** suitable for water supply pipelines, complete with all accessories, supports, and fittings as per CPHEEO guidelines and relevant IS codes.

2. Standards

The expansion bellows shall conform to the latest editions of the following:

- **EJMA Standards** (Expansion Joint Manufacturers Association)
- **IS 1538** – Cast iron fittings for pressure pipes
- **IS 6392** – Steel pipe flanges
- **IS 2062** – Structural steel
- **IS 1367** – Technical supply conditions for threaded fasteners
- CPHEEO Manual on Water Supply & Treatment

3. Design Requirements

- Type: **Axial metallic expansion bellows (flanged end)**
- Minimum overall length: **300 mm**
- Axial movement capacity:

- Compression: **15 mm (minimum)**
- Extension: **5 mm (minimum)**
- Design pressure: Suitable for **working pressure of pipeline (as specified in BOQ)** with adequate safety factor
- Temperature: Suitable for potable water applications
- Bellows shall be designed to absorb:
 - Thermal expansion/contraction
 - Vibration and minor misalignment
- Equipped with **tie rods/limit rods** to control over-extension and prevent damage

4. Materials of Construction (MOC)

Component	Material Specification
Bellows	SS SA 240 Gr. 304
Internal Sleeve	SS SA 240 Gr. 304
Weld Ends	IS 2062 Gr. B
Flanges	IS 2062 Gr. B (Drilling as per IS 1538 / IS 6392)
Limit Rods & Nuts	Carbon Steel conforming to IS 1367

5. Fabrication & Manufacturing

- Bellows shall be **hydraulically or mechanically formed** from stainless steel sheets.
- All welds shall be:
 - Full penetration
 - Tested by **Dye Penetration Test (DPT)** or equivalent
- Internal sleeve shall be provided to:
 - Protect bellows from flow-induced turbulence
 - Reduce erosion
- Flanges shall be **machine finished** and drilled accurately for proper alignment.
- Tie rods shall be properly threaded with locking arrangement.

6. Testing

Each expansion bellow shall be tested as per EJMA and IS standards:

- **Hydrostatic Test:** At 1.5 times design pressure
- **Leak Test:** No leakage permitted
- **Dimensional Inspection**
- **Movement Test** (Axial compression & extension)
- Material test certificates shall be submitted.

7. Installation

- Installation shall be done as per manufacturer's recommendations and CPHEEO guidelines.
- Bellows shall be installed:

- In correct alignment (no torsion or lateral load)
 - With proper supports and anchors
 - Tie rods shall be checked for correct adjustment.
 - Proper gaskets, nuts, bolts shall be used for flange joints.
 - Ensure no external load is transferred to the bellows.
-

8. Inspection & Approval

- Inspection shall be carried out by Engineer-in-Charge.
 - Manufacturer's test certificates and drawings shall be submitted for approval prior to installation.
-

9. Measurement

➤ **Mode of Measurement And Payment :**

Mode of Measurement is As per Schedule - B & Payment As per Schedule Of Payments.

10. Rate Includes

- Supply of expansion bellows with all accessories
 - Transportation, loading/unloading
 - Installation with nuts, bolts, gaskets
 - Testing and commissioning
 - All taxes, duties, and incidental charges
-

11. Guarantee

- The expansion bellows shall be guaranteed for **minimum 12 months** from date of commissioning against manufacturing defects, leakage, or failure.

➤ **ITEM NO- 23**

Providing and supplying ISI mark CI D/F Reflux Valves as per IS:5312 (Latest Edition) of following class and diameter including all taxes, insurance, transportation, freight charges, octroi, inspection charges, loading, unloading, conveyance to departmental stores, stacking etc. complete.

300 mm dia

600 mm dia

800 mm dia

900 mm dia

1100 mm dia

Reflux valves / SLUICE VALVE

Providing and Supplying C.I. Double Flanged Reflux Valves

1. Scope of Work

The work shall include manufacturing, testing, supplying, delivery, and stacking of ISI marked Cast Iron Double Flanged (D/F) Reflux Valves of specified class and diameter complete with all accessories, conforming to relevant Indian Standards and specifications, including

2. Applicable Standards

The reflux valves shall conform to the latest editions of the following Indian Standards:

- IS:5312 — Swing Check Type Reflux (Non-Return) Valves for Water Works Purposes
- IS:210 — Grey Iron Castings
- IS:1538 — Cast Iron Fittings
- IS:780 — Sluice Valve Specifications (for flange drilling compatibility where applicable)
- IS:6392 — Steel pipe flanges (where applicable)

The valves shall bear valid **ISI certification mark**.

3. Materials

3.1 Body and Cover

- Valve body and cover shall be manufactured from close-grained cast iron of high quality conforming to IS specifications.
- Casting shall be smooth, clean, and free from cracks, blow holes, cavities, shrinkage, or other defects.

3.2 Door/Disc

- The reflux valve door/disc shall be of cast iron/ductile iron with renewable seat arrangement where applicable.
- The door shall move freely and shall close automatically against reverse flow.

3.3 Seat Rings

- Seat rings shall be of gunmetal/bronze/stainless steel as specified in relevant IS standards.

3.4 Shaft and Hinges

- Hinge pins/shafts shall be of stainless steel/bronze material resistant to corrosion.

3.5 Fasteners

- Nuts, bolts, and washers shall be galvanized steel or stainless steel of approved quality.

3.6 Flanges

- Valves shall be double flanged and suitable for drilling as per relevant IS standards.
 - Flanges shall match the specified pressure rating and pipe class.
-

4. Design and Construction

- The valve shall be suitable for horizontal or vertical installation as specified.
 - The valve shall permit flow in one direction only and prevent reverse flow automatically.
 - The valve shall be designed for smooth operation with minimum head loss.
 - Ends shall be double flanged suitable for connection to standard pipe flanges.
-

5. Pressure Rating

The valve shall be of specified class/pressure rating such as:

- PN 1.0
- PN 1.6

or as specified in the Schedule/BOQ.

6. Testing

Each valve shall be tested at manufacturer's works in accordance with IS:5312 for:

- Hydrostatic body test
- Seat leakage test
- Operational test

Test certificates shall be furnished if required by the department.

7. Coating

- Internal and external surfaces shall be coated with approved black bituminous paint or fusion bonded epoxy coating suitable for potable water applications.
 - Coating shall be uniform and defect-free.
-

8. Inspection

- Valves shall be subject to inspection by the Engineer-in-Charge or authorized representative before dispatch.
 - The contractor/supplier shall provide all facilities required for inspection and testing at no extra cost.
-

9. Delivery and Handling

The item rate shall include:

- All taxes and duties
- Insurance
- Transportation and freight
- Loading and unloading
- Octroi and incidental charges
- Delivery at departmental store/site
- Proper stacking and protection against damage

10. Measurement

➤ Mode of Measurement And Payment :

Mode of Measurement is As per Schedule - B & Payment As per Schedule Of Payments.

ITEM No.24 Providing and supplying ISI mark CI D/F sluice Valves as per IS:14846 (Latest Edition) of following class and diameter including all taxes, insurance, transportation, freight charges, octroi, inspection charges, loading, unloading, conveyance to departmental stores, stacking etc. complete.

100 mm dia

150 mm dia

200 mm dia

Providing and Supplying ISI Mark C.I. Double Flanged Sluice Valves

1. Scope of Work

The work shall include manufacturing, testing, supplying, delivery, and stacking of ISI marked Cast Iron Double Flanged (D/F) Sluice Valves of specified class and diameter conforming to relevant Indian Standards complete with all accessories, including transportation, loading, unloading, insurance, conveyance to departmental stores/site, stacking, and all incidental charges as directed by the Engineer-in-Charge.

2. Applicable Standards

The sluice valves shall conform to the latest editions of the following standards:

- IS:14846 — Resilient Seated Cast Iron Sluice Valves for Water Works Purposes
- IS:210 — Grey Iron Castings
- IS:638 — Sheet Rubber Jointing and Rubber Insertion
- IS:1363 / IS:1367 — Specifications for nuts and bolts
- IS:1538 — Cast Iron Fittings

- Relevant IS standards for flange drilling and pressure ratings

The valves shall bear a valid ISI certification mark.

3. Materials

3.1 Valve Body, Bonnet and Cover

- Body, bonnet, and cover shall be manufactured from high quality cast iron conforming to IS specifications.
- Castings shall be smooth, dense, and free from cracks, blow holes, porosity, shrinkage defects, or other imperfections.

3.2 Wedge/Disc

- The wedge/disc shall be resilient seated type with EPDM/NBR rubber vulcanized coating suitable for potable water applications.
- The wedge shall ensure bubble-tight shutoff.

3.3 Stem/Spindle

- Stem/spindle shall be made from stainless steel conforming to relevant IS standards.
- The spindle shall have smooth machined threads and adequate strength to withstand operating torque.

3.4 Seat Arrangement

- The seating arrangement shall provide tight closure without leakage.
- Resilient seating material shall be durable and resistant to corrosion and abrasion.

3.5 Fasteners

- Nuts, bolts, washers, and other fasteners shall be galvanized steel or stainless steel of approved quality.

3.6 Flanges

- Valves shall be double flanged with flange dimensions and drilling conforming to relevant IS standards.
- Flanges shall match specified pressure class and pipe flange standards.

4. Design and Construction

- Valves shall be non-rising spindle (unless otherwise specified).
- The design shall permit smooth operation under full pressure conditions.
- Valve operation shall be clockwise closing unless specified otherwise.
- The valve shall be suitable for underground water supply applications.
- Ends shall be double flanged suitable for connection to standard pipe flanges.

5. Pressure Rating

The sluice valves shall be of specified pressure class such as:

- PN 1.0
- PN 1.6

or as specified in the BOQ/tender schedule.

6. Coating

- Internal and external surfaces of the valve shall be coated with fusion bonded epoxy coating or approved food-grade epoxy suitable for potable water service.
- Coating thickness shall conform to relevant IS specifications.
- Coating shall be uniform, smooth, and free from defects.

7. Testing

Each valve shall be tested at manufacturer's works in accordance with IS:14846 for:

- Hydrostatic body test
- Seat leakage test

- Operational/functional test

Necessary test certificates shall be submitted if required by the department.

8. Inspection

- Valves shall be available for inspection by the Engineer-in-Charge or authorized representative before dispatch.
- The supplier shall provide all testing facilities and assistance necessary for inspection at no additional cost.

9. Delivery and Handling

The rate shall include:

- GST and all applicable taxes
- Insurance
- Freight and transportation
- Loading and unloading
- Octroi and incidental charges
- Delivery to departmental stores/site
- Proper stacking and safe handling

➤ Mode of Measurement And Payment :

Mode of Measurement is As per Schedule - B & Payment As per Schedule Of Payments.

ITEM NO.25 BUTTERFLY VALVE: Supply, installation, testing & commissioning of double flanged cast iron Butterfly valve on delivery line of pumps as per IS 13095 (Latest Edition) of following class and diameter including all taxes, insurance, transportation, freight charges, octroi, inspection charges, loading, unloading, conveyance to departmental stores, stacking etc. complete.

300 mm dia

600 mm dia

800 mm dia

900 mm dia

1100 mm dia

1. Scope of Work

The work shall include manufacturing/providing, supplying, installing, testing, and commissioning of double flanged Cast Iron Butterfly Valves for pump delivery lines complete with all accessories, nuts, bolts, gaskets, jointing materials, erection, alignment, testing, commissioning, transportation, loading, unloading, stacking, and all incidental works as directed by the Engineer-in-Charge.

2. Applicable Standards

The butterfly valves shall conform to the latest editions of the following Indian Standards:

- IS:13095 — Butterfly Valves for General Purposes
- IS:210 — Grey Iron Castings
- IS:1538 — Cast Iron Fittings
- IS:1363 / IS:1367 — Nuts and Bolts Specifications
- Relevant IS standards for flange drilling and pressure ratings

The valves shall bear valid **ISI certification mark**, wherever applicable.

3. Materials

3.1 Valve Body

- The valve body shall be made of high-quality close-grained cast iron conforming to relevant IS specifications.
- Body casting shall be smooth, dense, and free from cracks, blow holes, porosity, shrinkage, and other manufacturing defects.

3.2 Disc

- The disc shall be of cast iron/ductile iron/stainless steel as specified.
- The disc shall be properly machined and balanced to ensure smooth operation and minimum pressure loss.

3.3 Shaft/Stem

- Shaft/stem shall be made of stainless steel of approved grade resistant to corrosion and wear.
- Shaft shall be of sufficient strength to withstand operating torque and hydraulic pressure.

3.4 Seat

- Valve seat shall be resilient rubber seat made of EPDM/NBR suitable for potable water applications.
- The seat shall ensure bubble-tight shutoff without leakage.

3.5 Bearings and Bushes

- Bearings/bushes shall be of self-lubricating and corrosion-resistant material.

3.6 Fasteners

- Nuts, bolts, washers, and fastening materials shall be galvanized steel/stainless steel of approved quality.

3.7 Flanges

- Valve ends shall be double flanged and drilled in accordance with relevant IS standards.
- Flanges shall match the specified pressure class and pipeline flange dimensions.

4. Design and Construction

- The butterfly valve shall be suitable for installation on pump delivery lines.
- Valve operation shall be manual gear operated/lever operated/electrically actuated as specified in BOQ.
- The valve shall provide smooth flow regulation and positive shutoff.
- The design shall permit easy maintenance and replacement of seat/disc components.
- Valve shall be suitable for bi-directional flow unless otherwise specified.

5. Pressure Rating

The butterfly valve shall be of specified pressure class such as:

- PN 1.0
- PN 1.6

or as specified in the tender schedule/BOQ.

6. Coating

- Internal and external surfaces shall be coated with fusion bonded epoxy coating or approved epoxy paint suitable for potable water applications.
- Coating thickness shall conform to relevant IS specifications.
- Coating shall be uniform and free from visible defects.

7. Installation

- The valve shall be installed in proper alignment on the delivery line of pumps.
- Necessary gaskets, nuts, bolts, and supports shall be provided.

- Care shall be taken to avoid stress on pipe joints and valve body.
 - The valve shall be installed complete with operating arrangement and accessories.
-

8. Testing and Commissioning

Each valve shall be factory tested as per IS:13095 for:

- Hydrostatic body test
- Seat leakage test
- Operational test

After installation, site testing and commissioning shall be carried out to ensure:

- Leak-proof operation
- Smooth opening and closing
- Proper functioning under working pressure

Any defects observed during testing shall be rectified by the contractor at no extra cost.

9. Inspection

- The valves shall be offered for inspection before dispatch if required by the department.
 - The contractor/supplier shall provide all necessary facilities for inspection and testing free of cost.
-

10. Delivery and Handling

The item rate shall include:

- All taxes and duties
- Insurance
- Transportation and freight
- Loading and unloading
- Octroi and incidental charges
- Conveyance to departmental stores/site
- Proper stacking, storage, and handling

➤ Mode of Measurement And Payment :

Mode of Measurement is As per Schedule - B & Payment As per Schedule Of Payments.

SCHEDULE – B4 PUMP HOUSE

➤ Item No : 1

Designing (aesthetically) and constructing R.C.C frame structure of pump room with positive suction With Gantry structure (Min. Height 4.5 M) and electrical panel room / switch gear minimum 4.5 m. Height as directed by Engineer Incharge, Up to 6.00 M (Plinth Level to Top slab Beam bottom) 1. Minimum 15 % opening for ventilation should be provided. 2. Pump room rolling shutter, door and windows of aluminium section and window grill of stainless steel should be provided (Included in Cost). 3. Plinth level of Pump house should be min.1.0 meter above GL. 4. Cost does not include foundation for pumping machinery. Positive suction With Gantry structure Upto 6.00 M (Plinth Level to Top slab Beam bottom) General Specification should be followed.

Design requirement of pump house: For tech data sheet refer Volume No IID Tech Data Sheet

DETAILED SPECIFICATION

2.1 :Excavation for foundation including throwing the excavated stuff up to a lead of 90 m. ordinary soil and soft murrum.

(A) 0.0 to 1.50 mtr Depth.

- Excavation shall be carried out in all sorts of soils mixed with sand gravel dry or wet soft murrum without any extra charges. Excavation shall be providing with shoring and strutting wherever necessary. The contractor shall have to excavate the foundation by providing ropes.
- The contractor at his own cost shall provide guarding and removal with the permission of the Engineer in charge of the work after the work is completed. If required dewatering shall have to be done without any extra cost under no circumstances the excavated stuff be laid within 3.0 mt. width from the edge of the excavated pit or trenches excavated stuff initially damped near the pit of trench shall be disposed by removing up to lead of 50 Mtr. at place shown by the in charge of the work with lift 1.5 Mtr.
- After completion of the work up to the from time to time to direct at the work pre formation trenches will be refilled very carefully with the stuff in layers of 30 cm. each and thoroughly compacted with heavy iron rammers and wooden tempers. The object desired to be gained is to get on including compact surface. The contractor shall have to remove the surplus earth outside the city limit with the permission of the Engineer-in-charge without any extra cost. The rate includes the dewatering by means of pumping and boiling but of water if necessary.
- The decision regarding classification of strata shall rest with the Engineer-in-charge

and his decision shall be final and binding to the contractor.

- All the materials encountered in the excavation shall be classified as under.
- All sorts of soil, sand gravel and other, similar and loose materials. These will include all material of an earthy or sandy nature, which can be easily ploughed, or small single and gravel, which can be easily removed the removal of small boulders not exceeding 0.03 cum or 30 lit. (About one on cit.) Occurring in such status will be included in the rate for this item.
- **SOFT MURRUM: -**
 - This shall include materials, which can be easily removed with the shovel after loosening.
- **AVERAGE MURRUM: -**
 - This type of stuff is intermediate between soft murrum and hard murrum.
- **HARD MURRUM: -**
 - This shall include all kinds of disintegrated rock shall be of inundated free form boulders larger than 0.03 cum. Or 30 lit. (About one cm. Fact.) And which can be removed with picks and shovels. Though not without some difficulty and which do not required blasting.
- **HARD MURRUM BOULDERS**
 - This shall include all kinds of disintegrated rock or shall in undated clay interspersed with boulders less than half a cubic meter (about half cm. yrd.) And larger. Then 0.03 cum. Or 30 lit. (Approx. one eft) which do not normally required. Blasting and can be removed with pick by wedge and hammer boulders bigger than ½ cum will be paid for as soft or hard rock according as it is soft or hard rock.
- **SOFT ROCK: -**
 - This shall include all materials which is rock or hard conglomerate, all decomposed and whether rock high fissured tack old masonry and also soft rock boulders bigger than ½ cubic meter and other verticals of rock which do not required blasting and which can be removed with pick crow bars, wedges and hammer with some difficulty
- **HARD ROCK (BLASTED): -**
 - This shall include all rocks, occurring in Masses that could be only be removed by blasting and where in the opinion have the Engineer blasting is necessary and is permissible.
- **HARD ROCK (CHISELED WEDGE OR LINE DRILED): -**
 - This shall include all rock, occurring in masses or boulders bigger than half cubic meter size each which can be best be removed by blasting by which owing to the proximity of structure, possibility of shattering the rock below or any other reasons

should be out by means of could chisels or wedges of line drilling.

- Payment shall be made per cum. Basis.

2.2: Providing and laying brick bats cement concrete for foundation with brick bats of well burnt brick as course aggregate ramming curing etc. complete.

(A) In BBCC 1:5:10

Materials:

- 1.1 Water shall conform to M-1 sand shall conform to M-6 cement shall conform to M-3 brick bats aggregate 40 mm nominal size shall conform to M-14.

2.0 Workmanship

2.1 General

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

2.2 Proportion of Mix :

- 2.2.2 The proportion of cement, sand and coarse aggregate shall be one part of cement, 5 parts of sand and 10 parts of Brick bats as Course aggregates and shall be measured by volume for BBCC 1:5:10.

2.3 Mixing:

- 2.3.1 The concrete shall be mixed in a mechanical mixer at the site of work. Hand mixing may however be allowed of smaller quantity of work if approved by the Engineer in charge. When hand mixing is permitted by the Engineer in charge in case of breakdown of machinery's and in the interest of the work. It shall be carried out a water tight platform and care shall be taken to ensure the mixing is continued, until the mass is uniform in color and consistency. However in such cases 10% more cement than otherwise required shall have to be used, without any extra cost. The mixing in mechanical mixer shall be done for a period 1 ½ to 2 minutes. The quantity of water shall be just sufficient to produce a dense concrete or required workability for the purpose.

2.4 Transporting & placing the concrete :

- 2.4.1 The concrete shall be banded from the place of mixing to the final position in not more than 15 minutes by the method of as directed and shall be placed in to its final position, compacted and finished within 30 minutes of mixing with water i.e. before the setting commences the concrete shall be laid in layers of 15 cm. to 20 cm.

2.5 Compacting :

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

2.6 Curing :

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

2.7 Mode of Measurement And Payment :

Mode of Measurement is As per Schedule - B & Payment As per Schedule Of Payments.

2.3:- Supplying cutting, bending, binding and placing in position steel as per plan and design and as per ISS 2502 including cost of steel and binding wire for reservoirs / structures only including lift up to 6 mtr height or depth below G.L. for all diameters. TMT Fe- 415 grade for all diameters.

Do- Thermos mechanically treated (TMT) bars Fe-415 grade for all diameters

The M.S. bars i.e. deformed or TMT bar steel shall be supplied by contractor and shall be got tested by contractor in any Government laboratory and test certificate shall be produced before placing in position steel shall be free from greasy substances. All scaffolding arrangement and binding wire etc. shall be provided and work shall be done as per standard practice. The rate includes providing M.S. bar banding and binding wire as per requirement placing reinforcement is required height, stays and levels.

Payment shall be made as per Qty. basis as per Schedule-B.

2.4: Providing and laying cement concrete 1:2:4 for RCC with 12 to 20 mm size black stone crushed metal including centering, curing, finishing etc. complete without reinforcement

RCC Slab, Lintel, Coping

1. Cement shall be brought by contractor having ISI mark standard make ordinary port land cement shall be brought to the work in suppliers bag and shall be stored and protected from moisture up to the completion of the work. It shall be gauged by the weight or by bags.
2. Best river sand of approved quality shall be used. It shall be clean sharp, and free from dust and dirt or other impurities. It necessary sand shall be washed and shall be stored in such a way so as to prevent the dust mixing by matters.
3. Any cement that shall have been injuriously effected by moisture and other caused shall be rejected and shall have to be removed by the contractor without any claims for the extra cost.

4. The coarse aggregate shall be consist of 12 mm to 20mm and or 6 mm to 12 mm size broken hard black trap metal approved by the in charge Engineer. It shall be well graded and free from dust of dirt and shall have to be washed and screened as directed.
5. Cement concrete shall consist of cement. Sand and course aggregate in the proportion as specified on the respective items. The questions regarding where the raft ends shall be added by the measuring water shall be as directed.
6. In order to test the consistency of the mixed concrete slumps tests shall be made by the contractor and when required by the in charge of work without any extra cost. The allowable slumps of concrete shall be not more than.
7. Before any concrete is placed in position loose pieces of timber loose stones. Saw dust etc. shall be removed from the form work proper water cement shall be observed concrete shall not be placed from height of more than 1.5 mtr. at any account. All cement concrete shall be placed carefully be manual or mechanical labour to required height in without any increased in the rates. The vibrator shall have to use for compactness of concrete. The consolidations shall be allowed. The tank floor and inside of the partition wall shall be plastered with of sikka or water proof compound approved by Executive Engineer. It shall be rubbed with corobranium stone if found necessary as per instruction of Executive Engineer.
8. The concrete shall be carried out during the height time if insisted up to sufficient number of labour without any claim for extra cost for, which necessary lighting arrangement shall be provided by the contractor without any claim or extra cost, concrete work shall be carried for full period of 24 hours of day.
9. The after to be used shall be fit for drinking water purpose and shall be obtained from source approved by the Engineer in charge works. The contractor shall make his own arrangement for water required for construction of work testing of the container and during of concrete work.
10. The cube test shall be carried out for specified designed strength of concrete. The cube shall be of 15 cm x 15 cm size and have to take the above cube for curing for specified days and same shall have be test at his own cost without any extra. The concrete work of lesser strength shall be rejected outright and contractor will be responsible for the same. No claim shall be submitted on this work.
11. All the form works of suitable dimensions and centering of approved size and quality shall be provided by contractor. The work wall and the placing of steel in position shall be checked well advance from the Engineer in charge by the contractor. If the from work not passed by the competent authority shall be removed without any claim for extra cost. In case of breakdown of form work

etc. The same shall be done good without any claim for extra cost. The ultimate responsibility for the safety and strength from work and liability of workman and payment for accident for compensation shall always rest with the contractor without any extra cost.

12. All safety provision shall have to be made by the contractor compensation to be paid to the partly will be paid by the contractor for which department will not be responsible.

13. Mode of Measurement And Payment :

Mode of Measurement is As per Schedule - B & Payment As per Schedule Of Payments.

2.4A.- Brick work using common burnt clay building bricks having crushing strength not less than 35 Kg. per Sq. mtr in foundation & plinth in Cement Mortar 1:6(1:Cement & 6 Fine Sand)

2.4 B do....do.....Brick work In Super structure in C.M. 1:6 .

1. The work shall be carried out as per the description of the item and as per the specification laid down in P.W.D. Hand Book Vol. II & I.
2. The bricks shall be uniform in color, well burnt, regular in shape, free from cracks, chips lump or any kind of impurities. The bricks shall not be used without soaking by immersion in water it shall be of standard size.
3. The bricks work shall be done in cement mortar consisting one part of approved quality ISI Mark, ordinary port land cement to size part of plain, coarsest sand as specified in Schedule-B shall be of approved quality. The sand shall be coarse angular and free from foreign materials.
4. The proportion mentioned in Schedule-B indicate first figure is for cement, figure is for sand & the ingredient shall be measured by volume according to the Schedule-B.
5. The mortar shall be mixed on water tight plat form in dry condition thoroughly; required quantity of water shall be added to get workable mixture and shall be used within half an hour after it is mixed.
6. The bricks shall be laid after well soaked in water from upward so as to form the key in masonry. All the joints shall be thoroughly filled with cement mortar joint of brick masonry shall not be exceeded 10 mm width.
7. The use of bricks lesser than half bricks shall be minimized. The joint shall be properly raked out up to 20 mm depth.

8. The progress of masonry works shall be in uniform height not exceeding more than one meter a day work. The work shall be carried out in best workman ship like manner.
9. Masonry shall have to be in plumb line and level.
10. The Masonry shall be kept constantly wet during execution and whole work shall be curried for seven days.
11. The rate includes the cost of masonry scaffolding T & P articles etc. complete.

12. Mode of Measurement And Payment :

Mode of Measurement is As per Schedule - B & Payment As per Schedule Of Payments.

2.5:- Providing and fixing 1mm thick M.S. sheet sliding shutters with frame & diagonal braces of size 40x 40x6 mm. Angle iron 3.15mm M.S. gusset plates @ junction & corners 25mm dia. pulley 40x 40x6 mm angle & " T " iron guide rail at top & bottom respectively with handles, stoppers, &locking arrangement etc. including applying a priming coat of a red lead paint .

Fully Paneled.

1.0. Materials:

M.S. sliding shutters shall be lubricated of M.S. component as given in the description of item. M.S. sheets 1 mm. thick shall be fixed to the frame with rivets or welds as approved. The shutters shall be provided with top and bottom guide rails of Angels or T-iron as specified and 25 mm. dia. steel pulleys at trie top. The frame shall be reverted and/or welded and wherever riveting shall be done 3.15 mm. gusset plates shall be provided at the junctions.

2.0. Workmanship :

- 2.1. The shutters shall be single or double leaf Gutters as specified. The guide rails shall be sufficiently long and continued along the wall on both ends so that the sliding shutters can rest against walls, living full opening when so required.
- 2.2. The guide rails shall be fixed to the floor by means of anchor bolts embedded in the cement concrete floor. The steel section at the top shall be suitably supported from the walls. Two channel sections shall be suitably fixed vertically below the extreme clamps in the wall and floor to avoid the shutters from going out of the supports at the top and bottom. A suitable clamping arrangement will be provided at either end of the opening to avoid the

shutters from rolling back into opening.

2.3. All the adjoining work damaged while fixing shall be made good to match the existing work.

2.4. All members of the sliding shutter including T-iron shall be thoroughly cleaned of rust, scales, dust etc. and given a priming coat of red lead before fixing them in position.

3.0. Mode of measurements & payment:

3.1. The sliding doors shall be measured in sq. meter. The height of the shutters shall be measured from outside to cut of the guide rail and width outside to outside of shutters including vertical channels in side. The rate includes providing handles, stoppers and locking arrangements etc. complete.

3.2. Mode of Measurement And Payment :

Mode of Measurement is As per Schedule - B & Payment As per Schedule Of Payments.

**2.6. Providing sand or murrum bedding incl. consolidating etc. comp.
From Selected excavated earth.**

1.0. Workmanship:

1.1. The earth to be used for. filling shall be free from salts, organic or other foreign matter. All clods of earth shall be broken.

1.2. As soon as the work in foundation has been completed and measured, the site of foundation shall be cleared of all debris, brick bats, mortar dropping etc; and filled with earth in layers not exceeding 20 Cms. Each layer shall be adequately watered, rammed and consolidated before the succeeding layer is laid. The earth shall be rammed with iron rammers where feasible and with the butt ends of crow-bars, where rammer cannot be used.

1.3. The plinth shall be similarly filled with earth in layers not exceeding 20 Cms. adequately watered and consolidated brimming with iron or wooden rammers. When filling reaches finished level, the surface shall be flooded with water for at least 24 hours and allowed to dry and then rammed and consolidated.

1.4. The finished level of filling shall be kept to shape intended to be given to floor.

1.5. In case of large heavy duty flooring like factory flooring, the consolidation may be done by power rollers, where so specified. The extent of consolidation required shall also be as specified.

- 1.6. The excavated stuff of the selected type shall be allowed to be used in filling the trenches and plinth. Under no circumstances black cotton soil be used for filling the plinth

Mode of Measurement And Payment :

Mode of Measurement is As per Schedule - B & Payment As per Schedule Of Payments.

2.7. Cement plastering 10mm thick in c.m. 1:3 in bk. Masonry including racking out joints or cement finishing comp.

- 1) The sand shall be washed before use if necessary
- 2) The mortar shall be prepared on water tight platform and shall be used with in an hour after mixing.
- 3) Cement mortar shall consist of one part of cement three parts of clean coarse river sand free from dust and other impurities.
- 4) The joint shall be racked up to about 20 mm depth.
- 5) Surface to be plastered shall be cleaned properly with a brush and Wetted before plaster is applied.
- 6) Plaster shall be finished in neru or cement as per instruction of Engineer in charge. 3 coats of color wash or white wash shall be applied as per standard after cleaning the surface by the contractor.

➤ **Mode of Measurement And Payment :**

Mode of Measurement is As per Schedule - B & Payment As per Schedule Of Payments.

2.8. Color washing with lime on wall surface (two cots) over and including a primary coat of white washing to give an even shade after thoroughly brooming the surface to remove all dirt ,dust mortar drops and other foreign matter.

1.0. Materials:

Clear-Colle : This shall be made from glue and boiling water by mixing 1 Kg. of glue to every 15 liters of water. The mixing shall be suitable tinted to match with colour of washing as directed. Glue shall conform to I.S. 852-1969

1.2. Lime :

Lime used shall be freshly burnt class 'C' lime (Fat lime) and white in colour conforming to I.S. 712-1973.

1.3. Water :

Water shall conform to M-I.

1.4. Gum :

Best quality of gum shall be used in the preparation of white or colour wash. The colour pigment of required tint and shade shall be mixed in lime cream. The mineral colour not affected by lime shall be used in preparing the colour wash.

2.0. Workmanship :

2.1. Sufficient quantity of colour wash enough for the complete job shall be prepared in one operation to avoid any difference in shade. The basic white wash solution shall be prepared in accordance with item 18.11. Mineral Colours not affected by lime shall be added to the white wash solution. No colour wash shall be done until a sample of the colour has been approved. It shall be noted that small samples of colour appears lighter in shade than when the same shades are applied precisely to large surface. The colour shall be of even tint, over the whole surface. If it is patchy or otherwise badly applied, it shall be rejected. Preparation of the flour wash with pigment shall be as under :

- (a) With Yellow and Red Ochre: Solid Lumps if any in the powder shall be crushed to powder and solution in water prepared and then added to white wash sieving it through a coarse cloth, mixed evenly and thoroughly to white wash in small quantities till the required shade is obtained.
- (b) With Blue Vitriol: Fresh crystals of hydrous copper sulphates (i.e. blue vitriol) shall be ground to fine powder and dissolved in small quantity of water. Sufficient quantity of solution enough to produce the colour wash of required shade shall be strained through a clean cloth, the filtrate being mixed evenly and thoroughly to the white wash.
- (c) Colour wash from other coloring pigment shall be prepared in accordance with the instructions of the manufacturer.

2.2. Preparation of Surface :

The surface shall be prepared by removing mortar toppings and foreign matter and thoroughly clean with wire or fiber brush or any suitable means as directed by the Engineer-in-charge. All loose pieces and scales shall be scrapped off and holes filled with mortar.

2.2.1. Wherever scaffolding is necessary it shall be erected in such a way that as far as possible on part of scaffolding shall rest against the surface to be white or

colour washed. A properly secured strong and well tied suspended platform (Zoola) may be used for white washing. Where ladders are used, pieces of old gunny bag shall be tied at top and bottom to prevent scratches to the floors and walls. For white washing of ceilings proper stage scaffolding shall be erected where necessary.

The colour wash shall be applied as under: On the surface prepared the white wash shall be applied with 'Moon' brush. The first stroke of the brush shall be from top downwards another, from bottom upwards over the first stroke and similar one stroke from the right another from the left, over the first stroke brush before it dries. This will form one coat. Each coat shall be allowed to dry before next coat applied. Number of coats as specified in item shall be applied. It shall present smooth and uniform finish free from brush marks and it should not come off easily when rubbed with finger.

The colour wash shall be applied in accordance with the procedure given in item No. 18.11. Application of white wash for colour washing on undecorated surface after the surface has been prepared. The first primary coat shall be of white wash and subsequent (minimum two) shall be colour wash and the entire surface shall represent a smooth and uniform finish. To start with, patch of 0.1 sq.mt. on prepared surface shall be colour washed with first coat of white wash and subsequent coat of colour wash solution in full numbers of coats as described in the item and the shade so obtained shall be examined before the entire work of colour washing is taken up in hand. It shall be noted that small areas of colour wash will appear lighter in shade than when the same shade is applied to the large surface.

2.2.2. For colour washing on decorated surfaces, after the surface has been prepared, a coat of white wash shall be applied for the patches and repairs. Then one coat or more of colour wash shall be applied over the entire surface, such that the colour of washed surface shall present a uniform colour shade. No primary coat is needed for a decorated surface bearing colour of same shade on surface requiring change of colour after the surface has been prepared as described above. Two coats of white wash shall be applied before application of specified number (minimum two) of coats of colour wash of the new shade.

2.3. Protective measure: The surface of doors, windows, floors, articles of furniture etc, and such other parts of the building not to be white washed shall be protected from being splashed upon. Such surfaces shall be cleaned of white wash splashed if any.

➤ **Mode of Measurement And Payment :**

Mode of Measurement is As per Schedule - B & Payment As per Schedule Of Payments.

2.9 : Cement concrete flooring 1:2:4 with using black stone crushed metal of 12 to 20 mm size including, Finishing lining curing etc. complete 50 mm thick

The item shall be carried out as per the description of item and specification laid down in P.W.D. Hand Book Vol. II & I.

The specification of materials for cement concrete will be as per item No-2 of this tender. The work shall be carried out as per instruction of Engineer in Charge The thickness of flooring; lining shall be 50 mm etc. complete.

Curing shall be started on the next day after finishing The rate shall be on square meter of the flooring of specified thickness as per Schedule-B incl. cost of bedding brick bat cement concrete.

➤ **Mode of Measurement And Payment :**

Mode of Measurement is As per Schedule - B & Payment As per Schedule Of Payments.

SCHEDULE B-5 Designing & Constructing Approach Road at Various HW and SHW

➤ **Box cutting the road surface to proper slope and camber for making a base for road work including removing the excavated stuff and depositing on the road side slope as directed up to 50 mtr lead**

1. The work shall consist of box cutting of the existing road surface to the required lines, levels, width, slope, and camber to prepare a proper formation for new road construction, as per approved drawings and directions of the Engineer-in-charge. The cutting shall be carried out to the specified depth, ensuring uniformity and accuracy in profile so as to achieve the designed subgrade.
2. All excavated material arising from the box cutting shall be removed and disposed of along the roadside slopes or at locations directed, within a lead of 50 meters. Care shall be taken to ensure that the disposed material does not obstruct drainage or traffic and is spread neatly as instructed.
3. The formation surface shall be dressed, leveled, and compacted properly to achieve a firm and even subgrade, free from loose soil, undulations, or irregularities. Any soft or unsuitable material encountered shall be removed and replaced with suitable approved material as directed.
4. The work shall include all labor, tools, and equipment required for cutting, dressing, leveling, and disposal of excavated material, complete in all respects, ensuring proper slope, camber, and alignment for subsequent road works. The Unit of item is Cmt.

➤ **Providing and laying cement concrete 1:3:6 (1-Cement : 3- coarse sand : 6- hand broken stone aggregates 40 mm nominal size) and curing complete excluding cost of formwork in (A) Foundation and Plinth**

1. The work shall consist of providing and laying plain cement concrete in proportion 1:3:6 (1 part cement : 3 parts coarse sand : 6 parts hand broken stone aggregate of 40 mm nominal size) for foundation and plinth works, as per approved drawings and specifications.
2. The cement shall be of approved quality Ordinary Portland Cement, the fine aggregate shall be clean, well-graded coarse sand free from silt, organic, or deleterious materials, and the coarse aggregate shall consist of hard, durable hand broken stone of 40 mm nominal size, well graded and free from dust and impurities. Potable water shall be used for mixing.
3. The concrete shall be machine mixed to achieve uniform consistency and proper workability. It shall be laid in position over a properly prepared and compacted base, in layers not exceeding 150 mm thickness, and shall be thoroughly compacted using mechanical vibrators or approved methods to ensure full compaction and elimination of voids.

4. The surface shall be finished to the required levels and slopes as per drawings. Care shall be taken to ensure that segregation of materials does not occur during transportation and placing of concrete.
 5. After placement, the concrete shall be properly cured by keeping it continuously moist for a minimum period of 7 to 14 days, using water ponding, wet gunny bags, or other approved methods to ensure adequate hydration and strength development.
 6. The work shall include all materials, labour, mixing, placing, compacting, finishing, and curing complete in all respects, but excluding the cost of formwork, and shall be executed as per standard engineering practices and directions of the Engineer-in-Charge. The Unit of item is Cmt.
- **Providing and laying cement concrete work 1:2:4 (1-Cement : 2- Coarse sand : 4- graded stone aggregates 20 mm nominal size) and curing complete excluding cost of formwork and reinforcement for reinforced concrete work in (A) Foundations, footings, Base or columns and Mass concrete (more than 10 ton)**
1. The work shall consist of providing and laying reinforced cement concrete of grade 1:2:4 (1 part cement : 2 parts coarse sand : 4 parts graded stone aggregate of 20 mm nominal size) for foundations, footings, bases, columns, and mass concrete works exceeding 10 tonnes, as per approved drawings and specifications.
 2. The cement shall be Ordinary Portland Cement of approved make and quality, the fine aggregate shall be clean, well-graded coarse sand free from silt and organic impurities, and the coarse aggregate shall consist of hard, durable, machine-crushed graded stone aggregates of 20 mm nominal size, conforming to relevant IS specifications. Potable water shall be used for mixing.
 3. The concrete shall be machine mixed to ensure uniformity and proper proportioning of materials. It shall be placed in position in layers not exceeding 150 mm thickness and shall be properly compacted using mechanical vibrators to ensure full compaction, elimination of air voids, and achievement of maximum density. Care shall be taken to avoid segregation during handling, transport, and placement.
 4. The concrete shall be laid over properly prepared surfaces or formwork and shall be finished to the required lines, levels, and slopes as shown in the drawings. Adequate care shall be taken to ensure proper bonding with adjoining concrete surfaces where applicable.
 5. After placement and compaction, the concrete shall be protected from sun, rain, and mechanical damage and shall be cured continuously for a minimum period of 7 to 14 days by approved methods such as ponding, wet covering, or continuous water sprinkling to ensure proper hydration and strength development.
 6. The work shall include all labour, materials, mixing, placing, compacting, finishing, and curing complete in all respects, but excluding the cost of

formwork and reinforcement steel, and shall be executed as per relevant IS codes and directions of the Engineer-in-Charge. The Unit of item is Cmt.

➤ **Providing TMT Bar FE 415 reinforcement for R.C.C. work including bending, binding and placing in position complete up to floor two level (more than 10 ton) RCC Slab.**

1. The work shall consist of providing Thermo Mechanically Treated (TMT) reinforcement steel bars of Fe-415 grade for reinforced cement concrete (RCC) works, conforming to IS 1786, including all straightening, cutting, bending, hooking, cranking, and binding operations as per approved structural drawings and bar bending schedule.
2. The reinforcement shall be supplied of approved make, free from rust, oil, grease, dirt, and other deleterious materials affecting bond with concrete. The steel shall be accurately fabricated to required shapes and dimensions using mechanical means to ensure precision and uniformity. Bending shall be carried out in accordance with IS 2502, and no re-bending or improper heating shall be permitted.
3. The reinforcement shall be placed in position as per design requirements for RCC slab work, including proper spacing, alignment, and cover. Bars shall be securely tied at all intersections using approved annealed binding wire of 16–18 gauge to maintain rigidity during concreting. Suitable cover blocks of required grade and size shall be provided to ensure specified clear cover.
4. All laps, splices, and anchorage shall be provided strictly as per structural design and relevant IS code provisions, ensuring proper load transfer and structural integrity. Chairs, spacers, and supports shall be used wherever required to maintain correct position of reinforcement during concreting.
5. The work shall include all materials, labour, tools, and equipment required for supplying, cutting, bending, binding, placing, and fixing reinforcement steel, complete in all respects, including all lifts up to floor two level (above 10 tonnes of steel quantity), but excluding the cost of concrete and formwork.
6. The reinforcement work shall be executed as per approved drawings, structural requirements, and directions of the Engineer-in-Charge, ensuring proper quality, safety, and compliance with relevant Indian Standard specifications. The Unit of item is Kg.

7. Mode of Measurement And Payment :

Mode of Measurement is As per Schedule - B & Payment As per Schedule Of Payments.

Deputy Executive Engineer
Public Health Sanitary Sub Dn.
Surat

Executive Engineer
Public Health Works Dn.
Surat

Contractor