

कार्यालय प्रमुख अभियंता  
लोक स्वास्थ्य यांत्रिकी विभाग  
जल भवन, बाणगंगा- भोपाल  
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क्रमांक 2737/प्र.अ/स्था.(राज.)/लो.स्वा.यॉ.वि./ भोपाल, दिनांक 01 सितम्बर 2023

// कार्यालयीन आदेश //

विभागीय एकीकृत दर सूची (Unified Schedule of Rates 'USoR') के निर्माण/नवीनीकरण हेतु गठित समिति की अनुशंसा के आधार पर नवीन विभागीय एकीकृत दर अनुसूची आज दिनांक 01 सितम्बर 2023 से निम्न दिशा-निर्देशानुसार लागू की जाती है :-

1. आज दिनांक 01 सितम्बर 2023 के उपरांत तैयार किये जाने वाले नवीन कार्यों के प्राक्कलन/डी.पी.आर. इस नवीन USoR के अनुसार ही बनाये जायेंगे।
2. आज दिनांक 01 सितम्बर 2023 के पूर्व स्वीकृत समस्त योजनाओं के पुनरीक्षण की स्थिति में पुनरीक्षित प्राक्कलन, विभागीय एकीकृत दर सूची-2018 (समस्त संशोधनों सहित) से ही बनाये जायेंगे।
3. पूर्व स्वीकृत समस्त कार्यों/योजनाओं के प्राक्कलनों, जिनकी तकनीकी स्वीकृति आज दिनांक 01 सितम्बर 2023 के पूर्व जारी हो चुकी है, वह यथावत जारी रहेगी अर्थात् उन प्राक्कलनों पर यह USoR लागू नहीं होगा।

  
(संजय कुमार अधवान)  
प्रमुख अभियंता

पृ. क्रमांक 12367/प्र.अ/मोनि./लो.स्वा.यॉ.वि./ भोपाल, दिनांक 01 सितम्बर 2023  
प्रतिलिपि :

1. निज सचिव, माननीय मंत्री जी/राज्यमंत्री जी, म.प्र. शासन, लोक स्वास्थ्य यांत्रिकी विभाग, भोपाल।
2. प्रमुख सचिव, म.प्र. शासन, लोक स्वास्थ्य यांत्रिकी विभाग, मंत्रालय वल्लभ भवन, भोपाल।
3. परियोजना निदेशक, म.प्र. जल निगम मर्यादित, अरेरा हिल्स, भोपाल।
4. प्रमुख अभियंता, लोक निर्माण विभाग/जल संसाधन विभाग/नगरीय प्रशासन एवं विकास विभाग/ग्रामीण यांत्रिकी सेवा, भोपाल।
5. मुख्य अभियंता, लोक स्वास्थ्य यांत्रिकी परिक्षेत्र भोपाल/इंदौर/जबलपुर/ग्वालियर एवं वि./यॉ. परिक्षेत्र, भोपाल।
6. अधीक्षण यंत्री, लोक स्वास्थ्य यांत्रिकी विभाग समस्त मण्डल मध्यप्रदेश।
7. कार्यपालन यंत्री (सिविल/मैके.) लोक स्वास्थ्य यांत्रिकी विभाग समस्त खण्ड मध्यप्रदेश।
8. सहायक यंत्री (एम.आई.एस.) कार्यालय प्रमुख अभियंता, लोक स्वास्थ्य यांत्रिकी विभाग भोपाल की ओर सूचनार्थ कर निर्देशित किया जाता है कि नवीन विभागीय यू.एस.ओ.आर. को विभागीय वेबसाइट पर अपलोड करें।
9. आदेश नस्ती।

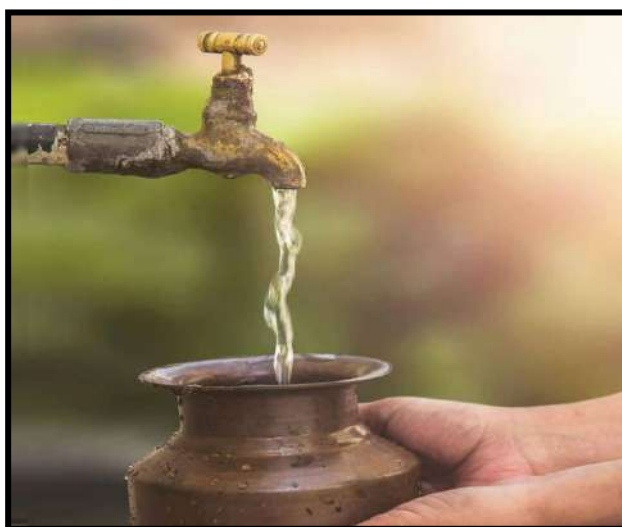
  
प्रमुख अभियंता

# GOVERNMENT OF MADHYA PRADESH

## PUBLIC HEALTH ENGINEERING DEPARTMENT



### UNIFIED SCHEDULE OF RATES FOR WATER SUPPLY, SEWERAGE AND ALLIED WORKS



**IN FORCE FROM: 1<sup>st</sup> September 2023**

Issued by  
**Engineer-In-Chief**  
**Public Health Engineering Department**  
**Madhya Pradesh**

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## **PREFACE**

Madhya Pradesh Public Health Engineering Department (MPPHED) has prepared an Unified Schedule of Rates (USoR)-2023, for the works to be implemented under various Central and State Government flagship program like Jal Jeevan Mission with the intention to accommodate various items related to rural drinking water supply works and others rural water supply schemes considering interest of rural sector development work. It was also intended that the estimation based on this USoR will provide the updated cost for preparation of estimates and to benefit staff and other stakeholders for assessments/ preparation of DPR/tender documents/ Feasibility reports/ consistent estimate of the cost of the Rural Water Supply Project etc. in the State.

The updation/modification of earlier Unified Schedule of Rates for Water Supply, Sewerage, and Allied Works in force from 3rd July 2018 was primarily required due to change in rates of basic material, labour, steel, Pipe products, transportation and other materials. All items of previous USoR have been added/modified based learning of Engineers /Consultants / Contractors of MPPHED during the execution of works.

The support of manufacturers/vendors/suppliers such as providing their rates/catalogues has made us comfortable to reach at reasonable rates of the materials. Though best efforts have been made to procure the present basic rates of every item; Wherever vendors were reluctant to provide any support of rates and accordingly rates of some items could not be directly received from the market. Such items have been arrived on the basis of earlier USoR 2018 rates & experience with suitable adjustments. It is worth mentioning that inspite of genuine efforts, suggestion/ modifications if any, needed would be highly appreciated. Committee of departmental engineers having experience was contributed to cross check this USoR prepared by agency M/s Lexus Infratech LLP, Bhopal.

Regular meetings were held with all PHED engineers and agency's consultants working with PHED for detailed discussions & to freeze the rates of basic materials and nomenclature of the items. The nomenclature of items has been improved and those Items of USoR-2018 which have become obsolete have been deleted. Many new items using new material/technology have also been added in this USoR.

I am deeply grateful to Shri Sanjay Kumar Shukla (IAS), Principal Secretary, GoMP PHE Department, for his guidance which helped us to boost up the work.



I am gratified for the input of Shri K.K.Songaria, Engineer in Chief (Advisor), Shri R K Hirodia, Chief Engineer PHED Bhopal Zone Bhopal, Shri Rajesh Shakyawar, S.E. O/o the Engineer-in-Chief, Shri Subodh Jain, S.E. O/o the Engineer-in-Chief, Shri Alok Agrawal, SE O/o the Engineer-in-Chief, Shri Pankaj Vijayvargiya, Executive Engineer O/o the Engineer-in-Chief, Shri M.C. Ahirwar, SE Bhopal Circle Bhopal, Shri Pankaj Rao Gourkhede, Executive Engineer (E&M) Division Bhopal, Shri Sunil Chaturvedi, Executive Engineer, CP-2 Division, Smt. Manju Singh, Executive Engineer, Bhopal Division, Shri C.K. Dave, Executive Engineer, Rajgarh Division, Shri R.K. Chawla, Assistant Engineer, Shri Ali Asgar, Assistant Engineer, Bhopal

I am thankful to Shri A.K. Jain, Project Director MP Jal Nigam along with his team, Shri Ashish Shrivastava, CGM, Shri P K Raghuvanshi, CGM, Shri Alok Jain, CGM, Shri P K Guru, GM, Shri Ajay Diwakar, GM, who contributed a lot in the chapter related to them, I am also thankful to the subject experts/ consultants of M/s Lexus Infratech LLP, Bhopal working with MPPHED & MP Jal Nigam for their valuable suggestions and refinement of USoR. The attempt had been successful only due to the extensive efforts of Engineers/ subject experts/PMU consultant of MPPHED & MP Jal Nigam working in different sectors by ensuring incorporation of related sectoral items & their proper nomenclature in the USoR.

This Unified Schedule of Rates 2023 has been prepared to cater the estimation and evaluation needs of Rural Water supply, Sewerage and other allied works Infrastructures Development works under Jal Jeevan Mission and other various programmes. Although every care has been taken, yet in such a complex work, it is possible that typographical or other error or omissions might have crept in, suggestion for improvement and corrections in this unified SoR/future modifications will be most welcomed from all quarters.

I thankfully acknowledge, the earnest efforts of persons who have helped directly or indirectly and whose name has not been mentioned here.



**Er. Sanjay Kumar Andhawan**  
**Engineer in Chief**  
**Public Health Engineering Department**  
**Jal Bhawan, Banganga, Bhopal, Madhya Pradesh**

**UNIFIED SCHEDULE OF RATES  
GENERAL NOTES  
WATER SUPPLY AND SEWERAGE WORKS**

**1. Definitions:**

The following terms and expressions wherever they appear in the schedule of rates shall have the meaning and implications assigned to them.

- i. **Engineer in Charge:** Engineer in Charge would refer to the Executive Engineer of Public Health Engineering Division in charge of work.
- ii. **Diameter:** Diameter of pipes, specials, valves etc. shall be the nominal internal diameter of the bore except for PVC pipe for which the diameter of pipe will denote the outer nominal diameter of pipe. These would be as per IS codes.
- iii. **Providing & Fixing:-** The provision of all materials and labour and the performance of all workmanship together with the use of all materials and labour, transport, tools, plants, appliances and all other provisions necessary for the proper execution of work as described in the concerned item of schedule of rates and the provision for uses of all coverings or casing etc. are necessary to protect the work from inclement weather etc. and from damages from falling materials or other causes and all required safety arrangements.
- iv. **Laying and Fixing only:** As defined, for 'providing and fixing' except the provision of the materials (which will be supplied free of cost by the department for incorporation in the work) to be fixed or laid, but including taking supply of the articles from the Public Health Engineering Department Stores and the provisions of materials necessary for the proper execution of the work as described in the item of schedule of rates which are subsidiary to, but are not supplied as part of the principal articles such as bolts, nuts, packing, jointing materials etc, and the like unless other-wise specifically excluded and mentioned in the tender documents. This also includes testing, closing, preparing, loading and returning empty cases, containers, bags & baggage of the articles provided by the Department if any, to the place of issue without any extra charges.
- v. **Loading and unloading of pipe:**
- vi. During unloading, the pipe shall not be drawn on hard ground and shall be gently unloaded using proper supports without causing any damage to the pipe etc. Unloading of pipes on timber skids without steadying rope and thus allowing the pipe to bump against one another shall not be allowed and the contractor shall be responsible for any damage.
- vii. **Best:** With reference to quality of materials and workmanship the word 'Best' When used shall mean that in the opinion of the Engineer-in-Charge, there is no superior material or article or class of workmanship obtainable in the market.
  - (a) I.S.S.: The Indian Standard Specifications as issued by the Bureau of Indian Standards, New Delhi current and updated.
  - (b) B.S.S. The British Standard Specifications as issued by the British Standard Institution current and up dated.

2. **Complete:**

The provision of all such materials and labour and the performance of all such workmanship which may be necessary for the proper execution of the work in best workmanship manner but not particularly described in the items of schedule of rates due to their petty nature.

3. **Approval of materials:**

All materials shall be used strictly in accordance with the specifications and of the description and make as detailed in items of schedule of rate. The quantity of the various kinds of materials to be used in the works shall in all cases be determined by the Executive Engineer. All materials before use in the works shall require prior approval of the Engineer-in-charge. When materials are specified to comply with an I.S. or B.S., the contractor shall, if required, furnish the manufactures' certificate that the materials satisfy the requirement of the I.S. or B.S. respectively.

4. **Alternative:**

No alternative materials other than those specified in the agreement will generally be allowed to be used in the works except when their use becomes absolutely necessary in the interest of work on such grounds due to unavailability in the market due to import restrictions or any other particular reasons which are beyond control of the contractor. But in all such cases, the Executive Engineer after satisfying himself about the facts will permit in writing the use of such alternatives and will recommend suitable alternation in rates for such works to the competent authority. No permission for using such alternative material shall however be granted if so mentioned in the tender documents.

5. **Laying:**

The approximate positions of all fittings shall generally be shown on the plans prepared for the purpose. But it will be the sole responsibility of the contractor to ascertain the work on the spot and the exact position where each fitting is to be fixed from the Engineer-in-Charge before carrying out the work. When the pipe is closed and trench gets flooded by rain, due care shall be taken to prevent the pipe from flooding.

6. **Testing of materials:**

The contractor, on completion, or whenever required by the Engineer-in-Charge, shall prove all materials and pipes, fittings, joints and other accessories etc. to be clear, clean, perfect in working conditions and strong enough to withstand the test so specified here-in-under different items of the specifications. For this purpose the contractor at his own expense, shall provide all instruments and suitable appliances and carry out the necessary test before the Engineer-in-Charge or his representative to his entire satisfaction. The contractor shall rectify any defects as to the materials or workmanship, so noticed, and the defective portions re-tested at his expense. Till such time the test is completed an extra 10% of the bill amount shall be withheld from the contractor's running bill and same will be released only after testing, up to the entire satisfaction of the Engineer-in-Charge such material/works shall be replaced/redone if so required by Engineer in Charge.

**7. Lead**

Rates include all leads & lifts for the materials and no extra lead on account of shifting of materials from one place to another is payable, unless it is specifically mentioned in the contract agreement.

**8. Specifications:**

Work shall be executed in accordance with the specifications given in this schedule and the specifications for works in vogue in P.H.E.D., Govt of M.P., and the specifications attached with the 'Notice Inviting Tenders' and the "Contract Agreement". Latest C.P.H.E.E.O. manual, published by the Ministry of Urban Development, Govt. of India shall also be applicable. In case of any discrepancy, the specific provision in the 'Contract Agreement' will take precedence and the decision of the authority, sanctioning the tender, shall be binding and final. The materials to be used in works i.e. pipes; specials, valves etc. are to be supplied by the departmental store, unless otherwise mentioned in the contract document. As such, specifications for the same are not given in this schedule of rates. In case any materials are required to be supplied by the contractor for any particular work, materials conforming to relevant I.S. Specification, B.S. specification, material of best quality available in the market shall only to be used after the approval of the Engineer in Charge.

**9. Civil works:**

It shall be done as per specification given in chapter XII and standard IS code for each work.

**10. Safety:**

The contractor shall be fully and solely responsible for making all the safety arrangements pertaining to the work. The contractor shall be fully responsible and liable in all respects for any accidents and subsequent legal consequences.

**11. Interpretation:**

The Engineer in Chief P.H.E.D., Bhopal shall be the sole deciding Authority as to the meaning, interpretation and implications of various provisions in this schedule of rates. His decision shall be final and binding on all concerned.

**12. Award of Contract:**

The rates for various items of works given in this Unified Schedule of Rates are based on average current market rates of materials & labour for whole of the Madhya Pradesh State. The market rates may vary from place to place in the State depending upon the local conditions. No contract should, therefore be awarded directly on the rates given in this Unified Schedule of Rates without inviting proper tenders.

**13. Application of Rates for Departmental Work:-**

The rates for various items of works given in this Unified Schedule of Rates includes for 10% contractor's profit, 1% T&P, 3% sundries and 1% water charges. If the work is carried out Departmentally then the rates applicable for Departmental works shall be 9.56%  $[(100 \times 11)/115]$  less than the rates of various items given in this Unified Schedule of Rates. The over all rate to carry out the work departmentally shall be decided by the Superintending Engineer of the circle based on prevailing rate in circle after deducting 9.56% from the rates. No work shall be done departmentally unless other wise permitted in writing by the competent authority as per manual provisions.



14. As per **prevailing** excise duty norms, duty exemption is on certain diameter of Water Supply Pipes. Therefore, no excise duty is considered while computing the rates for cast iron pipes and A.C. Pressure pipe., it will be payable as per actual on producing the necessary certificate on this account to respective Executive Engineer of the Division where such work is executed after the award of the contract and after obtaining full excise duty exemption as per prevailing rules. All the concerned officers shall be responsible to get all the prevailing exemptions in any tax or duty as per prevailing policy. The computation of rates for D.I. pipes, S.W. pipes, R.C.C. pipe, U.P.V.C. pipes of G.I. pipes are exclusive of excise duty and excise duty exemption shall be obtained as per prevailing rules for these pipes also and this benefit shall be availed by the deptt.
15. All necessary permissions regarding road cutting, blasting, electrical line/pole shifting, road diversion/closer, underground utility services shifting/closer disturbance, tree cutting etc. and all other permissions or licenses or permits etc. where ever applicable, such as from labour department, mining department, P & T department, Electricity board or company district administration, PWD, WRD, Local Urban bodies etc. shall also be obtained by the contractor from the competent authority at his own cost. The contractor shall be fully responsible for any consequences for any lapse in this.

**CHAPTER - 01**

**DUCTILE IRON PRESSURE PIPES AND  
SPECIALS WITH TYTON JOINTS AND DUCTILE  
IRON VALVES**

## CHAPTER – 01

### DUCTILE IRON PRESSURE PIPES AND SPECIALS WITH TYTON JOINTS AND DUCTILE IRON VALVES

#### NOTES:

- 1 All the pipes, specials, joints to be used in the work shall conform to relevant Indian standard duly inspected and tested and having B.I.S. certification Mark.
- 2 The jointing materials i.e. Tyton rings if supplied by the Department from departmental store, no extra charges for carting of the same to site of work will be payable. In case jointing materials are required to be arranged by the contractor the same should conform to relevant Indian standard duly inspected and tested and bearing B.I.S. certification Mark.
- 3 The rates include charges for all tools and plant, chain pulley blocks, other appliances etc. required for lifting and laying the pipes and specials in position including testing as per approved drawings.
- 4 The rates include provision and use of all coverings etc. to protect the work from inclement weather etc. and from damages from falling materials and other causes.
- 5 The rate include provision of handling, storing under cover as required and returning of empty cases or container to Public Health Engineering Department Stores without any extra cost, for such materials as may be supplied by the department.
- 6 All measurements should be of the finished work.
- 7 Fitting must of superior quality & equivalent to Kiswak /Electro steel / Kejriwal/ Jindal.
- 8 Rates include the supply of pipes and specials at departmental store/site store.
- 9 Works will be executed in accordance with the general specifications given in P.H.E. Department and the specials notes if any, covered in the contract agreement of the work and all the relevant latest version of I.S. Specifications as detailed below: -

S.No.	I.S. Number	Title
1	IS 8329:2000	Centrifugally cast (spun) ductile iron pressure pipes for water, gas and sewage (Third revision)
2	IS 9523:2000	Ductile Iron fittings for pressure pipes for water, gas and sewage.
3	IS 12288:1987	Code of practice for use and laying of ductile iron pipes.
4	IS 5382:2018	Rubber sealing rings for gas mains, water mains and sewage (First revision)
5	IS 14846:2000	The Sluice Valves (50-1200 mm size)
6	IS 14845: 2000	The resilient seated C.I. Air relief valve
7	IS 5312: 2004(Part I & II)	The Swing check type reflux valves
8	IS 13095:2020	The Butter fly valves

- 10 This USOR contains the rates of all the items without GST. No claims against GST shall be entertained at any level. GST shall be paid by the Agency/ Contractor directly to the concerning department. However, All the estimates prepared on this USOR will include GST, as an extra amount as per prevailing rates on the sum of the estimate to arrive at the gross amount.

## DUCTILE IRON PRESSURE PIPES AND SPECIALS WITH TYTON JOINTS AND DUCTILE IRON VALVES

S. No.	Particulars of Items	Unit	Rate (in Rs.)
1.1	Providing, laying and jointing including testing following socket & spigot centrifugally cast (Spun) Ductile Iron pressure pipes with inside cement mortar lining (class K-7) conforming to IS 8329/2000 with suitable Rubber Gasket (Push on) joints as per IS:5382/85		
1.1.1	80 mm diameter	Meter	1391.00
1.1.2	100 mm diameter	Meter	1500.00
1.1.3	150 mm diameter	Meter	2139.00
1.1.4	200 mm diameter	Meter	2671.00
1.1.5	250 mm diameter	Meter	3520.00
1.1.6	300 mm diameter	Meter	4433.00
1.1.7	350 mm diameter	Meter	5344.00
1.1.8	400 mm diameter	Meter	6597.00
1.1.9	450 mm diameter	Meter	7764.00
1.1.10	500 mm diameter	Meter	9054.00
1.1.11	600 mm diameter	Meter	11737.00
1.1.12	700 mm diameter	Meter	15099.00
1.1.13	750 mm diameter	Meter	17855.00
1.1.14	800 mm diameter	Meter	19800.00
1.1.15	900 mm diameter	Meter	24330.00
1.1.16	1000 mm diameter	Meter	28944.00
1.2	Labour for laying in position including testing following socket & spigot Ductile Iron(K-7) pressure pipes		
1.2.1	100 mm diameter	Meter	25.00
1.2.2	150 mm diameter	Meter	36.00
1.2.3	200 mm diameter	Meter	49.00
1.2.4	250 mm diameter	Meter	66.00
1.2.5	300 mm diameter	Meter	81.00
1.2.6	350 mm diameter	Meter	111.00
1.2.7	400 mm diameter	Meter	132.00
1.2.8	450 mm diameter	Meter	156.00
1.2.9	500 mm diameter	Meter	179.00
1.2.10	600 mm diameter	Meter	235.00
1.2.11	700 mm diameter	Meter	308.00
1.2.12	750 mm diameter	Meter	356.00
1.2.13	800 mm diameter	Meter	450.00
1.2.14	900 mm diameter	Meter	553.00
1.2.15	1000 mm diameter	Meter	676.00
1.3	Providing, laying and jointing including testing following socket & spigot centrifugally cast (Spun) Ductile Iron		

S. No.	Particulars of Items	Unit	Rate (in Rs.)
	pressure pipes with inside cement mortar lining (class K-9) conforming to IS 8329/2000 with suitable Rubber Gasket (Push on) joints as per IS:5382/85		
1.3.1	80 mm diameter	Meter	1587.00
1.3.2	100 mm diameter	Meter	1716.00
1.3.3	150 mm diameter	Meter	2471.00
1.3.4	200 mm diameter	Meter	3202.00
1.3.5	250 mm diameter	Meter	4286.00
1.3.6	300 mm diameter	Meter	5375.00
1.3.7	350 mm diameter	Meter	6606.00
1.3.8	400 mm diameter	Meter	7856.00
1.3.9	450 mm diameter	Meter	9458.00
1.3.10	500 mm diameter	Meter	10998.00
1.3.11	600 mm diameter	Meter	14460.00
1.3.12	700 mm diameter	Meter	17642.00
1.3.13	750 mm diameter	Meter	20367.00
1.3.14	800 mm diameter	Meter	22075.00
1.3.15	900 mm diameter	Meter	26640.00
1.3.16	1000 mm diameter	Meter	31760.00
1.4	Labour for laying in position including testing following socket & spigot Ductile Iron (K-9) pressure pipes		
1.4.1	100 mm diameter	Meter	28.00
1.4.2	150 mm diameter	Meter	42.00
1.4.3	200 mm diameter	Meter	58.00
1.4.4	250 mm diameter	Meter	78.00
1.4.5	300 mm diameter	Meter	99.00
1.4.6	350 mm diameter	Meter	131.00
1.4.7	400 mm diameter	Meter	156.00
1.4.8	450 mm diameter	Meter	185.00
1.4.9	500 mm diameter	Meter	212.00
1.4.10	600 mm diameter	Meter	279.00
1.4.11	700 mm diameter	Meter	350.00
1.4.12	750 mm diameter	Meter	399.00
1.4.13	800 mm diameter	Meter	455.00
1.4.14	900 mm diameter	Meter	557.00
1.4.15	1000 mm diameter	Meter	667.00
1.5	Providing Rubber ISI marked Gasket (push on) joint as per IS-5382/85 to following DI pipes class K-7 and K-9 including testing of joints and cost of jointing materials (Rubber Gasket and soap solution etc.)		
1.5.1	100 mm diameter	Each	126.00
1.5.2	150 mm diameter	Each	146.00
1.5.3	200 mm diameter	Each	251.00

S. No.	Particulars of Items	Unit	Rate (in Rs.)
1.5.4	250 mm diameter	Each	293.00
1.5.5	300 mm diameter	Each	319.00
1.5.6	350 mm diameter	Each	363.00
1.5.7	400 mm diameter	Each	566.00
1.5.8	450 mm diameter	Each	654.00
1.5.9	500 mm diameter	Each	723.00
1.5.10	600 mm diameter	Each	821.00
1.5.11	700 mm diameter	Each	1135.00
1.5.12	750 mm diameter	Each	1260.00
1.5.13	800 mm diameter	Each	1339.00
1.5.14	900 mm diameter	Each	1572.00
1.5.15	1000 mm diameter	Each	1771.00
1.6	Labour for providing including testing, Rubber Gasket (push on) joints to following D.I. Pipes class K-7 & K-9 including joints but excluding cost of Rubber Gasket.		
1.6.1	100 mm diameter	Each	83.00
1.6.2	150 mm diameter	Each	92.00
1.6.3	200 mm diameter	Each	100.00
1.6.4	250 mm diameter	Each	118.00
1.6.5	300 mm diameter	Each	129.00
1.6.6	350 mm diameter	Each	151.00
1.6.7	400 mm diameter	Each	191.00
1.6.8	450 mm diameter	Each	213.00
1.6.9	500 mm diameter	Each	228.00
1.6.10	600 mm diameter	Each	276.00
1.6.11	700 mm diameter	Each	320.00
1.6.12	750 mm diameter	Each	342.00
1.6.13	800 mm diameter	Each	360.00
1.6.14	900 mm diameter	Each	406.00
1.6.15	1000 mm diameter	Each	447.00
<b>DUCTILE IRON FITTING PN-16</b>			
<b>Note : IF PN-10 fittings is used than 90% of rate is payable for providing, fixing and fitting.</b>			
1.7	Providing and Laying including testing ductile iron PN 16 type flanged sockets conforming to IS:9523/2000 having dimension as per table 23 of IS:9523/2000 in the following nominal diameter/sizes with external bitumen coating and internal cement mortar lining with finishing as per clause 13 of IS:9523/2000.		
1.7.1	100 mm diameter	Each	1307.00
1.7.2	150 mm diameter	Each	2107.00
1.7.3	200 mm diameter	Each	2750.00



S. No.	Particulars of Items	Unit	Rate (in Rs.)
1.7.4	250 mm diameter	Each	4532.00
1.7.5	300 mm diameter	Each	5044.00
1.7.6	350 mm diameter	Each	7055.00
1.7.7	400 mm diameter	Each	8576.00
1.7.8	450 mm diameter	Each	10518.00
1.7.9	500 mm diameter	Each	14946.00
1.7.10	600 mm diameter	Each	21086.00
1.7.11	700 mm diameter	Each	30642.00
1.7.12	750 mm diameter	Each	46875.00
1.7.13	800 mm diameter	Each	42070.00
1.7.14	900 mm diameter	Each	52689.30
1.7.15	1000 mm diameter	Each	70354.00
1.8	Labour only for Laying including testing Ductile Iron PN 16 type flanged sockets conforming to IS:9523/2000 having dimension as per table 23 of IS:9523/2000 in the following nominal diameter/sizes with external bitumen coating and internal cement mortar lining with finishing as per clause 13 of IS:9523/2000		
1.8.1	100 mm diameter	Each	47.00
1.8.2	150 mm diameter	Each	62.00
1.8.3	200 mm diameter	Each	72.00
1.8.4	250 mm diameter	Each	103.00
1.8.5	300 mm diameter	Each	145.00
1.8.6	350 mm diameter	Each	197.00
1.8.7	400 mm diameter	Each	254.00
1.8.8	450 mm diameter	Each	321.00
1.8.9	500 mm diameter	Each	373.00
1.8.10	600 mm diameter	Each	466.00
1.8.11	700 mm diameter	Each	714.00
1.8.12	750 mm diameter	Each	880.00
1.8.13	800 mm diameter	Each	1009.00
1.8.14	900 mm diameter	Each	1138.00
1.8.15	1000 mm diameter	Each	1423.00
1.9	Providing and laying including testing ductile PN 16 type iron flanged spigot conforming to IS:9523/2000 having dimension as per table 24 of IS:9523/2000 in the following nominal diameter/sizes with external bitumen coating and internal cement mortar lining with finishing as per clause 13 of IS:9523/2000.		
1.9.1	100 mm diameter	Each	1469.00
1.9.2	150 mm diameter	Each	3016.00
1.9.3	200 mm diameter	Each	3745.00
1.9.4	250 mm diameter	Each	5377.00

S. No.	Particulars of Items	Unit	Rate (in Rs.)
1.9.5	300 mm diameter	Each	7010.00
1.9.6	350 mm diameter	Each	9493.00
1.9.7	400 mm diameter	Each	11386.00
1.9.8	450 mm diameter	Each	14118.00
1.9.9	500 mm diameter	Each	15748.00
1.9.10	600 mm diameter	Each	24817.00
1.9.11	700 mm diameter	Each	39974.00
1.9.12	750 mm diameter	Each	53008.00
1.9.13	800 mm diameter	Each	48540.00
1.9.14	900 mm diameter	Each	62246.00
1.9.15	1000 mm diameter	Each	75932.00
1.10	Labour only for Laying including testing Ductile Iron PN 16 type flanged Spigot conforming to IS:9523/2000 having dimension as per table 24 of IS:9523/2000 in the following nominal diameter/sizes with external bitumen coating and internal cement mortar lining with finishing as per clause 13 of IS:9523/2000		
1.10.1	100 mm diameter	Each	48.00
1.10.2	150 mm diameter	Each	77.00
1.10.3	200 mm diameter	Each	111.00
1.10.4	250 mm diameter	Each	154.00
1.10.5	300 mm diameter	Each	197.00
1.10.6	350 mm diameter	Each	255.00
1.10.7	400 mm diameter	Each	312.00
1.10.8	450 mm diameter	Each	384.00
1.10.9	500 mm diameter	Each	461.00
1.10.10	600 mm diameter	Each	654.00
1.10.11	700 mm diameter	Each	1163.00
1.10.12	750 mm diameter	Each	1288.00
1.10.13	800 mm diameter	Each	1360.00
1.10.14	900 mm diameter	Each	1754.00
1.10.15	1000 mm diameter	Each	2129.00
1.11	Providing and Laying including testing Ductile iron Mechanical joint collar with follower glands conforming to IS-9523/2000 having dimension as per table 24 of IS-9523/2000 in the following nominal diameter/sizes with external bitumen and internal cement mortar lining.		PN-1.6
1.11.1	100 mm diameter	Each	2322.00
1.11.2	150 mm diameter	Each	3713.00
1.11.3	200 mm diameter	Each	5048.00
1.11.4	250 mm diameter	Each	6627.00
1.11.5	300 mm diameter	Each	8335.00
1.11.6	350 mm diameter	Each	11380.00

S. No.	Particulars of Items	Unit	Rate (in Rs.)
1.11.7	400 mm diameter	Each	13960.00
1.11.8	450 mm diameter	Each	17883.00
1.11.9	500 mm diameter	Each	20542.00
1.11.10	600 mm diameter	Each	26187.00
1.11.11	700 mm diameter	Each	59510.00
1.11.112	750 mm diameter	Each	60160.00
1.11.13	800 mm diameter	Each	68575.00
1.11.14	900 mm diameter	Each	95491.00
1.11.15	1000 mm diameter	Each	105251.00
1.12	Labour only for Laying including testing Ductile Iron Mechanical Joint collar with follower glands conforming to IS-9523/2000 having dimension as per table 24 of IS-9523/2000 in the following nominal diameter /sizes with internal cement mortar lining.		
1.12.1	100 mm diameter	Each	84.00
1.12.2	150 mm diameter	Each	133.00
1.12.3	200 mm diameter	Each	163.00
1.12.4	250 mm diameter	Each	222.00
1.12.5	300 mm diameter	Each	286.00
1.12.6	350 mm diameter	Each	390.00
1.12.7	400 mm diameter	Each	494.00
1.12.8	450 mm diameter	Each	573.00
1.12.9	500 mm diameter	Each	662.00
1.12.10	600 mm diameter	Each	839.00
1.12.11	700 mm diameter	Each	1254.00
1.12.12	750 mm diameter	Each	1432.00
1.12.13	800 mm diameter	Each	1654.00
1.12.14	900 mm diameter	Each	1985.00
1.12.15	1000 mm diameter	Each	2533.00
1.13	Providing and Laying including testing Ductile Iron Double Socket 90° Bends conforming to IS:9523/2000 having dimension as per table 15 of IS:9523/2000 in the following nominal diameter/sizes with external bitumen coating and internal cement mortar lining.		
1.13.1	100 mm diameter	Each	1527.00
1.13.2	150 mm diameter	Each	2648.00
1.13.3	200 mm diameter	Each	4698.00
1.13.4	250 mm diameter	Each	6106.00
1.13.5	300 mm diameter	Each	9962.00
1.13.6	350 mm diameter	Each	13185.00
1.13.7	400 mm diameter	Each	18540.00
1.13.8	450 mm diameter	Each	22807.00
1.13.9	500 mm diameter	Each	33512.00

S. No.	Particulars of Items	Unit	Rate (in Rs.)
1.13.10	600 mm diameter	Each	49968.00
1.13.11	700 mm diameter	Each	78564.00
1.13.12	750 mm diameter	Each	110164.00
1.13.13	800 mm diameter	Each	110495.00
1.13.14	900 mm diameter	Each	157651.00
1.13.15	1000 mm diameter	Each	231873.00
1.14	Labour only for Laying including testing Ductile Iron Double Socket 90° Bends conforming to IS:9523/2000 having dimension as per table 15 of IS:9523/2000 in the following nominal diameter/sizes with external bitumen coating and internal cement mortar lining.		
1.14.1	100 mm diameter	Each	42.00
1.14.2	150 mm diameter	Each	77.00
1.14.3	200 mm diameter	Each	123.00
1.14.4	250 mm diameter	Each	185.00
1.14.5	300 mm diameter	Each	262.00
1.14.6	350 mm diameter	Each	347.00
1.14.7	400 mm diameter	Each	443.00
1.14.8	450 mm diameter	Each	578.00
1.14.9	500 mm diameter	Each	713.00
1.14.10	600 mm diameter	Each	1083.00
1.14.11	700 mm diameter	Each	1580.00
1.14.12	750 mm diameter	Each	1908.00
1.14.13	800 mm diameter	Each	2120.00
1.14.14	900 mm diameter	Each	2833.00
1.14.15	1000 mm diameter	Each	3854.00
1.15	Providing and Laying including testing Ductile Iron Double Socket 45° Bends conforming to IS:9523/2000 having dimension as per table 16 of IS:9523/2000 in the following nominal diameter/sizes with external bitumen coating and internal cement mortar lining.		
1.15.1	100 mm diameter	Each	1316.00
1.15.2	125 mm diameter	Each	1647.00
1.15.3	150 mm diameter	Each	2090.00
1.15.4	200 mm diameter	Each	3416.00
1.15.5	250 mm diameter	Each	4665.00
1.15.6	300 mm diameter	Each	7071.00
1.15.7	350 mm diameter	Each	9286.00
1.15.8	400 mm diameter	Each	12856.00
1.15.9	450 mm diameter	Each	16621.00
1.15.10	500 mm diameter	Each	22603.00
1.15.11	600 mm diameter	Each	32985.00
1.15.12	700 mm diameter	Each	50920.00

S. No.	Particulars of Items	Unit	Rate (in Rs.)
1.15.13	750 mm diameter	Each	68427.00
1.15.14	800 mm diameter	Each	73461.00
1.15.15	900 mm diameter	Each	101584.00
1.15.16	1000 mm diameter	Each	152605.00
1.16	Labour only for Laying including testing Ductile Iron Double Socket 45° Bends conforming to IS:9523/2000 having dimension as per table 16 of IS:9523/2000 in the following nominal diameter/sizes with external bitumen coating and internal cement mortar lining.		
1.16.1	100 mm diameter	Each	39.00
1.16.2	125 mm diameter	Each	50.00
1.16.3	150 mm diameter	Each	62.00
1.16.4	200 mm diameter	Each	108.00
1.16.5	250 mm diameter	Each	139.00
1.16.6	300 mm diameter	Each	193.00
1.16.7	350 mm diameter	Each	251.00
1.16.8	400 mm diameter	Each	328.00
1.16.9	450 mm diameter	Each	424.00
1.16.10	500 mm diameter	Each	520.00
1.16.11	600 mm diameter	Each	763.00
1.16.12	700 mm diameter	Each	1041.00
1.16.13	750 mm diameter	Each	1310.00
1.16.14	800 mm diameter	Each	1426.00
1.16.15	900 mm diameter	Each	1927.00
1.16.16	1000 mm diameter	Each	2490.00
1.17	Providing and Laying including testing Ductile Iron Double Socket 22.5° Bends conforming to IS:9523/2000 having dimension as per table 17 of IS:9523/2000 in the following nominal diameter/sizes with external bitumen coating and internal cement mortar lining.		
1.17.1	100 mm diameter	Each	1232.00
1.17.2	125 mm diameter	Each	1499.00
1.17.3	150 mm diameter	Each	1862.00
1.17.4	200 mm diameter	Each	2786.00
1.17.5	250 mm diameter	Each	3790.00
1.17.6	300 mm diameter	Each	5782.00
1.17.7	350 mm diameter	Each	7309.00
1.17.8	400 mm diameter	Each	10232.00
1.17.9	450 mm diameter	Each	12659.00
1.17.10	500 mm diameter	Each	16280.00
1.17.11	600 mm diameter	Each	25188.00
1.17.12	700 mm diameter	Each	39959.00
1.17.13	750 mm diameter	Each	52703.00

S. No.	Particulars of Items	Unit	Rate (in Rs.)
1.17.14	800 mm diameter	Each	57162.00
1.17.15	900 mm diameter	Each	75983.00
1.17.16	1000 mm diameter	Each	108639.00
1.18	Labour only for Laying including testing Ductile Iron Double Socket 22.5° Bends conforming to IS:9523/2000 having dimension as per table 17 of IS:9523/2000 in the following nominal diameter/sizes with external bitumen coating and internal cement mortar lining.		
1.18.1	100 mm diameter	Each	35.00
1.18.2	125 mm diameter	Each	46.00
1.18.3	150 mm diameter	Each	58.00
1.18.4	200 mm diameter	Each	93.00
1.18.5	250 mm diameter	Each	123.00
1.18.6	300 mm diameter	Each	170.00
1.18.7	350 mm diameter	Each	208.00
1.18.8	400 mm diameter	Each	270.00
1.18.9	450 mm diameter	Each	331.00
1.18.10	500 mm diameter	Each	397.00
1.18.11	600 mm diameter	Each	609.00
1.18.12	700 mm diameter	Each	809.00
1.18.13	750 mm diameter	Each	983.00
1.18.14	800 mm diameter	Each	1098.00
1.18.15	900 mm diameter	Each	1407.00
1.18.16	1000 mm diameter	Each	1850.00
1.19	Providing and Laying including testing Ductile Iron Double Socket 11.25° bends conforming to IS-9523/2000 having dimension as per table 18 of IS-9523/2000 in the following nominal diameter/ sizes with external bitumen coating and internal cement mortar lining.		
1.19.1	100 mm diameter	Each	1154.00
1.19.2	125 mm diameter	Each	1415.00
1.19.3	150 mm diameter	Each	1811.00
1.19.4	200 mm diameter	Each	2643.00
1.19.5	250 mm diameter	Each	3474.00
1.19.6	300 mm diameter	Each	4858.00
1.19.7	350 mm diameter	Each	6204.00
1.19.8	400 mm diameter	Each	8883.00
1.19.9	450 mm diameter	Each	11117.00
1.19.10	500 mm diameter	Each	13427.00
1.19.11	600 mm diameter	Each	19924.00
1.19.12	700 mm diameter	Each	32096.00
1.19.13	750 mm diameter	Each	43252.00



S. No.	Particulars of Items	Unit	Rate (in Rs.)
1.19.14	800 mm diameter	Each	47491.00
1.19.15	900 mm diameter	Each	67185.00
1.19.16	1000 mm diameter	Each	88121.00
1.20	Labour only for Laying including testing Ductile Iron Double Socket 11.25° bends conforming to IS-9523/2000 having dimension as per table 18 of IS-9523/2000 in the following nominal diameter /sizes with external bitumen coating and internal cement mortar lining.		
1.20.1	100 mm diameter	Each	35.00
1.20.2	125 mm diameter	Each	42.00
1.20.3	150 mm diameter	Each	54.00
1.20.4	200 mm diameter	Each	81.00
1.20.5	250 mm diameter	Each	116.00
1.20.6	300 mm diameter	Each	154.00
1.20.7	350 mm diameter	Each	181.00
1.20.8	400 mm diameter	Each	224.00
1.20.9	450 mm diameter	Each	308.00
1.20.10	500 mm diameter	Each	347.00
1.20.11	600 mm diameter	Each	509.00
1.20.12	700 mm diameter	Each	663.00
1.20.13	750 mm diameter	Each	809.00
1.20.14	800 mm diameter	Each	902.00
1.20.15	900 mm diameter	Each	1156.00
1.20.16	1000 mm diameter	Each	1465.00
1.21	Providing and Laying including testing Ductile Iron All socket Tees conforming to IS-9523/2000 having dimension as per table 21 of IS-9523/2000 in the following nominal diameter/sizes with external bitumen coating and internal cement mortar lining with finishing as per clause 13 of IS-9523/2000.		
1.21.1	100 mm x 80 mm	Each	1726.00
1.21.2	100 mm x 100 mm	Each	2104.00
1.21.3	150 mm x 80 mm	Each	2874.00
1.21.4	150 mm x 100 mm	Each	2882.00
1.21.5	150 mm x 150 mm	Each	3329.00
1.21.6	200 mm x 80 mm	Each	3441.00
1.21.7	200 mm x 100 mm	Each	3985.00
1.21.8	200 mm x 150 mm	Each	4572.00
1.21.9	200 mm x 200 mm	Each	5258.00
1.21.10	250 mm x 80 mm	Each	5144.00
1.21.11	250 mm x 100 mm	Each	5121.00
1.21.12	250 mm x 150 mm	Each	6084.00
1.21.13	250 mm x 250 mm	Each	7786.00

S. No.	Particulars of Items	Unit	Rate (in Rs.)
1.21.14	300 mm x 100 mm	Each	5654.00
1.21.15	300 mm x 200 mm	Each	8932.00
1.21.16	300 mm x 300 mm	Each	11454.00
1.22	Labour only for Laying including testing Ductile Iron All socket Tees conforming to IS-9523/2000 having dimension as per table 21 of IS-9523/2000 in the following nominal diameter/sizes with external bitumen coating and internal cement mortar lining.		
1.22.1	100 mm x 80 mm	Each	56.00
1.22.2	100 mm x 100 mm	Each	60.00
1.22.3	150 mm x 80 mm	Each	80.00
1.22.4	150 mm x 100 mm	Each	88.00
1.22.5	150 mm x 150 mm	Each	103.00
1.22.6	200 mm x 80 mm	Each	115.00
1.22.7	200 mm x 100 mm	Each	123.00
1.22.8	200 mm x 150 mm	Each	143.00
1.22.9	200 mm x 200 mm	Each	165.00
1.22.10	250 mm x 80 mm	Each	147.00
1.22.11	250 mm x 100 mm	Each	159.00
1.22.12	250 mm x 150 mm	Each	179.00
1.22.13	250 mm x 250 mm	Each	227.00
1.22.14	300 mm x 100 mm	Each	203.00
1.22.15	300 mm x 200 mm	Each	286.00
1.22.16	300 mm x 300 mm	Each	326.00
1.23	Providing and Laying including testing Ductile Iron Double Socket branch flange Tee conforming to IS-9523/2000 having dimension as per table 21 of IS-9523/2000 in the following nominal diameter/sizes with external bitumen coating and internal cement mortar lining with finishing as per clause 13 of IS-9523/2000.		
1.23.1	100 mm x 80 mm	Each	2295.00
1.23.2	100 mm x 100 mm	Each	2382.00
1.23.3	150 mm x 80 mm	Each	2419.00
1.23.4	150 mm x 100 mm	Each	3151.00
1.23.5	150 mm x 150 mm	Each	4184.00
1.23.6	200 mm x 80 mm	Each	3943.00
1.23.7	200 mm x 100 mm	Each	4052.00
1.23.8	200 mm x 150 mm	Each	5337.00
1.23.9	200 mm x 200 mm	Each	6452.00
1.23.10	250 mm x 80 mm	Each	4136.00
1.23.11	250 mm x 100 mm	Each	6237.00
1.23.12	250 mm x 150 mm	Each	6488.00

S. No.	Particulars of Items	Unit	Rate (in Rs.)
1.23.13	250 mm x 200 mm	Each	7871.00
1.23.14	250 mm x 250 mm	Each	9346.00
1.23.15	300 mm x 80 mm	Each	6484.00
1.23.16	300 mm x 100 mm	Each	6836.00
1.23.17	300 mm x 150 mm	Each	8455.00
1.23.18	300 mm x 200 mm	Each	9382.00
1.23.19	300 mm x 250 mm	Each	10894.00
1.23.20	300 mm x 300 mm	Each	11822.00
1.23.21	350 mm x 100 mm	Each	8832.00
1.23.22	350 mm x 200 mm	Each	13647.00
1.23.23	350 mm x 350 mm	Each	18611.00
1.23.24	400 mm x 80 mm	Each	10451.00
1.23.25	400 mm x 100 mm	Each	11094.00
1.23.26	400 mm x 150 mm	Each	12669.00
1.23.27	400 mm x 200 mm	Each	14487.00
1.23.28	400 mm x 300 mm	Each	20209.00
1.23.29	400 mm x 400 mm	Each	22079.00
1.23.30	450 mm x 100 mm	Each	13491.00
1.23.31	450 mm x 250 mm	Each	18333.00
1.23.32	500 mm x 100 mm	Each	15530.00
1.23.33	500 mm x 200 mm	Each	24627.00
1.23.34	500 mm x 400 mm	Each	34539.00
1.23.35	500 mm x 500 mm	Each	33004.00
1.23.36	600 mm x 200 mm	Each	29002.00
1.24	Labour only for Laying including testing Ductile Iron Double Socketed Branch Flange Tee Conforming to IS-9523/2000 having dimension as per table 21 of IS-9523/2000 in the following nominal diameter/sizes with external bitumen coating and internal cement mortar lining.		
1.24.1	100 mm x 80 mm	Each	59.00
1.24.2	100 mm x 100 mm	Each	67.00
1.24.3	150 mm x 80 mm	Each	83.00
1.24.4	150 mm x 100 mm	Each	91.00
1.24.5	150 mm x 150 mm	Each	111.00
1.24.6	200 mm x 80 mm	Each	115.00
1.24.7	200 mm x 100 mm	Each	127.00
1.24.8	200 mm x 150 mm	Each	147.00
1.24.9	200 mm x 200 mm	Each	174.00
1.24.10	250 mm x 80 mm	Each	147.00
1.24.11	250 mm x 100 mm	Each	155.00
1.24.12	250 mm x 150 mm	Each	194.00
1.24.13	250 mm x 200 mm	Each	214.00
1.24.14	250 mm x 250 mm	Each	246.00
1.24.15	300 mm x 80 mm	Each	190.00

S. No.	Particulars of Items	Unit	Rate (in Rs.)
1.24.16	300 mm x 100 mm	Each	202.00
1.24.17	300 mm x 150 mm	Each	230.00
1.24.18	300 mm x 200 mm	Each	266.00
1.24.19	300 mm x 250 mm	Each	301.00
1.24.20	300 mm x 300 mm	Each	353.00
1.24.21	350 mm x 100 mm	Each	238.00
1.24.22	350 mm x 200 mm	Each	309.00
1.24.23	350 mm x 350 mm	Each	464.00
1.24.24	400 mm x 80 mm	Each	277.00
1.24.25	400 mm x 100 mm	Each	293.00
1.24.26	400 mm x 150 mm	Each	341.00
1.24.27	400 mm x 200 mm	Each	373.00
1.24.28	400 mm x 300 mm	Each	460.00
1.24.29	400 mm x 400 mm	Each	595.00
1.24.30	450 mm x 100 mm	Each	353.00
1.24.31	450 mm x 250 mm	Each	484.00
1.24.32	500 mm x 100 mm	Each	412.00
1.24.33	500 mm x 200 mm	Each	507.00
1.24.34	500 mm x 400 mm	Each	737.00
1.24.35	500 mm x 500 mm	Each	900.00
1.24.36	600 mm x 200 mm	Each	686.00
1.25	Providing and Laying including testing Ductile Iron Double Socket Reducer conforming to IS-9523/2000 having dimension as per table 21 of IS-9523/2000 in the following nominal diameter/sizes with external bitumen coating and internal cement mortar lining with finishing as per clause 13 of IS-9523/2000.		
1.25.1	100 mm x 80 mm	Each	1136.00
1.25.2	150 mm x 80 mm	Each	1907.00
1.25.3	150 mm x 100 mm	Each	1995.00
1.25.4	200 mm x 100 mm	Each	2793.00
1.25.5	200 mm x 150 mm	Each	2670.00
1.25.6	250 mm x 150 mm	Each	3936.00
1.25.7	300 mm x 150 mm	Each	5726.00
1.25.8	300 mm x 200 mm	Each	5543.00
1.25.9	300 mm x 250 mm	Each	5324.00
1.25.10	350 mm x 200 mm	Each	7223.00
1.25.11	350 mm x 250 mm	Each	6751.00
1.25.12	350 mm x 300 mm	Each	6403.00
1.25.13	400 mm x 250 mm	Each	9943.00
1.25.14	400 mm x 300 mm	Each	8729.00
1.25.15	400 mm x 350 mm	Each	8078.00
1.25.16	450 mm x 350 mm	Each	11257.00
1.25.17	450 mm x 400 mm	Each	10480.00

S. No.	Particulars of Items	Unit	Rate (in Rs.)
1.25.18	500 mm x 350 mm	Each	15105.00
1.25.19	500 mm x 400 mm	Each	14524.00
1.25.20	600 mm x 400 mm	Each	23259.00
1.25.21	600 mm x 500 mm	Each	20095.00
1.26	Labour only for laying including testing ductile iron double socket reducer conforming to IS-9523/2000 having dimension as per table 20 of IS-9523/2000 in the following nominal diameter/sizes with external bitumen coating and internal cement mortar lining with finishing as per clause 13 of IS-9523/2000.		
1.26.1	100 mm x 80 mm	Each	33.00
1.26.2	150 mm x 80 mm	Each	54.00
1.26.3	150 mm x 100 mm	Each	58.00
1.26.4	200 mm x 100 mm	Each	83.00
1.26.5	200 mm x 150 mm	Each	92.00
1.26.6	250 mm x 150 mm	Each	125.00
1.26.7	300 mm x 150 mm	Each	162.00
1.26.8	300 mm x 200 mm	Each	162.00
1.26.9	300 mm x 250 mm	Each	150.00
1.26.10	350 mm x 200 mm	Each	217.00
1.26.11	350 mm x 250 mm	Each	212.00
1.26.12	350 mm x 300 mm	Each	208.00
1.26.13	400 mm x 250 mm	Each	258.00
1.26.14	400 mm x 300 mm	Each	250.00
1.26.15	400 mm x 350 mm	Each	225.00
1.26.16	450 mm x 350 mm	Each	300.00
1.26.17	450 mm x 400 mm	Each	283.00
1.26.18	500 mm x 350 mm	Each	396.00
1.26.19	500 mm x 400 mm	Each	375.00
1.26.20	600 mm x 400 mm	Each	583.00
1.26.21	600 mm x 500 mm	Each	516.00
1.27	Providing, Laying including testing and Jointing of welded double flanged centrifugal cast (spun) ductile Iron pressure pipes conforming to IS:8329/2000 in the length of 1m. for class K-9 with inside cement mortar lining for the following sizes/dia pipes.		
1.27.1	100 mm diameter	Each	5487.00
1.27.2	150 mm diameter	Each	7611.00
1.27.3	200 mm diameter	Each	9809.00
1.27.4	250 mm diameter	Each	13981.00
1.27.5	300 mm diameter	Each	17689.00

S. No.	Particulars of Items	Unit	Rate (in Rs.)
1.27.6	350 mm diameter	Each	20422.00
1.27.7	400 mm diameter	Each	28303.00
1.27.8	450 mm diameter	Each	34638.00
1.27.9	500 mm diameter	Each	39380.00
1.27.10	600 mm diameter	Each	51137.00
1.27.11	700 mm diameter	Each	64047.29
1.27.12	750 mm diameter	Each	92460.00
1.27.13	800 mm diameter	Each	98968.00
1.27.14	900 mm diameter	Each	122069.00
1.27.15	1000 mm diameter	Each	148669.00
1.28	Providing, Laying including testing and Jointing of welded double flanged centrifugal cast (spun) ductile Iron pressure pipes conforming to IS-8329/2000 in the length of 2 m for class K-9 with inside cement mortar, lining for the following sizes/dia pipes.		
1.28.1	100 mm diameter	Each	7399.00
1.28.2	150 mm diameter	Each	10304.00
1.28.3	200 mm diameter	Each	13229.00
1.28.4	250 mm diameter	Each	18559.00
1.28.5	300 mm diameter	Each	23482.00
1.28.6	350 mm diameter	Each	27514.00
1.28.7	400 mm diameter	Each	36919.00
1.28.8	450 mm diameter	Each	44817.00
1.28.9	500 mm diameter	Each	51289.00
1.28.10	600 mm diameter	Each	66205.00
1.28.11	700 mm diameter	Each	80471.00
1.29	Providing, Laying including testing and Jointing of welded double flanged centrifugal cast (spun) ductile Iron pressure pipes conforming to IS:8329/2000 in the length of 3 m for class K-9 with inside cement mortar, lining for the following sizes/dia pipes		
1.29.1	100 mm diameter	Each	9310.00
1.29.2	150 mm diameter	Each	12994.00
1.29.3	200 mm diameter	Each	16646.00
1.29.4	250 mm diameter	Each	23143.00
1.29.5	300 mm diameter	Each	29277.00
1.29.6	350 mm diameter	Each	34604.00
1.29.7	400 mm diameter	Each	45534.00
1.29.8	450 mm diameter	Each	54994.00
1.29.9	500 mm diameter	Each	63194.00
1.29.10	600 mm diameter	Each	81275.00
1.29.11	700 mm diameter	Each	102028.00



S. No.	Particulars of Items	Unit	Rate (in Rs.)
1.30	Providing, Laying including testing and Jointing welded double flanged centrifugal cast (spun) ductile Iron pressure pipes conforming to IS-8329/2000 in the length of 4 m for class K-9 with inside cement mortar lining for the following sizes/dia pipes.		
1.30.1	100 mm diameter	Each	11221.00
1.30.2	150 mm diameter	Each	15691.00
1.30.3	200 mm diameter	Each	20062.00
1.30.4	250 mm diameter	Each	27724.00
1.30.5	300 mm diameter	Each	35070.00
1.30.6	350 mm diameter	Each	41695.00
1.30.7	400 mm diameter	Each	54148.00
1.30.8	450 mm diameter	Each	65170.00
1.30.9	500 mm diameter	Each	75107.00
1.30.10	600 mm diameter	Each	96343.00
1.30.11	700 mm diameter	Each	121018.00
1.31	Providing, Laying including testing and Jointing welded double flanged centrifugal cast (spun) ductile Iron pressure pipes conforming to IS:8329/2000 in the length of 4.5 m for class K-9 with inside cement mortar lining for the following sizes/dia pipes.		
1.31.1	100 mm diameter	Each	12177.00
1.31.2	150 mm diameter	Each	17037.00
1.31.3	200 mm diameter	Each	21768.00
1.31.4	250 mm diameter	Each	30015.00
1.31.5	300 mm diameter	Each	37967.00
1.31.6	350 mm diameter	Each	45241.00
1.31.7	400 mm diameter	Each	58459.00
1.31.8	450 mm diameter	Each	70260.00
1.31.9	500 mm diameter	Each	81060.00
1.31.10	600 mm diameter	Each	104729.00
1.31.11	700 mm diameter	Each	131534.00
1.32	Providing, Laying including testing and Jointing welded double flanged centrifugal cast (spun) ductile Iron pressure pipes conforming to IS:8329/2000 in the length of 5 m for class K-9 with inside cement mortar lining for the following sizes/dia pipes.		
1.32.1	100 mm diameter	Each	13137.00
1.32.2	150 mm diameter	Each	18390.00
1.32.3	200 mm diameter	Each	23488.00

S. No.	Particulars of Items	Unit	Rate (in Rs.)
1.32.4	250 mm diameter	Each	32333.00
1.32.5	300 mm diameter	Each	40901.00
1.32.6	350 mm diameter	Each	48888.00
1.32.7	400 mm diameter	Each	62908.00
1.32.8	450 mm diameter	Each	75551.00
1.32.9	500 mm diameter	Each	87308.00
1.32.10	600 mm diameter	Each	111860.00
1.32.11	700 mm diameter	Each	140455.00
1.33	Providing, Laying including testing and Jointing of welded double flanged centrifugal cast (spun) ductile Iron pressure pipes conforming to IS:8329/2000 in the length of 5.2 m for class K-9 with inside cement mortar lining for the following sizes/dia pipes		
1.33.1	100 mm diameter	Each	13614.00
1.33.2	150 mm diameter	Each	19061.00
1.33.3	200 mm diameter	Each	24342.00
1.33.4	250 mm diameter	Each	34424.00
1.33.5	300 mm diameter	Each	42346.00
1.33.6	350 mm diameter	Each	50659.00
1.33.7	400 mm diameter	Each	65060.00
1.33.8	450 mm diameter	Each	78092.00
1.33.9	500 mm diameter	Each	90283.00
1.33.10	600 mm diameter	Each	115624.00
1.33.11	700 mm diameter	Each	145197.00
1.34	Labour only for Laying including testing welded double flanged centrifugal cast (spun) ductile Iron pressure pipes conforming to IS:8329/2000 in the length of 1 m for class K-9 with inside cement mortar lining for the following sizes/dia pipes		
1.34.1	100 mm diameter	Each	111.00
1.34.2	150 mm diameter	Each	167.00
1.34.3	200 mm diameter	Each	211.00
1.34.4	250 mm diameter	Each	304.00
1.34.5	300 mm diameter	Each	391.00
1.34.6	350 mm diameter	Each	468.00
1.34.7	400 mm diameter	Each	554.00
1.34.8	450 mm diameter	Each	655.00
1.34.9	500 mm diameter	Each	758.00
1.34.10	600 mm diameter	Each	1019.00
1.34.11	700 mm diameter	Each	1291.00
1.35	Labour only for Laying including testing welded double flanged centrifugal cast (spun) ductile Iron pressure pipes		

S. No.	Particulars of Items	Unit	Rate (in Rs.)
	conforming to IS: 8329/2000 in the length of 2 m for class K-9 with inside cement mortar lining for the following sizes/dia pipes.		
1.35.1	100 mm diameter	Each	183.00
1.35.2	150 mm diameter	Each	275.00
1.35.3	200 mm diameter	Each	373.00
1.35.4	250 mm diameter	Each	470.00
1.35.5	300 mm diameter	Each	619.00
1.35.6	350 mm diameter	Each	694.00
1.35.7	400 mm diameter	Each	802.00
1.35.8	450 mm diameter	Each	919.00
1.35.9	500 mm diameter	Each	1006.00
1.35.10	600 mm diameter	Each	1283.00
1.35.11	700 mm diameter	Each	1762.00
1.36	Labour only for Laying including testing welded double flanged centrifugal cast (spun) ductile Iron pressure pipes conforming to IS: 8329/2000 in the length of 3 m for class K-9 with inside cement mortar, lining for the following sizes/dia pipes.		
1.36.1	100 mm diameter	Each	256.00
1.36.2	150 mm diameter	Each	367.00
1.36.3	200 mm diameter	Each	520.00
1.36.4	250 mm diameter	Each	667.00
1.36.5	300 mm diameter	Each	846.00
1.36.6	350 mm diameter	Each	919.00
1.36.7	400 mm diameter	Each	1051.00
1.36.8	450 mm diameter	Each	1184.00
1.36.9	500 mm diameter	Each	1239.00
1.36.10	600 mm diameter	Each	1547.00
1.36.11	700 mm diameter	Each	2217.00
1.37	Labour only for Laying including testing welded double flanged centrifugal cast (spun) ductile Iron pressure pipes conforming to IS: 8329/2000 in the length of 4 m for class K-9 with inside cement mortar, lining for the following sizes/dia pipes.		
1.37.1	100 mm diameter	Each	328.00
1.37.2	150 mm diameter	Each	490.00
1.37.3	200 mm diameter	Each	666.00
1.37.4	250 mm diameter	Each	848.00
1.37.5	300 mm diameter	Each	1074.00
1.37.6	350 mm diameter	Each	1145.00
1.37.7	400 mm diameter	Each	1299.00

S. No.	Particulars of Items	Unit	Rate (in Rs.)
1.37.8	450 mm diameter	Each	1448.00
1.37.9	500 mm diameter	Each	1503.00
1.37.10	600 mm diameter	Each	1811.00
1.37.11	700 mm diameter	Each	2673.00
1.38	Labour only for Laying including testing and Jointing welded double flanged centrifugal cast (spun) ductile Iron pressure pipes conforming to IS: 8329/2000 in the length of 4.5 m for class K-9 with inside cement mortar, lining for the following sizes/dia pipe.		
1.38.1	100 mm diameter	Each	364.00
1.38.2	150 mm diameter	Each	544.00
1.38.3	200 mm diameter	Each	724.00
1.38.4	250 mm diameter	Each	939.00
1.38.5	300 mm diameter	Each	1188.00
1.38.6	350 mm diameter	Each	1257.00
1.38.7	400 mm diameter	Each	1424.00
1.38.8	450 mm diameter	Each	1580.00
1.38.9	500 mm diameter	Each	1628.00
1.38.10	600 mm diameter	Each	1943.00
1.38.11	700 mm diameter	Each	2900.00
1.39	Labour only for Laying including testing welded double flanged centrifugal cast (spun) ductile Iron pressure pipes conforming to IS: 8329/2000 in the length of 5 m for class K-9 with inside cement mortar lining for the following sizes/dia pipes.		
1.39.1	100 mm diameter	Each	425.00
1.39.2	150 mm diameter	Each	625.00
1.39.3	200 mm diameter	Each	861.00
1.39.4	250 mm diameter	Each	1168.00
1.39.5	300 mm diameter	Each	1486.00
1.39.6	350 mm diameter	Each	1880.00
1.39.7	400 mm diameter	Each	2265.00
1.39.8	450 mm diameter	Each	2721.00
1.39.9	500 mm diameter	Each	3218.00
1.39.10	600 mm diameter	Each	4314.00
1.39.11	700 mm diameter	Each	5370.00
1.40	Labour only for Laying including testing welded double flanged centrifugal cast (spun) ductile Iron pressure pipes conforming to IS:8329/2000 in the length of 5.2 m for class K-9 with inside cement mortar lining for the following sizes/dia pipes.		
1.40.1	100 mm diameter	Each	440.00

S. No.	Particulars of Items	Unit	Rate (in Rs.)	
1.40.2	150 mm diameter	Each	647.00	
1.40.3	200 mm diameter	Each	890.00	
1.40.4	250 mm diameter	Each	1204.00	
1.40.5	300 mm diameter	Each	1531.00	
1.40.6	350 mm diameter	Each	1926.00	
1.40.7	400 mm diameter	Each	2314.00	
1.40.8	450 mm diameter	Each	2774.00	
1.40.9	500 mm diameter	Each	3267.00	
1.40.10	600 mm diameter	Each	4367.00	
1.40.11	700 mm diameter	Each	5461.00	
1.41	Providing & fixing of following Ductile iron double flanged sluice valves as per IS :14846-2000 fitted with cap including jointing & testing with cost of jointing material such as bolts, nuts, rubber insertions etc. all complete.		CLASS PN-1.0	CLASS PN -1.6
1.41.1	80 mm diameter	Each	8590.00	8980.00
1.41.2	100 mm diameter	Each	11519.00	12033.00
1.41.3	150 mm diameter	Each	17169.00	17900.00
1.41.4	200 mm diameter	Each	32673.00	34084.00
1.41.5	250 mm diameter	Each	46833.00	48837.00
1.41.6	300 mm diameter	Each	58727.00	61170.00
1.41.7	350 mm diameter	Each	112590.00	117344.00
1.41.8	400 mm diameter	Each	135943.00	141741.00
1.41.9	450 mm diameter	Each	159536.00	166201.00
1.41.10	500 mm diameter	Each	298722.00	311887.00
1.42	Fixing of following Ductile iron double flanged sluice valves fitted with cap testing with cost of jointing material such as bolts, nuts, rubber insertions etc. all complete (only valve to be supplied by department free of cost).		CLASS PN-1.0/ PN - 1.6	
1.42.1	80 mm diameter	Each	343.00	
1.42.2	100 mm diameter	Each	402.00	
1.42.3	150 mm diameter	Each	581.00	
1.42.4	200 mm diameter	Each	793.00	
1.42.5	250 mm diameter	Each	1223.00	
1.42.6	300 mm diameter	Each	1436.00	
1.42.7	350 mm diameter	Each	2423.00	
1.42.8	400 mm diameter	Each	3703.00	
1.42.9	450 mm diameter	Each	4519.00	
1.42.10	500 mm diameter	Each	5613.29	
1.43	Labour for laying and fixing of following ductile iron double flanged sluice valves (vide item no.1) including jointing and testing but without cost of Jointing materials.		CLASS PN-1.0/ PN - 1.6	

S. No.	Particulars of Items	Unit	Rate (in Rs.)	
1.43.1	80 mm diameter	Each	121.00	
1.43.2	100 mm diameter	Each	159.00	
1.43.3	150 mm diameter	Each	239.00	
1.43.4	200 mm diameter	Each	341.00	
1.43.5	250 mm diameter	Each	495.00	
1.43.6	300 mm diameter	Each	625.00	
1.43.7	350 mm diameter	Each	1120.00	
1.43.8	400 mm diameter	Each	1340.00	
1.43.9	450 mm diameter	Each	1519.00	
1.43.10	500 mm diameter	Each	1875.80	
1.44	Providing & fixing following ductile iron double flanged check valve without damper (non-return valve) including jointing & testing with cost of jointing material such as bolts, nuts and rubber insertion all complete as per IS:5312-2004 (Part-II)		Class PN-1.0	Class PN-1.6
1.44.1	200 mm diameter	Each	27118.00	28369.00
1.44.2	250 mm diameter	Each	38993.00	40698.00
1.44.3	300 mm diameter	Each	60731.00	63350.00
1.44.4	350 mm diameter	Each	107404.00	111771.00
1.44.5	400 mm diameter	Each	155458.00	155458.00
1.44.6	500 mm diameter	Each	269109.00	269109.00
1.44.7	600 mm diameter	Each	498258.00	498258.00
1.45	Labour for laying and fixing of following ductile iron double flanged check valve without damper (non-return valve) including jointing & testing with cost of jointing material such as bolts, nuts and rubber insertion all complete as per IS: 5312 (Part II)		Class PN-1.0	
1.45.1	200 mm diameter	Each	605.00	
1.45.2	250 mm diameter	Each	827.00	
1.45.3	300 mm diameter	Each	1276.00	
1.45.4	350 mm diameter	Each	1860.00	
1.45.5	400 mm diameter	Each	2797.00	
1.45.6	500 mm diameter	Each	5250.00	
1.45.7	600 mm diameter	Each	8235.00	
1.46	Labour for laying and fixing of following ductile iron double flanged check valve without damper (non-return valve) excluding jointing & testing with cost of jointing material such as bolts, nuts and rubber insertion all complete as per IS: 5312 (Part II)		Class PN-1.0	
1.46.1	200 mm diameter	Each	300.00	
1.46.2	250 mm diameter	Each	394.00	
1.46.3	300 mm diameter	Each	590.00	



S. No.	Particulars of Items	Unit	Rate (in Rs.)	
1.46.4	350 mm diameter	Each	720.00	
1.46.5	400 mm diameter	Each	1244.00	
1.46.6	500 mm diameter	Each	1844.00	
1.46.7	600 mm diameter	Each	3241.00	
1.47	Providing & fixing following ductile iron butterfly valves including jointing & testing with cost of jointing material such as bolts, nuts and rubber insertion all complete as per IS:13095-1991.		Class PN-1.0	Class PN-1.6
1.47.1	100 mm diameter	Each	6710.00	7036.00
1.47.2	150 mm diameter	Each	8895.00	9372.00
1.47.3	200 mm diameter	Each	15864.00	16722.00
1.47.4	250 mm diameter	Each	21487.00	22649.00
1.47.5	300 mm diameter	Each	26395.00	27835.00
1.47.6	350 mm diameter	Each	58148.00	61290.00
1.47.7	400 mm diameter	Each	76630.00	80767.00
1.47.8	450 mm diameter	Each	82325.00	86776.00
1.47.9	500 mm diameter	Each	152628.00	161005.00
1.48	Labour for laying and fixing of following ductile iron butterfly valves including jointing & testing but without cost of jointing materials.		Class PN-1.0/ PN - 1.6	
1.48.1	100 mm diameter	Each	140.00	
1.48.2	150 mm diameter	Each	157.00	
1.48.3	200 mm diameter	Each	228.00	
1.48.4	250 mm diameter	Each	260.00	
1.48.5	300 mm diameter	Each	351.00	
1.48.6	350 mm diameter	Each	538.00	
1.48.7	400 mm diameter	Each	618.00	
1.48.8	450 mm diameter	Each	708.00	
1.48.9	500 mm diameter	Each	1015.00	
1.49	Labour for laying and fixing of following ductile iron butterfly valves including jointing & testing but with cost of jointing materials.		Class PN-1.0/ PN - 1.6	
1.49.1	100 mm diameter	Each	256.00	
1.49.2	150 mm diameter	Each	273.00	
1.49.3	200 mm diameter	Each	344.00	
1.49.4	250 mm diameter	Each	448.00	
1.49.5	300 mm diameter	Each	539.00	
1.49.6	350 mm diameter	Each	1498.00	
1.49.7	400 mm diameter	Each	1738.00	
1.49.8	450 mm diameter	Each	2028.00	
1.49.9	500 mm diameter	Each	2655.00	
1.50	Providing & fixing following ductile iron single chamber triple function temper proof air valves, small orifice with		Class PN -1.0	Class PN-1.6

S. No.	Particulars of Items	Unit	Rate (in Rs.)	
	screwed end as per IS:14845-2000 including jointing & testing with cost of jointing material and rubber insertion all complete as per IS:13095-1991.			
1.50.1	50 mm diameter	Each	9630.00	9980.00
1.50.2	80 mm diameter	Each	10197.00	10557.00
1.50.3	100 mm diameter	Each	14311.00	14811.00
1.50.4	150 mm diameter	Each	24779.00	24779.00
1.51	Labour for laying and fixing of following ductile iron single chamber triple function temper proof air valves small orifice with screwed end i/c jointing & testing but without cost of jointing material.		Class PN -1.0	
1.51.1	50 mm diameter	Each	75.00	
1.51.2	80 mm diameter	Each	100.00	
1.51.3	100 mm diameter	Each	133.00	
1.51.4	150 mm diameter	Each	175.00	
1.52	Labour for laying and fixing of following ductile iron single chamber triple function temper proof Air valves small orifice with screwed end i/c jointing & testing but with cost of jointing material.			
1.52.1	50 mm diameter	Each	238.00	
1.52.2	80 mm diameter	Each	263.00	
1.52.3	100 mm diameter	Each	296.00	
1.52.4	150 mm diameter	Each	338.00	

## **CHAPTER - 02**

# **POLYETHYLENE PIPE AND FITTINGS**

## CHAPTER – 02

### POLYETHYLENE PIPE AND FITTINGS

#### NOTES:

##### Applicable Codes:

The manufacturing testing, supplying, laying, jointing and testing at work sites of PE pipes shall comply with IS: 4984-2016 all currently applicable statutes, regulations, standards and amendments and others as follows-

Code No.	Title / Specification
IS 4984:2016	High Density Polyethylene pipes renamed as PE (Polyethylene Pipes) for Water Supply.
IS 2530	Methods of test for polyethylene moulding materials and polyethylene compounds GRP Pipes, Joint and Fittings for use for Potable Water Supply.
IS 4905:2015	Methods for random sampling
IS 7328:2020	High Density Polyethylene materials for moulding and extrusion
IS 9845:1998	Method of analysis for the determination of specific and / or overall migration of constituents of plastic material and articles intended to come into contact with foodstuffs.
IS 10141:2001	Positive list of constituents of polyethylene in contact with food stuffs, pharmaceuticals and drinking water.
IS 16738:1982	Polyethylene for its safe use in contact with foodstuff, Pharmaceuticals and drinking water.
<b>Other Reference code</b>	
IS 5382:2018	Rubber sealing rings for gas mains, wate mains and sewers.
IS 7634:2012	Plastics pipes selection, handling, storage and installation for potable water supplies Code of practice Part 2 laying and jointing of polyethylene (PE) Pipes.
ISO 4427-1:2019	Plastics Piping systems for water supply and for drainage and sewerage under pressure- Polyethylene Part 1: General & Part 2: Pipes
ISO 4427-2:2019	
BS EN 1553 part 3 or ISO 8085 Part 3	Polyethylene fittings for use with polyethylene pipes for the supply of gaseous fuels - Metric- Series-Specifications Part 3: Electro fusion fittings.
BS EN 12201 - Part-3	Plastics piping systems for water supply - polyethylene (PE) Part 3: Fittings
ISO 4422-4	Pipes and fittings made of plasticized poly (Vinyl chloride) (PVC-U) for water supply -Specifications -Part 4: Valves and ancillary equipment
IS 8008 Part-I to 9 :2003	Moulded Fitting: Injection moulded/machined High-density Polyethylene (HDPE) fittings for potable Water supplies.
15:8360 part-I & Part- 3:2022	Fabricated Fitting: Specification for fabricated High-density polyethylene (HDPE) fittings for potable water supplies
ISO 14236:1995	Plastic Pipes and fittings Mechanical-joint compression fittings for use with - polyethylene pressure pipes in water supply systems

#### PART-A-POLYETHYLENE PIPE as per IS 4984:2016

Notes:

##### 1. Raw Material

- (a) Resin used to manufacturers the PE pipe shall be 100% virgin. The Material Classification and Conformity to IS 4984-2016, (Table-2) shall be provided

by the raw material (resin) manufacturer with documentation duly certified by resin manufacturer.

- (b) The resin should have been certified by an independent laboratory of international repute like Bodycote/ Selvan/ Advantica for having passed 10000hour long term hydrostatic strengths (LHTS) test extrapolated to 50 years to show that the resin has minimum MRS of over 10MPa. There should not be any brittle knee at 80°C before 5000 hours' internal certificate of any resin manufacturer will not be acceptable.
- (c) Certificate from reputed organization or Raw material supplier for having passed the full scale rapid crack propagation test as per ISO 13478, High density poly ethylene (HDPE) used for manufacturing of pipe shall conforming to designation PEEWA-50-T-003 of IS 7328. HDPE pipe conforming to designation PEEWA-50-T-003 of IS; 7328 may also be used. Melt Flow rate (MFR) of the specific base density material shall also conform to clause of IS: 7328.
- (d) The resin/ material shall be compounded with carbon black. The carbon black content in the material shall be within  $2.5 \pm 0.5\%$  and the dispersion of carbon black shall be satisfactory.

## 2. **Colour**

The colour of the PE pipe shall be black.

The colour of the PE pipe shall be black with blue identification stripes for the purpose of identification of the pipes covered in this standard.

Identification Stripes: Each black pipe shall contain minimum three longitudinal stripes of width 3 mm (Min) in blue colour, circumferentially distributed. These stripes shall be co-extruded during pipe manufacturing and shall not be more than 0.2 mm in depth for wall thickness up to 10 mm and 0.5-- beyond 10 mm. The material of the stripes shall be of the same type as used in the base compound for the pipe.

- (a) Manufacturer's name/Trade-mark.
- (b) Material Designation.
- (c) Pressure rating.
- (d) Standard Dimension Ration (SDR)
- (e) Outside diameter
- (f) Lot No./Batch No. containing information of date of manufacture.
- (g) BIS certification marking on each pipe.

## 3. **Length of Straight Pipe & Coiling pipe.**

- (a) **Straight Pipe:** The Length of straight pipe used shall be more than 6 m or as agreed by Engineer-in-Charge. Short length of 3 meter-(minimum) up to a maximum of 10% of the total supply may be permitted. Pipe beyond 110 mm dia. shall be supplied in straight length not less than 6m.
- (b) **Coiling:** The pipes supplied in coils shall be coiled on drums of minimum diameter of 18 times the nominal diameter of the pipe ensuring that kinking of pipe is prevented.

## 4. **Marking of Pipe/Coil.**

Each Straight length of pipe shall be clearly marked in indelible ink/paint on either end and for coil at both ends or hot embossed on white base every meter throughout the length of pipe/coil with the following information:

- (a) Manufacturer's name/Trade-mark.
- (b) Material Designation.
- (c) Pressure rating.
- (d) Standard Dimension Ration (SDR)

- (e) Outside diameter
  - (f) Lot No./Batch No. containing information of date of manufacture.
  - (g) BIS certification marking on each pipe.
5. **Anti-oxidant**  
The percentage of anti-oxidant used shall not be more than 0.3 percent by mass of finished resin. The anti-oxidant used shall be physiologically harm less and shall be selected from the list given in IS:16738.
  6. **Reworked Material**  
No addition of Reworked/recycled material from the manufacturer's own rework material resulting from the manufacture of pipes is permissible and the vendor is required to use only 100% virgin resin/Material.
  7. **Dimension & Maximum Ovality of Pipe:**  
The outside diameter of pipes, tolerance on the same and ovality of pipe shall be as given in Table 3 and Standard Dimension Ratio (SDR) and corresponding wall Thickness (e) of Pipe shall be as given in Table 4 as per IS 4984:2016 (Clause 7.4).
  8. **Visual Appearance:**  
The internal and external surfaces of the pipes shall be smooth, clean and free from grooving and other defects. The ends of pipes shall be cleanly cut square with axis of the pipes within the tolerances given and free from deformity. Slight shallow longitudinal grooves or irregularities in the wall thickness shall be permissible provided that the wall thickness remains within the permissible limits.
  9. **Performance Requirements:**  
The Pipe shall meet the requirement of IS 4984:2016 for tests like, Internal Pressure Creep Rupture test for pipe- Acceptance & Type Test, Internal Pressure Creep Rupture test- for Pipe Joint, Longitudinal Reversion test, Carbon Black Content & Dispersion, Melt flow rate test, Oxygen Induction Time, Overall migration, Density, Tensile Butt Fusion, Elongation at break & Slow Crack Propagation Rate etc.
  10. Standard Quality Assurance Plan (QAP) is enclosed as Annexure-A for TPI by recommended agency or department at factory.

#### **PART-B- PE PIPE (Blue Colour)) as Per ISO 4427:2019**

The PE Blue colour pipe (formerly known as MDPE pipe) conforming to ISO 4427:2019 (Part 1 & Part 2) manufactured from virgin resin PE 80 Food grade compounded Raw Material having blue colour only for PN16 (with relevant SDR as per standard) & quality assurance certificate from quality agencies as approved by department. Please refer Annexure-B & Annexure-C for details of requirement to be maintained by manufacturer, Quality Assurance Plan (QAP) and testing to be performed at factory by the TPI or department.

#### **PART-C. OTHER REQUIREMENTS**

##### **1. Handling, Transportation storage and lowering of pipes.**

###### **(a) Fittings and Specials:**

All PE fittings/specials shall be fabricated or injection moulded at factory as per IS: 8360 (Part-I & Part-III) and as per IS: 8008 (Part-I to Part-IX). Fittings will be butt welded on the pipes or other fittings by use of heat fusion.

All PE fittings/ specials shall be of minimum PN 6 or above pressure class, fabricated in accordance with IS 8360 (part I & III). PE Injection moulded fittings shall be as per IS: 8008 (part I to IX). All fittings/specials shall be fabricated or moulded at factory only. No fabrication or moulding will be

allowed at site, unless specifically permitted by the Engineer-in-Charge.

Fittings will be welded on to the pipes or other fittings by use of Electro-fusion process. Recommended makes for PE / Compression fittings / specials are Kimplas, Georg Fischer, Glynwed, Trustlene, Astore, Magnum and GPS.

(b) **Bends**

PE bends shall be plain square ended conforming to IS: 8360 Part I & III Specifications. Bends shall be moulded.

(c) **Tee**

PE Tees shall be plain square ended conforming to IS: 8360 Part I & II Specifications. Tees may be equal tees or reduced take off tees. Tees shall be moulded.

(d) **Reducers**

PE Reducers shall be plain square ended conforming to IS: 8008 Part I & VII Specifications. Reducer must be moulded.

(e) **Flanged PE pipe ends**

PE Stub ends shall be square ended conforming to IS: 8008 Part I & VI Specifications. Stub ends will be welded on the pipe. Flange will be of slip on flange type.

2. **Electro Fusion Tapping Saddle, Branch Saddle & Electro Fusion fittings:**

(a) All the Electro fusion fittings should be manufactured with top quality virgin pre-compounded PE 100 resin which should be compatible with the distribution mains.

(b) The products shall comply with the requirements of EN 12201-3, EN 1555-3 or ISO 8085-3.

(c) All the fittings shall be of SDR 11 rating.

(d) The fittings shall have the approval from any three Agencies like KIWA, DVGW, WRC-NSF, U.K. CIPET etc.

(e) All the products shall be manufactured by injection moulding using virgin compounded PE 100 polymer having a melt flow rate between 0.2- 1.4 grams/ 10 minutes and shall be compatible for fusing on PE 100 distribution mains manufactured according to the relevant national or international standards. The polymer used should comply with the requirements of EN 12201 -1

(f) Process voltage of all saddles must not exceed a maximum of 40 volts.

3. **Compression Fitting.**

(a) Compression fitting used for House service connection should comply as per ISO 14236 with Threaded metal inserts -SS 304 with BSP Threads.

(b) **Pressure Testing-**

The Pressure rating of compression fittings should be as per clause 8 of ISO 14236 which shall be PN 16

(c) **Dimensions-**

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

Leak tightness under internal pressure. • Leak tightness under internal Vacuum. Long term Pressure test for Leak tightness for assembled joint. • MRS Value as per ISO 9080 • Resistance to Internal Pressure. • Effects on Quality of Water.

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

- (a) Odour & Flavour of Water.
- (b) Appearance of Water.
- (c) Growth of Micro Organism.
- (d) Extraction of Metals.
- (e) All fittings with threaded ends should be with BSP threads.

4. **Test to Establish Perfectibility/portability of work**

Specimen of pipe shall be tested to establish the suitability for use in carrying potable water

- (a) Smell of the extract
- (b) Clarity of the colour of the extract
- (c) Acidity and Alkalinity.
- (d) Global migration UV absorbing material Heavy metals
- (e) Unreacted monomers (styrene) and biological tests.

5. **Hydraulic Test after laying.**

After laying the pipe hydraulic test shall be done to conform the quality of work and material. There should not be any signs of localized swelling, leakage or weeping.

6. Laying of pipes and fittings/specials includes all precautions to guard against possible damages to the existing structure/pipes lines, cables etc., taking precautions to prevent dirt from entering the pipe ends, lowering and laying pipes and specials in the trenches with specials arrangement such as cranes, tripods with chain pulley block, use of slings of canvas etc. to fit the ends of pipes and fittings/ specials to lift and lower the same. Inspection of pipes and fittings for defects by striking with a light hammer while suspended. Laying of pipes perfectly true in alignment and to gradient etc.

7. Providing and supply of PE pipes (blue colour) house services connections with necessary Electro Fusion & Compression fittings are also given. PE pipes (blue colour) conforming to ISO 4427:2019 with quality assurance certificates from WRAS/CIPET etc, are used. Electro Fusion & compression fittings are to be used as per ISO norms as given in the relevant items.

8. **Measurement**

- (a) The net length of pipe shall be measured in running meters correct to 10mm. The portion of the pipe inside the joints shall not be included in the length of pipe work, Specials shall be excluded and measured and paid separately under the relevant item.
- (b) PE Pipes & Fitting are designated by Outer diameter

9. This USOR contains the rates of all the items without GST. GST shall be paid separately as per prevailing norms as claimed by the contractor in his bill. All the estimates based on this USOR will include GST as an extra amount as per prevailing rates on the sum of the estimate to arrive at the gross amount.
10. The cost of third party Inspection at factory is included in the rates of items.



## POLYETHYLENE PIPE AND FITTINGS

S.No.	Particulars of Items	Unit	Rate (in Rs.)		
2.1	Providing, laying, Jointing & field testing of PE pipes made from 100% virgin material (Earlier know as high Density Polyethylene pipes, PE 100) conforming to IS 4984/ 14151/ 12786/ 13488 with necessary jointing material like mechanical connector or jointing pipes by heating the ends of pipes with the help of Teflon coated electric mirror/ heater to the required temperature and then mechanically pressing the ends together against each other, to form a monolithic & leak proof joint by thermosetting process. It may be required to be done with Jacks/Hydraulic Jacks/ But fusion machine. (50mm & above fusion jointed & below 50mm mechanical jointed)		6 Kg/cm <sup>2</sup>	8 Kg/cm <sup>2</sup>	10 Kg/cm <sup>2</sup>
2.1.1	40 mm dia	Meter	48.00	61.00	75.00
2.1.2	50 mm dia	Meter	75.00	94.00	115.00
2.1.3	63 mm dia	Meter	125.00	160.00	178.00
2.1.4	75 mm dia	Meter	194.00	223.00	247.00
2.1.5	90 mm dia	Meter	239.00	293.00	343.00
2.1.6	110 mm dia	Meter	368.00	432.00	493.00
2.1.7	125 mm dia	Meter	463.00	549.00	628.00
2.1.8	140 mm dia	Meter	574.00	686.00	777.00
2.1.9	160 mm dia	Meter	742.00	882.00	1008.00
2.1.10	180 mm dia	Meter	938.00	1095.00	1268.00
2.1.11	200 mm dia	Meter	1138.00	1350.00	1552.00
2.1.12	225 mm dia	Meter	1450.00	1692.00	1960.00
2.1.13	250 mm dia	Meter	1782.00	2081.00	2402.00
2.1.14	280 mm dia	Meter	2187.00	2608.00	3040.00
2.1.15	315 mm dia	Meter	2899.00	3284.00	3842.00
2.2	Providing and laying including testing Bend 90° conforming to IS specifications.		6 Kg/cm <sup>2</sup>	8 Kg/cm <sup>2</sup>	10 Kg/cm <sup>2</sup>
2.2.1	40 mm dia	Each	61.00	63.00	65.00
2.2.2	50 mm dia	Each	81.00	85.00	91.00
2.2.3	63 mm dia	Each	113.00	117.00	145.00
2.2.4	75 mm dia	Each	170.00	175.00	192.00
2.2.5	90 mm dia	Each	241.00	254.00	282.00
2.2.6	110 mm dia	Each	284.00	324.00	383.00
2.2.7	125 mm dia	Each	408.00	468.00	621.00

S.No.	Particulars of Items	Unit	Rate (in Rs.)		
2.2.8	140 mm dia	Each	539.00	654.00	833.00
2.2.9	160 mm dia	Each	748.00	986.00	1209.00
2.2.10	180 mm dia	Each	1108.00	1348.00	1680.00
2.2.11	200 mm dia	Each	1441.00	1808.00	2291.00
2.2.12	225 mm dia	Each	1831.00	2303.00	2747.00
2.2.13	250 mm dia	Each	2443.00	3098.00	3705.00
2.2.14	280 mm dia	Each	3374.00	4293.00	5139.00
2.3	Providing and laying including testing Bend 45 <sup>0</sup> conforming to IS specifications.		6 Kg/cm <sup>2</sup>	8 Kg/cm <sup>2</sup>	10 Kg/cm <sup>2</sup>
2.3.1	63 mm dia	Each	123.00	123.00	151.00
2.3.2	75 mm dia	Each	186.00	186.00	229.00
2.3.3	90 mm dia	Each	253.00	253.00	319.00
2.3.4	110 mm dia	Each	327.00	385.00	455.00
2.3.5	125 mm dia	Each	458.00	556.00	669.00
2.3.6	140 mm dia	Each	646.00	798.00	996.00
2.3.7	160 mm dia	Each	975.00	1193.00	1411.00
2.3.8	180 mm dia	Each	1262.00	1434.00	1952.00
2.3.9	200 mm dia	Each	1685.00	1829.00	2680.00
2.4	Providing and laying including testing Equal Tee conforming to IS specifications.		6 Kg/cm <sup>2</sup>	8 Kg/cm <sup>2</sup>	10 Kg/cm <sup>2</sup>
2.4.1	63 mm dia	Each	130.00	140.00	151.00
2.4.2	75 mm dia	Each	207.00	213.00	250.00
2.4.3	90 mm dia	Each	333.00	338.00	396.00
2.4.4	110 mm dia	Each	443.00	473.00	571.00
2.4.5	125 mm dia	Each	505.00	615.00	772.00
2.4.6	140 mm dia	Each	673.00	864.00	1047.00
2.4.7	160 mm dia	Each	998.00	1277.00	1497.00
2.4.8	180 mm dia	Each	1402.00	1750.00	2122.00
2.4.9	200 mm dia	Each	1870.00	2370.00	2858.00
2.5	Providing and laying including testing Pipe end conforming to IS specifications.		6 Kg/cm <sup>2</sup>	8 Kg/cm <sup>2</sup>	10 Kg/cm <sup>2</sup>
2.5.1	63 mm dia	Each	104.00	106.00	108.00
2.5.2	75 mm dia	Each	140.00	148.00	148.00
2.5.3	90 mm dia	Each	186.00	202.00	202.00
2.5.4	110 mm dia	Each	204.00	232.00	232.00
2.5.5	125 mm dia	Each	311.00	344.00	344.00
2.5.6	140 mm dia	Each	384.00	425.00	425.00
2.5.7	160 mm dia	Each	395.00	451.00	451.00
2.5.8	180 mm dia	Each	572.00	642.00	642.00
2.5.9	200 mm dia	Each	583.00	661.00	679.00
2.6	Providing and laying including testing Reducer conforming to IS specifications.		6 Kg/cm <sup>2</sup>	8 Kg/cm <sup>2</sup>	10 Kg/cm <sup>2</sup>
2.6.1	63 mm x 50 mm dia	Each	104.00	118.00	120.00

S.No.	Particulars of Items	Unit	Rate (in Rs.)		
2.6.2	75 mm x 63 mm dia	Each	126.00	137.00	143.00
2.6.3	90 mm x 75 mm dia	Each	137.00	153.00	172.00
2.6.4	110 mm x 90 mm dia	Each	146.00	176.00	204.00
2.6.5	125 mm x 110 mm dia	Each	149.00	204.00	220.00
2.6.6	140 mm x 125 mm dia	Each	178.00	236.00	245.00
2.6.7	160 mm x 140 mm dia	Each	226.00	306.00	338.00
2.6.8	180 mm x 160 mm dia	Each	270.00	381.00	431.00
2.6.9	200 mm x 180 mm dia	Each	322.00	461.00	489.00
2.7	Providing butt fusion welded joint/ jointing by heating to the ends with the help of Teflon coated electric mirror/heater ends together etc. by thermosetting process to PE-100 pipe and specials. (6kg, 8kg, 10kg) (50mm & above fusion jointed & below 50mm mechanical jointed) including testing.				
2.7.1	63 mm dia	Each	106.00		
2.7.2	75 mm dia	Each	135.00		
2.7.3	90 mm dia	Each	150.00		
2.7.4	110 mm dia	Each	164.00		
2.7.5	125 mm dia	Each	197.00		
2.7.6	140 mm dia	Each	210.00		
2.7.7	160 mm dia	Each	232.00		
2.7.8	180 mm dia	Each	245.00		
2.7.9	200 mm dia	Each	262.00		
2.8	Providing and laying including testing End Cap conforming to IS specifications.		6 Kg/cm <sup>2</sup>	8 Kg/cm <sup>2</sup>	10 Kg/cm <sup>2</sup>
2.8.1	63 mm dia	Each	105.00	106.00	109.00
2.8.2	75 mm dia	Each	139.00	142.00	147.00
2.8.3	90 mm dia	Each	156.00	158.00	163.00
2.8.4	110 mm dia	Each	129.00	144.00	149.00
2.8.5	125 mm dia	Each	184.00	230.00	233.00
2.8.6	140 mm dia	Each	245.00	269.00	274.00
2.8.7	160 mm dia	Each	286.00	367.00	378.00
2.8.8	180 mm dia	Each	381.00	429.00	442.00
2.8.9	200 mm dia	Each	439.00	497.00	515.00
<b>MDPE Pipes House Services Connection with necessary Electro Fusion &amp; Compression fittings.</b>					
2.9	Providing and Supplying Blue MDPE pipes conforming to ISO 4427:1996 manufactured from virgin resin PE 80 Food grade compounded Raw Material having Blue Colour only with				

S.No.	Particulars of Items	Unit	Rate (in Rs.)
	quality assurance certificate from quality agencies like WRC/CIPET (India)/ DVGW /KIWA /SPGN etc. for usage in Drinking Water System. The cost shall include testing of all materials, Inspection charges, transportation up to site, transit insurance, loading, unloading, stacking etc. complete.		
2.9.1	PN 16 (SDR 9)		
2.9.1.1	20 mm dia	Meter	39.00
2.9.1.2	25 mm dia	Meter	53.00
2.9.1.3	32 mm dia	Meter	88.00
2.9.1.4	40 mm dia	Meter	114.00
2.9.1.5	50 mm dia	Meter	175.00
2.10	Providing & Supply of Electro Fusion Tapping Ferrule (Branch Tapping Saddle) female BSP Threaded with SS 304 insert fittings in accordance with BS EN 12201: Part-3 suitable for drinking water with in black/ blue colour manufactured from compounded PE80/PE100 pipes, in pressure rating SDR 11 with min PN 12.5 rated. The cost such as testing, inspection charges, transportation up to site, transit insurance, loading, unloading, stacking etc. complete.		
	Electo Fusion Tapping Ferrule Saddle		
2.10.1	63 mm x 15 mm	Each	1178.00
2.10.2	63 mm x 20 mm	Each	1178.00
2.10.3	63 mm x 25 mm	Each	1178.00
2.10.4	75 mm x 15 mm	Each	1178.00
2.10.5	75 mm x 20 mm	Each	1178.00
2.10.6	75 mm x 25 mm	Each	1178.00
2.10.7	90 mm x 15 mm	Each	1178.00
2.10.8	90 mm x 20 mm	Each	1178.00
2.10.9	90 mm x 25 mm	Each	1178.00
2.10.10	90 mm x 32 mm	Each	1528.00
2.10.11	90 mm x 40 mm	Each	1528.00
2.10.12	90 mm x 50 mm	Each	1528.00
2.10.13	110 mm x 15 mm	Each	1178.00
2.10.14	110 mm x 20 mm	Each	1178.00

S.No.	Particulars of Items	Unit	Rate (in Rs.)
2.10.15	110 mm x 25 mm	Each	1178.00
2.10.16	110 mm x 32 mm	Each	1528.00
2.10.17	110 mm x 40 mm	Each	1528.00
2.10.18	110 mm x 50 mm	Each	1528.00
2.10.19	160 mm x 15 mm	Each	1178.00
2.10.20	160 mm x 20 mm	Each	1178.00
2.10.21	160 mm x 25 mm	Each	1178.00
2.10.22	160 mm x 32 mm	Each	1669.00
2.10.23	160 mm x 40 mm	Each	1669.00
2.10.24	160 mm x 50 mm	Each	1669.00
2.10.25	200 mm x 15 mm	Each	1662.00
2.10.26	200 mm x 20 mm	Each	1662.00
2.10.27	200 mm x 25 mm	Each	1662.00
2.10.28	200 mm x 32 mm	Each	2405.00
2.10.29	200 mm x 40 mm	Each	2405.00
2.10.30	200 mm x 50 mm	Each	2405.00
2.10.31	250 mm x 15 mm	Each	1662.00
2.10.32	250 mm x 20 mm	Each	1662.00
2.10.33	250 mm x 25 mm	Each	1662.00
2.10.34	250 mm x 32 mm	Each	2405.00
2.10.35	250 mm x 40 mm	Each	2405.00
2.10.36	250 mm x 50 mm	Each	2405.00
2.11	Providing & Supply of Compression fitting, PN 16 rated in conformation to ISO: 14236-2000 and shall be tested as per ISO: 3459, ISO: 3501 & ISO: 3503, suitable for drinking water & approved by WRAS, UKI KIWA etc., in food grade polypropylene and shall be inclusive of all cost such as testing, inspection charges, transportation up to site, transit insurance, loading, unloading, stacking etc. complete.		
2.11.1	Compression Fittings Metal inserted Compression Female Threaded Adaptor with SS 304 Material.		
2.11.1.1	20 mm x 15 mm	Each	200.00
2.11.1.2	25 mm x 20 mm	Each	259.00
2.11.1.3	32 mm x 25 mm	Each	354.00
2.11.1.4	40 mm x 32 mm	Each	601.00
2.11.1.5	50 mm x 40 mm	Each	778.00
2.11.1.6	63 mm x 50 mm	Each	1061.00

S.No.	Particulars of Items	Unit	Rate (in Rs.)
2.11.2	Metal inserted Compression Male Threaded Adaptor with SS 304 material		
2.11.2.1	20 mm x 15 mm	Each	200.00
2.11.2.2	25 mm x 20 mm	Each	259.00
2.11.2.3	32 mm x 25 mm	Each	354.00
2.11.2.4	40 mm x 32 mm	Each	601.00
2.11.2.5	50 mm x 40 mm	Each	778.00
2.11.2.6	63 mm x 50 mm	Each	1061.00
2.11.3	Compression 90° Elbow threaded male off take in Metal		
2.11.3.1	20 mm x 15 mm	Each	212.00
2.11.3.2	25 mm x 20 mm	Each	283.00
2.11.3.3	32 mm x 25 mm	Each	389.00
2.11.3.4	40 mm x 32 mm	Each	1356.00
2.11.3.5	50 mm x 40 mm	Each	1768.00
2.11.3.6	63 mm x 50 mm	Each	2594.00
2.11.4	Compression 90° Elbow threaded Female off take in Metal		
2.11.4.1	20 mm x 15 mm	Each	212.00
2.11.4.2	25 mm x 20 mm	Each	283.00
2.11.4.3	32 mm x 25 mm	Each	389.00
2.11.4.4	40 mm x 32 mm	Each	1356.00
2.11.4.5	50 mm x 40 mm	Each	1768.00
2.11.4.6	63 mm x 50 mm	Each	2594.00
2.11.5	Compression 90° Elbow		
2.11.5.1	20 mm	Each	130.00
2.11.5.2	25 mm	Each	177.00
2.11.5.3	32 mm	Each	230.00
2.11.5.4	40 mm	Each	460.00
2.11.5.5	50 mm	Each	653.00
2.11.5.6	63 mm	Each	885.00
2.12	Providing & Supply of PVC Ball Valves in PN-16 rating with one end compression using blue colour compression nut in polypropylene material & other end with female threads conforming to ISO:4422-4, certified from WRAS UK/KIWA etc. suitable for food products & drinking water, female threads in accordance with ISO : 7/ BS/ : 21/ IS: 554 and shall be inclusive of all cost such as testing, inspection charges, transportation up to site, transit		

S.No.	Particulars of Items	Unit	Rate (in Rs.)
	insurance, loading, unloading, stacking etc. complete. PVC Ball Valve with Compression & Female Threads		
2.12.1	20 mm x 15 mm	Each	206.00
2.12.2	25 mm x 20 mm	Each	268.00
2.12.3	32 mm x 25 mm	Each	302.00
2.12.4	40 mm x 32 mm	Each	648.00
2.12.5	50 mm x 40 mm	Each	869.00
2.12.6	63 mm x 50 mm	Each	1336.00
2.13	Providing & Supplying of Clamp Saddle (DI Strap Saddle) for House Service connections from metal pipe water distribution mains shall be of fastened strap type with threaded outlet for service connection. Clamp Saddle shall be suitable for nominal size of distribution mains pipe line. The strap shall be elastomer coated (insulated) type for firm grip on pipe as well as to protect the coating on the pipe and to insulate the unidentical metals. The saddle shall be single strap type up to pipe sizes of NB 600 and service outlet 15mm, 20mm & 25mm. Fasteners shall be of threaded nut bolt washer type. The sealing between the saddle and mains shall be obtained by using a profiled elastomer		
	seal matching to the curvature of the pipe. The seal shall be of elastomer type, suitable for all potable water application. The material of construction of the body, straps, fasteners etc. shall be of non-corrosive material such as engineering plastic (PE/PP) or stainless steel or a combination of both. and shall be inclusive of all cost such as testing inspection charges, transportation up to site, transit insurance, loading, unloading, stacking etc.		

S.No.	Particulars of Items	Unit	Rate (in Rs.)
	complete.		
2.13.1	80 NB x 15mm, 20mm, 25mm	Each	1179.00
2.13.2	100 NB x 15mm, 20mm, 25mm	Each	1297.00
2.13.3	150 NB x 15mm, 20mm, 25mm	Each	1533.00
2.13.4	200 NB x 15mm, 20mm, 25mm	Each	1768.00
2.13.5	250 NB x 15mm, 20mm, 25mm	Each	1768.00
2.13.6	300 NB x 15mm, 20mm, 25mm	Each	2240.00
2.14	Providing, Supplying and fixing of Electro Fusion Fittings in accordance with BS EN 12201: Part-3 suitable for drinking water with in black/blue colour manufactured from compounded PE80/ PE100 virgin polymer and compatible with PE80/PE100 pipes, in pressure rated SDR11 with min PN 12.5 rated for water application. The cost such as testing, inspection charges, transportation up to site, transit insurance, loading, unloading, stacking etc. all complete.		
2.14.1	Electro Fusion Coupler		
2.14.1.1	20 mm	Each	118.00
2.14.1.2	25 mm	Each	118.00
2.14.1.3	32 mm	Each	118.00
2.14.1.4	40 mm	Each	218.00
2.14.1.5	50 mm	Each	270.00
2.14.1.6	63 mm	Each	291.00
2.14.1.7	75 mm	Each	523.00
2.14.1.8	90 mm	Each	561.00
2.14.1.9	110 mm	Each	799.00
2.14.1.10	125 mm	Each	812.00
2.14.1.11	140 mm	Each	1743.00
2.14.1.12	160 mm	Each	1910.00
2.14.1.13	180 mm	Each	2852.00
2.14.1.14	200 mm	Each	3723.00
2.14.1.15	225 mm	Each	4420.00
2.14.1.16	250 mm	Each	5386.00
2.14.1.17	280 mm	Each	10791.00
2.14.1.18	315 mm	Each	10830.00
2.14.2	Electro Fusion Equal Tee		
2.14.2.1	20 mm	Each	295.00
2.14.2.2	25 mm	Each	295.00
2.14.2.3	32 mm	Each	295.00
2.14.2.4	40 mm	Each	1000.00



S.No.	Particulars of Items	Unit	Rate (in Rs.)
2.14.2.5	50 mm	Each	1111.00
2.14.2.6	63 mm	Each	1238.00
2.14.2.7	75 mm	Each	1651.00
2.14.2.8	90 mm	Each	2051.00
2.14.2.9	110 mm	Each	2476.00
2.14.2.10	125 mm	Each	3065.00
2.14.2.11	140 mm	Each	6947.00
2.14.2.12	160 mm	Each	6947.00
2.14.2.13	180 mm	Each	10139.00
2.14.2.14	200 mm	Each	12969.00
2.14.2.15	225 mm	Each	15327.00
2.14.2.16	250 mm	Each	22401.00
2.14.2.17	280 mm	Each	24759.00
2.14.2.18	315 mm	Each	27117.00
2.14.3	Electro Fusion Elbow 90°		
2.14.3.1	20 mm	Each	224.00
2.14.3.2	25 mm	Each	224.00
2.14.3.3	32 mm	Each	224.00
2.14.3.4	40 mm	Each	589.00
2.14.3.5	50 mm	Each	589.00
2.14.3.6	63 mm	Each	589.00
2.14.3.7	75 mm	Each	1297.00
2.14.3.8	90 mm	Each	1768.00
2.14.3.9	110 mm	Each	2358.00
2.14.3.10	125 mm	Each	2830.00
2.14.3.11	140 mm	Each	6013.00
2.14.3.12	160 mm	Each	7781.00
2.14.3.13	180 mm	Each	10021.00
2.14.3.14	200 mm	Each	18864.00
2.14.3.15	225 mm	Each	21222.00
2.14.3.16	250 mm	Each	23580.00
2.14.3.17	280 mm	Each	25938.00
2.14.3.18	315 mm	Each	29475.00
2.14.4	Electro Fusion Reducer		
2.14.4.1	25 mm x 20 mm	Each	236.00
2.14.4.2	32 mm x 20 mm	Each	236.00
2.14.4.3	32 mm x 25 mm	Each	236.00
2.14.4.4	40 mm x 32 mm	Each	790.00
2.14.4.5	50 mm x 32 mm	Each	990.00
2.14.4.6	50 mm x 40 mm	Each	1094.00
2.14.4.7	63 mm x 32 mm	Each	1167.00
2.14.4.8	63 mm x 40 mm	Each	1180.00
2.14.4.9	63 mm x 50 mm	Each	1368.00
2.14.4.10	90 mm x 63 mm	Each	1935.00
2.14.4.11	90 mm x 75 mm	Each	2476.00
2.14.4.12	110 mm x 75 mm	Each	3124.00

S.No.	Particulars of Items	Unit	Rate (in Rs.)
2.14.4.13	110 mm x 90 mm	Each	3561.00
2.14.4.14	125 mm x 90 mm	Each	4504.00
2.14.4.15	125 mm x 110 mm	Each	4504.00
2.14.4.16	140 mm x 90 mm	Each	4952.00
2.14.4.17	140 mm x 110 mm	Each	4952.00
2.14.4.18	140 mm x 125 mm	Each	4952.00
2.14.4.19	160 mm x 110 mm	Each	6484.00
2.14.4.20	160 mm x 125 mm	Each	6484.00
2.14.4.21	160 mm x 140 mm	Each	6484.00
2.14.4.22	180 mm x 125 mm	Each	7310.00
2.14.4.23	180 mm x 140 mm	Each	7310.00
2.14.4.24	180 mm x 160 mm	Each	7310.00
2.14.4.25	200 mm x 160 mm	Each	8724.00
2.14.4.26	200 mm x 180 mm	Each	8724.00
2.14.4.27	225 mm x 160 mm	Each	10611.00
2.14.4.28	225 mm x 180 mm	Each	10611.00
2.14.4.29	225 mm x 200 mm	Each	10611.00
2.14.4.30	250 mm x 160 mm	Each	12969.00
2.14.4.31	250 mm x 200 mm	Each	12969.00
2.14.4.32	250 mm x 225 mm	Each	12969.00
2.14.5	Electro Fusion End Cap		
2.14.5.1	20 mm	Each	179.00
2.14.5.2	25 mm	Each	179.00
2.14.5.3	32 mm	Each	179.00
2.14.5.4	40 mm	Each	389.00
2.14.5.5	50 mm	Each	472.00
2.14.5.6	63 mm	Each	684.00
2.14.5.7	75 mm	Each	1026.00
2.14.5.8	90 mm	Each	1297.00
2.14.5.9	110 mm	Each	1651.00
2.14.5.10	125 mm	Each	2004.00
2.14.5.11	140 mm	Each	2947.00
2.14.5.12	160 mm	Each	4244.00
2.14.5.13	180 mm	Each	5188.00
2.14.5.14	200 mm	Each	6131.00
2.14.5.15	225 mm	Each	10021.00
2.14.5.16	250 mm	Each	11790.00
2.14.5.17	280 mm	Each	12969.00
2.14.5.18	315 mm	Each	14148.00
2.14.6	Spigot Long Neck Pipe End (Stub End) for Electro Fusion Joint		
2.14.6.1	63 mm	Each	422.00
2.14.6.2	75 mm	Each	475.00
2.14.6.3	90 mm	Each	595.00
2.14.6.4	110 mm	Each	908.00

<b>S.No.</b>	<b>Particulars of Items</b>	<b>Unit</b>	<b>Rate (in Rs.)</b>
2.14.6.5	125 mm	Each	1430.00
2.14.6.6	140 mm	Each	1627.00
2.14.6.7	160 mm	Each	2328.00
2.14.6.8	180 mm	Each	3140.00
2.14.6.9	200 mm	Each	3690.00
2.14.6.10	225 mm	Each	4427.00
2.14.6.11	250 mm	Each	5085.00
2.14.6.12	280 mm	Each	5692.00
2.14.6.13	315 mm	Each	7398.00

# Public Health Engineering Department

## QUALITY ASSURANCE PLAN

(Only for PE pipe-Blue Colour (MDPE pipe) and fitting Products manufacture according of ISO 4427 upto date ammended)

Standard Quality plan (QAP) for PE Blue colour pipe chapter No- 2 of MP PHED USoR

S. No.	Stages	Characteristics	Samples to Check	Reference Document	Frequency	Acceptance Criteria	Formant of Records	Inspection by		Remarks
								M	TPI/C or both	
1	Inspection of Raw Material	Base Density	Clause-4.4.1 and Table-1 ISO:4427,1183,7328	ISO11832/ASTM D1505	According to ISO-1183-2	930 to 960 kg/m3	RMTC	P	R	
2		Melt Flow Rate	Clause-4.4.1 and Table-1 ISO:4427,1183	ISO1133-2005/ASTM D-1238	According to ISO-1183-2	0.2 to 1.40gm/10 Minute(Max Deviation of 20% of the nominated Value)	RMTC	P	R	
4	Inspection & Testing of finished product pipe	1) Colour	Cause-5.2 of ISO:4427:2 Annex-A	ISO4427-2	According to ISO-4427-2	Clause-5.2 of ISO:4427:2 Annex-A	MTC	P	W	
		2) Visual appearance	Clause-5.1 of ISO:4427	ISO4427	According to ISO-4427-2	Clause-5.4 of ISO:4427	MTC	P	W	
		3) Length	Clause-6.5 of ISO:4427-2	ISO4427	According to ISO-4427-2	Clause-5.1 of ISO:4427	MTC	P	W	
		4) Coilling	Clause-5.4 of ISO:4427-2	ISO4427-2	According to ISO-4427-2	Clause-5.4 of ISO:4427-2	MTC	P	W	
		5) Dimensions	Clause-6.1 of ISO:4427-2	ISO4427-2	According to ISO-4427-2	Clause-6.1 of ISO:4427-2	MTC	P	W	
		6) Ovality	Clause-6.2 of ISO:4427-2	ISO4427-2	According to ISO-4427-2 & Table-1	ISO-4427-2 & Table-1	MTC	P	W	
		7) Wall Thickness	Clasue-6.3 of ISO:4427-2	ISO4427-2	According to ISO-4427-2 & Table-2	Clause-6.3 ISO:4427-2& Table-2	MTC	P	W	

S. No.	Stages	Characteristics	Samples to Check	Reference Document	Frequency	Acceptance Criteria	Formant of Records	Inspection by		Remarks
								M	TPI/C or both	
5	Hydrostatic Pressure Test		Clasue-7.1 and Table-3 of ISO:4427-2 100 Hours	ISO1187-1& ISO-1167-2	According to ISO-1167-1	Clause-7.1 and Table-3 of ISO:4427-2 100 hours	MTC	P	W	
			Clasue-7.1 and Table-3 of ISO:4427-2 165 Hours	ISO1167-1& ISO-1187-2	According to ISO-1167-1	Clause-7.1 and Table-3 of ISO:4427-2 165 hours	MTC	P	R	
			Clasue-7.1 and Table-3 of ISO:4427-2 1000 Hours	ISO1167-1& ISO-1187-2	According to ISO-1167-1	Clause-7.1 and Table-3 of ISO:4427-2 1000 hours	MTC	P	R	
6	De-cohesion of electrofusion joint		Clause-4.1 and Table-2 of ISO:4427:2	ISO-13954	According to ISO-4427-1	Percentage of Brittle Fallure<33.3%	MTC	P	R	
7	Reversion Test		Clause-8.2 and Table-5 of ISO:4427:2	ISO-2505	According to ISO-2505	Reversion shall no be greater than 3%	MTC	P	W	
8	Pigment dispersion (Blue Pigment Only)		Clause-4,2 and table-2 of ISO:4427-1	ISO-18553	According to ISO-18553	<GRADE 3 Uniform	MTC	P	W	
9	Melt flow Rate		Clause-8, 2 and Table-5 of ISO:4427-2	ISO-1133-2005	According to ISO-1133	0.2 to 1.40gm/10 Minute (Max Deviation of 20% of the nominated Value)	MTC	P	W	
10	Oxidation Induction Time		Clause-8, 2 and Table-5 of ISO:4427-2	ISO-4427-2	According to ISO-11357-6	Min-20 Minutes	MTC	P	W	

S. No.	Stages	Characteristics	Samples to Check	Reference Document	Frequency	Acceptance Criteria	Formant of Records	Inspection by		Remarks
								M	TPI/C or both	
11	Density		Clause-4,4,1 and Table-1 of ISO:4427/1183	ISO-1183-2	According to ISO-1183-2	930 to 960 kg/m3	MTC	P	W	Clause-4,4,1 and Table-1 of ISO:4427/1183
12	Tensile Strength For Butt Fusion		Clause-4,2 and table-2 of ISO:4427-1	ISO-13953	According to ISO-13953	No Brittle Failer	MTC	P/R	R	Clause-4,2 and table-2 of ISO:4427-1
13	Elongation at break		Clause-5.2 and table-5 of ISO:4427-2Z	ISO-6259-1 & 6259-3	According to ISO-6259	>350%	MTC	P	W	Clause-5.2 and table-5 of ISO:4427-2Z
14	Slow Crack Growth Rate		Clause-4,2 and table-2 of ISO:4427-1	ISO-13479/IS-4984	According to ISO-13479	As per ISA 4427	MTC	P/R	R	Clause-4,2 and table-2 of ISO:4427-1
15	Marking on Pipe		100%	Clause-11.1,11.2 Table no. 6 ISO 4427-2	Every Coil or Pipe	Clause-11.1,11.2 Table no. 6 ISO 4427-2	MTC	P	W	100%
16	Effect on Water Quality		Review of document	Raw Material Manufacturer's declaration	-	PE resin grade shall meet FDA regulation 21 CFR 177,1520 is suitable for food packaging and pipe for drinking water. Raw Material Manufacturer declaration for PE resin grade to be reviewed	-	R	R	Review of document

**LEGENDS:**

RMTC – RAW MATERIAL TEST CERTIFICATE

MTC – MANUFACTURER TEST CERTIFICATE

TPI – THIRD PARTY INSPECTION AGENCY WHICH SHALL BE APPROVED BY PHED

Note :- 1) THE MEASURING INSTRUMENTS &amp; TEST EQUIPMENTS SHALL BE CALIBRATED PERIODICALLY &amp; PUT UP TO TPI/C FOR VERIFICATION

2) ALL PIPES OF SAME SIZE AND PRESSURE RATING IN SINGLE CONSIGNMENT SHALL CONSTITUTE A LOT

3) ALL SPELITICATION SHOULD BE AS PER CONTACT AGEEMENT/RELAVENT IS CODE

4) SAMPLING CRITERIA AS PER RESPECTIVE STANDARD/TEST METHOD.

M- MANUFACTUREER

C- CUSTOMER (PHED) &amp;TPI

P- PERFORM

R- REVIEW

W- WITNESS

**CHAPTER - 03**

**GALVANISED IRON PIPES, SPECIALS AND  
GUN METAL OR BRASS FITTINGS**

## CHAPTER – 03

### GALVANISED IRON PIPES, SPECIALS AND GUN METAL OR BRASS FITTINGS

#### NOTES:

1. The G.I. pipes shall be conforming to IS - 1239:2004 (Pt -I), 1239:2011 (Pt-II)
2. The hot dip Zinc coating on M.S. tubes shall be conforming to IS - 4736:1986
3. The Copper alloy Gate valves, Globe wheel valves, Check valves shall be conforming to IS - 778: 1984 (Reaffirmed 2020)
4. The ferrules for water service related IS - 8794:1988 and IS - 2692-1989
5. All measurement shall be of the finished work.
6. Work shall be executed in accordance with the Indian Standards Specifications and special notes if any, covered in the agreement of the work.
7. This USOR contains the rates of all the items without GST. GST shall be paid separately as per prevailing government norms as claimed by the contractor in his bill. All the estimates prepared on this USOR will include GST as an extra amount as per prevailing rates on the sum of the estimate to arrive at the gross amount.

### GALVANISED IRON PIPES, SPECIALS AND GUN METAL OR BRASS FITTINGS

S.No.	Particulars of Items	Unit	Rates (in Rs.)		
3.1	Providing laying and jointing of following galvanized Iron (MS) Pipes with specials (such as bends, elbows, tees etc) class light, medium & heavy including testing of joints, cost of pipes, specials and jointing materials all complete. Pipes and sockets conforming to IS-1239/2011 Part II.		Light	Medium	Heavy
3.1.1	15 mm dia	Meter	119.00	133.00	149.00
3.1.2	20 mm dia	Meter	150.00	165.00	189.00
3.1.3	25 mm dia	Meter	206.00	235.00	270.00
3.1.4	32 mm dia	Meter	252.00	291.00	338.00
3.1.5	40 mm dia	Meter	317.00	340.00	398.00
3.1.6	50 mm dia	Meter	390.00	463.00	541.00
3.1.7	65 mm dia	Meter	533.00	599.00	698.00
3.1.8	80 mm dia	Meter	618.00	759.00	848.00
3.1.9	100 mm dia	Meter	887.00	1085.00	1229.00
3.1.10	125 mm dia	Meter	-	1421.00	1540.00
3.1.11	150 mm dia	Meter	-	1683.00	1855.00
3.2	Labour for laying and jointing of following galvanized Iron (MS) pipes with specials (such as bends, elbows, tees etc) class light, medium & heavy including testing of joints and cost of jointing materials but excluding cost of pipes & specials.		Light	Medium	Heavy



S.No.	Particulars of Items	Unit	Rates (in Rs.)		
3.2.1	15 mm dia	Meter	12.00	13.00	14.00
3.2.2	20 mm dia	Meter	13.00	15.00	16.00
3.2.3	25 mm dia	Meter	19.00	21.00	20.00
3.2.4	32 mm dia	Meter	22.00	23.00	22.00
3.2.5	40 mm dia	Meter	28.00	30.00	28.00
3.2.6	50 mm dia	Meter	30.00	32.00	31.00
3.2.7	65 mm dia	Meter	41.00	53.00	49.00
3.2.8	80 mm dia	Meter	43.00	59.00	52.00
3.2.9	100 mm dia	Meter	62.00	80.00	76.00
3.2.10	125 mm dia	Meter	-	103.00	97.00
3.2.11	150 mm dia	Meter	-	120.00	115.00
3.3	Providing and fixing following Gate (full way) valves tested to 300 lbs/Sq. inch or 300 psi 21.00 kg/cm <sup>2</sup> conforming to IS 778/1984 (Reaffirmed 2005) Class-I		Screwed	Flanged	
3.3.1	15 mm dia	Each	688.00	834.00	
3.3.2	20 mm dia	Each	956.00	1161.00	
3.3.3	25 mm dia	Each	1322.00	1626.00	
3.3.4	32 mm dia	Each	2033.00	2503.00	
3.3.5	40 mm dia	Each	2699.00	3316.00	
3.3.6	50 mm dia	Each	4187.00	5144.00	
3.3.7	65 mm dia	Each	6639.00	8161.00	
3.3.8	80 mm dia	Each	10168.00	12455.00	
3.3.9	100 mm dia	Each	19747.00	24168.00	
3.4	Providing and fixing following gate (fullway) valves tested to 300 lbs/ Sq. inch or 300 psi 21.00 kg/cm <sup>2</sup> conforming to IS 778/1984 (Reaffirmed 2005) Class-II		Screwed	Flanged	
3.4.1	15 mm dia	Each	689.00	895.00	
3.4.2	20 mm dia	Each	958.00	1221.00	
3.4.3	25 mm dia	Each	1335.00	1675.00	
3.4.4	32 mm dia	Each	2064.00	2552.00	
3.4.5	40 mm dia	Each	2744.00	3368.00	
3.4.6	50 mm dia	Each	4239.00	5237.00	
3.4.7	65 mm dia	Each	6592.00	8239.00	
3.4.8	80 mm dia	Each	10279.00	12496.00	
3.4.9	100 mm dia	Each	19902.00	24230.00	
3.5	Providing and fixing following class-I Globe wheel valves, conforming to IS 778/1984 (Reaffirmed 2005), tested to 21.00 Kg/cm <sup>2</sup> .		Screwed	Flanged	
3.5.1	15 mm dia	Each	423.00	827.00	
3.5.2	20 mm dia	Each	646.00	1063.00	
3.5.3	25 mm dia	Each	998.00	1601.00	

S.No.	Particulars of Items	Unit	Rates (in Rs.)	
3.5.4	32 mm dia	Each	1452.00	2292.00
3.5.5	40 mm dia	Each	2012.00	3166.00
3.5.6	50 mm dia	Each	2879.00	4572.00
3.5.7	65 mm dia	Each	5479.00	8560.00
3.5.8	80 mm dia	Each	6712.00	10435.00
3.5.9	100 mm dia	Each	14044.00	21845.00
3.6	Providing and fixing following class-II Globe wheel valves, conforming to IS 778/1984 (Reaffirmed 2005), tested to 21.00 Kg/cm <sup>2</sup> .		Screwed	Flanged
3.3.1	15 mm dia	Each	520.00	806.00
3.3.2	20 mm dia	Each	800.00	1036.00
3.3.3	25 mm dia	Each	1232.00	1559.00
3.3.4	32 mm dia	Each	1858.00	2596.00
3.3.5	40 mm dia	Each	2487.00	3577.00
3.3.6	50 mm dia	Each	3561.00	4434.00
3.3.7	65 mm dia	Each	6793.00	8252.00
3.3.8	80 mm dia	Each	8317.00	10175.00
3.3.9	100 mm dia	Each	17409.00	21284.00
3.7	Providing and fixing following check (non-return) valves Class-I, conforming to IS-778/1984 (Reaffirmed 2005) female ends, tested to 21.00 Kg/cm <sup>2</sup> .		Screwed	Flanged
3.7.1	15 mm dia	Each	704.00	900.00
3.7.2	20 mm dia	Each	990.00	1356.00
3.7.3	25 mm dia	Each	1492.00	2006.00
3.7.4	32 mm dia	Each	2269.00	3021.00
3.7.5	40 mm dia	Each	3216.00	4252.00
3.7.6	50 mm dia	Each	4708.00	6265.00
3.7.7	65 mm dia	Each	7678.00	10127.00
3.7.8	80 mm dia	Each	10441.00	13706.00
3.3.9.	100 mm dia	Each	21862.00	28678.00
3.8	Providing and fixing following check (non-return) valves Class II, conforming to IS-778/1984 (Reaffirmed 2005) female ends, tested to 21.00 Kg/cm <sup>2</sup> .		Screwed	Flanged
3.8.1	15 mm dia	Each	582.00	801.00
3.8.2	20 mm dia	Each	893.00	1205.00
3.8.3	25 mm dia	Each	1341.00	1785.00
3.8.4	32 mm dia	Each	2037.00	2686.00
3.8.5	40 mm dia	Each	2894.00	3795.00
3.8.6	50 mm dia	Each	4220.00	5612.00
3.8.7	65 mm dia	Each	9283.00	9020.00
3.8.8	80 mm dia	Each	9329.00	12230.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)	
3.8.9	100 mm dia	Each	19540.00	25636.00
3.9	Providing and fixing following Gun Metal or brass ferrules conforming to IS-2692/1989 (Reaffirmed 2005), tested to 21.00 Kg/cm <sup>2</sup> . i/c boring and tapping the main.		Screwed	
3.9.1	15 mm dia	Each	666.00	
3.9.2	20 mm dia	Each	1049.00	
3.9.3	25 mm dia	Each	2514.00	
3.10	Labour for laying, fixing including testing and carriage of Screwed or flanged Gate valves (full way) Class-I		Screwed	Flanged
3.10.1	15 mm dia	Each	16.00	20.00
3.10.2	20 mm dia	Each	20.00	26.00
3.10.3	25 mm dia	Each	34.00	44.00
3.10.4	32 mm dia	Each	48.00	67.00
3.10.5	40 mm dia	Each	62.00	82.00
3.10.6	50 mm dia	Each	94.00	140.00
3.10.7	65 mm dia	Each	171.00	247.00
3.10.8	80 mm dia	Each	239.00	335.00
3.10.9	100 mm dia	Each	453.00	635.00
3.11	Labour for laying, fixing and including testing carriage of Screwed or flanged Gate valves (full way) Class-II.		Screwed	Flanged
3.11.1	15 mm dia	Each	21.00	26.00
3.11.2	20 mm dia	Each	26.00	34.00
3.11.3	25 mm dia	Each	42.00	57.00
3.11.4	32 mm dia	Each	62.00	82.00
3.11.5	40 mm dia	Each	76.00	100.00
3.11.6	50 mm dia	Each	120.00	157.00
3.11.7	65 mm dia	Each	222.00	283.00
3.11.8	80 mm dia	Each	299.00	385.00
3.11.9	100 mm dia	Each	552.00	694.00
3.12	Labour for laying, fixing and including testing carriage of Screwed or flanged globe wheel valves Class-I.		Screwed	Flanged
3.12.1	15 mm dia	Each	16.00	20.00
3.12.2	20 mm dia	Each	23.00	30.00
3.12.3	25 mm dia	Each	34.00	45.00
3.12.4	32 mm dia	Each	56.00	72.00
3.12.5	40 mm dia	Each	77.00	98.00
3.12.6	50 mm dia	Each	104.00	137.00
3.12.7	65 mm dia	Each	205.00	265.00
3.12.8	80 mm dia	Each	271.00	347.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)	
3.12.9	100 mm dia	Each	449.00	601.00
3.13	Labour for laying, fixing and including testing carriage of Screwed or flanged globe wheel valves Class-II.		Screwed	Flanged
3.13.1	15 mm dia	Each	19.00	25.00
3.13.2	20 mm dia	Each	27.00	35.00
3.13.3	25 mm dia	Each	43.00	55.00
3.13.4	32 mm dia	Each	72.00	89.00
3.13.5	40 mm dia	Each	95.00	132.00
3.13.6	50 mm dia	Each	130.00	181.00
3.13.7	65 mm dia	Each	232.00	309.00
3.13.8	80 mm dia	Each	309.00	396.00
3.13.9	100 mm dia	Each	548.00	697.00
3.14	Labour for laying, fixing and including testing carriage of Screwed or flanged check (non return) valves Class-I.		Screwed	Flanged
3.14.1	15 mm dia	Each	16.00	20.00
3.14.2	20 mm dia	Each	22.00	29.00
3.14.3	25 mm dia	Each	33.00	45.00
3.14.4	32 mm dia	Each	56.00	73.00
3.14.5	40 mm dia	Each	79.00	99.00
3.14.6	50 mm dia	Each	107.00	138.00
3.14.7	65 mm dia	Each	203.00	265.00
3.14.8	80 mm dia	Each	273.00	358.00
3.14.9	100 mm dia	Each	454.00	605.00
3.15	Labour for laying, fixing and including testing carriage of Screwed or flanged check (non return) valves Class-II.		Screwed	Flanged
3.15.1	15 mm dia	Each	18.00	24.00
3.15.2	20 mm dia	Each	27.00	35.00
3.15.3	25 mm dia	Each	43.00	53.00
3.15.4	32 mm dia	Each	67.00	88.00
3.15.5	40 mm dia	Each	90.00	120.00
3.15.6	50 mm dia	Each	124.00	166.00
3.15.7	65 mm dia	Each	246.00	313.00
3.15.8	80 mm dia	Each	325.00	416.00
3.15.9	100 mm dia	Each	565.00	710.00
3.16	Labour for laying, fixing and including testing carriage of following Gun Metal or brass ferrules.		Screwed	
3.16.1	15 mm dia	Each	159.00	
3.16.2	20 mm dia	Each	248.00	
3.16.3	25 mm dia	Each	596.00	

S.No.	Particulars of Items	Unit	Rates (in Rs.)		
3.17	Providing & fixing including testing water taps.		Stainless Steel	CI self closing	Brass Heavy Duty
3.17.1	15 mm dia	Each	210.00	284.00	412.00
3.17.2	20 mm dia	Each	277.00	355.00	527.00
3.18	Labour for fixing including testing and carriage of water taps		Stainless Steel	CI self closing	Brass Heavy Duty
3.18.1	15 mm dia	Each	8.00	10.00	13.00
3.18.2	20 mm dia	Each	10.00	12.00	18.00
3.19	Providing and fixing Screwed Ball valves tested to 21.09 kg/cm <sup>2</sup> conforming to IS 778/1984				
3.19.1	15 mm dia	Each	480.00		
3.19.2	20 mm dia	Each	680.00		
3.19.3	25 mm dia	Each	1069.00		
3.19.4	32 mm dia	Each	1850.00		
3.19.5	40 mm dia	Each	2611.00		
3.19.6	50 mm dia	Each	3803.00		
3.19.7	65 mm dia	Each	7776.00		
3.19.8	80 mm dia	Each	13426.00		
3.19.9	100 mm dia	Each	21034.00		
3.20	Labour only for fixing and carriage of Ball valves tested to 21 kg/cm <sup>2</sup> conforming to IS 778/1984				
3.20.1	15 mm dia	Each	25.00		
3.20.2	20 mm dia	Each	32.00		
3.20.3	25 mm dia	Each	42.00		
3.20.4	32 mm dia	Each	69.00		
3.20.5	40 mm dia	Each	89.00		
3.20.6	50 mm dia	Each	120.00		
3.20.7	65 mm dia	Each	258.00		
3.20.8	80 mm dia	Each	422.00		
3.20.9	100 mm dia	Each	642.00		
3.21	Providing and fixing G. I. Union in G.I. Pipe line including cutting threading testing etc. complete (New work) conforming to IS 1879				
3.21.1	15 mm diameter pipe.	Each	126.00		
3.21.2	20 mm diameter pipe.	Each	193.00		
3.21.3	25 mm diameter pipe	Each	265.00		
3.21.4	32 mm diameter pipe.	Each	383.00		
3.21.5	40 mm diameter pipe.	Each	476.00		
3.21.6	50 mm diameter pipe.	Each	712.00		
3.21.7	65 mm diameter pipe	Each	1370.00		
3.21.8	80 mm diameter pipe	Each	1945.00		

S.No.	Particulars of Items	Unit	Rates (in Rs.)
3.21.9	100 mm diameter pipe	Each	2566.00
3.22	Labour for fixing G. I. Union in G.I. Pipe line including cutting threading, testing and carriage of etc. complete (New work)		
3.22.1	15 mm diameter pipe.	Each	18.00
3.22.2	20 mm diameter pipe.	Each	27.00
3.22.3	25 mm diameter pipe	Each	34.00
3.22.4	32 mm diameter pipe.	Each	46.00
3.22.5	40 mm diameter pipe.	Each	61.00
3.22.6	50 mm diameter pipe.	Each	78.00
3.22.7	65 mm diameter pipe	Each	123.00
3.22.8	80 mm diameter pipe	Each	188.00
3.22.9	100 mm diameter pipe	Each	297.00
3.23	Providing and fixing G. I. Union in G.I. Pipe line including cutting threading testing etc. complete (Old work) conforming to IS 1879		
3.23.1	15 mm diameter pipe.	Each	148.00
3.23.2	20 mm diameter pipe.	Each	235.00
3.23.3	25 mm diameter pipe	Each	318.00
3.23.4	32 mm diameter pipe.	Each	451.00
3.23.5	40 mm diameter pipe.	Each	565.00
3.23.6	50 mm diameter pipe.	Each	840.00
3.23.7	65 mm diameter pipe	Each	1571.00
3.23.8	80 mm diameter pipe	Each	2265.00
3.23.9	100 mm diameter pipe	Each	3051.00
3.24	Labour for fixing G. I. Union in G.I. Pipe line including cutting threading, testing and carriage etc. complete (Old work)		
3.24.1	15 mm diameter pipe.	Each	41.00
3.24.2	20 mm diameter pipe.	Each	69.00
3.24.3	25 mm diameter pipe	Each	87.00
3.24.4	32 mm diameter pipe.	Each	114.00
3.24.5	40 mm diameter pipe.	Each	151.00
3.24.6	50 mm diameter pipe.	Each	206.00
3.24.7	65 mm diameter pipe	Each	325.00
3.24.8	80 mm diameter pipe	Each	508.00
3.24.9	100 mm diameter pipe	Each	782.00
3.25	Providing and fixing G. I. socket in G.I. Pipe line including cutting threading testing etc. complete (Old work) conforming to IS 1879		
3.25.1	15 mm dia	Each	27.00
3.25.2	20 mm dia	Each	41.00
3.25.3	25 mm dia	Each	52.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)
3.25.4	32 mm dia	Each	78.00
3.25.5	40 mm dia	Each	100.00
3.25.6	50 mm dia	Each	162.00
3.25.7	65 mm dia	Each	240.00
3.25.8	80 mm dia	Each	359.00
3.25.9	100 mm dia	Each	585.00
3.25.10	125 mm dia	Each	762.00
3.25.11	150 mm dia	Each	915.00
3.26	Labour only for fixing G.I. socket in G.I. Pipe line including cutting threading, testing and carriage of etc. complete. (Old work)		
3.26.1	15 mm dia	Each	9.00
3.26.2	20 mm dia	Each	14.00
3.26.3	25 mm dia	Each	18.00
3.26.4	32 mm dia	Each	27.00
3.26.5	40 mm dia	Each	33.00
3.26.6	50 mm dia	Each	54.00
3.26.7	65 mm dia	Each	68.00
3.26.8	80 mm dia	Each	101.00
3.26.9	100 mm dia	Each	167.00
3.26.10	125 mm dia	Each	229.00
3.26.11	150 mm dia	Each	265.00
3.27	Providing and fixing G. I. Bend 90° in G.I. Pipe line including cutting threading testing etc. complete (Old work) conforming to IS 1879		
3.27.1	15 mm dia	Each	57.00
3.27.2	20 mm dia	Each	87.00
3.27.3	25 mm dia	Each	134.00
3.27.4	32 mm dia	Each	230.00
3.27.5	40 mm dia	Each	346.00
3.27.6	50 mm dia	Each	515.00
3.27.7	65 mm dia	Each	543.00
3.27.8	80 mm dia	Each	688.00
3.27.9	100 mm dia	Each	2216.00
3.27.10	125 mm dia	Each	3139.00
3.27.11	150 mm dia	Each	3353.00
3.28	Labour only for fixing G. I. Bend 90° in G.I. Pipe line including cutting threading, testing and carriage etc. complete (Old work)		
3.28.1	15 mm dia	Each	17.00
3.28.2	20 mm dia	Each	25.00
3.28.3	25 mm dia	Each	44.00
3.28.4	32 mm dia	Each	71.00
3.28.5	40 mm dia	Each	86.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)
3.28.6	50 mm dia	Each	130.00
3.28.7	65 mm dia	Each	162.00
3.28.8	80 mm dia	Each	190.00
3.28.9	100 mm dia	Each	540.00
3.28.10	125 mm dia	Each	622.00
3.28.11	150 mm dia	Each	755.00
3.29	Providing and fixing G. I. Tee in G.I. Pipe line including cutting threading testing etc. complete (Old work) conforming to IS 1879		
3.29.1	15 mm dia	Each	76.00
3.29.2	20 mm dia	Each	123.00
3.29.3	25 mm dia	Each	167.00
3.29.4	32 mm dia	Each	282.00
3.29.5	40 mm dia	Each	360.00
3.29.6	50 mm dia	Each	621.00
3.29.7	65 mm dia	Each	972.00
3.29.8	80 mm dia	Each	1342.00
3.29.9	100 mm dia	Each	2292.00
3.30	Labour only for fixing G. I. Tee in G.I. Pipe line including cutting threading, testing and carriage etc. complete (Old work)		
3.30.1	15 mm dia	Each	27.00
3.30.2	20 mm dia	Each	44.00
3.30.3	25 mm dia	Each	59.00
3.30.4	32 mm dia	Each	100.00
3.30.5	40 mm dia	Each	128.00
3.30.6	50 mm dia	Each	215.00
3.30.7	65 mm dia	Each	362.00
3.30.8	80 mm dia	Each	467.00
3.30.9	100 mm dia	Each	860.00
3.31	Providing and fixing G. I. Elbow in G.I. Pipe line including cutting threading testing etc. complete (Old work) conforming to IS 1879.		
3.31.1	15 mm dia	Each	51.00
3.31.2	20 mm dia	Each	89.00
3.31.3	25 mm dia	Each	122.00
3.31.4	32 mm dia	Each	191.00
3.31.5	40 mm dia	Each	254.00
3.31.6	50 mm dia	Each	465.00
3.31.7	65 mm dia	Each	743.00
3.31.8	80 mm dia	Each	999.00
3.31.9	100 mm dia	Each	1843.00



S.No.	Particulars of Items	Unit	Rates (in Rs.)
3.32	Labour only for fixing G. I. Elbow in G.I. Pipe line including cutting threading testing etc. complete (Old work)		
3.32.1	15 mm dia	Each	20.00
3.32.2	20 mm dia	Each	32.00
3.32.3	25 mm dia	Each	43.00
3.32.4	32 mm dia	Each	71.00
3.32.5	40 mm dia	Each	90.00
3.32.6	50 mm dia	Each	167.00
3.32.7	65 mm dia	Each	261.00
3.32.8	80 mm dia	Each	353.00
3.32.9	100 mm dia	Each	682.00
3.33	Providing and fixing G. I. Nipple of minimum length in G.I. Pipe line including cutting, threading, testing and carriage etc. complete (Old work) conforming to IS 1879		
3.33.1	15 mm dia	Each	33.00
3.33.2	20 mm dia	Each	48.00
3.33.3	25 mm dia	Each	72.00
3.33.4	32 mm dia	Each	115.00
3.33.5	40 mm dia	Each	142.00
3.33.6	50 mm dia	Each	214.00
3.33.7	65 mm dia	Each	387.00
3.33.8	80 mm dia	Each	576.00
3.33.9	100 mm dia	Each	1064.00
3.34	Labour only for fixing G. I. Nipple of minimum length in G.I. Pipe line including cutting threading testing etc. complete (Old work)		
3.34.1	15 mm dia	Each	14.00
3.34.2	20 mm dia	Each	18.00
3.34.3	25 mm dia	Each	27.00
3.34.4	32 mm dia	Each	44.00
3.34.5	40 mm dia	Each	56.00
3.34.6	50 mm dia	Each	79.00
3.34.7	65 mm dia	Each	143.00
3.34.8	80 mm dia	Each	215.00
3.34.9	100 mm dia	Each	398.00
3.35	Providing and fixing G. I. Barrel Nipple (reducer) in G.I. Pipe line including cutting threading testing etc. complete (New work) conforming to IS 1879		
3.35.1	15 mm x 80 mm	Each	29.00
3.35.2	15 mm x 100 mm	Each	35.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)
3.35.3	20 mm x 80 mm	Each	36.00
3.35.4	20 mm x 100 mm	Each	39.00
3.35.5	25 mm x 80 mm	Each	48.00
3.35.6	25 mm x 10 mm	Each	49.00
3.35.7	32 mm x 80 mm	Each	67.00
3.35.8	32 mm x 100 mm	Each	86.00
3.35.9	40 mm x 80 mm	Each	93.00
3.35.10	40 mm x 100 mm	Each	118.00
3.35.11	50 mm x 80 mm	Each	100.00
3.35.12	50 mm x 100 mm	Each	130.00
3.35.13	50 mm x 150 mm	Each	140.00
3.35.14	65 mm x 80 mm	Each	104.00
3.35.15	65 mm x 100 mm	Each	167.00
3.35.16	65 mm x 150 mm	Each	242.00
3.35.17	80 mm x 100 mm	Each	192.00
3.35.18	80 mm x 150 mm	Each	205.00
3.35.19	100 mm x 150 mm	Each	306.00
3.35.20	80 mm x 125 mm	Each	337.00
3.35.21	100 mm x 125 mm	Each	416.00
3.35.22	125 mm x 150 mm	Each	560.00
3.36	Labour only for fixing G. I Barrel Nipple (reducer)G.I. Pipe line i/c cutting threading testing etc. complete (New work)		
3.36.1	15 mm x 80 mm	Each	3.00
3.36.2	15 mm x 100 mm	Each	5.00
3.36.3	20 mm x 80 mm	Each	5.00
3.36.4	20 mm x 100 mm	Each	5.00
3.36.5	25 mm x 80 mm	Each	6.00
3.36.6	25 mm x 10 mm	Each	6.00
3.36.7	32 mm x 80 mm	Each	8.00
3.36.8	32 mm x 100 mm	Each	10.00
3.36.9	40 mm x 80 mm	Each	12.00
3.36.10	40 mm x 100 mm	Each	15.00
3.36.11	50 mm x 80 mm	Each	13.00
3.36.12	50 mm x 100 mm	Each	16.00
3.36.13	50 mm x 150 mm	Each	17.00
3.36.14	65 mm x 80 mm	Each	13.00
3.36.15	65 mm x 100 mm	Each	21.00
3.36.16	65 mm x 150 mm	Each	30.00
3.36.17	80 mm x 100 mm	Each	23.00
3.36.18	80 mm x 150 mm	Each	25.00
3.36.19	100 mm x 150 mm	Each	37.00
3.36.20	80 mm x 125 mm	Each	41.00
3.36.21	100 mm x 125 mm	Each	51.00
3.36.22	125 mm x 150 mm	Each	68.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)
3.37	Providing and fixing G. I. Barrel Nipple (reducer) in G.I. Pipe line i/c cutting threading testing etc. complete (Old work) conforming to IS 1879		
3.37.1	15 mm x 80 mm	Each	35.00
3.37.2	15 mm x 100 mm	Each	41.00
3.37.3	20 mm x 80 mm	Each	43.00
3.37.4	20 mm x 100 mm	Each	48.00
3.37.5	25 mm x 80 mm	Each	58.00
3.37.6	25 mm x 10 mm	Each	60.00
3.37.7	32 mm x 80 mm	Each	82.00
3.37.8	32 mm x 100 mm	Each	105.00
3.37.9	40 mm x 80 mm	Each	113.00
3.37.10	40 mm x 100 mm	Each	144.00
3.37.11	50 mm x 80 mm	Each	121.00
3.37.12	50 mm x 100 mm	Each	158.00
3.37.13	50 mm x 150 mm	Each	170.00
3.37.14	65 mm x 80 mm	Each	125.00
3.37.15	65 mm x 100 mm	Each	202.00
3.37.16	65 mm x 150 mm	Each	293.00
3.37.17	80 mm x 100 mm	Each	233.00
3.37.18	80 mm x 150 mm	Each	248.00
3.37.19	100 mm x 150 mm	Each	370.00
3.37.20	80 mm x 125 mm	Each	409.00
3.37.21	100 mm x 125 mm	Each	505.00
3.37.22	125 mm x 150 mm	Each	679.00
3.38	Labour only for fixing G. I. Barrel Nipple (reducer)G.I. Pipe line i/c cutting threading testing etc. complete (Old work)		
3.38.1	15 mm x 80 mm	Each	9.00
3.38.2	15 mm x 100 mm	Each	12.00
3.38.3	20 mm x 80 mm	Each	12.00
3.38.4	20 mm x 100 mm	Each	13.00
3.38.5	25 mm x 80 mm	Each	15.00
3.38.6	25 mm x 10 mm	Each	16.00
3.38.7	32 mm x 80 mm	Each	22.00
3.38.8	32 mm x 100 mm	Each	28.00
3.38.9	40 mm x 80 mm	Each	30.00
3.38.10	40 mm x 100 mm	Each	39.00
3.38.11	50 mm x 80 mm	Each	32.00
3.38.12	50 mm x 100 mm	Each	43.00
3.38.13	50 mm x 150 mm	Each	46.00
3.38.14	65 mm x 80 mm	Each	33.00
3.38.15	65 mm x 100 mm	Each	54.00
3.38.16	65 mm x 150 mm	Each	78.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)
3.38.17	80 mm x 100 mm	Each	62.00
3.38.18	80 mm x 150 mm	Each	67.00
3.38.19	100 mm x 150 mm	Each	99.00
3.38.20	80 mm x 125 mm	Each	109.00
3.38.21	100 mm x 125 mm	Each	135.00
3.38.22	125 mm x 150 mm	Each	182.00
3.39	Providing and fixing G. I. threaded Flange in G.I. Pipe line i/c cutting threading testing etc. complete (New work) conforming to IS 1879		
3.39.1	15 mm dia	Each	87.00
3.39.2	20 mm dia	Each	92.00
3.39.3	25 mm dia	Each	116.00
3.39.4	32 mm dia	Each	137.00
3.39.5	40 mm dia	Each	169.00
3.39.6	50 mm dia	Each	217.00
3.39.7	65 mm dia	Each	258.00
3.39.8	80 mm dia	Each	346.00
3.39.9	100 mm dia	Each	460.00
3.39.10	125 mm dia	Each	750.00
3.39.11	150 mm dia	Each	854.00
3.39.12	200 mm dia	Each	1395.00
3.40	Labour only for fixing G.I. threaded Flange in G.I. Pipe line i/c cutting threading, testing and carriage etc. complete. (New work)		
3.40.1	15 mm dia	Each	10.00
3.40.2	20 mm dia	Each	12.00
3.40.3	25 mm dia	Each	14.00
3.40.4	32 mm dia	Each	16.00
3.40.5	40 mm dia	Each	21.00
3.40.6	50 mm dia	Each	26.00
3.40.7	65 mm dia	Each	31.00
3.40.8	80 mm dia	Each	43.00
3.40.9	100 mm dia	Each	56.00
3.40.10	125 mm dia	Each	91.00
3.40.11	150 mm dia	Each	104.00
3.40.12	200 mm dia	Each	169.00
3.41	Providing and fixing G. I. threaded Flange in G.I. Pipe line including cutting threading testing etc. complete (Old work) conforming to IS 1879		
3.41.1	15 mm dia	Each	106.00
3.41.2	20 mm dia	Each	112.00
3.41.3	25 mm dia	Each	140.00
3.41.4	32 mm dia	Each	166.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)
3.41.5	40 mm dia	Each	205.00
3.41.6	50 mm dia	Each	263.00
3.41.7	65 mm dia	Each	313.00
3.41.8	80 mm dia	Each	420.00
3.41.9	100 mm dia	Each	557.00
3.41.10	125 mm dia	Each	909.00
3.41.11	150 mm dia	Each	1036.00
3.41.12	200 mm dia	Each	1691.00
3.42	Labour only for fixing G. I. threaded Flange in G.I. Pipe line including cutting threading, testing and carriage etc. complete (Old work)		
3.42.1	15 mm dia	Each	29.00
3.42.2	20 mm dia	Each	30.00
3.42.3	25 mm dia	Each	38.00
3.42.4	32 mm dia	Each	45.00
3.42.5	40 mm dia	Each	55.00
3.42.6	50 mm dia	Each	70.00
3.42.7	65 mm dia	Each	84.00
3.42.8	80 mm dia	Each	113.00
3.42.9	100 mm dia	Each	150.00
3.42.10	125 mm dia	Each	243.00
3.42.11	150 mm dia	Each	277.00
3.42.12	200 mm dia	Each	452.00
3.43	Providing and fixing wrought steel Plug in G.I. Pipe line with outer threading testing etc. complete (New & Old work) conforming to IS 1879		
3.43.1	15 mm dia	Each	23.00
3.43.2	20 mm dia	Each	31.00
3.43.3	25 mm dia	Each	51.00
3.43.4	32 mm dia	Each	84.00
3.43.5	40 mm dia	Each	120.00
3.43.6	50 mm dia	Each	184.00
3.43.7	65 mm dia	Each	237.00
3.43.8	80 mm dia	Each	297.00
3.43.9	100 mm dia	Each	528.00
3.44	Labour only for fixing wrought steel Plug in G.I. Pipe line with outer threading, testing and carriage etc. complete. (Old Work)		
3.44.1	15 mm dia	Each	6.00
3.44.2	20 mm dia	Each	8.00
3.44.3	25 mm dia	Each	14.00
3.44.4	32 mm dia	Each	23.00
3.44.5	40 mm dia	Each	32.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)
3.44.6	50 mm dia	Each	49.00
3.44.7	65 mm dia	Each	63.00
3.44.8	80 mm dia	Each	79.00
3.44.9	100 mm dia	Each	141.00
3.45	Providing and fixing wrought steel Cap Plug with threading in G.I. Pipe line testing etc. complete conforming to IS:1879 (New & Old Work)		
3.45.1	15 mm dia	Each	47.00
3.45.2	20 mm dia	Each	68.00
3.45.3	25 mm dia	Each	112.00
3.45.4	32 mm dia	Each	153.00
3.45.5	40 mm dia	Each	203.00
3.45.6	50 mm dia	Each	329.00
3.45.7	65 mm dia	Each	376.00
3.45.8	80 mm dia	Each	720.00
3.45.9	100 mm dia	Each	1021.00
3.46	Labour only for fixing wrought steel Cap Plug with threading in G.I. Pipe line, testing and carriage etc. complete (Old work)		
3.46.1	15 mm dia	Each	16.00
3.46.2	20 mm dia	Each	24.00
3.46.3	25 mm dia	Each	38.00
3.46.4	32 mm dia	Each	49.00
3.46.5	40 mm dia	Each	66.00
3.46.6	50 mm dia	Each	90.00
3.46.7	65 mm dia	Each	114.00
3.46.8	80 mm dia	Each	184.00
3.46.9	100 mm dia	Each	313.00
3.47	Providing and fixing G. I. Cross with outer threading in G.I. Pipe line i/c cutting threading testing etc. complete (Old work)		
3.47.1	15 mm dia	Each	133.00
3.47.2	20 mm dia	Each	188.00
3.47.3	25 mm dia	Each	293.00
3.47.4	32 mm dia	Each	458.00
3.47.5	40 mm dia	Each	601.00
3.47.6	50 mm dia	Each	915.00
3.48	Labour only for fixing G. I. cross outer threading in G.I. Pipe line i/c cutting, threading, testing and carriage etc. complete (Old work)		
3.48.1	15 mm dia	Each	41.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)
3.48.2	20 mm dia	Each	58.00
3.48.3	25 mm dia	Each	83.00
3.48.4	32 mm dia	Each	128.00
3.48.5	40 mm dia	Each	165.00
3.48.6	50 mm dia	Each	255.00
3.49	Providing and fixing Tank Nipple with outer threading in G.I. Pipe line i/c cutting threading testing etc. complete conforming to IS 1879		
3.49.1	15 mm dia	Each	106.00
3.49.2	20 mm dia	Each	153.00
3.49.3	25 mm dia	Each	206.00
3.49.4	32 mm dia	Each	346.00
3.49.5	40 mm dia	Each	545.00
3.49.6	50 mm dia	Each	731.00
3.50	Labour only for Tank Nipple with outer threading in G.I. Pipe line including cutting, threading, testing and carriage etc. complete		
3.50.1	15 mm dia	Each	16.00
3.50.2	20 mm dia	Each	23.00
3.50.3	25 mm dia	Each	35.00
3.50.4	32 mm dia	Each	49.00
3.50.5	40 mm dia	Each	62.00
3.50.6	50 mm dia	Each	99.00

## **CHAPTER - 04**

### **ORIENTED P.V.C. (PVC-O) PIPES**



## CHAPTER- 04

### ORIENTED P.V.C. (PVC-O) PIPES

**Notes: -**

- 1 The Oriented Un-Plasticized Polyvinyl Chloride PVC-O pipes for potable water supply as per IS: 16647-2017 duly inspected and tested and having BIS certification mark.
- 2 Classification of the material to be used for manufacturing of PVC-O pipe shall be 500 and design coefficient (C- Factor) shall be 1.4. Selection, Handling, storage and installation of PVC-O pipes as per IS:7634-2003 (Part-3).
- 3 Pipes should be stacked on a surface flat and free from sharp objects, stones or projection in order to avoid deformation or damages. Ends of pipes should be protected from abrasion and chipping.
- 4 This pipe shall strictly be used in pumping mains.
- 5 In rocky area 15 cm. cushion of sand or moorum below and above the pipes should be provided as per IS:7634-2003 (Part III)
- 6 All measurements shall be of the finished work. The net length of pipes as laid or fixed shall be measured in running meters correct to 10 mm. Specials shall be excluded and measured and paid separately under the relevant item. The portion of the pipe inside the joints not be included in the length of pipe work. Excavation refilling masonry and concrete work wherever required shall be measured and paid for separately under relevant items of work.
- 7 Work shall be executed in accordance with the Indian Standards Specifications and special notes if any, mentioned in the agreement of the work.
- 8 Ordinary HDPE/DVCI fittings of one class higher shall be used for connecting and laying the PVC-O Pipe line. The rates for such works will be payable as per relevant chapters in SOR.
- 9 These pipes are to be used in water supply and to be installed below the ground where high vacuum or external pressure could be developed. As per Table 12 of BIS 16647: 2017, the ring stiffness of the pipe shall be  $\geq 4 \text{ KN/m}^2$  to meet the requirement of vacuum and external pressure. This criteria of ring stiffness can be met out from the class 500 PN 16 onwards rating pipes, hence the pipes of rating starting from PN 16 have been taken in this USOR.
- 10 GST shall be paid separately to the contractor as per prevailing Government norms.**
- 11 All the estimates based on this USOR will include GST as an extra amount as per prevailing rates on the sum of the estimate to arrive at the gross amount,

### ORIENTED P.V.C. (PVC-O) PIPES

S.No.	Particulars of Items	Unit	Rates (in Rs.)		
4.1	Providing, laying and jointing following P.V.C. pipes with solvent cement joint for 6, 8 and 10 kg/cm <sup>2</sup> . pressures including testing of joints, cost of jointing materials etc. complete in all respect.		6Kg/Cm <sup>2</sup>	8 Kg/Cm <sup>2</sup>	10Kg/Cm <sup>2</sup>
4.1.1	90 mm dia.	Meter	184.00	227.00	275.00
4.1.2	110 mm dia.	Meter	259.00	332.00	402.00
4.1.3	140 mm dia.	Meter	430.00	547.00	655.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)		
4.1.4	160 mm dia.	Meter	539.00	710.00	859.00
4.1.5	180 mm dia.	Meter	690.00	881.00	1083.00
4.1.6	200 mm dia.	Meter	844.00	1095.00	1340.00
4.2	Labour for laying in position including testing following PVC pipes of 6, 8 and 10 kg/cm <sup>2</sup> Pressure.		6Kg/Cm <sup>2</sup>	8 Kg/Cm <sup>2</sup>	10Kg/Cm <sup>2</sup>
4.2.1	90 mm dia.	Meter	6.00	6.00	6.00
4.2.2	110 mm dia.	Meter	7.00	7.00	7.00
4.2.3	140 mm dia.	Meter	8.00	8.00	8.00
4.2.4	160 mm dia.	Meter	10.00	10.00	10.00
4.2.5	180 mm dia.	Meter	11.00	11.00	11.00
4.2.6	200 mm dia.	Meter	13.00	13.00	13.00
4.3	Providing, Solvent Cement Joints to PVC Pipes and fittings of 6, 8 and 10 kg/cm <sup>2</sup> Pressure including testing of joints and cost of jointing materials (i.e. socket, coupler & solvent cement)		6Kg/Cm <sup>2</sup>	8 Kg/Cm <sup>2</sup>	10Kg/Cm <sup>2</sup>
4.3.1	90 mm dia.	Each	26.00	26.00	26.00
4.3.2	110 mm dia.	Each	28.00	28.00	28.00
4.3.3	140 mm dia.	Each	37.00	37.00	37.00
4.3.4	160 mm dia.	Each	44.00	44.00	44.00
4.3.5	180 mm dia.	Each	56.00	56.00	56.00
4.3.6	200 mm dia.	Each	67.00	67.00	67.00
4.4	Labour for providing solvent cement joints to PVC pipes and fittings of 6, 8 and 10 kg/cm <sup>2</sup> Pressure including testing of joints but excluding cost of jointing materials (i.e. coupler and solvent cement)		6Kg/Cm <sup>2</sup>	8 Kg/Cm <sup>2</sup>	10Kg/Cm <sup>2</sup>
4.4.1	90 mm dia.	Each	20.00	20.00	20.00
4.4.2	110 mm dia.	Each	21.00	21.00	21.00
4.4.3	140 mm dia.	Each	24.00	24.00	24.00
4.4.4	160 mm dia.	Each	26.00	26.00	26.00
4.4.5	180 mm dia.	Each	28.00	28.00	28.00
4.4.6	200 mm dia.	Each	34.00	34.00	34.00
4.5	Providing and laying in position including testing following PVC bends suitable for 6, 8 and 10 kg/cm <sup>2</sup> pressure pipes.		6Kg/Cm <sup>2</sup>	8 Kg/Cm <sup>2</sup>	10Kg/Cm <sup>2</sup>
4.5.1	90 mm dia.	Each	158.00	211.00	269.00
4.5.2	110 mm dia.	Each	292.00	364.00	437.00
4.5.3	140 mm dia.	Each	604.00	840.00	1010.00
4.5.4	160 mm dia.	Each	904.00	1132.00	1362.00
4.5.5	180 mm dia.	Each	1226.00	1537.00	1850.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)		
4.5.6	200 mm dia.	Each	1700.00	2131.00	2567.00
4.6	Providing and laying in position including testing following PVC Tees, suitable for 6, 8 and 10 kg/cm <sup>2</sup> pressure pipes.		6Kg/Cm <sup>2</sup>	8 Kg/Cm <sup>2</sup>	10Kg/Cm <sup>2</sup>
4.6.1	90 mm dia.	Each	110.00	137.00	167.00
4.6.2	100 mm dia.	Each	162.00	225.00	278.00
4.6.3	140 mm dia.	Each	386.00	482.00	478.00
4.6.4	160 mm dia.	Each	544.00	680.00	845.00
4.6.5	180 mm dia.	Each	700.00	876.00	1092.00
4.6.6	200 mm dia.	Each	917.00	1228.00	1530.00
4.7	Providing and laying in position including testing following PVC flanged tail pieces suitable for 6, 8 and 10 kg/cm <sup>2</sup> pressure pipes.		6Kg/Cm <sup>2</sup>	8 Kg/Cm <sup>2</sup>	10Kg/Cm <sup>2</sup>
4.7.1	90 mm dia.	Each	70.00	86.00	94.00
4.7.2	110 mm dia.	Each	137.00	156.00	156.00
4.7.3	140 mm dia.	Each	239.00	246.00	269.00
4.7.4	160 mm dia.	Each	350.00	392.00	415.00
4.7.5	180 mm dia.	Each	482.00	540.00	588.00
4.7.6	200 mm dia.	Each	713.00	794.00	725.00
4.9	Providing and laying in position including testing following PVC end Cap (plugs) suitable for 6, 8 and 10 kg/cm <sup>2</sup> pressure pipes.		6Kg/Cm <sup>2</sup>	8 Kg/Cm <sup>2</sup>	10Kg/Cm <sup>2</sup>
4.9.1	90 mm dia.	Each	42.00	48.00	63.00
4.9.2	110 mm dia.	Each	66.00	66.00	91.00
4.9.3	140 mm dia.	Each	105.00	106.00	146.00
4.9.4	160 mm dia.	Each	161.00	179.00	243.00
4.9.5	180 mm dia.	Each	216.00	236.00	328.00
4.9.6	200 mm dia.	Each	271.00	290.00	399.00
4.10	Providing and laying in position including testing PVC coupler suitable for 6, 8 and 10 kg/cm <sup>2</sup> pressure pipes.		6Kg/Cm <sup>2</sup>	8 Kg/Cm <sup>2</sup>	10Kg/Cm <sup>2</sup>
4.10.1	90 mm dia.	Each	57.00	67.00	97.00
4.10.2	110 mm dia.	Each	92.00	105.00	148.00
4.10.3	140 mm dia.	Each	165.00	198.00	310.00
4.10.4	160 mm dia.	Each	290.00	350.00	398.00
4.10.5	180 mm dia.	Each	406.00	480.00	501.00
4.10.6	200 mm dia	Each	522.00	566.00	599.00
4.11	Providing and laying in position including testing of following PVC Reducers suitable for 6, 8 and 10 kg/cm <sup>2</sup> pressure pipes.		6Kg/Cm <sup>2</sup>	8 Kg/Cm <sup>2</sup>	10Kg/Cm <sup>2</sup>
4.11.1	110 mm x 90 mm dia.	Each	78.00	94.00	111.00
4.11.2	140 mm x 90 mm dia.	Each	124.00	145.00	158.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)		
4.11.3	160 mm x 90 mm dia.	Each	159.00	186.00	270.00
4.11.4	140 mm x 110 mm dia.	Each	165.00	196.00	289.00
4.11.5	160 mm x 110 mm dia.	Each	127.00	152.00	177.00
4.11.6	160 mm x 140 mm dia.	Each	158.00	186.00	276.00
4.11.7	180 mm x 90 mm dia	Each	221.00	263.00	296.00
4.11.8	180 mm x 110 mm dia	Each	285.00	336.00	394.00
4.11.9	180 mm x 140 mm dia	Each	164.00	193.00	229.00
4.11.10	180 mm x 160 mm dia	Each	232.00	274.00	318.00
4.11.11	200 mm x 110 mm dia.	Each	382.00	453.00	529.00
4.11.12	200 mm x 140 mm dia	Each	249.00	296.00	344.00
4.11.13	200 mm x 160 mm dia	Each	400.00	479.00	556.00
4.11.14	200 mm x 180 mm dia	Each	412.00	498.00	578.00
4.12	Labour for laying in position including testing all types of PVC fittings such as bends, tees, plugs etc. for following PVC pipes.		6Kg/Cm <sup>2</sup>	8 Kg/Cm <sup>2</sup>	10Kg/Cm <sup>2</sup>
4.12.1	90 mm dia.	Each	8.00	8.00	8.00
4.12.2	110 mm dia.	Each	9.00	9.00	9.00
4.12.3	140 mm dia.	Each	11.00	11.00	11.00
4.12.4	160 mm dia.	Each	13.00	13.00	13.00
4.12.5	180 mm dia.	Each	14.00	14.00	14.00
4.12.6	200 mm dia.	Each	16.00	16.00	16.00
4.13	Providing and fixing PVC Djoint (Detachable joint) in PVC pipe line suitable for classes up to 10kg/sqcm Pressure pipes nut bolt, cutting of pipe, testing of joints etc complete.		6Kg/Cm <sup>2</sup>	8 Kg/Cm <sup>2</sup>	10Kg/Cm <sup>2</sup>
4.13.1	90 mm dia.	Each	124.00	124.00	124.00
4.13.2	110 mm dia.	Each	141.00	141.00	141.00
4.13.3	140 mm dia.	Each	184.00	184.00	184.00
4.13.4	160 mm dia.	Each	288.00	288.00	288.00
4.13.5	180 mm dia.	Each	336.00	336.00	336.00
4.13.6	200 mm dia.	Each	501.00	501.00	501.00
4.14	Labour only for fixing PVC D-joint (Detachable joint) in PVC pipe line suitable for classes up to 10kg/sqcm Pressure pipes cutting of pipe, testing of joints etc complete.		6Kg/Cm <sup>2</sup>	8 Kg/Cm <sup>2</sup>	10Kg/Cm <sup>2</sup>
4.14.1	90 mm dia.	Each	22.00	22.00	22.00
4.14.2	110 mm dia.	Each	23.00	23.00	23.00
4.14.3	140 mm dia.	Each	31.00	31.00	31.00
4.14.4	160 mm dia.	Each	36.00	36.00	36.00
4.14.5	180 mm dia.	Each	40.00	40.00	40.00
4.14.6	200 mm dia.	Each	55.00	55.00	55.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)		
	<b>PVC -O Pipes</b>				
4.15	Providing, laying, jointing, testing and commissioning of ISI marked PVC-O (Oriented Plasticized Polyvinyl Chloride) ring fit type pipe having orientation class 500 : C-1.4 with integral homogeneous spigot, elastomeric sealing ring made of EPDM rubber (one per pipe) including testing of joints, cost of jointing materials etc. Complete in all respect. Pressure Rating as per IS Code — IS:16647-2017 for following diameters.				
<b>4.15.1</b>	<b>PN-12.5</b>				
4.15.1.1	110 mm dia	RM		544.00	
4.15.1.2	160 mm dia	RM		937.00	
4.15.1.3	200 mm dia	RM		1284.00	
4.15.1.4	250 mm dia	RM		1761.00	
4.15.1.5	315 mm dia	RM		2280.00	
4.15.1.6	400 mm dia	RM		3516.00	
<b>4.15.2</b>	<b>PN-16</b>				
4.15.2.1	110 mm dia	RM		651.00	
4.15.2.2	160 mm dia	RM		1088.00	
4.15.2.3	200 mm dia	RM		1349.00	
4.15.2.4	250 mm dia	RM		1898.00	
4.15.2.5	315 mm dia	RM		2394.00	
4.15.2.6	400 mm dia	RM		3652.00	
<b>4.15.3</b>	<b>PN-20</b>				
4.15.3.1	110 mm dia	RM		731.00	
4.15.3.2	160 mm dia	RM		1132.00	
4.15.3.3	200 mm dia	RM		1478.00	
4.15.3.4	250 mm dia	RM		2074.00	
4.15.3.5	315 mm dia	RM		2944.00	
4.15.3.6	400 mm dia	RM		4475.00	
<b>4.15.4</b>	<b>PN-25</b>				
4.15.4.1	110 mm dia	RM		808.00	
4.15.4.2	160 mm dia	RM		1177.00	
4.15.4.3	200 mm dia	RM		1600.00	
4.15.4.4	250 mm dia	RM		2239.00	
4.15.4.5	315 mm dia	RM		3495.00	
4.15.4.6	400 mm dia	RM		5300.00	
4.15.5	Providing, laying, jointing, testing and commissioning of ISI marked PVC-O (Oriented Plasticized Polyvinyl Chloride) fittings PN 16/		11.25 <sup>0</sup> Bend,	22.50 <sup>0</sup> Bend,	45 <sup>0</sup> Bend,

S.No.	Particulars of Items	Unit	Rates (in Rs.)		
	PN 20/ PN 25 for above Pipes.				
4.15.5.1	110 mm	Each	2080.00	2080.00	2300.00
4.15.5.2	160 mm	Each	4586.00	4586.00	5036.00
4.15.5.3	200 mm	Each	8299.00	8299.00	9127.00
4.15.5.4	250 mm	Each	12637.00	12637.00	14969.00
4.15.5.5	315 mm	Each	24224.00	24224.00	26560.00
4.15.5.6	400 mm	Each	45216.00	45216.00	51452.00
	<b>Coupler</b>				
4.15.5.7	110 mm	Each		1995.00	
4.15.5.8	160 mm	Each		3558.00	
4.15.5.9	200 mm	Each		5143.00	
4.15.5.10	250 mm	Each		9627.00	
4.15.5.11	315 mm	Each		18248.00	
4.15.5.12	400 mm	Each		36854.00	
	<b>Reducer</b>				
4.15.5.13	110 mm X 90 mm	Each		2493.00	
4.15.5.14	160 mm x 110 mm	Each		4092.00	
4.15.5.15	160 mm x 140 mm	Each		4104.00	
4.15.5.16	200 mm x 160 mm	Each		7079.00	
4.15.5.17	250 mm x 200 mm	Each		7751.00	
4.15.5.18	315 mm x 250 mm	Each		15812.00	
4.15.5.19	400 mm x 315 mm	Each		32822.00	

**CHAPTER - 05**

**M.S. PIPES, SPECIALS, FITTINGS INCLUDING  
FABRICATION AND LAYING**

## CHAPTER – 05

### M.S. PIPES, SPECIALS, FITTINGS INCLUDING FABRICATION AND LAYING

- 1 This Specification covers the requirements for manufacturing, supplying, laying, jointing, testing at worksite of Electrically Welded Steel pipes, internally lined with cement concrete and externally coated with cement mortar, used for water supply mains.

- 2 **Applicable Codes**

IS : 3589	Seamless/Electrically Welded Steel Pipes for Water, Gas, Sewage Specification
IS : 5822:1994	Code of Practice for laying of Electrically Welded Steel Pipes for Water Supply.
IS : 7322:1985	Specification for Specials for Steel Cylinder Reinforced Concrete Pipes.
IS : 432:1982	Mild Steel and Medium Tensile Bars Reinforcement Part I
IS 432:1982	Specifications for Mild Steel and Medium Tensile Bars and Hard Drawn Steel Wire (Third Revision) Part II
IS : 2328:2018	Flattening Test for Seamless Pipes
IS : 12269:2013	Specification for 53 Grade Ordinary Portland Cement (OPC)
IS : 6452:1989	Specification for High Alumina Cement for Structural Use (1st Revision)
IS : 8112:2013	Specification for Curing of High Strength OPC
IS : 8041:1990	Specifications for Curing of Rapid Hardening Cement
IS : 269:2015	Specifications for Ordinary Portland Cement (OPC)
IS : 455:2015	Specifications for Portland Slag Cement
IS : 1489:2015	Specifications for Portland Pozzolana Cement
IS : 8043:1991	Specifications for Hydrophobic Portland Cement
IS : 3600:2022	Methods of Testing Fusion Welded Joints and Weld Metal in Steel cylinder pipes with concrete lining and crating (specifications) Part-1.

2. Steel :

- 2.1. Other I.S. Codes not Specifically mentioned here but pertaining to the use of Electrically Welded Steel pipes shall form part of these Specifications.

- 3 The preferred outside Diameter and thickness of the pipes shall be as per the Table of IS : 1916: 2018

- 4 Length: The pipes shall be manufactured in lengths of 6m, unless otherwise specified.

- 5 Welding: For manufacturing of the pipes at site, the welding & testing should comply with IS: 816:1969.

- 6 Fabrication of specials: Specials such as bends, tapers, tees shall Conform to IS:7322, Specials shall be fabricated by cutting plates of the specified thickness to the required shape obtained by developing the form of specials on ground.

- 7 **Measurement:**

The net length of pipes as laid or fixed should be measured in running meters correct to a fraction of the decimal. Specials should be excluded and enumerated and paid for separately. The portion of the pipe within the collar at the joints shall not be included in the length of pipe work.

- 8 **Rates**

The rates include charges for all tools & plants, required for lifting and laying the



pipes and specials in positions as per approved drawing and specifications. The rates include provision and use of all coverings etc. to protect the works from inclement weather etc. and from damages from fall of materials, and other causes.

- 9 The rates shown in item are exclusive of the cost of any type of coating but dimensionally suitable for internal epoxy lining. In case of inside cement mortar lining extra weight of shell shall be adjusted at the rate of Rs. 81.00 (Eighty one only) per kg according to the following factor.

**Extra mass per meter length of pipe =  $t_c \times t \times 0.01233$**

**Where in  $t_c$  = Cement mortar coating thickness in mm**

**$t$  = Shell thickness in mm**

- 10 The estimate rates for pipe using steel plate (shell) thickness other than mentioned in item shall be adjusted to the rate of Rs. 81.00 per kg for deferred thickness.
- 11 This USOR contains the rates of all the items without GST. GST shall be paid separately as per prevailing government norms as claimed by the contractor in his bill. All the estimates based on this USOR will include GST as an extra amount as per prevailing rates on the sum of the estimate to arrive at the gross amount.

### **M.S. PIPES, SPECIALS, FITTINGS INCLUDING FABRICATION AND LAYING**

Sr. No.	Description of Item	Unit	Rate (in Rs.)
<b>M.S. PIPES</b>			
5.1	Manufacturing, supplying at site & laying, jointing of following M.S. pipes as per IS specifications, duly testing for usage in Drinking water inclusive of all materials, inspection charges, transit insurance, loading/unloading, FOR site and stacking etc. complete as per direction of Engineer-in-Charge. (Excluding protective coating)		
<b>5.1.1</b>	<b>Dia. of pipe 100 mm (I.D) Thickness of pipe:</b>		
5.1.1.1	4 mm	Meter	1008.00
5.1.1.2	6 mm	Meter	1545.00
5.1.1.3	8 mm	Meter	2104.00
<b>5.1.2</b>	<b>Dia. of pipe 150 mm (I.D) Thickness of pipe:</b>		
5.1.2.1	4 mm	Meter	1493.00
5.1.2.2	6 mm	Meter	2274.00
5.1.2.3	8 mm	Meter	3078.00
<b>5.1.3</b>	<b>Dia. of pipe 200 mm (I.D) Thickness of pipe:</b>		
5.1.3.1	4 mm	Meter	1977.00
5.1.3.2	6 mm	Meter	3003.00
5.1.3.3	8 mm	Meter	4052.00
<b>5.1.4</b>	<b>Dia. of pipe 250 mm (I.D) Thickness of pipe:</b>		
5.1.4.1	4 mm	Meter	2462.00
5.1.4.2	6 mm	Meter	3731.00
5.1.4.3	8 mm	Meter	5026.00
<b>5.1.5</b>	<b>Dia. of pipe 300 mm (I.D) Thickness of pipe:</b>		

Sr. No.	Description of Item	Unit	Rate (in Rs.)
5.1.5.1	4 mm	Meter	2947.00
5.1.5.2	6 mm	Meter	4460.00
5.1.5.3	8 mm	Meter	5999.00
<b>5.1.6</b>	<b>Dia. of pipe 350 mm (I.D) Thickness of pipe:</b>		
5.1.6.1	4 mm	Meter	3431.00
5.1.6.2	6 mm	Meter	5189.00
5.1.6.3	8 mm	Meter	6973.00
<b>5.1.7</b>	<b>Dia. of pipe 400 mm (I.D) Thickness of pipe:</b>		
5.1.7.1	4 mm	Meter	3916.00
5.1.7.2	6 mm	Meter	5918.00
5.1.7.3	8 mm	Meter	7947.00
<b>5.1.8</b>	<b>Dia. of pipe 450 mm (I.D) Thickness of pipe:</b>		
5.1.8.1	4 mm	Meter	4401.00
5.1.8.2	6 mm	Meter	6646.00
5.1.8.3	8 mm	Meter	8920.00
5.1.8.4	10 mm	Meter	11190.00
<b>5.1.9</b>	<b>Dia. of pipe 500 mm (I.D) Thickness of pipe:</b>		
5.1.9.1	5 mm	Meter	5618.00
5.1.9.2	6 mm	Meter	6801.00
5.1.9.3	8 mm	Meter	9126.00
5.1.9.4	10 mm	Meter	11442.00
<b>5.1.10</b>	<b>Dia. of pipe 550 mm (I.D) Thickness of pipe:</b>		
5.1.10.1	5 mm	Meter	6190.00
5.1.10.2	6 mm	Meter	7492.00
5.1.10.3	8 mm	Meter	10049.00
5.1.10.4	10 mm	Meter	12596.00
5.1.10.5	12 mm	Meter	15225.00
<b>5.1.11</b>	<b>Dia. of pipe 600 mm (I.D) Thickness of pipe:</b>		
5.1.11.1	6 mm	Meter	8135.00
5.1.11.2	8 mm	Meter	10908.00
5.1.11.3	10 mm	Meter	13668.00
5.1.11.4	12 mm	Meter	16516.00
<b>5.1.12</b>	<b>Dia. of pipe 650 mm (I.D) Thickness of pipe :</b>		
5.1.12.1	6 mm	Meter	8817.00
5.1.12.2	8 mm	Meter	11820.00
5.1.12.3	10 mm	Meter	14807.00
5.1.12.4	12 mm	Meter	17888.00
<b>5.1.13</b>	<b>Dia. of pipe 700 mm (I.D) Thickness of pipe :</b>		
5.1.13.1	6 mm	Meter	9489.00
5.1.13.2	8 mm	Meter	12718.00
5.1.13.3	10 mm	Meter	15929.00
5.1.13.4	12 mm	Meter	19238.00
5.1.13.5	14 mm	Meter	22412.00
<b>5.1.14</b>	<b>Dia. of pipe 750 mm (I.D) Thickness of pipe :</b>		
5.1.14.1	7 mm	Meter	11814.00

Sr. No.	Description of Item	Unit	Rate (in Rs.)
5.1.14.2	8 mm	Meter	13599.00
5.1.14.3	10 mm	Meter	17029.00
5.1.14.4	12 mm	Meter	20563.00
<b>5.1.15</b>	<b>Dia. of pipe 800 mm (I.D) Thickness of pipe :</b>		
5.1.15.1	7 mm	Meter	12595.00
5.1.15.2	8 mm	Meter	14496.00
5.1.15.3	10 mm	Meter	18149.00
5.1.15.4	12 mm	Meter	21912.00
<b>5.1.16</b>	<b>Dia. of pipe 850 mm (I.D) Thickness of pipe :</b>		
5.1.16.1	8 mm	Meter	15236.00
5.1.16.2	10 mm	Meter	19072.00
5.1.16.3	12 mm	Meter	23024.00
<b>5.1.17</b>	<b>Dia. of pipe 900 mm (I.D) Thickness of pipe :</b>		
5.1.17.1	8 mm	Meter	16103.00
5.1.17.2	10 mm	Meter	20155.00
5.1.17.3	12 mm	Meter	24328.00
<b>5.1.18</b>	<b>Dia. of pipe 950 mm (I.D) Thickness of pipe :</b>		
5.1.18.1	8 mm	Meter	16989.00
5.1.18.2	10 mm	Meter	21262.00
5.1.18.3	12 mm	Meter	25661.00
<b>5.1.19</b>	<b>Dia. of pipe 1000 mm (I.D) Thickness of pipe :</b>		
5.1.19.1	8 mm	Meter	17922.00
5.1.19.2	10 mm	Meter	22427.00
5.1.19.3	12 mm	Meter	27065.00
<b>5.1.20</b>	<b>Dia. of pipe 1050 mm (I.D) Thickness of pipe :</b>		
5.1.20.1	8 mm	Meter	18811.00
5.1.20.2	10 mm	Meter	23537.00
5.1.20.3	12 mm	Meter	28402.00
<b>5.1.21</b>	<b>Dia. of pipe 1100 mm (I.D) Thickness of pipe :</b>		
5.1.21.1	10 mm	Meter	24361.00
5.1.21.2	12 mm	Meter	29395.00
<b>5.1.22</b>	<b>Dia. of pipe 1150 mm (I.D) Thickness of pipe :</b>		
5.1.22.1	10 mm	Meter	25458.00
5.1.22.2	12 mm	Meter	30716.00
<b>5.1.23</b>	<b>Dia. of pipe 1200 mm (I.D) Thickness of pipe :</b>		
5.1.23.1	10 mm	Meter	26521.00
5.1.23.2	12 mm	Meter	31996.00
<b>5.1.24</b>	<b>Dia. of pipe 1250 mm (I.D) Thickness of pipe :</b>		
5.1.24.1	10 mm	Meter	27761.00
5.1.24.2	12 mm	Meter	33489.00
<b>5.1.25</b>	<b>Dia. of pipe 1300 mm (I.D) Thickness of pipe :</b>		
5.1.25.1	10mm	Meter	28713.00
5.1.25.2	12mm	Meter	34636.00
<b>5.1.26</b>	<b>Dia. of pipe 1350 mm (I.D) Thickness of pipe :</b>		
5.1.26.1	10 mm	Meter	29770.00

Sr. No.	Description of Item	Unit	Rate (in Rs.)
5.1.26.2	12 mm	Meter	35909.00
<b>5.1.27</b>	<b>Dia. of pipe 1400 mm (I.D) Thickness of pipe :</b>		
5.1.27.1	12 mm	Meter	35285.00
5.1.27.2	14 mm	Meter	41036.00
<b>5.1.28</b>	<b>Dia. of pipe 1450 mm (I.D) Thickness of pipe :</b>		
5.1.28.1	12 mm	Meter	36484.00
5.1.28.2	14 mm	Meter	42428.00
<b>5.1.29</b>	<b>Dia. of pipe 1500 mm (I.D) Thickness of pipe :</b>		
5.1.29.1	12 mm	Meter	38148.00
5.1.29.2	14 mm	Meter	44362.00
<b>5.1.30</b>	<b>Dia. of pipe 1550 mm (I.D) Thickness of pipe :</b>		
5.1.30.1	12 mm	Meter	39355.00
5.1.30.2	14 mm	Meter	45765.00
<b>5.1.31</b>	<b>Dia. of pipe 1600 mm (I.D) Thickness of pipe :</b>		
5.1.31.1	14 mm	Meter	49105.00
5.1.31.2	16 mm	Meter	56004.00
<b>5.1.32</b>	<b>Dia. of pipe 1650 mm (I.D) Thickness of pipe :</b>		
5.1.32.1	14 mm	Meter	53962.00
5.1.32.2	16 mm	Meter	61555.00
5.1.32.3	18 mm	Meter	69166.00
<b>5.1.33</b>	<b>Dia. of pipe 1700 mm (I.D) Thickness of pipe :</b>		
5.1.33.1	14 mm	Meter	52147.00
5.1.33.2	16 mm	Meter	59470.00
5.1.33.3	18 mm	Meter	66810.00
<b>5.1.34</b>	<b>Dia. of pipe 1750 mm (I.D) Thickness of pipe :</b>		
5.1.34.1	14 mm	Meter	53668.00
5.1.34.2	16 mm	Meter	61202.00
5.1.34.3	18 mm	Meter	68755.00
<b>5.1.35</b>	<b>Dia. of pipe 1800 mm (I.D) Thickness of pipe :</b>		
5.1.35.1	14 mm	Meter	55189.00
5.1.35.2	16 mm	Meter	62935.00
5.1.35.3	18 mm	Meter	70699.00
<b>5.1.36</b>	<b>Dia. of pipe 1850 mm (I.D) Thickness of pipe :</b>		
5.1.36.1	14 mm	Meter	57457.00
5.1.36.2	16 mm	Meter	65523.00
5.1.36.3	20 mm	Meter	81707.00
<b>5.1.37</b>	<b>Dia. of pipe 1900 mm (I.D) Thickness of pipe :</b>		
5.1.37.1	16 mm	Meter	66400.00
5.1.37.2	18 mm	Meter	74587.00
5.1.37.3	20 mm	Meter	82792.00
<b>5.1.38</b>	<b>Dia. of pipe 1950 mm (I.D) Thickness of pipe :</b>		
5.1.38.1	16 mm	Meter	68133.00
5.1.38.2	18 mm	Meter	76532.00
5.1.38.3	20 mm	Meter	84947.00

Sr. No.	Description of Item	Unit	Rate (in Rs.)
<b>Fabrication of M.S. Pipes and Specials</b>			
5.2	Fabrication of M.S. pipes & specials as per IS specifications with inside & outside epoxy coating as per relevant IS code, duly tested for usage in Drinking water inclusive of all materials, inspection charges, transit insurance, loading/unloading, FOR site, & stacking etc. complete as for direction of Engineer-in-Charge.	Kg	93.00
5.3	Labour only for lowering and laying of MS pipe and specials as per approved specification complete as directed by Engineer in Charge.	Kg	2.00
5.4	Providing and applying primer and one coat of red oxide externally.	Sqm	57.00
5.5	Providing and applying primer and one coat of red oxide of iron paint, internally.	Sqm	130.00
<b>Laying of M.S. Pipes and Specials</b>			
5.6	Labour Only for lowering & laying of M.S. Pipes as per approved specification and as directed by Engineer in charge.		
<b>5.6.1</b>	<b>4 mm to 8 mm thick.</b>		
5.6.1.1	100 mm to 500 mm. dia.	Meter	80.00
5.6.1.2	Above 500 mm. to 750 mm. dia.	Meter	127.00
5.6.1.3	Above 750 mm. to 1050 mm. dia.	Meter	178.00
<b>5.6.2</b>	<b>10 mm to 12 mm thick.</b>		
5.6.2.1	400 mm to 7520 mm. dia.	Meter	207.00
5.6.2.2	Above 750 mm. to 1050 mm. dia.	Meter	285.00
5.6.2.3	Above 1050 mm. to 1200 mm. dia.	Meter	353.00
5.6.2.4	Above 1200 mm to 1550 mm. dia	Meter	422.00
<b>5.6.3</b>	<b>14 mm to 20 mm thick.</b>		
5.6.3.1	Above 700 mm to 1000 mm. dia.	Meter	343.00
5.6.3.2	Above 1050 mm. to 1250 mm. dia.	Meter	418.00
5.6.3.3	Above 1250 mm. to 1450 mm. dia.	Meter	501.00
5.6.3.4	Above 1450 mm to 1750 mm. dia	Meter	595.00
5.6.3.5	Above 1750 mm to 2000 mm. dia	Meter	701.00
5.7	Providing rigid welded joint to the following MS Pipe including testing of joints and cost of jointing material as per relevant approve specification complete.		
<b>5.7.1</b>	<b>Dia. of pipe 250 mm (I.D) Thickness of pipe :</b>		
5.7.1.1	4 mm	Meter	60.00
5.7.1.2	6 mm	Meter	123.00
5.7.1.3	8 mm	Meter	257.00
<b>5.7.2</b>	<b>Dia. of pipe 300 mm (I.D) Thickness of pipe :</b>		
5.7.2.1	4 mm	Meter	71.00
5.7.2.2	6 mm	Meter	147.00
5.7.2.3	8 mm	Meter	305.00
<b>5.7.3</b>	<b>Dia. of pipe 350 mm (I.D) Thickness of pipe :</b>		

Sr. No.	Description of Item	Unit	Rate (in Rs.)
5.7.3.1	4 mm	Meter	83.00
5.7.3.2	6 mm	Meter	170.00
5.7.3.3	8 mm	Meter	353.00
<b>5.7.4</b>	<b>Dia. of pipe 400 mm (I.D) Thickness of pipe :</b>		
5.7.4.1	4 mm	Meter	94.00
5.7.4.2	6 mm	Meter	194.00
5.7.4.3	8 mm	Meter	401.00
5.7.4.4	10 mm	Meter	493.00
<b>5.7.5</b>	<b>Dia. of pipe 450 mm (I.D) Thickness of pipe :</b>		
5.7.5.1	4 mm	Meter	106.00
5.7.5.2	6 mm	Meter	217.00
5.7.5.3	8 mm	Meter	450.00
5.7.5.4	10 mm	Meter	552.00
<b>5.6.6</b>	<b>Dia. of pipe 500 mm (I.D) Thickness of pipe :</b>		
5.6.6.1	5 mm	Meter	118.00
5.6.6.2	6 mm	Meter	241.00
5.6.6.3	8 mm	Meter	498.00
5.6.6.4	10 mm	Meter	611.00
5.6.6.5	12 mm	Meter	1098.00
<b>5.6.7</b>	<b>Dia. of pipe 550 mm (I.D) Thickness of pipe :</b>		
5.6.7.1	5 mm	Meter	130.00
5.6.7.2	6 mm	Meter	264.00
5.6.7.3	8 mm	Meter	546.00
5.6.7.4	10 mm	Meter	669.00
5.6.7.5	12 mm	Meter	1203.00
<b>5.6.8</b>	<b>Dia. of pipe 600 mm (I.D) Thickness of pipe :</b>		
5.6.8.1	6 mm	Meter	287.00
5.6.8.2	8 mm	Meter	594.00
5.6.8.3	10 mm	Meter	728.00
5.6.8.4	12 mm	Meter	1308.00
<b>5.6.9</b>	<b>Dia. of pipe 650 mm (I.D) Thickness of pipe :</b>		
5.6.9.1	6 mm	Meter	311.00
5.6.9.2	8 mm	Meter	643.00
5.6.9.3	10 mm	Meter	787.00
5.6.9.4	12 mm	Meter	1413.00
<b>5.6.10</b>	<b>Dia. of pipe 700 mm (I.D) Thickness of pipe :</b>		
5.6.10.1	6 mm	Meter	334.00
5.6.10.2	8 mm	Meter	691.00
5.6.10.3	10 mm	Meter	846.00
5.6.10.4	12 mm	Meter	1517.00
5.6.10.5	14 mm	Meter	1526.00
<b>5.6.11</b>	<b>Dia. of pipe 750 mm (I.D) Thickness of pipe :</b>		
5.6.11.1	7 mm	Meter	359.00
5.6.11.2	8 mm	Meter	739.00
5.6.11.3	10 mm	Meter	904.00

Sr. No.	Description of Item	Unit	Rate (in Rs.)
5.6.11.4	12 mm	Meter	1622.00
<b>5.6.12</b>	<b>Dia. of pipe 800 mm (I.D) Thickness of pipe :</b>		
5.6.12.1	7 mm	Meter	382.00
5.6.12.2	8 mm	Meter	787.00
5.6.12.3	10 mm	Meter	963.00
5.6.12.4	12 mm	Meter	1727.00
<b>5.6.13</b>	<b>Dia. of pipe 850 mm (I.D) Thickness of pipe :</b>		
5.6.13.1	8 mm	Meter	820.00
5.6.13.2	10 mm	Meter	1017.00
5.6.13.3	12 mm	Meter	1823.00
<b>5.6.14</b>	<b>Dia. of pipe 900 mm (I.D) Thickness of pipe :</b>		
5.6.14.1	8 mm	Meter	868.00
5.6.14.2	10 mm	Meter	1076.00
5.6.14.3	12 mm	Meter	1928.00
<b>5.6.15</b>	<b>Dia. of pipe 950 mm (I.D) Thickness of pipe :</b>		
5.6.15.1	8 mm	Meter	868.00
5.6.15.2	10 mm	Meter	1076.00
5.6.15.3	12 mm	Meter	1928.00
<b>5.6.16</b>	<b>Dia. of pipe 1000 mm (I.D) Thickness of pipe :</b>		
5.6.16.1	8 mm	Meter	980.00
5.6.16.2	10 mm	Meter	1198.00
5.6.16.3	12 mm	Meter	2146.00
<b>5.6.17</b>	<b>Dia. of pipe 1050 mm (I.D) Thickness of pipe :</b>		
5.6.17.1	8 mm	Meter	1028.00
5.6.17.2	10 mm	Meter	1257.00
5.6.17.3	12 mm	Meter	2251.00
<b>5.6.18</b>	<b>Dia. of pipe 1100 mm (I.D) Thickness of pipe :</b>		
5.6.18.1	10 mm	Meter	1315.00
5.6.18.2	12 mm	Meter	2356.00
<b>5.6.19</b>	<b>Dia. of pipe 1150 mm (I.D) Thickness of pipe :</b>		
5.6.19.1	10 mm	Meter	1374.00
5.6.19.2	12 mm	Meter	2460.00
<b>5.6.20</b>	<b>Dia. of pipe 1200 mm (I.D) Thickness of pipe :</b>		
5.6.20.1	10 mm	Meter	1433.00
5.6.20.2	12 mm	Meter	2565.00
<b>5.6.21</b>	<b>Dia. of pipe 1250 mm (I.D) Thickness of pipe :</b>		
5.6.21.1	10 mm	Meter	1491.00
5.6.21.2	12 mm	Meter	2670.00
<b>5.6.22</b>	<b>Dia. of pipe 1300 mm (I.D) Thickness of pipe :</b>		
5.6.22.1	10 mm	Meter	1550.00
5.6.22.2	12 mm	Meter	2775.00
<b>5.6.23</b>	<b>Dia. of pipe 1350 mm (I.D) Thickness of pipe :</b>		
5.6.23.1	10 mm	Meter	1609.00
5.6.23.2	12 mm	Meter	2880.00
<b>5.6.24</b>	<b>Dia. of pipe 1400 mm (I.D) Thickness of pipe :</b>		

Sr. No.	Description of Item	Unit	Rate (in Rs.)
5.6.24.1	12 mm	Meter	2976.00
5.6.24.2	14 mm	Meter	2984.00
<b>5.6.25</b>	<b>Dia. of pipe 1450 mm (I.D) Thickness of pipe :</b>		
5.6.25.1	12 mm	Meter	3081.00
5.6.25.2	14 mm	Meter	3089.00
<b>5.6.26</b>	<b>Dia. of pipe 1500 mm (I.D) Thickness of pipe :</b>		
5.6.26.1	12 mm	Meter	3185.00
5.6.26.2	14 mm	Meter	3194.00
<b>5.6.27</b>	<b>Dia. of pipe 1550 mm (I.D) Thickness of pipe :</b>		
5.6.27.1	12 mm	Meter	3290.00
5.6.27.2	14 mm	Meter	3299.00
<b>5.6.28</b>	<b>Dia. of pipe 1600 mm (I.D) Thickness of pipe :</b>		
5.6.28.1	14 mm	Meter	3395.00
5.6.28.2	16 mm	Meter	3403.00
<b>5.6.29</b>	<b>Dia. of pipe 1650 mm (I.D) Thickness of pipe :</b>		
5.6.29.1	14 mm	Meter	3525.00
5.6.29.2	16 mm	Meter	3533.00
5.6.29.3	18 mm	Meter	3592.00
<b>5.6.30</b>	<b>Dia. of pipe 1700 mm (I.D) Thickness of pipe :</b>		
5.6.30.1	14 mm	Meter	3630.00
5.6.30.2	16 mm	Meter	3638.00
5.6.30.3	18 mm	Meter	3697.00
<b>5.6.31</b>	<b>Dia. of pipe 1750 mm (I.D) Thickness of pipe :</b>		
5.6.31.1	14 mm	Meter	3735.00
5.6.31.2	16 mm	Meter	3743.00
5.6.31.3	18 mm	Meter	3802.00
<b>5.6.32</b>	<b>Dia. of pipe 1800 mm (I.D) Thickness of pipe :</b>		
5.6.32.1	14 mm	Meter	3839.00
5.6.32.2	16 mm	Meter	3848.00
5.6.32.3	18 mm	Meter	3906.00
<b>5.6.33</b>	<b>Dia. of pipe 1850 mm (I.D) Thickness of pipe :</b>		
5.6.33.1	14 mm	Meter	3944.00
5.6.33.2	16 mm	Meter	3953.00
5.6.33.3	20 mm	Meter	4011.00
<b>5.6.34</b>	<b>Dia. of pipe 1900 mm (I.D) Thickness of pipe :</b>		
5.6.34.1	16 mm	Meter	4049.00
5.6.34.2	18 mm	Meter	4057.00
5.6.34.3	20 mm	Meter	4116.00
<b>5.6.35</b>	<b>Dia. of pipe 1950 mm (I.D) Thickness of pipe :</b>		
5.6.35.1	16 mm	Meter	4154.00
5.6.35.2	18 mm	Meter	4162.00
5.6.35.3	20 mm	Meter	4170.00
<b>5.6.36</b>	<b>Dia. of pipe 2000 mm (I.D) Thickness of pipe :</b>		
5.6.36.1	16 mm	Meter	4258.00
5.6.36.3	20 mm	Meter	4275.00



Sr. No.	Description of Item	Unit	Rate (in Rs.)
5.7	Providing & applying 30 mm thick 1:3 cement mortar coating outside face of M S pipe as per relevant IS specification including testing along with fixing of (100 x 3 mm) wire mesh as per approved specification per Sqm.	Sqm	656.00
5.8	Providing & applying inside 20 mm thick 1:2 cement mortar on inside face of pipe as per relevant IS specification including testing as directed by Engineer in Charge	Sqm	420.00
5.9	Providing & applying 406 micron epoxy coating as per relevant IS 3589 & other relevant specification on outside face of pipe including testing.	Sqm	373.00
5.10	Providing & applying 406 micron food grade epoxy coating on inside face of pipe as per IS 3589 & other relevant IS specification including testing.	Sqm	373.00
5.11	Providing & applying External Polyurethane Coating on outer face of Pipe as per relevant IS codes with the coating on teel pipes using 100% solids (Solventless) two compent, fast curing Rigid, Direct to metal (DTM), polyurethane Coating classified under ASTM D-16, Type-V and latest editions of ANSI/ AWWA C222 standard to be followed.	Sqm	756.00
5.12	Providing & applying external anti-corrosion 3 LPE Coating on outer face of Pipe as per IS 3589 & other relevant IS codes by using 3 layers side Extruded Polyethylene coating (confirming to DIN - 30670).	Sqm	1220.00
5.13	Providing & applying external Coating of Dual Layer Fusion bond epoxy (DRBE) on outer face of steel pipe as per the IS 3589 & IS 15659 Part-2, 2006 and other relevant IS codes, DFBE Coating to be Compling with standards of CSA Z245.20-18.	Sqm	697.00

**CHAPTER - 06**

**ASBESTOS CEMENT PRESSURE PIPES AND  
COST IRON FITTINGS**

## CHAPTER – 06

### ASBESTOS CEMENT PRESSURE PIPES AN COST IRON FITTINGS

#### NOTES:

- 1 The A.C.P. pipes shall be conforming to IS - 1592:2003
- 2 The laying of A.C.P pipes shall be done as per IS - 6530: 1972
- 3 C.I. specials for A.C.P. pipes shall be done as per IS - 5531:2014
- 4 The C.I.D. joints shall be conforming to IS - 8794:1988
- 5 The rubber sealing of the D. Joint shall be conforming to IS - 10292:1988
- 6 All measurements shall be of the finished work.
- 7 Work shall be executed in accordance with the Indian Standards Specifications and special notes if any, covered in the agreement of the work.
- 8 This USOR contains the rates of all the items without GST. GST shall be paid separately as per prevailing government norms as claimed by the contractor in his bill. All the estimates based on this USOR will include GST as an extra amount as per prevailing rates on the sum of the estimate to arrive at the gross amount.

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### ASBESTOS CEMENT PRESSURE PIPES AN COST IRON FITTINGS

S.No.	Particulars of Items	Unit	Rate (in Rs)		
6.1	Providing, laying and jointing of following Asbestos cement pressure pipe ISI marked conforming to IS1592/03 tested to the required pressure including testing of joints, cost of pipes but excluding cost of CI detachable joint all complete manufactured by mazza process.		Class 15	Class 20	Class 25
6.1.1	80 mm	Meter	277.00	359.00	456.00
6.1.2	100 mm	Meter	313.00	395.00	493.00
6.1.3	125 mm	Meter	412.00	510.00	641.00
6.1.4	150 mm	Meter	571.00	708.00	890.00
6.1.5	200 mm	Meter	973.00	1219.00	1548.00
6.1.6	250 mm	Meter	1275.00	1663.00	2026.00
6.1.7	300 mm	Meter	1758.00	2261.00	2885.00
6.1.8	350 mm	Meter	2198.00	2850.00	3593.00
6.2	Providing, laying and jointing of Asbestos cement pressure pipe with A.C. coupler Joint ISI marked and conforming to IS-1592/03 tested to the required pressure including testing of joints, cost of pipes all complete. manufactured by mazza process.		Class 15	Class 20	Class 25
6.2.1	80 mm	Meter	347.00	442.00	545.00
6.2.2	100 mm	Meter	372.00	462.00	564.00
6.2.3	125 mm	Meter	478.00	586.00	732.00

S.No.	Particulars of Items	Unit	Rate (in Rs)		
6.2.4	150 mm	Meter	577.00	716.00	900.00
6.2.5	200 mm	Meter	978.00	1252.00	1557.00
6.2.6	250 mm	Meter	1307.00	1669.00	2075.00
6.2.7	300 mm	Meter	1808.00	2338.00	2968.00
6.2.8	350 mm	Meter	2343.00	3033.00	3792.00
6.3	Labour for laying in position including testing of following Asbestos cement pressure pipes Class 15, 20 & 25.				
6.3.1	80 mm	Meter	8.00		
6.3.2	100 mm	Meter	10.00		
6.3.3	125 mm	Meter	14.00		
6.3.4	150 mm	Meter	19.00		
6.3.5	200 mm	Meter	34.00		
6.3.6	250 mm	Meter	45.00		
6.3.7	300 mm	Meter	62.00		
6.3.8	350 mm	Meter	68.00		
6.4	Providing & fixing detachable joints to following size asbestos cement pressure pipes and fittings including cost of C.I. detachable joints conforming to IS/8794/1988 with bolts, nuts and rubber rings conforming to IS-5382/85 & IS-10292/88 manufactured by mazza process including testing.		Class 15	Class 20	Class 25
6.4.1	80 mm	Each	311.00	319.00	323.00
6.4.2	100 mm	Each	402.00	417.00	413.00
6.4.3	125 mm	Each	502.00	544.00	552.00
6.4.4	150 mm	Each	614.00	624.00	660.00
6.4.5	200 mm	Each	866.00	942.00	971.00
6.4.6	250 mm	Each	1081.00	1193.00	1209.00
6.4.7	300 mm	Each	1322.00	1501.00	1519.00
6.4.8	350 mm	Each	2208.00	2383.00	2688.00
6.5	Labour for providing detachable joints to asbestos cement pressure pipes and fittings Class 15, 20 & 25 including testing of joints but excluding cost of C.I. Detachable joints.				
6.5.1	80 mm	Each	82.00		
6.5.2	100 mm	Each	116.00		
6.5.3	125 mm	Each	136.00		
6.5.4	150 mm	Each	149.00		
6.5.5	200 mm	Each	168.00		

S.No.	Particulars of Items	Unit	Rate (in Rs)		
6.5.6	250 mm	Each	178.00		
6.5.7	300 mm	Each	203.00		
6.5.8	350 mm	Each	226.00		
6.6	Providing and laying in position including testing of following Cast Iron plain ended 90 <sup>0</sup> bends conforming to IS/ 5531/1988 (Reaffirmed 2002). manufactured by mazza process.		Class 15	Class 20	Class 25
6.6.1	80 mm	Each	539.00	615.00	696.00
6.6.2	100 mm	Each	750.00	922.00	1045.00
6.6.3	125 mm	Each	1051.00	1276.00	1444.00
6.6.4	150 mm	Each	1489.00	1822.00	2049.00
6.6.5	200 mm	Each	2586.00	3169.00	3585.00
6.6.6	250 mm	Each	3778.00	4627.00	5127.00
6.6.7	300 mm	Each	5517.00	6776.00	7508.00
6.6.8	350 mm	Each	7412.00	9016.00	10472.00
6.7	Labour for laying in position including testing of following Cast Iron plain ended 90 <sup>0</sup> bends conforming to IS/ 5531/ 1988 (Reaffirmed 2002)		Class 15	Class 20	Class 25
6.7.1	80 mm	Each	18.00	19.00	25.00
6.7.2	100 mm	Each	24.00	31.00	38.00
6.7.3	125 mm	Each	37.00	42.00	46.00
6.7.4	150 mm	Each	50.00	61.00	69.00
6.7.5	200 mm	Each	85.00	106.00	124.00
6.7.6	250 mm	Each	119.00	145.00	166.00
6.7.7	300 mm	Each	171.00	211.00	244.00
6.7.8	350 mm	Each	216.00	244.00	267.00
6.8	Providing and laying in position including testing of following Cast Iron plain ended 45 <sup>0</sup> bends conforming to IS/ 5531/ 1988 (Reaffirmed 2002). manufactured by mazza process.		Class 15	Class 20	Class 25
6.8.1	80 mm	Each	546.00	622.00	701.00
6.8.2	100 mm	Each	737.00	906.00	1023.00
6.8.3	125 mm	Each	991.00	1218.00	1375.00
6.8.4	150 mm	Each	1388.00	1693.00	1908.00
6.8.5	200 mm	Each	2311.00	2850.00	3225.00
6.8.6	250 mm	Each	3247.00	4004.00	4468.00
6.8.7	300 mm	Each	4622.00	5721.00	6427.00
6.8.8	350 mm	Each	6201.00	7665.00	8909.00
6.9	Labour for laying in position		Class 15	Class 20	Class 25

S.No.	Particulars of Items	Unit	Rate (in Rs)		
	including testing of following Cast Iron plain ended 45 <sup>0</sup> bends conforming to IS/ 5531/ 1988 (Reaffirmed 2002)				
6.9.1	80 mm	Each	18.00	18.00	23.00
6.9.2	100 mm	Each	24.00	29.00	29.00
6.9.3	125 mm	Each	32.00	40.00	39.00
6.9.4	150 mm	Each	45.00	56.00	51.00
6.9.5	200 mm	Each	77.00	95.00	79.00
6.9.6	250 mm	Each	108.00	132.00	116.00
6.9.7	300 mm	Each	154.00	190.00	164.00
6.9.8	350 mm	Each	178.00	225.00	195.00
6.10	Providing and laying in position including testing of following Cast Iron plain ended 22.5 <sup>0</sup> bends conforming to IS/ 5531/ 1988 (Reaffirmed 2002). manufactured by mazza process.		Class 15	Class 20	Class 25
6.10.1	80 mm	Each	384.00	439.00	513.00
6.10.2	100 mm	Each	519.00	648.00	753.00
6.10.3	125 mm	Each	687.00	855.00	1009.00
6.10.4	150 mm	Each	971.00	1200.00	1414.00
6.10.5	200 mm	Each	1617.00	2023.00	2413.00
6.10.6	250 mm	Each	2203.00	2771.00	3243.00
6.10.7	300 mm	Each	3127.00	3943.00	4666.00
6.10.8	350 mm	Each	4512.00	5704.00	6881.00
6.11	Labour for laying in position including testing of following Cast Iron plain ended 22.5 <sup>0</sup> bends conforming to IS/ 5531/ 1988 (Reaffirmed 2002)		Class 15	Class 20	Class 25
6.11.1	80 mm	Each	13.00	16.00	18.00
6.11.2	100 mm	Each	18.00	24.00	25.00
6.11.3	125 mm	Each	24.00	29.00	33.00
6.11.4	150 mm	Each	34.00	42.00	48.00
6.11.5	200 mm	Each	56.00	71.00	85.00
6.11.6	250 mm	Each	77.00	98.00	115.00
6.11.7	300 mm	Each	109.00	137.00	165.00
6.11.8	350 mm	Each	126.00	166.00	198.00
6.12	Providing and laying in position including testing of following Cast Iron plain ended 11¼ <sup>0</sup> bends conforming to IS/ 5531/ 1988 (Reaffirmed 2002) manufactured by mazza process.		Class 15	Class 20	Class 25

S.No.	Particulars of Items	Unit	Rate (in Rs)		
6.12.1	80 mm	Each	333.00	376.00	452.00
6.12.2	100 mm	Each	448.00	567.00	680.00
6.12.3	125 mm	Each	587.00	737.00	898.00
6.12.4	150 mm	Each	835.00	1042.00	1268.00
6.12.5	200 mm	Each	1398.00	1772.00	2180.00
6.12.6	250 mm	Each	1849.00	2368.00	2865.00
6.12.7	300 mm	Each	2623.00	3366.00	4115.00
6.12.8	350 mm	Each	3532.00	4552.00	5605.00
6.13	Labour for laying in position including testing of following Cast Iron plain ended 11¼ <sup>0</sup> bends conforming to IS/ 5531/ 1988 (Reaffirmed 2002)		Class 15	Class 20	Class 25
6.13.1	80 mm	Each	11.00	13.00	14.00
6.13.2	100 mm	Each	16.00	18.00	22.00
6.13.3	125 mm	Each	18.00	24.00	28.00
6.13.4	150 mm	Each	26.00	34.00	41.00
6.13.5	200 mm	Each	48.00	58.00	68.00
6.13.6	250 mm	Each	61.00	79.00	96.00
6.13.7	300 mm	Each	87.00	111.00	133.00
6.13.8	350 mm	Each	112.00	144.00	171.00
6.14	Providing and laying in position including testing of following Cast Iron plain ended Tees Body & Branch conforming to IS/ 5531/ 1988 (Reaffirmed 2002) manufactured by mazza process.		Class 15	Class 20	Class 25
6.14.1	80 mm x 80 mm	Each	666.00	761.00	876.00
6.14.2	100 mm x 80 mm	Each	863.00	994.00	1123.00
6.14.3	100 mm x 100 mm	Each	952.00	1178.00	1350.00
6.14.4	125 mm x 80 mm	Each	1096.00	1303.00	1460.00
6.14.5	125 mm x 100 mm	Each	1214.00	1549.00	1743.00
6.14.6	125 mm x 125 mm	Each	1365.00	1674.00	1908.00
6.14.7	150 mm x 80 mm	Each	1660.00	2009.00	2262.00
6.14.8	150 mm x 100 mm	Each	1733.00	2126.00	2404.00
6.14.9	150 mm x 125 mm	Each	1831.00	2242.00	2548.00
6.14.10	150 mm x 150 mm	Each	1995.00	2441.00	2765.00
6.14.11	200 mm x 80 mm	Each	2839.00	3456.00	3897.00
6.14.12	200 mm x 100 mm	Each	2921.00	3697.00	4034.00
6.14.13	200 mm x 125 mm	Each	3023.00	3901.00	4185.00
6.14.14	200 mm x 150 mm	Each	3243.00	4372.00	4412.00
6.14.15	200 mm x 200 mm	Each	3571.00	5090.00	4986.00
6.14.16	250 mm x 80 mm	Each	4195.00	5233.00	5637.00
6.14.17	250 mm x 100 mm	Each	4277.00	5238.00	5781.00
6.14.18	250 mm x 125 mm	Each	4395.00	5376.00	5946.00
6.14.19	250 mm x 150 mm	Each	4566.00	5586.00	6185.00

S.No.	Particulars of Items	Unit	Rate (in Rs)		
6.14.20	250 mm x 200 mm	Each	4969.00	6088.00	6775.00
6.14.21	250 mm x 250 mm	Each	5340.00	6561.00	7275.00
6.14.22	300 mm x 80 mm	Each	6176.00	7542.00	8306.00
6.14.23	300 mm x 100 mm	Each	6259.00	7679.00	8448.00
6.14.24	300 mm x 125 mm	Each	6383.00	7814.00	8654.00
6.14.25	300 mm x 150 mm	Each	6485.00	7952.00	8790.00
6.14.26	300 mm x 200 mm	Each	6994.00	8569.00	9474.00
6.14.27	300 mm x 250 mm	Each	7404.00	9049.00	9757.00
6.14.28	300 mm x 300 mm	Each	7953.00	9803.00	10916.00
6.14.29	350 mm x 200 mm	Each	9247.00	11302.00	13079.00
6.14.30	350 mm x 250 mm	Each	9657.00	11783.00	13700.00
6.14.31	350 mm x 300 mm	Each	10275.00	12535.00	14583.00
6.14.32	350 mm x 350 mm	Each	10822.00	13288.00	15415.00
6.15	Labour for laying in position including testing of following Cast Iron plain ended Tees Body & Branch conforming to IS/5531/1988 (Reaffirmed 2002)		Class 15	Class 20	Class 25
6.15.1	80 mm x 80 mm	Each	24.00	26.00	29.00
6.15.2	100 mm x 80 mm	Each	29.00	34.00	38.00
6.15.3	100 mm x 100 mm	Each	32.00	40.00	46.00
6.15.4	125 mm x 80 mm	Each	37.00	45.00	50.00
6.15.5	125 mm x 100 mm	Each	42.00	53.00	61.00
6.15.6	125 mm x 125 mm	Each	48.00	58.00	68.00
6.15.7	150 mm x 80 mm	Each	58.00	69.00	77.00
6.15.8	150 mm x 100 mm	Each	58.00	74.00	87.00
6.15.9	150 mm x 125 mm	Each	63.00	77.00	92.00
6.15.10	150 mm x 150 mm	Each	69.00	85.00	96.00
6.15.11	200 mm x 80 mm	Each	98.00	119.00	137.00
6.15.12	200 mm x 100 mm	Each	101.00	122.00	141.00
6.15.13	200 mm x 125 mm	Each	103.00	127.00	147.00
6.15.14	200 mm x 150 mm	Each	111.00	135.00	155.00
6.15.15	200 mm x 200 mm	Each	122.00	151.00	173.00
6.15.16	250 mm x 80 mm	Each	143.00	174.00	202.00
6.15.17	250 mm x 100 mm	Each	145.00	180.00	206.00
6.15.18	250 mm x 125 mm	Each	151.00	185.00	213.00
6.15.19	250 mm x 150 mm	Each	157.00	190.00	220.00
6.15.20	250 mm x 200 mm	Each	169.00	209.00	240.00
6.15.21	250 mm x 250 mm	Each	183.00	225.00	257.00
6.15.22	300 mm x 80 mm	Each	211.00	259.00	296.00
6.15.23	300 mm x 100 mm	Each	214.00	264.00	304.00
6.15.24	300 mm x 125 mm	Each	220.00	267.00	312.00
6.15.25	300 mm x 150 mm	Each	222.00	272.00	316.00
6.15.26	300 mm x 200 mm	Each	241.00	294.00	338.00
6.15.27	300 mm x 250 mm	Each	254.00	309.00	356.00



S.No.	Particulars of Items	Unit	Rate (in Rs)		
6.15.28	300 mm x 300 mm	Each	273.00	336.00	389.00
6.15.29	350 mm x 200 mm	Each	316.00	386.00	443.00
6.15.30	350 mm x 250 mm	Each	329.00	405.00	469.00
6.15.31	350 mm x 300 mm	Each	351.00	428.00	492.00
6.15.32	350 mm x 350 mm	Each	370.00	454.00	530.00
6.16	Providing and laying in position including testing of following Cast Iron plain ended Crosses conforming to IS/5531/1988 (Reaffirmed 2002) manufactured by mazza process.		Class 15	Class 20	Class 25
6.16.1	80 mm x 80 mm	Each	879.00	993.00	1149.00
6.16.2	100 mm x 100 mm	Each	1245.00	1548.00	1788.00
6.16.3	125 mm x 125 mm	Each	1773.00	2176.00	2507.00
6.16.4	150 mm x 150 mm	Each	2602.00	3183.00	3637.00
6.16.5	200 mm x 200 mm	Each	4664.00	5722.00	6557.00
6.16.6	250 mm x 250 mm	Each	6916.00	8501.00	9517.00
6.16.7	300 mm x 300 mm	Each	10315.00	12678.00	14199.00
6.16.8	350 mm x 350 mm	Each	15103.00	18448.00	21467.00
6.17	Labour for laying in position including testing of following Cast Iron plain ended Crosses conforming to IS/5531/1988 (Reaffirmed 2002)		Class 15	Class 20	Class 25
6.17.1	80 mm x 80 mm	Each	29.00	32.00	34.00
6.17.2	100 mm x 100 mm	Each	40.00	50.00	60.00
6.17.3	125 mm x 125 mm	Each	58.00	71.00	82.00
6.17.4	150 mm x 150 mm	Each	86.00	103.00	118.00
6.17.5	200 mm x 200 mm	Each	155.00	189.00	216.00
6.17.6	250 mm x 250 mm	Each	232.00	277.00	318.00
6.17.7	300 mm x 300 mm	Each	349.00	412.00	470.00
6.17.8	350 mm x 350 mm	Each	456.00	555.00	629.00
6.18	Providing and laying in position including testing of following Cast Iron plain ended Reducers conforming to IS/5531/1988 (Reaffirmed 2002) manufactured by mazza process.		Class 15	Class 20	Class 25
6.18.1	100 mm x 80 mm	Each	594.00	709.00	809.00
6.18.2	125 mm x 80 mm	Each	702.00	835.00	955.00
6.18.3	125 mm x 100 mm	Each	780.00	957.00	1097.00
6.18.4	150 mm x 80 mm	Each	858.00	1028.00	1176.00
6.18.5	150 mm x 100 mm	Each	936.00	1154.00	1322.00
6.18.6	150 mm x 125 mm	Each	1042.00	1276.00	1473.00
6.18.7	200 mm x 100 mm	Each	1290.00	1595.00	1856.00

S.No.	Particulars of Items	Unit	Rate (in Rs)		
6.18.8	200 mm x 125 mm	Each	1388.00	1717.00	2021.00
6.18.9	200 mm x 150 mm	Each	1551.00	1914.00	2235.00
6.18.10	250 mm x 125 mm	Each	1687.00	2029.00	2431.00
6.18.11	250 mm x 150 mm	Each	1849.00	2297.00	2658.00
6.18.12	250 mm x 200 mm	Each	2198.00	2735.00	3185.00
6.18.13	300 mm x 150 mm	Each	2304.00	2877.00	3365.00
6.18.14	300 mm x 200 mm	Each	2657.00	3318.00	3910.00
6.18.15	300 mm x 250 mm	Each	2942.00	3543.00	4305.00
6.18.16	350 mm x 300 mm	Each	5493.00	6765.00	7805.00
6.19	Labour for laying in position including testing of following Cast Iron plain ended Reducers conforming to IS/5531/1988 (Reaffirmed 2002)		Class 15	Class 20	Class 25
6.19.1	100 mm x 80 mm	Each	18.00	24.00	28.00
6.19.2	125 mm x 80 mm	Each	24.00	26.00	30.00
6.19.3	125 mm x 100 mm	Each	27.00	32.00	35.00
6.19.4	150 mm x 80 mm	Each	29.00	34.00	39.00
6.19.5	150 mm x 100 mm	Each	32.00	37.00	41.00
6.19.6	150 mm x 125 mm	Each	34.00	42.00	48.00
6.19.7	200 mm x 100 mm	Each	42.00	53.00	61.00
6.19.8	200 mm x 125 mm	Each	45.00	58.00	82.00
6.19.9	200 mm x 150 mm	Each	50.00	63.00	76.00
6.19.10	250 mm x 125 mm	Each	56.00	69.00	81.00
6.19.11	250 mm x 150 mm	Each	61.00	77.00	88.00
6.19.12	250 mm x 200 mm	Each	74.00	90.00	101.00
6.19.13	300 mm x 150 mm	Each	77.00	95.00	110.00
6.19.14	300 mm x 200 mm	Each	87.00	111.00	134.00
6.19.15	300 mm x 250 mm	Each	98.00	116.00	138.00
6.19.16	350 mm x 300 mm	Each	171.00	212.00	244.00
6.20	Providing and laying in position including testing of following Cast Iron Flange spigot (Adopter) conforming to IS/ 5531/ 1988 (Reaffirmed 2002) manufactured by mazza process.		Class 15	Class 20	Class 25
6.20.1	80 mm	Each	534.00	569.00	614.00
6.20.2	100 mm	Each	655.00	735.00	792.00
6.20.3	125 mm	Each	842.00	938.00	1059.00
6.20.4	150 mm	Each	1103.00	1231.00	1347.00
6.20.5	200 mm	Each	1635.00	1859.00	2068.00
6.20.6	250 mm	Each	2652.00	3048.00	3306.00
6.20.7	300 mm	Each	3442.00	3983.00	4373.00
6.20.8	350 mm	Each	4358.00	5040.00	5675.00
6.21	Labour for laying in position including testing of following		Class 15	Class 20	Class 25

S.No.	Particulars of Items	Unit	Rate (in Rs)		
	Cast Iron Flange spigot (Adopter) conforming to IS/ 5531/ 1988 (Reaffirmed 2002)				
6.21.1	80 mm	Each	18.00	18.00	22.00
6.21.2	100 mm	Each	21.00	24.00	26.00
6.21.3	125 mm	Each	27.00	32.00	35.00
6.21.4	150 mm	Each	37.00	40.00	44.00
6.21.5	200 mm	Each	53.00	61.00	68.00
6.21.6	250 mm	Each	87.00	101.00	114.00
6.21.7	300 mm	Each	111.00	130.00	142.00
6.21.8	350mm	Each	142.00	166.00	184.00
6.22	Providing and laying in position including testing of following Cast Iron end plugs (Dead end cap) conforming to IS/ 5531/ 1988 (Reaffirmed 2002) manufactured by mazza process.		Class 15	Class 20	Class 25
6.22.1	80 mm	Each	245.00	266.00	318.00
6.22.2	100 mm	Each	352.00	397.00	510.00
6.22.3	125 mm	Each	490.00	583.00	709.00
6.22.4	150 mm	Each	735.00	872.00	1051.00
6.22.5	200 mm	Each	1341.00	1614.00	1954.00
6.22.6	250 mm	Each	1900.00	2283.00	2718.00
6.22.7	300 mm	Each	2818.00	3380.00	4058.00
6.22.8	350 mm	Each	3932.00	4708.00	5561.00
6.23	Labour for laying in position including testing of following Cast Iron end plugs (Dead end cap) conforming to IS/ 5531/ 1988 (Reaffirmed 2002)		Class 15	Class 20	Class 25
6.23.1	80 mm	Each	8.00	8.00	11.00
6.23.2	100 mm	Each	11.00	13.00	15.00
6.23.3	125 mm	Each	16.00	18.00	19.00
6.23.4	150 mm	Each	24.00	29.00	33.00
6.23.5	200 mm	Each	45.00	53.00	58.00
6.23.6	250 mm	Each	60.00	74.00	84.00
6.23.7	300 mm	Each	93.00	111.00	127.00
6.23.8	350 mm	Each	118.00	144.00	164.00

**CHAPTER - 07**  
**BAR WRAPPED STEEL CYLINDER PIPES**  
**(BWSC)**

## CHAPTER – 07

### BAR WRAPPED STEEL CYLINDER PIPES (BWSC)

#### NOTES :

##### 1 Scope

This specification covers the requirements for design, manufacturing, testing, supplying, laying, jointing, welding and testing at works and site of Bar Wrapped Steel Cylinder (BWSC) Pipes used for water supply mains.

##### 2 Applicable Codes

IS:	Specifications for structural Steel (Standard Quality)
226:1975	
IS: 38:2016	Specifications for coarse and fine aggregates from natural sources for concrete
IS:	Specifications for mild steel and medium tensile steel bar/wires for concrete reinforcement
432:1982	
Part1	Mild Steel and medium tensile steel bar/wires
Part2	Hard drawn steel wire
IS:	Specifications for Hard Drawn Steel Wire for Concrete Reinforcement
1566:1982	
IS:2062	Specifications for Steel for General Structural Purposes
IS:	Methods of Test for Concrete Pipes
3597:1988	
IS:	Code of Practice for liquid penetrant flaw detection
3658:1999	
IS:	Code of Practice for laying of Electrically Welded Steel Pipes for Water Supply
5822:1994	
IS:	Specifications for Specials for Steel Cylinder Reinforced Concrete pipes
7322:1985	
IS:	Specifications for Bar Wrapped steel Cylinder Pipes (including Fittings)
15155:2020	
AWWA	Manual M-9 Concrete pressure pipe
EN641	Reinforced Concrete Pressure Pipe, Cylinder Type, including Joints & fittings

Other I.S Codes not specifically mentioned here but pertaining to the use of BWSC pipes form part of these Specifications.

##### 3 Design Criteria

The reinforcement of the pipe shall consist of a welded steel cylinder and bar/wire is directly wrapped under low tension. The average circumferential stress in the steel cylinder and bar/wire reinforcement of the pipe shall be as given below: -

At factory test pressure, stress shall not exceed 187 N/mm<sup>2</sup> nor 75 percent of the minimum yield strength of the steel used in the cylinder.

At site test pressure, stress shall neither exceed 165 N/mm<sup>2</sup> nor 75 percent of the minimum yield strength of the steel used in the cylinder.

At working pressure, stress shall not exceed 125 N/mm<sup>2</sup> nor 50 percent of the minimum yield strength of the steel used in the cylinder.

- 4 Preparing Pipe faces for Welding: Before aligning, assembling and welding, the pipe faces shall be cleaned by scrapping by wire brushes or any other method specified by the authority.

- 5 **Welding:** Generally the welding of pipe in the field should comply with IS : 816: 1969.

5.1 For field welding rates applicable for similar welding in M S Pipes, shall be adopted

- 6 **Internal Diameter:** The internal diameter shall be measured at each end of the pipe at approximately 50 mm from the ends. Two measurements of the internal diameter at 90° to each other shall be made at each end and centre. The internal diameter shall be maintained within the tolerance specified
- 7 **Wall Thickness:** Measurement of outside circumference of the pipe shall be made at three positions and average outside diameter of the pipe shall be calculated. The inside diameter shall be measured at three positions and average shall be calculated.
- 8 **Specials and Fittings**
  - 8.1 The steel for fabricated steel plate specials, in cut, shaped and welded so that finished special has the required shape and internal dimensions. Adjacent segments are jointed by butt welding. Before lining and coating the welding of special shall be tested by use of hot oil or dye penetrant according to IS 3658 and defects, if any shall be rectified. The steel plate thickness for specials shall be as given in IS: 7322.
  - 8.2 All the specials shall be tested for hydrostatic pressure as specified for BWSC pipes and to the pressure specified for pipes in the reaches where the specials are fitted.
- 9 **Specials and Fittings** For lowering, laying & pouring of cement mortar in the field on joints (after laying & welding) rate as per PSC pipes Lowering, laying & jointing shall be adopted.
- 10 Whenever manufacturer is separate and contractor for lowering, laying, jointing & testing are different, the principal contractor shall enter in to the agreement with BWSC pipe manufacturer for satisfactory manufacturing, transporting, lowering, laying, jointing and testing of pipe.
- 11 **Measurement:-** The net length of pipes as laid or fixed shall be measured in running meters correct to a cm. Specials shall be excluded and measured and paid separately under the relevant item. The portion of the pipe at the joints (inside the joints) shall not be included in the length of pipe work. Excavation, refilling, masonry and concrete work wherever required shall be measured and paid for separately under relevant items of work.
- 12 **Rates-** The rate shall include the cost of materials and labour involved in all the operations except for the items measured/enumerated separately under clause 'Measurements', which shall be paid separately.
- 13 This USOR contains the rates of all the items without GST. No claims against GST shall be entertained at any level. GST shall be paid by the Agency/ Contractor directly to the concerning department. However, All the estimates prepared on this USOR will include GST, as an extra amount as per prevailing rates on the sum of the estimate to arrive at the gross amount.

### **BAR WRAPPED STEEL CYLINDER PIPES (BWSC)**

Sr. No.	Particulars of Items	Unit	Rate (in Rs.)
7.1	Providing Bar Wrapped Steel Cylinder Pipes test Pressure 4 Kg/cm <sup>2</sup> including testing, inspection, transportation at site, transit insurance, loading unloading & stacking etc. complete.		
7.1.1	350 mm dia	Meter	3570.00
7.1.2	400 mm dia	Meter	3941.00
7.1.3	450 mm dia	Meter	4581.00

Sr. No.	Particulars of Items	Unit	Rate (in Rs.)
7.1.4	500 mm dia	Meter	4941.00
7.1.5	600 mm dia	Meter	6303.00
7.1.6	700 mm dia	Meter	7651.00
7.1.7	800 mm dia	Meter	8801.00
7.1.8	900 mm dia	Meter	11062.00
7.1.9	1000 mm dia	Meter	12699.00
7.1.10	1100 mm dia	Meter	18323.00
7.1.11	1200 mm dia	Meter	20420.00
7.1.12	1300 mm dia	Meter	22313.00
7.1.13	1400 mm dia	Meter	25118.00
7.1.14	1500 mm dia	Meter	29707.00
7.1.15	1600 mm dia	Meter	32056.00
7.2	Labour only for laying & jointing Bar Wrapped Steel Cylinder Pipes test Pressure 4 Kg/cm <sup>2</sup> including testing & cost of jointing material as per relevant IS specification.		
7.2.1	350 mm dia	Meter	575.00
7.2.2	400 mm dia	Meter	662.00
7.2.3	450 mm dia	Meter	757.00
7.2.4	500 mm dia	Meter	901.00
7.2.5	600 mm dia	Meter	1019.00
7.2.6	700 mm dia	Meter	1200.00
7.2.7	800 mm dia	Meter	1374.00
7.2.8	900 mm dia	Meter	1737.00
7.2.9	1000 mm dia	Meter	1749.00
7.2.10	1100 mm dia	Meter	2494.00
7.2.11	1200 mm dia	Meter	2775.00
7.2.12	1300 mm dia	Meter	2945.00
7.2.13	1400 mm dia	Meter	2577.00
7.2.14	1500 mm dia	Meter	2778.00
7.2.15	1600 mm dia	Meter	3178.00
7.3	Providing Bar Wrapped Steel Cylinder Pipes test Pressure 6 Kg/cm <sup>2</sup> including testing, inspection, transportation at site, transit insurance, loading unloading & stacking etc. complete		
7.3.1	350 mm dia	Meter	3575.00
7.3.2	400 mm dia	Meter	3946.00
7.3.3	450 mm dia	Meter	4586.00
7.3.4	500 mm dia	Meter	4951.00
7.3.5	600 mm dia	Meter	6311.00
7.3.6	700 mm dia	Meter	7669.00
7.3.7	800 mm dia	Meter	8811.00
7.3.8	900 mm dia	Meter	11071.00
7.3.9	1000 mm dia	Meter	12714.00
7.3.10	1100 mm dia	Meter	18333.00
7.3.11	1200 mm dia	Meter	20435.00

Sr. No.	Particulars of Items	Unit	Rate (in Rs.)
7.3.12	1300 mm dia	Meter	22323.00
7.3.13	1400 mm dia	Meter	25133.00
7.3.14	1500 mm dia	Meter	29727.00
7.3.15	1600 mm dia	Meter	32076.00
7.4	Labour only for laying & Jointing Bar Wrapped Steel Cylinder Pipes Test Pressure 6 Kg/cm <sup>2</sup> including cost of jointing material as per relevant IS specification.		
7.4.1	350 mm dia	Meter	576.00
7.4.2	400 mm dia	Meter	664.00
7.4.3	450 mm dia	Meter	760.00
7.4.4	500 mm dia	Meter	905.00
7.4.5	600 mm dia	Meter	1024.00
7.4.6	700 mm dia	Meter	1204.00
7.4.7	800 mm dia	Meter	1378.00
7.4.8	900 mm dia	Meter	1739.00
7.4.9	1000 mm dia	Meter	1753.00
7.4.10	1100 mm dia	Meter	2496.00
7.4.11	1200 mm dia	Meter	2778.00
7.4.12	1300 mm dia	Meter	2948.00
7.4.13	1400 mm dia	Meter	2579.00
7.4.14	1500 mm dia	Meter	2780.00
7.4.15	1600 mm dia	Meter	3181.00
7.5	Providing Bar Wrapped Steel Cylinder pipes test Pressure 8 Kg/cm <sup>2</sup> including testing, inspection, transportation at site, transit insurance, loading unloading & stacking etc. complete.		
7.5.1	350 mm dia	Meter	3578.00
7.5.2	400 mm dia	Meter	3956.00
7.5.3	450 mm dia	Meter	4692.00
7.5.4	500 mm dia	Meter	4963.00
7.5.5	600 mm dia	Meter	6319.00
7.5.6	700 mm dia	Meter	7690.00
7.5.7	800 mm dia	Meter	8823.00
7.5.8	900 mm dia	Meter	11078.00
7.5.9	1000 mm dia	Meter	12730.00
7.5.10	1100 mm dia	Meter	18348.00
7.5.11	1200 mm dia	Meter	20455.00
7.5.12	1300 mm dia	Meter	22335.00
7.5.13	1400 mm dia	Meter	25152.00
7.5.14	1500 mm dia	Meter	29749.00
7.5.15	1600 mm dia	Meter	32098.00
7.6	Labour only for laying & Jointing Bar Wrapped Steel Cylinder Pipes Test Pressure 8 Kg/cm <sup>2</sup> including cost of jointing material as per relevant IS specification.		
7.6.1	350 mm dia	Meter	577.00



Sr. No.	Particulars of Items	Unit	Rate (in Rs.)
7.6.2	400 mm dia	Meter	669.00
7.6.3	450 mm dia	Meter	764.00
7.6.4	500 mm dia	Meter	910.00
7.6.5	600 mm dia	Meter	1029.00
7.6.6	700 mm dia	Meter	1208.00
7.6.7	800 mm dia	Meter	1383.00
7.6.8	900 mm dia	Meter	1740.00
7.6.9	1000 mm dia	Meter	1758.00
7.6.10	1100 mm dia	Meter	2498.00
7.6.11	1200 mm dia	Meter	2781.00
7.6.12	1300 mm dia	Meter	2953.00
7.6.13	1400 mm dia	Meter	2581.00
7.6.14	1500 mm dia	Meter	2783.00
7.6.15	1600 mm dia	Meter	3184.00
7.7	Providing Bar Wrapped Steel Cylinder Pipes test Pressure 10 Kg/cm <sup>2</sup> including testing, inspection, transportation at site, transit insurance, loading unloading & stacking etc. complete.		
7.7.1	350 mm dia	Meter	3580.00
7.7.2	400 mm dia	Meter	3966.00
7.7.3	450 mm dia	Meter	4600.00
7.7.4	500 mm dia	Meter	4975.00
7.7.5	600 mm dia	Meter	6329.00
7.7.6	700 mm dia	Meter	7715.00
7.7.7	800 mm dia	Meter	8837.00
7.7.8	900 mm dia	Meter	11084.00
7.7.9	1000 mm dia	Meter	12750.00
7.7.10	1100 mm dia	Meter	18368.00
7.7.11	1200 mm dia	Meter	20480.00
7.7.12	1300 mm dia	Meter	22350.00
7.7.13	1400 mm dia	Meter	25177.00
7.7.14	1500 mm dia	Meter	29774.00
7.7.15	1600 mm dia	Meter	32123.00
7.8	Labour only for laying & Jointing Bar Wrapped Steel Cylinder Pipes Test Pressure 10 Kg/cm <sup>2</sup> including cost of jointing material as per relevant IS specification.		
7.8.1	350 mm dia	Meter	577.00
7.8.2	400 mm dia	Meter	674.00
7.8.3	450 mm dia	Meter	769.00
7.8.4	500 mm dia	Meter	916.00
7.8.5	600 mm dia	Meter	1035.00
7.8.6	700 mm dia	Meter	1213.00
7.8.7	800 mm dia	Meter	1388.00
7.8.8	900 mm dia	Meter	1741.00
7.8.9	1000 mm dia	Meter	1763.00

Sr. No.	Particulars of Items	Unit	Rate (in Rs.)
7.8.10	1100 mm dia	Meter	2502.00
7.8.11	1200 mm dia	Meter	2786.00
7.8.12	1300 mm dia	Meter	2957.00
7.8.13	1400 mm dia	Meter	2585.00
7.8.14	1500 mm dia	Meter	2787.00
7.8.15	1600 mm dia	Meter	3187.00
7.9	Providing Bar Wrapped Steel Cylinder Pipes test Pressure 12 Kg/cm <sup>2</sup> including testing, inspection, transportation at site, transit insurance, loading unloading & stacking etc. complete.		
7.9.1	350 mm dia	Meter	3583.00
7.9.2	400 mm dia	Meter	3974.00
7.9.3	450 mm dia	Meter	4607.00
7.9.4	500 mm dia	Meter	4990.00
7.9.5	600 mm dia	Meter	6344.00
7.9.6	700 mm dia	Meter	7744.00
7.9.7	800 mm dia	Meter	9403.00
7.9.8	900 mm dia	Meter	11190.00
7.9.9	1000 mm dia	Meter	13540.00
7.9.10	1100 mm dia	Meter	18393.00
7.9.11	1200 mm dia	Meter	20505.00
7.9.12	1300 mm dia	Meter	22370.00
7.9.13	1400 mm dia	Meter	25207.00
7.9.14	1500 mm dia	Meter	30440.00
7.9.15	1600 mm dia	Meter	32329.00
7.10	Labour only for laying & Jointing Bar Wrapped Steel Cylinder Pipes Test Pressure 12 Kg/cm <sup>2</sup> including cost of jointing material as per relevant IS specification.		
7.10.1	350 mm dia	Meter	578.00
7.10.2	400 mm dia	Meter	681.00
7.10.3	450 mm dia	Meter	775.00
7.10.4	500 mm dia	Meter	922.00
7.10.5	600 mm dia	Meter	1041.00
7.10.6	700 mm dia	Meter	1219.00
7.10.7	800 mm dia	Meter	1460.00
7.10.8	900 mm dia	Meter	1744.00
7.10.9	1000 mm dia	Meter	1848.00
7.10.10	1100 mm dia	Meter	2506.00
7.10.11	1200 mm dia	Meter	2790.00
7.10.12	1300 mm dia	Meter	2962.00
7.10.13	1400 mm dia	Meter	2589.00
7.10.14	1500 mm dia	Meter	3008.00
7.10.15	1600 mm dia	Meter	3336.00
7.11	Providing Bar Wrapped Steel Cylinder Pipes test Pressure 14 Kg/cm <sup>2</sup> including testing, inspection,		

Sr. No.	Particulars of Items	Unit	Rate (in Rs.)
	transportation at site, transit insurance, loading unloading & stacking etc. complete.		
7.11.1	350 mm dia	Meter	3586.00
7.11.2	400 mm dia	Meter	3986.00
7.11.3	450 mm dia	Meter	4619.00
7.11.4	500 mm dia	Meter	5114.00
7.11.5	600 mm dia	Meter	6605.00
7.11.6	700 mm dia	Meter	8529.00
7.11.7	800 mm dia	Meter	10469.00
7.11.8	900 mm dia	Meter	12516.00
7.11.9	1000 mm dia	Meter	15973.00
7.11.10	1100 mm dia	Meter	18453.00
7.11.11	1200 mm dia	Meter	21010.00
7.11.12	1300 mm dia	Meter	23961.00
7.11.13	1400 mm dia	Meter	27972.00
7.11.14	1500 mm dia	Meter	36013.00
7.11.15	1600 mm dia	Meter	37718.00
7.12	Labour only for laying & Jointing Bar Wrapped Steel Cylinder Pipes Test Pressure 14 Kg/cm <sup>2</sup> including cost of jointing material as per relevant IS specification.		
7.12.1	350 mm dia	Meter	579.00
7.12.2	400 mm dia	Meter	686.00
7.12.3	450 mm dia	Meter	795.00
7.12.4	500 mm dia	Meter	932.00
7.12.5	600 mm dia	Meter	1051.00
7.12.6	700 mm dia	Meter	1329.00
7.12.7	800 mm dia	Meter	1703.00
7.12.8	900 mm dia	Meter	1901.00
7.12.9	1000 mm dia	Meter	2066.00
7.12.10	1100 mm dia	Meter	2517.00
7.12.11	1200 mm dia	Meter	2830.00
7.12.12	1300 mm dia	Meter	3134.00
7.12.13	1400 mm dia	Meter	2848.00
7.12.14	1500 mm dia	Meter	3202.00
7.12.15	1600 mm dia	Meter	3187.00
7.13	Providing Bar Wrapped Steel Cylinder Pipes test Pressure 16 Kg/cm <sup>2</sup> including testing, inspection, transportation at site, transit insurance, loading unloading & stacking etc. complete.		
7.13.1	350 mm dia	Meter	3591.00
7.13.2	400 mm dia	Meter	4001.00
7.13.3	450 mm dia	Meter	4674.00
7.13.4	500 mm dia	Meter	5441.00
7.13.5	600 mm dia	Meter	6981.00
7.13.6	700 mm dia	Meter	9154.00

Sr. No.	Particulars of Items	Unit	Rate (in Rs.)
7.13.7	800 mm dia	Meter	10620.00
7.13.8	900 mm dia	Meter	13523.00
7.13.9	1000 mm dia	Meter	16425.00
7.13.10	1100 mm dia	Meter	19430.00
7.13.11	1200 mm dia	Meter	22738.00
7.13.12	1300 mm dia	Meter	26201.00
7.13.13	1400 mm dia	Meter	30509.00
7.13.14	1500 mm dia	Meter	37073.00
7.13.15	1600 mm dia	Meter	40764.00
7.14	Labour only for laying & Jointing Bar Wrapped Steel Cylinder Pipes Test Pressure 16 Kg/cm <sup>2</sup> including cost of jointing material as per relevant IS specification.		
7.14.1	350 mm dia	Meter	580.00
7.14.2	400 mm dia	Meter	691.00
7.14.3	450 mm dia	Meter	825.00
7.14.4	500 mm dia	Meter	1012.00
7.14.5	600 mm dia	Meter	1145.00
7.14.6	700 mm dia	Meter	1458.00
7.14.7	800 mm dia	Meter	1788.00
7.14.8	900 mm dia	Meter	2055.00
7.14.9	1000 mm dia	Meter	2088.00
7.14.10	1100 mm dia	Meter	2691.00
7.14.11	1200 mm dia	Meter	3147.00
7.14.12	1300 mm dia	Meter	3423.00
7.14.13	1400 mm dia	Meter	3180.00
7.14.14	1500 mm dia	Meter	3592.00
7.14.15	1600 mm dia	Meter	4081.00
7.15	Providing Bar Wrapped Steel Cylinder Pipes test Pressure 18 Kg/cm <sup>2</sup> including testing, inspection, transportation at site, transit insurance, loading unloading & stacking etc. complete.		
7.15.1	350 mm dia	Meter	3596.00
7.15.2	400 mm dia	Meter	4039.00
7.15.3	450 mm dia	Meter	4939.00
7.15.4	500 mm dia	Meter	5755.00
7.15.5	600 mm dia	Meter	7448.00
7.15.6	700 mm dia	Meter	9784.00
7.15.7	800 mm dia	Meter	11440.00
7.15.8	900 mm dia	Meter	14525.00
7.15.9	1000 mm dia	Meter	17815.00
7.15.10	1100 mm dia	Meter	20910.00
7.15.11	1200 mm dia	Meter	24537.00
7.15.12	1300 mm dia	Meter	28217.00
7.15.13	1400 mm dia	Meter	33193.00
7.15.14	1500 mm dia	Meter	39725.00

Sr. No.	Particulars of Items	Unit	Rate (in Rs.)
7.15.15	1600 mm dia	Meter	44217.00
7.16	Labour only for laying & Jointing Bar Wrapped Steel Cylinder Pipes Test Pressure 18 Kg/cm <sup>2</sup> including cost of jointing material as per relevant IS specification.		
7.16.1	350 mm dia	Meter	581.00
7.16.2	400 mm dia	Meter	700.00
7.16.3	450 mm dia	Meter	842.00
7.16.4	500 mm dia	Meter	1047.00
7.16.5	600 mm dia	Meter	1196.00
7.16.6	700 mm dia	Meter	1523.00
7.16.7	800 mm dia	Meter	1922.00
7.16.8	900 mm dia	Meter	2157.00
7.16.9	1000 mm dia	Meter	2207.00
7.16.10	1100 mm dia	Meter	2821.00
7.16.11	1200 mm dia	Meter	3307.00
7.16.12	1300 mm dia	Meter	3680.00
7.16.13	1400 mm dia	Meter	3367.00
7.16.14	1500 mm dia	Meter	3771.00
7.16.15	1600 mm dia	Meter	4437.00
7.17	Providing Bar Wrapped Steel Cylinder Pipes test Pressure 20 Kg/cm <sup>2</sup> including testing, inspection, transportation at site, transit insurance, loading unloading & stacking etc. complete.		
7.17.1	350 mm dia	Meter	3641.00
7.17.2	400 mm dia	Meter	4315.00
7.17.3	450 mm dia	Meter	5275.00
7.17.4	500 mm dia	Meter	6199.00
7.17.5	600 mm dia	Meter	8031.00
7.17.6	700 mm dia	Meter	10622.00
7.17.7	800 mm dia	Meter	13184.00
7.17.8	900 mm dia	Meter	15970.00
7.17.9	1000 mm dia	Meter	19508.00
7.17.10	1100 mm dia	Meter	23030.00
7.17.11	1200 mm dia	Meter	27023.00
7.17.12	1300 mm dia	Meter	31166.00
7.17.13	1400 mm dia	Meter	36834.00
7.17.14	1500 mm dia	Meter	43967.00
7.17.15	1600 mm dia	Meter	48262.23
7.18	Labour only for laying & Jointing Bar Wrapped Steel Cylinder Pipes Test Pressure 20 Kg/cm <sup>2</sup> including cost of jointing material as per relevant IS specification.		
7.18.1	350 mm dia	Meter	587.00
7.18.2	400 mm dia	Meter	713.00
7.18.3	450 mm dia	Meter	881.00

<b>Sr. No.</b>	<b>Particulars of Items</b>	<b>Unit</b>	<b>Rate (in Rs.)</b>
7.18.4	500 mm dia	Meter	1127.00
7.18.5	600 mm dia	Meter	1289.00
7.18.6	700 mm dia	Meter	1652.00
7.18.7	800 mm dia	Meter	2082.00
7.18.8	900 mm dia	Meter	2371.00
7.18.9	1000 mm dia	Meter	2418.00
7.18.10	1100 mm dia	Meter	3108.00
7.18.11	1200 mm dia	Meter	3633.00
7.18.12	1300 mm dia	Meter	4053.00
7.18.13	1400 mm dia	Meter	3660.00
7.18.14	1500 mm dia	Meter	4119.00
7.18.15	1600 mm dia	Meter	4773.00

## **CHAPTER - 08**

**CAST IRON SOCKET AND SPIGOT PIPES AND SPECIALS WITH LEAD JOINTS, TYTON JOINTS, CAST IRON PIPES AND SPECIALS WITH SPECIAL WITH FLANGED JOINTS, CAST IRON VALVES, SLUICE GATE & AIR VALVES**

**CHAPTER – 08**  
**CAST IRON SOCKET AND SPIGOT PIPES AND SPECIALS WITH**  
**LEAD JOINTS, TYTON JOINTS, CAST IRON PIPES AND SPECIALS**  
**WITH SPECIAL WITH FLANGED JOINTS, CAST IRON VALVES,**  
**SLUICE GATE & AIR VALVES**

**Notes: -**

1. The C.I. pipe shall conform to IS -1536-2001
2. The C.I. fittings shall conform to IS -1538-1993 (Part I to XXIV).
3. The laying of C.I. pipes shall be done as per IS -3114:1994
4. The caulking lead shall conform to IS 782: 1978
5. The rubber sealing rings for jointing of pipe line shall be conforming to IS 5382: 2018
6. The Horizontal C.I. double flanged pipe shall conform to IS -7181-1986
7. The C.I. fittings shall conform to IS -1538-1993 (Part I to XXIV).
8. The laying of C.I. pipes shall be done as per IS -3114:1994
9. The Sluice Valves (50-1000 mm size) shall be conforming to IS -14846:2000
10. The resilient seated C.I. Air relief valve shall be conforming to IS - 14845: 2000
11. The Swing check type reflux valves shall be conforming to IS - 5312: 2004 (Part I & II).
12. The Butter fly valves shall be conforming to IS - 13095:2020
13. All measurement shall be of the finished work.
14. Work shall be executed in accordance with the relevant Indian Standard Specifications (Updated) and all the conditions of the agreement of the work.
15. This USOR contains the rates of all the items without GST. GST shall be paid separately as per prevailing government norms as claimed by the contractor in his bill. All the estimates based on this USOR will include GST as an extra amount as per prevailing rates on the sum of the estimate to arrive at the gross amount.

**CAST IRON SOCKET AND SPIGOT PIPES AND SPECIALS WITH**  
**LEAD JOINTS, TYTON JOINTS, CAST IRON PIPES AND**  
**SPECIALS WITH SPECIAL WITH FLANGED JOINTS, CAST IRON**  
**VALVES, SLUICE GATE & AIR VALVES**

S.No.	Particulars of Items	Unit	Rates (in Rs.)		
8.1	Providing, laying and jointing following socket and spigot cast iron (Spun) Pipes including testing of joints, cost of pipes and jointing materials etc. complete.		Class LA	Class A	Class B
8.1.1	80 mm diameter	Meter	1780.00	1924.00	2054.00
8.1.2	100 mm diameter	Meter	2195.00	2403.00	2555.00
8.1.3	125 mm diameter	Meter	2860.00	3106.00	3333.00
8.1.4	150 mm diameter	Meter	3553.00	3876.00	4160.00
8.1.5	200 mm diameter	Meter	5191.00	5609.00	6044.00
8.1.6	250 mm diameter	Meter	6973.00	7561.00	8149.00
8.1.7	300 mm diameter	Meter	8964.00	9762.00	10539.00
8.1.8	350 mm diameter	Meter	11252.00	12162.00	13147.00



S.No.	Particulars of Items	Unit	Rates (in Rs.)		
8.1.9	400 mm diameter	Meter	13685.00	14898.00	16036.00
8.1.10	450 mm diameter	Meter	16551.00	18108.00	19471.00
8.1.11	500 mm diameter	Meter	19318.00	20968.00	22617.00
8.1.12	600 mm diameter	Meter	25723.00	27978.00	30217.00
8.1.13	700 mm diameter	Meter	33538.00	36253.00	38828.00
8.1.14	750 mm diameter	Meter	37208.00	40274.00	43324.00
8.1.15	800 mm diameter	Meter	43273.00	46568.00	49845.00
8.1.16	900 mm diameter	Meter	51587.00	55669.00	59753.00
8.1.17	1000 mm diameter	Meter	60948.00	65924.00	70674.00
8.2	Labour for laying in position socket & spigot cast iron (Spun) pipes. [ Laying work shall conform to IS 3114: 1994]		Class LA	Class A	Class B
8.2.1	80 mm diameter	Meter	25.00	27.00	29.00
8.2.2	100 mm diameter	Meter	31.00	34.00	36.00
8.2.3	125 mm diameter	Meter	40.00	43.00	47.00
8.2.4	150 mm diameter	Meter	50.00	55.00	58.00
8.2.5	200 mm diameter	Meter	73.00	79.00	85.00
8.2.6	250 mm diameter	Meter	100.00	109.00	117.00
8.2.7	300 mm diameter	Meter	129.00	140.00	151.00
8.2.8	350 mm diameter	Meter	165.00	177.00	191.00
8.2.9	400 mm diameter	Meter	200.00	217.00	232.00
8.2.10	450 mm diameter	Meter	243.00	265.00	283.00
8.2.11	500 mm diameter	Meter	281.00	304.00	326.00
8.2.12	600 mm diameter	Meter	375.00	407.00	438.00
8.2.13	700 mm diameter	Meter	477.00	516.00	555.00
8.2.14	750 mm diameter	Meter	529.00	575.00	619.00
8.2.15	800 mm diameter	Meter	588.00	637.00	687.00
8.2.16	900 mm diameter	Meter	725.00	787.00	848.00
8.2.17	1000 mm diameter	Meter	878.00	952.00	1024.00
8.3	Providing lead caulked joints to following socket & spigot cast iron (spun) pipes and specials class 'LA' 'A' and 'B' including testing of the joints and cost of jointing materials (i.e. pig lead and spun yarn) etc. complete.				
8.3.1	80 mm diameter	Each	516.00		
8.3.2	100 mm diameter	Each	595.00		
8.3.3	125 mm diameter	Each	764.00		
8.3.4	150 mm diameter	Each	910.00		
8.3.5	200 mm diameter	Each	1292.00		
8.3.6	250 mm diameter	Each	1589.00		
8.3.7	300 mm diameter	Each	1888.00		

S.No.	Particulars of Items	Unit	Rates (in Rs.)	
8.3.8	350 mm diameter	Each	2116.00	
8.3.9	400 mm diameter	Each	2506.00	
8.3.10	450 mm diameter	Each	3393.00	
8.3.11	500 mm diameter	Each	3464.00	
8.3.12	600 mm diameter	Each	4454.00	
8.3.13	700 mm diameter	Each	5081.00	
8.3.14	750 mm diameter	Each	5698.00	
8.3.15	800 mm diameter	Each	6863.00	
8.3.16	900 mm diameter	Each	8046.00	
8.3.17	1000 mm diameter	Each	9283.00	
8.4	Labour for providing lead caulked joints to following socket & spigot cast iron (spun) pipes and specials class 'LA' 'A' and 'B' including testing of joints but excluding cost of jointing materials (i.e. pig lead and spun yarn).			
8.4.1	80 mm diameter	Each	197.00	
8.4.2	100 mm diameter	Each	202.00	
8.4.3	125 mm diameter	Each	301.00	
8.4.4	150 mm diameter	Each	305.00	
8.4.5	200 mm diameter	Each	405.00	
8.4.6	250 mm diameter	Each	505.00	
8.4.7	300 mm diameter	Each	605.00	
8.4.8	350 mm diameter	Each	621.00	
8.4.9	400 mm diameter	Each	812.00	
8.4.10	450 mm diameter	Each	911.00	
8.4.11	500 mm diameter	Each	963.00	
8.4.12	600 mm diameter	Each	1309.00	
8.4.13	700 mm diameter	Each	1406.00	
8.4.14	750 mm diameter	Each	1516.00	
8.4.15	800 mm diameter	Each	1636.00	
8.4.16	900 mm diameter	Each	1856.00	
8.4.17	1000 mm diameter	Each	2038.00	
8.5	Providing and laying in position following double socket cast iron 90° bend.		Medium Class	Heavy Class
8.5.1	80 mm diameter	Each	1284.00	1353.00
8.5.2	100 mm diameter	Each	1729.00	1804.00
8.5.3	125 mm diameter	Each	2330.00	2480.00
8.5.4	150 mm diameter	Each	3082.00	3232.00
8.5.5	200 mm diameter	Each	4735.00	5036.00
8.5.6	250 mm diameter	Each	6840.00	7366.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)	
8.5.7	300 mm diameter	Each	9396.00	10147.00
8.5.8	350 mm diameter	Each	13137.00	14239.00
8.5.9	400 mm diameter	Each	16914.00	18408.00
8.5.10	450 mm diameter	Each	20847.00	22814.00
8.5.11	500 mm diameter	Each	26590.00	29107.00
8.5.12	600 mm diameter	Each	39019.00	42953.00
8.5.13	700 mm diameter	Each	54831.00	60574.00
8.5.14	750 mm diameter	Each	63878.00	70722.00
8.5.15	800 mm diameter	Each	76466.00	84809.00
8.5.16	900 mm diameter	Each	101010.00	112512.00
8.5.17	1000 mm diameter	Each	129361.00	144184.00
8.6	Providing and laying in position following double socket cast iron 45° bend.		Medium Class	Heavy Class
8.6.1	80 mm diameter	Each	1284.00	1311.00
8.6.2	100 mm diameter	Each	1675.00	1748.00
8.6.3	125 mm diameter	Each	2185.00	2331.00
8.6.4	150 mm diameter	Each	2840.00	2986.00
8.6.5	200 mm diameter	Each	4224.00	4516.00
8.6.6	250 mm diameter	Each	6045.00	6482.00
8.6.7	300 mm diameter	Each	8230.00	8813.00
8.6.8	350 mm diameter	Each	11643.00	12508.00
8.6.9	400 mm diameter	Each	14790.00	15891.00
8.6.10	450 mm diameter	Each	18015.00	19510.00
8.6.11	500 mm diameter	Each	22578.00	24387.00
8.6.12	600 mm diameter	Each	32411.00	35243.00
8.6.13	700 mm diameter	Each	44683.00	48695.00
8.6.14	750 mm diameter	Each	51527.00	56326.00
8.6.15	800 mm diameter	Each	61238.00	66989.00
8.6.16	900 mm diameter	Each	79382.00	87239.00
8.6.17	1000 mm diameter	Each	100686.00	110811.00
8.7	Providing and laying in position following double socket cast iron 22½° bend.		Medium Class	Heavy Class
8.7.1	80 mm diameter	Each	1092.00	1165.00
8.7.2	100 mm diameter	Each	1457.00	1529.00
8.7.3	125 mm diameter	Each	1894.00	1966.00
8.7.4	150 mm diameter	Each	2476.00	2549.00
8.7.5	200 mm diameter	Each	3714.00	3860.00
8.7.6	250 mm diameter	Each	5244.00	5462.00
8.7.7	300 mm diameter	Each	6919.00	7283.00
8.7.8	350 mm diameter	Each	9676.00	10227.00
8.7.9	400 mm diameter	Each	12193.00	12901.00
8.7.10	450 mm diameter	Each	14632.00	15498.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)	
8.7.11	500 mm diameter	Each	18251.00	19352.00
8.7.12	600 mm diameter	Each	25882.00	27612.00
8.7.13	700 mm diameter	Each	35086.00	37603.00
8.7.14	750 mm diameter	Each	40671.00	43346.00
8.7.15	800 mm diameter	Each	47629.00	51193.00
8.7.16	900 mm diameter	Each	61076.00	65855.00
8.7.17	1000 mm diameter	Each	76790.00	82946.00
8.8	Providing and laying in position following double socket cast iron 11¼° bend.		Medium Class	Heavy Class
8.8.1	80 mm diameter	Each	1020.00	1092.00
8.8.2	100 mm diameter	Each	1311.00	1384.00
8.8.3	125 mm diameter	Each	1748.00	1821.00
8.8.4	150 mm diameter	Each	2258.00	2331.00
8.8.5	200 mm diameter	Each	3350.00	3496.00
8.8.6	250 mm diameter	Each	4734.00	4880.00
8.8.7	300 mm diameter	Each	6263.00	6482.00
8.8.8	350 mm diameter	Each	8653.00	9047.00
8.8.9	400 mm diameter	Each	10856.00	11328.00
8.8.10	450 mm diameter	Each	12901.00	13531.00
8.8.11	500 mm diameter	Each	16127.00	16914.00
8.8.12	600 mm diameter	Each	22578.00	23758.00
8.8.13	700 mm diameter	Each	30366.00	32096.00
8.8.14	750 mm diameter	Each	34850.00	36895.00
8.8.15	800 mm diameter	Each	40582.00	43255.00
8.8.16	900 mm diameter	Each	51922.00	55244.00
8.8.17	1000 mm diameter	Each	64802.00	69014.00
8.9	Providing and laying in position following all socket cast iron Tees (all sizes in Milimeters) Body x Branch Dia		Medium Class	Heavy Class
8.9.1	80 mm x 80 mm	Each	1577.00	1648.00
8.9.2	100 mm x 80 mm	Each	1935.00	2007.00
8.9.3	100 mm x 100 mm	Each	2078.00	2150.00
8.9.4	125 mm x 80 mm	Each	2437.00	2580.00
8.9.5	125 mm x 100 mm	Each	2580.00	2723.00
8.9.6	125 mm x 125 mm	Each	2795.00	2938.00
8.9.7	150 mm x 80 mm	Each	3082.00	3225.00
8.9.8	150 mm x 100 mm	Each	3225.00	3368.00
8.9.9	150 mm x 125 mm	Each	3368.00	3583.00
8.9.10	150 mm x 150 mm	Each	3583.00	3798.00
8.9.11	200 mm x 80 mm	Each	4515.00	4801.00
8.9.12	200 mm x 100 mm	Each	4658.00	4945.00
8.9.13	200 mm x 125 mm	Each	4801.00	5088.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)	
8.9.14	200 mm x 150 mm	Each	5016.00	5303.00
8.9.15	200 mm x 200 mm	Each	5518.00	5805.00
8.9.16	250 mm x 80 mm	Each	6306.00	6736.00
8.9.17	250 mm x 100 mm	Each	6450.00	6880.00
8.9.18	250 mm x 125 mm	Each	6665.00	7095.00
8.9.19	250 mm x 150 mm	Each	6880.00	7310.00
8.9.20	250 mm x 200 mm	Each	7310.00	7740.00
8.9.21	250 mm x 250 mm	Each	7811.00	8313.00
8.9.22	300 mm x 80 mm	Each	8528.00	9173.00
8.9.23	300 mm x 100 mm	Each	8600.00	9245.00
8.9.24	300 mm x 125 mm	Each	8815.00	9460.00
8.9.25	300 mm x 150 mm	Each	8958.00	9603.00
8.9.26	300 mm x 200 mm	Each	9531.00	10176.00
8.9.27	300 mm x 250 mm	Each	10033.00	10750.00
8.9.28	300 mm x 300 mm	Each	10678.00	11395.00
8.9.29	350 mm x 200 mm	Each	13295.00	14318.00
8.9.30	350 mm x 250 mm	Each	13924.00	14947.00
8.9.31	350 mm x 300 mm	Each	14632.00	15655.00
8.9.32	350 mm x 350 mm	Each	15340.00	16442.00
8.9.33	400 mm x 200 mm	Each	16678.00	18015.00
8.9.34	400 mm x 250 mm	Each	17307.00	18644.00
8.9.35	400 mm x 300 mm	Each	17936.00	19352.00
8.9.36	400 mm x 350 mm	Each	18723.00	20139.00
8.9.37	400 mm x 400 mm	Each	19667.00	21083.00
8.9.38	450 mm x 250 mm	Each	21555.00	23207.00
8.9.39	450 mm x 300 mm	Each	22263.00	23915.00
8.9.40	450 mm x 350 mm	Each	23050.00	24702.00
8.9.41	450 mm x 400 mm	Each	23836.00	25488.00
8.9.42	450 mm x 450 mm	Each	24780.00	26511.00
8.9.43	500 mm x 250 mm	Each	25724.00	28006.00
8.9.44	500 mm x 300 mm	Each	26432.00	28714.00
8.9.45	500 mm x 350 mm	Each	27219.00	29500.00
8.9.46	500 mm x 400 mm	Each	28006.00	30366.00
8.9.47	500 mm x 450 mm	Each	28950.00	31310.00
8.9.48	500 mm x 500 mm	Each	30051.00	32490.00
8.9.49	600 mm x 300 mm	Each	37446.00	40986.00
8.9.50	600 mm x 350 mm	Each	38232.00	41772.00
8.9.51	600 mm x 400 mm	Each	39176.00	42717.00
8.9.52	600 mm x 450 mm	Each	40120.00	43739.00
8.9.53	600 mm x 500 mm	Each	41143.00	44762.00
8.9.54	600 mm x 600 mm	Each	43582.00	47358.00
8.9.55	700 mm x 350 mm	Each	52550.00	57349.00
8.9.56	700 mm x 400 mm	Each	53494.00	58371.00
8.9.57	700 mm x 450 mm	Each	54517.00	59473.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)	
8.9.58	700 mm x 500 mm	Each	55539.00	60495.00
8.9.59	700 mm x 600 mm	Each	57663.00	62541.00
8.9.60	700 mm x 700 mm	Each	60417.00	65451.00
8.9.61	750 mm x 400 mm	Each	61439.00	67261.00
8.9.62	750 mm x 450 mm	Each	62541.00	68362.00
8.9.63	750 mm x 500 mm	Each	63642.00	69542.00
8.9.64	750 mm x 600 mm	Each	65766.00	71666.00
8.9.65	750 mm x 700 mm	Each	68205.00	74105.00
8.9.66	750 mm x 750 mm	Each	69935.00	75914.00
8.9.67	800 mm x 400 mm	Each	72578.00	79544.00
8.9.68	800 mm x 450 mm	Each	73631.00	80678.00
8.9.69	800 mm x 500 mm	Each	74765.00	81812.00
8.9.70	800 mm x 600 mm	Each	77195.00	84242.00
8.9.71	800 mm x 700 mm	Each	79706.00	86834.00
8.9.72	800 mm x 750 mm	Each	81002.00	88211.00
8.9.73	800 mm x 800 mm	Each	82946.00	90236.00
8.9.74	900 mm x 450 mm	Each	94773.00	104331.00
8.9.75	900 mm x 500 mm	Each	95907.00	105465.00
8.9.76	900 mm x 600 mm	Each	98580.00	108300.00
8.9.77	900 mm x 700 mm	Each	101334.00	111054.00
8.9.78	900 mm x 750 mm	Each	102630.00	112431.00
8.9.79	900 mm x 800 mm	Each	104088.00	113808.00
8.9.80	900 mm x 900 mm	Each	107814.00	117696.00
8.9.81	1000 mm x 500 mm	Each	120936.00	133492.00
8.9.82	1000 mm x 600 mm	Each	123528.00	136165.00
8.9.83	1000 mm x 700 mm	Each	126768.00	139567.00
8.9.84	1000 mm x 750 mm	Each	128146.00	141025.00
8.9.85	1000 mm x 800 mm	Each	129685.00	142483.00
8.9.86	1000 mm x 900 mm	Each	132763.00	145561.00
8.9.87	1000 mm x 1000 mm	Each	137137.00	150016.00
8.10	Providing and laying in position following all socketed cast iron crosses (all sizes in milliNos).		Medium Class	Heavy Class
8.10.1	80 mm	Each	2169.00	2244.00
8.10.2	100 mm	Each	2768.00	2917.00
8.10.3	125 mm	Each	3740.00	3890.00
8.10.4	150 mm	Each	4788.00	5012.00
8.10.5	200 mm	Each	7256.00	7630.00
8.10.6	250 mm	Each	10248.00	10847.00
8.10.7	300 mm	Each	13914.00	14737.00
8.11	Providing and laying in position following socket & spigot cast iron tapers (Reducer) (all sizes in mm).		Medium Class	Heavy Class

S.No.	Particulars of Items	Unit	Rates (in Rs.)	
8.11.1	100 mm x 80 mm	Each	1075.00	1147.00
8.11.2	125 mm x 80 mm	Each	1433.00	1505.00
8.11.3	125 mm x 100 mm	Each	1505.00	1648.00
8.11.4	150 mm x 80 mm	Each	1792.00	1935.00
8.11.5	150 mm x 100 mm	Each	1863.00	2007.00
8.11.6	150 mm x 125 mm	Each	2007.00	2222.00
8.11.7	200 mm x 100 mm	Each	2652.00	2867.00
8.11.8	200 mm x 125 mm	Each	2795.00	3010.00
8.11.9	200 mm x 150 mm	Each	3010.00	3225.00
8.11.10	250 mm x 125 mm	Each	3798.00	4013.00
8.11.11	250 mm x 150 mm	Each	3942.00	4228.00
8.11.12	250 mm x 200 mm	Each	4371.00	4730.00
8.11.13	300 mm x 150 mm	Each	5303.00	5733.00
8.11.14	300 mm x 200 mm	Each	5805.00	6306.00
8.11.15	300 mm x 250 mm	Each	6306.00	6951.00
8.11.16	350 mm x 200 mm	Each	7776.00	8424.00
8.11.17	350 mm x 250 mm	Each	8424.00	9153.00
8.11.18	350 mm x 300 mm	Each	9072.00	9963.00
8.11.19	400 mm x 250 mm	Each	10611.00	11583.00
8.11.20	400 mm x 300 mm	Each	11421.00	12474.00
8.11.21	400 mm x 350 mm	Each	12231.00	13446.00
8.11.22	450 mm x 350 mm	Each	13689.00	14985.00
8.11.23	450 mm x 400 mm	Each	14661.00	16119.00
8.11.24	500 mm x 350 mm	Each	15714.00	17091.00
8.11.25	500 mm x 400 mm	Each	16686.00	18225.00
8.11.26	500 mm x 450 mm	Each	17739.00	19441.00
8.11.27	600 mm x 400 mm	Each	22276.00	24301.00
8.11.28	600 mm x 450 mm	Each	23410.00	25597.00
8.11.29	600 mm x 500 mm	Each	24625.00	26974.00
8.11.30	700 mm x 500 mm	Each	29566.00	32239.00
8.11.31	700 mm x 600 mm	Each	32320.00	35398.00
8.11.32	750 mm x 600 mm	Each	36370.00	39853.00
8.11.33	750 mm x 700 mm	Each	39691.00	43660.00
8.11.34	800 mm x 600 mm	Each	36132.00	39485.00
8.11.35	800 mm x 700 mm	Each	39112.00	42986.00
8.11.36	800 mm x 750 mm	Each	40825.00	44923.00
8.11.37	900 mm x 700 mm	Each	46785.00	51106.00
8.11.38	900 mm x 750 mm	Each	48499.00	55278.00
8.11.39	900 mm x 800 mm	Each	50287.00	53118.00
8.11.40	1000 mm x 800 mm	Each	57066.00	62356.00
8.11.41	1000 mm x 900 mm	Each	60940.00	66900.00
8.12	Providing and laying in position including testing following Double Socket cast		Medium Class	Heavy Class

S.No.	Particulars of Items	Unit	Rates (in Rs.)	
	iron tapers (reducer) (all sizes in mm)			
8.12.1	100 mm x 80 mm	Each	1075.00	1290.00
8.12.2	125 mm x 80 mm	Each	1433.00	1935.00
8.12.3	125 mm x 100 mm	Each	1505.00	2150.00
8.12.4	150 mm x 80 mm	Each	1792.00	2222.00
8.12.5	150 mm x 100 mm	Each	1863.00	2437.00
8.12.6	150 mm x 125 mm	Each	2007.00	2723.00
8.12.7	200 mm x 100 mm	Each	2652.00	3082.00
8.12.8	200 mm x 125 mm	Each	2795.00	3368.00
8.12.9	200 mm x 150 mm	Each	3010.00	3655.00
8.12.10	250 mm x 125 mm	Each	3798.00	4156.00
8.12.11	250 mm x 150 mm	Each	3942.00	4443.00
8.12.12	250 mm x 200 mm	Each	4371.00	5160.00
8.12.13	300 mm x 150 mm	Each	5303.00	5375.00
8.12.14	300 mm x 200 mm	Each	5805.00	6020.00
8.12.15	300 mm x 250 mm	Each	6306.00	6808.00
8.12.16	350 mm x 200 mm	Each	7776.00	9477.00
8.12.17	350 mm x 250 mm	Each	8424.00	10611.00
8.12.18	350 mm x 300 mm	Each	9072.00	11826.00
8.12.19	400 mm x 250 mm	Each	10611.00	12069.00
8.12.20	400 mm x 300 mm	Each	11421.00	13284.00
8.12.21	400 mm x 350 mm	Each	12231.00	14661.00
8.12.22	450 mm x 350 mm	Each	13689.00	15795.00
8.12.23	450 mm x 400 mm	Each	14661.00	17253.00
8.12.24	500 mm x 350 mm	Each	15714.00	17982.00
8.12.25	500 mm x 400 mm	Each	16686.00	19522.00
8.12.26	500 mm x 450 mm	Each	17739.00	20737.00
8.12.27	600 mm x 400 mm	Each	22276.00	24301.00
8.12.28	600 mm x 450 mm	Each	23410.00	25111.00
8.12.29	600 mm x 500 mm	Each	24625.00	26893.00
8.12.30	700 mm x 500 mm	Each	29566.00	31429.00
8.12.31	700 mm x 600 mm	Each	32320.00	35398.00
8.12.32	750 mm x 600 mm	Each	36370.00	38071.00
8.12.33	750 mm x 700 mm	Each	39691.00	42283.00
8.12.34	800 mm x 600 mm	Each	34155.00	37526.00
8.12.35	800 mm x 700 mm	Each	37825.00	41720.00
8.12.36	800 mm x 750 mm	Each	40072.00	44192.00
8.12.37	900 mm x 700 mm	Each	42769.00	47113.00
8.12.38	900 mm x 750 mm	Each	45165.00	51981.00
8.12.39	900 mm x 800 mm	Each	48985.00	51832.00
8.12.40	1000 mm x 800 mm	Each	52506.00	57824.00
8.12.41	1000 mm x 900 mm	Each	57150.00	63142.00
8.13	Providing and laying in		Medium	Heavy Class



S.No.	Particulars of Items	Unit	Rates (in Rs.)	
	position following cast iron collars		Class	
8.13.1	80 mm diameter	Each	932.00	1003.00
8.13.2	100 mm diameter	Each	1147.00	1218.00
8.13.3	125 mm diameter	Each	1505.00	1577.00
8.13.4	150 mm diameter	Each	1935.00	2007.00
8.13.5	200 mm diameter	Each	2723.00	2867.00
8.13.6	250 mm diameter	Each	3727.00	3942.00
8.13.7	300 mm diameter	Each	4873.00	5088.00
8.13.8	350 mm diameter	Each	6665.00	6975.00
8.13.9	400 mm diameter	Each	7983.00	8525.00
8.13.10	450 mm diameter	Each	9843.00	10308.00
8.13.11	500 mm diameter	Each	11703.00	12323.00
8.13.12	600 mm diameter	Each	15888.00	16740.00
8.13.13	700 mm diameter	Each	20848.00	21933.00
8.13.14	750 mm diameter	Each	23560.00	24800.00
8.13.15	800 mm diameter	Each	27622.00	29161.00
8.13.16	900 mm diameter	Each	34345.00	36289.00
8.13.17	1000 mm diameter	Each	41959.00	44308.00
8.14	Providing and laying in position following cast iron socket caps.		Heavy Class	
8.14.1	80 mm diameter	Each	502.00	
8.14.2	100 mm diameter	Each	645.00	
8.14.3	125 mm diameter	Each	860.00	
8.14.4	150 mm diameter	Each	1075.00	
8.14.5	200 mm diameter	Each	1720.00	
8.14.6	250 mm diameter	Each	2437.00	
8.14.7	300 mm diameter	Each	3297.00	
8.14.8	350 mm diameter	Each	4728.00	
8.14.9	400 mm diameter	Each	5968.00	
8.14.10	450 mm diameter	Each	7518.00	
8.14.11	500 mm diameter	Each	9145.00	
8.14.12	600 mm diameter	Each	13253.00	
8.14.13	700 mm diameter	Each	18213.00	
8.14.14	750 mm diameter	Each	21080.00	
8.14.15	800 mm diameter	Each	25435.00	
8.14.16	900 mm diameter	Each	32806.00	
8.14.17	1000 mm diameter	Each	41635.00	
8.15	Providing and laying in position following cast iron plugs.		Medium Class	Heavy Class
8.15.1	80 mm diameter	Each	143.00	215.00
8.15.2	100 mm diameter	Each	215.00	287.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)	
8.15.3	125 mm diameter	Each	358.00	430.00
8.15.4	150 mm diameter	Each	573.00	645.00
8.15.5	200 mm diameter	Each	932.00	1003.00
8.15.6	250 mm diameter	Each	1433.00	1577.00
8.15.7	300 mm diameter	Each	2007.00	2150.00
8.15.8	350 mm diameter	Each	2856.00	3082.00
8.15.9	400 mm diameter	Each	3833.00	4059.00
8.15.10	450 mm diameter	Each	4886.00	5186.00
8.15.11	500 mm diameter	Each	6088.00	6464.00
8.15.12	600 mm diameter	Each	9020.00	9546.00
8.15.13	700 mm diameter	Each	12853.00	13530.00
8.15.14	750 mm diameter	Each	15108.00	15860.00
8.15.15	800 mm diameter	Each	18213.00	19065.00
8.15.16	900 mm diameter	Each	23793.00	24878.00
8.15.17	1000 mm diameter	Each	30535.00	31853.00
8.16	Providing and laying in position following sizes of socket & spigot or all socketed cast iron specials class MEDIUM or HEAVY which does not appear in above items of schedule.		Medium Class	Heavy Class
8.16.1	80 mm to 300 mm dia	Kg	72.00	72.00
8.16.2	Above 300 mm Dia	Kg	75.00	75.00
8.17	Labour for laying in position following double socket cast iron 45° bends.		Medium Class	Heavy Class
8.17.1	80 mm diameter	Each	46.00	49.00
8.17.2	100 mm diameter	Each	62.00	65.00
8.17.3	125 mm diameter	Each	81.00	86.00
8.17.4	150 mm diameter	Each	105.00	111.00
8.17.5	200 mm diameter	Each	157.00	168.00
8.17.6	250 mm diameter	Each	224.00	241.00
8.17.7	300 mm diameter	Each	305.00	327.00
8.17.8	350 mm diameter	Each	400.00	430.00
8.17.9	400 mm diameter	Each	508.00	546.00
8.17.10	450 mm diameter	Each	619.00	670.00
8.17.11	500 mm diameter	Each	776.00	838.00
8.17.12	600 mm diameter	Each	1113.00	1211.00
8.17.13	700 mm diameter	Each	1535.00	1673.00
8.17.14	750 mm diameter	Each	1770.00	1935.00
8.17.15	800 mm diameter	Each	2043.00	2235.00
8.17.16	900 mm diameter	Each	2648.00	2911.00
8.17.17	1000 mm diameter	Each	3359.00	3697.00
8.18	Labour for laying in position		Medium	Heavy Class

S.No.	Particulars of Items	Unit	Rates (in Rs.)	
	following double socket cast Iron 90° bends		Class	
8.18.1	80 mm diameter	Each	46.00	49.00
8.18.2	100 mm diameter	Each	62.00	65.00
8.18.3	125 mm diameter	Each	84.00	89.00
8.18.4	150 mm diameter	Each	111.00	116.00
8.18.5	200 mm diameter	Each	170.00	181.00
8.18.6	250 mm diameter	Each	246.00	265.00
8.18.7	300 mm diameter	Each	338.00	365.00
8.18.8	350 mm diameter	Each	451.00	489.00
8.18.9	400 mm diameter	Each	581.00	632.00
8.18.10	450 mm diameter	Each	716.00	784.00
8.18.11	500 mm diameter	Each	913.00	1000.00
8.18.12	600 mm diameter	Each	1340.00	1476.00
8.18.13	700 mm diameter	Each	1884.00	2081.00
8.18.14	750 mm diameter	Each	2194.00	2430.00
8.18.15	800 mm diameter	Each	2551.00	2830.00
8.18.16	900 mm diameter	Each	3370.00	3754.00
8.18.17	1000 mm diameter	Each	4316.00	4810.00
8.19	Labour for laying in position following double socket cast iron 22½°. bends.		Medium Class	Heavy Class
8.19.1	80 mm diameter	Each	46.00	43.00
8.19.2	100 mm diameter	Each	54.00	57.00
8.19.3	125 mm diameter	Each	70.00	73.00
8.19.4	150 mm diameter	Each	92.00	95.00
8.19.5	200 mm diameter	Each	138.00	143.00
8.19.6	250 mm diameter	Each	195.00	203.00
8.19.7	300 mm diameter	Each	257.00	270.00
8.19.8	350 mm diameter	Each	332.00	351.00
8.19.9	400 mm diameter	Each	419.00	443.00
8.19.10	450 mm diameter	Each	503.00	532.00
8.19.11	500 mm diameter	Each	627.00	665.00
8.19.12	600 mm diameter	Each	889.00	949.00
8.19.13	700 mm diameter	Each	1205.00	1292.00
8.19.14	750 mm diameter	Each	1397.00	1489.00
8.19.15	800 mm diameter	Each	1589.00	1708.00
8.19.16	900 mm diameter	Each	2038.00	2197.00
8.19.17	1000 mm diameter	Each	2562.00	2767.00
8.20	Labour for laying in position following double socket cast iron 11¼ ° bends.		Medium Class	Heavy Class
8.20.1	80 mm diameter	Each	46.00	41.00
8.20.2	100 mm diameter	Each	49.00	51.00
8.20.3	125 mm diameter	Each	65.00	68.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)	
8.20.4	150 mm diameter	Each	84.00	86.00
8.20.5	200 mm diameter	Each	124.00	130.00
8.20.6	250 mm diameter	Each	176.00	181.00
8.20.7	300 mm diameter	Each	232.00	241.00
8.20.8	350 mm diameter	Each	297.00	311.00
8.20.9	400 mm diameter	Each	373.00	389.00
8.20.10	450 mm diameter	Each	443.00	465.00
8.20.11	500 mm diameter	Each	554.00	581.00
8.20.12	600 mm diameter	Each	776.00	816.00
8.20.13	700 mm diameter	Each	1043.00	1103.00
8.20.14	750 mm diameter	Each	1197.00	1267.00
8.20.15	800 mm diameter	Each	1354.00	1443.00
8.20.16	900 mm diameter	Each	1732.00	1843.00
8.20.17	1000 mm diameter	Each	2162.00	2303.00
8.21	Labour for laying in position including testing following all socket cast iron, tees (all Sizes in mm)		Medium Class	Heavy Class
8.21.1	80 mm x 80 mm	Each	59.00	62.00
8.21.2	100 mm x 80 mm	Each	73.00	76.00
8.21.3	100 mm x 100 mm	Each	78.00	81.07
8.21.4	125 mm x 80 mm	Each	92.00	97.00
8.21.5	125 mm x 100 mm	Each	97.00	103.00
8.21.6	125 mm x 125 mm	Each	105.00	111.00
8.21.7	150 mm x 80 mm	Each	116.00	122.00
8.21.8	150 mm x 100 mm	Each	122.00	127.00
8.21.9	150 mm x 125 mm	Each	127.00	135.00
8.21.10	150 mm x 150 mm	Each	135.00	143.00
8.21.11	200 mm x 80 mm	Each	170.00	181.00
8.21.12	200 mm x 100 mm	Each	176.00	186.00
8.21.13	200 mm x 125 mm	Each	181.00	192.00
8.21.14	200 mm x 150 mm	Each	189.00	200.00
8.21.15	200 mm x 200 mm	Each	208.00	219.00
8.21.16	250 mm x 80 mm	Each	238.00	254.00
8.21.17	250 mm x 100 mm	Each	243.00	259.00
8.21.18	250 mm x 125 mm	Each	251.00	268.00
8.21.19	250 mm x 150 mm	Each	259.00	276.00
8.21.20	250 mm x 200 mm	Each	276.00	292.00
8.21.21	250 mm x 250 mm	Each	295.00	313.00
8.21.22	300 mm x 80 mm	Each	322.00	346.00
8.21.23	300 mm x 100 mm	Each	324.00	349.00
8.21.24	300 mm x 125 mm	Each	332.00	357.00
8.21.25	300 mm x 150 mm	Each	338.00	362.00
8.21.26	300 mm x 200 mm	Each	359.00	384.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)	
8.21.27	300 mm x 250 mm	Each	378.00	405.00
8.21.28	300 mm x 300 mm	Each	403.00	430.00
8.21.29	350 mm x 200 mm	Each	457.00	492.00
8.21.30	350 mm x 250 mm	Each	478.00	513.00
8.21.31	350 mm x 300 mm	Each	503.00	538.00
8.21.32	350 mm x 350 mm	Each	527.00	565.00
8.21.33	400 mm x 200 mm	Each	573.00	619.00
8.21.34	400 mm x 250 mm	Each	595.00	640.00
8.21.35	400 mm x 300 mm	Each	616.00	665.00
8.21.36	400 mm x 350 mm	Each	643.00	692.00
8.21.37	400 mm x 400 mm	Each	676.00	724.00
8.21.38	450 mm x 250 mm	Each	740.00	797.00
8.21.39	450 mm x 300 mm	Each	765.00	822.00
8.21.40	450 mm x 350 mm	Each	792.00	849.00
8.21.41	450 mm x 400 mm	Each	819.00	876.00
8.21.42	450 mm x 450 mm	Each	851.00	911.00
8.21.43	500 mm x 250 mm	Each	884.00	962.00
8.21.44	500 mm x 300 mm	Each	908.00	986.00
8.21.45	500 mm x 350 mm	Each	935.00	1013.00
8.21.46	500 mm x 400 mm	Each	962.00	1043.00
8.21.47	500 mm x 450 mm	Each	995.00	1076.00
8.21.48	500 mm x 500 mm	Each	1032.00	1116.00
8.21.49	600 mm x 300 mm	Each	1286.00	1408.00
8.21.50	600 mm x 350 mm	Each	1313.00	1435.00
8.21.51	600 mm x 400 mm	Each	1346.00	1467.00
8.21.52	600 mm x 450 mm	Each	1378.00	1503.00
8.21.53	600 mm x 500 mm	Each	1413.00	1538.00
8.21.54	600 mm x 600 mm	Each	1497.00	1627.00
8.21.55	700 mm x 350 mm	Each	1805.00	1970.00
8.21.56	700 mm x 400 mm	Each	1838.00	2005.00
8.21.57	700 mm x 450 mm	Each	1873.00	2043.00
8.21.58	700 mm x 500 mm	Each	1908.00	2078.00
8.21.59	700 mm x 600 mm	Each	1981.00	2148.00
8.21.60	700 mm x 700 mm	Each	2076.00	2248.00
8.21.61	750 mm x 400 mm	Each	2111.00	2311.00
8.21.62	750 mm x 450 mm	Each	2148.00	2348.00
8.21.63	750 mm x 500 mm	Each	2186.00	2389.00
8.21.64	750 mm x 600 mm	Each	2259.00	2462.00
8.21.65	750 mm x 700 mm	Each	2343.00	2546.00
8.21.66	750 mm x 750 mm	Each	2403.00	2608.00
8.21.67	800 mm x 400 mm	Each	2421.00	2654.00
8.21.68	800 mm x 450 mm	Each	2457.00	2692.00
8.21.69	800 mm x 500 mm	Each	2494.00	2730.00
8.21.70	800 mm x 600 mm	Each	2575.00	2811.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)	
8.21.71	800 mm x 700 mm	Each	2659.00	2897.00
8.21.72	800 mm x 750 mm	Each	2702.00	2943.00
8.21.73	800 mm x 800 mm	Each	2767.00	3011.00
8.21.74	900 mm x 450 mm	Each	3162.00	3481.00
8.21.75	900 mm x 500 mm	Each	3200.00	3519.00
8.21.76	900 mm x 600 mm	Each	3289.00	3613.00
8.21.77	900 mm x 700 mm	Each	3381.00	3705.00
8.21.78	900 mm x 750 mm	Each	3424.00	3751.00
8.21.79	900 mm x 800 mm	Each	3473.00	3797.00
8.21.80	900 mm x 900 mm	Each	3597.00	3927.00
8.21.81	1000 mm x 500 mm	Each	4035.00	4454.00
8.21.82	1000 mm x 600 mm	Each	4121.00	4543.00
8.21.83	1000 mm x 700 mm	Each	4229.00	4656.00
8.21.84	1000 mm x 750 mm	Each	4275.00	4705.00
8.21.85	1000 mm x 800 mm	Each	4327.00	4754.00
8.21.86	1000 mm x 900 mm	Each	4429.00	4856.00
8.21.87	1000 mm x 1000 mm	Each	4575.00	5005.00
8.22	Labour for laying in position following all socket cast iron crosses. (all sizes in mm)		Medium Class	Heavy Class
8.22.1	80 mm diameter	Each	78.00	81.00
8.22.2	100 mm diameter	Each	100.00	105.00
8.22.3	125 mm diameter	Each	135.00	141.00
8.22.4	150 mm diameter	Each	173.00	181.00
8.22.5	200 mm diameter	Each	262.00	276.00
8.22.6	250 mm diameter	Each	370.00	392.00
8.22.7	300 mm diameter	Each	503.00	532.00
8.23	Labour for laying in position including testing following socket and spigot cast iron tapers, (reducer) (all Sizes in mm)		Medium Class	Heavy Class
8.23.1	100 mm x 80 mm	Each	41.00	43.00
8.23.2	125 mm x 80 mm	Each	54.00	57.00
8.23.3	125 mm x 100 mm	Each	57.00	62.00
8.23.4	150 mm x 80 mm	Each	68.00	73.00
8.23.5	150 mm x 100 mm	Each	70.00	76.00
8.23.6	150 mm x 125 mm	Each	78.00	84.00
8.23.7	200 mm x 100 mm	Each	100.00	108.00
8.23.8	200 mm x 125 mm	Each	105.00	114.00
8.23.9	200 mm x 150 mm	Each	114.00	122.00
8.23.10	250 mm x 125 mm	Each	143.00	151.00
8.23.11	250 mm x 150 mm	Each	149.00	159.00
8.23.12	250 mm x 200 mm	Each	165.00	178.00
8.23.13	300 mm x 150 mm	Each	200.00	216.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)	
8.23.14	300 mm x 200 mm	Each	219.00	238.00
8.23.15	300 mm x 250 mm	Each	238.00	262.00
8.23.16	350 mm x 200 mm	Each	259.00	281.00
8.23.17	350 mm x 250 mm	Each	281.00	305.00
8.23.18	350 mm x 300 mm	Each	303.00	332.00
8.23.19	400 mm x 250 mm	Each	354.00	386.00
8.23.20	400 mm x 300 mm	Each	381.00	416.00
8.23.21	400 mm x 350 mm	Each	408.00	449.00
8.23.22	450 mm x 350 mm	Each	457.00	500.00
8.23.23	450 mm x 400 mm	Each	489.00	538.00
8.23.24	500 mm x 350 mm	Each	524.00	570.00
8.23.25	500 mm x 400 mm	Each	557.00	608.00
8.23.26	500 mm x 450 mm	Each	592.00	649.00
8.23.27	600 mm x 400 mm	Each	743.00	811.00
8.23.28	600 mm x 450 mm	Each	781.00	854.00
8.23.29	600 mm x 500 mm	Each	822.00	900.00
8.23.30	700 mm x 500 mm	Each	986.00	1076.00
8.23.31	700 mm x 600 mm	Each	1078.00	1181.00
8.23.32	750 mm x 600 mm	Each	1213.00	1330.00
8.23.33	750 mm x 700 mm	Each	1324.00	1457.00
8.23.34	800 mm x 600 mm	Each	1311.00	1432.00
8.23.35	800 mm x 700 mm	Each	1419.00	1559.00
8.23.36	800 mm x 750 mm	Each	1481.00	1630.00
8.23.37	900 mm x 700 mm	Each	1697.00	1854.00
8.23.38	900 mm x 750 mm	Each	1759.00	2005.00
8.23.39	900 mm x 800 mm	Each	1824.00	1927.00
8.23.40	1000 mm x 800 mm	Each	2070.00	2262.00
8.23.41	1000 mm x 900 mm	Each	2211.00	2427.00
8.24	Labour for laying in position including testing following Double Socket cast iron taper/reducer (all sizes in mm)		Medium Class	Heavy Class
8.24.1	100 mm x 80 mm	Each	41.00	49.00
8.24.2	125 mm x 80 mm	Each	54.00	73.00
8.24.3	125 mm x 100 mm	Each	57.00	81.00
8.24.4	150 mm x 80 mm	Each	68.00	84.00
8.24.5	150 mm x 100 mm	Each	70.00	92.00
8.24.6	150 mm x 125 mm	Each	76.00	103.00
8.24.7	200 mm x 100 mm	Each	100.00	116.00
8.24.8	200 mm x 125 mm	Each	105.00	127.00
8.24.9	200 mm x 150 mm	Each	114.00	138.00
8.24.10	250 mm x 125 mm	Each	143.00	157.00
8.24.11	250 mm x 150 mm	Each	149.00	168.00
8.24.12	250 mm x 200 mm	Each	165.00	195.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)	
8.24.13	300 mm x 150 mm	Each	200.00	203.00
8.24.14	300 mm x 200 mm	Each	219.00	227.00
8.24.15	300 mm x 250 mm	Each	238.00	257.00
8.24.16	350 mm x 200 mm	Each	259.00	316.00
8.24.17	350 mm x 250 mm	Each	281.00	354.00
8.24.18	350 mm x 300 mm	Each	303.00	395.00
8.24.19	400 mm x 250 mm	Each	354.00	403.00
8.24.20	400 mm x 300 mm	Each	381.00	443.00
8.24.21	400 mm x 350 mm	Each	408.00	489.00
8.24.22	450 mm x 350 mm	Each	457.00	527.00
8.24.23	450 mm x 400 mm	Each	489.00	576.00
8.24.24	500 mm x 350 mm	Each	524.00	600.00
8.24.25	500 mm x 400 mm	Each	557.00	651.00
8.24.26	500 mm x 450 mm	Each	592.00	692.00
8.24.27	600 mm x 400 mm	Each	743.00	811.00
8.24.28	600 mm x 450 mm	Each	781.00	838.00
8.24.29	600 mm x 500 mm	Each	822.00	897.00
8.24.30	700 mm x 500 mm	Each	986.00	1049.00
8.24.31	700 mm x 600 mm	Each	1078.00	1181.00
8.24.32	750 mm x 600 mm	Each	1213.00	1270.00
8.24.33	750 mm x 700 mm	Each	1324.00	1411.00
8.24.34	800 mm x 600 mm	Each	1232.00	1354.00
8.24.35	800 mm x 700 mm	Each	1365.00	1505.00
8.24.36	800 mm x 750 mm	Each	1446.00	1594.00
8.24.37	900 mm x 700 mm	Each	1543.00	1700.00
8.24.38	900 mm x 750 mm	Each	1630.00	1876.00
8.24.39	900 mm x 800 mm	Each	1767.00	1870.00
8.24.40	1000 mm x 800 mm	Each	1894.00	2086.00
8.24.41	1000 mm x 900 mm	Each	2062.00	2278.00
8.25	Labour for laying in position including testing following cast Iron Collars		Medium Class	Heavy Class
8.25.1	80 mm diameter	Each	35.00	38.00
8.25.2	100 mm diameter	Each	43.00	46.00
8.25.3	125 mm diameter	Each	57.00	59.00
8.25.4	150 mm diameter	Each	73.00	76.00
8.25.5	200 mm diameter	Each	103.00	108.00
8.25.6	250 mm diameter	Each	141.00	149.00
8.25.7	300 mm diameter	Each	184.00	192.00
8.25.8	350 mm diameter	Each	232.00	243.00
8.25.9	400 mm diameter	Each	278.00	297.00
8.25.10	450 mm diameter	Each	343.00	359.00
8.25.11	500 mm diameter	Each	408.00	430.00
8.25.12	600 mm diameter	Each	554.00	584.00



S.No.	Particulars of Items	Unit	Rates (in Rs.)	
8.25.13	700 mm diameter	Each	727.00	765.00
8.25.14	750 mm diameter	Each	822.00	865.00
8.25.15	800 mm diameter	Each	922.00	973.00
8.25.16	900 mm diameter	Each	1146.00	1211.00
8.25.17	1000 mm diameter	Each	1400.00	1478.00
8.26	Labour for laying in position following socketed cast iron caps.			
8.26.1	80 mm diameter	Each	19.00	
8.26.2	100 mm diameter	Each	24.00	
8.26.3	125 mm diameter	Each	32.00	
8.26.4	150 mm diameter	Each	41.00	
8.26.5	200 mm diameter	Each	65.00	
8.26.6	250 mm diameter	Each	92.00	
8.26.7	300 mm diameter	Each	124.00	
8.26.8	350 mm diameter	Each	165.00	
8.26.9	400 mm diameter	Each	208.00	
8.26.10	450 mm diameter	Each	262.00	
8.26.11	500 mm diameter	Each	319.00	
8.26.12	600 mm diameter	Each	462.00	
8.26.13	700 mm diameter	Each	635.00	
8.26.14	750 mm diameter	Each	735.00	
8.26.15	800 mm diameter	Each	849.00	
8.26.16	900 mm diameter	Each	1095.00	
8.26.17	1000 mm diameter	Each	1389.00	
8.27	Labour for laying in position including testing following cast iron plugs.		Medium Class	Heavy Class
8.27.1	80 mm diameter	Each	5.00	8.00
8.27.2	100 mm diameter	Each	8.00	11.00
8.27.3	125 mm diameter	Each	14.00	16.00
8.27.4	150 mm diameter	Each	22.00	24.00
8.27.5	200 mm diameter	Each	35.00	38.00
8.27.6	250 mm diameter	Each	54.00	59.00
8.27.7	300 mm diameter	Each	76.00	81.00
8.27.8	350 mm diameter	Each	103.00	111.00
8.27.9	400 mm diameter	Each	138.00	146.00
8.27.10	450 mm diameter	Each	176.00	186.00
8.27.11	500 mm diameter	Each	219.00	232.00
8.27.12	600 mm diameter	Each	324.00	343.00
8.27.13	700 mm diameter	Each	462.00	486.00
8.27.14	750 mm diameter	Each	543.00	570.00
8.27.15	800 mm diameter	Each	635.00	665.00
8.27.16	900 mm diameter	Each	830.00	867.00
8.27.17	1000 mm diameter	Each	1065.00	1111.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)		
8.30	Labour for laying in position following sizes of socket & spigot or all socketed cast iron standard specials class 'MEDIUM' or 'HEAVY' Which do not appear in above items of the schedule.		Medium Class	Heavy Class	
8.30.1	80 mm to 1000 mm Dia	Kg	2.00	2.00	
8.31	Providing, laying and jointing following cast iron tyton pipes with tyton joints including testing of joints, cost of pipes and jointing materials etc complete.		Class LA	Class A	Class B
8.31.1	80 mm diameter	Meter	1707.00	1852.00	1982.00
8.31.2	100 mm diameter	Meter	2158.00	2322.00	2474.00
8.31.3	125 mm diameter	Meter	2753.00	2999.00	3226.00
8.31.4	150 mm diameter	Meter	3429.00	3751.00	4036.00
8.31.5	200 mm diameter	Meter	5030.00	5448.00	5884.00
8.31.6	250 mm diameter	Meter	6773.00	7361.00	7949.00
8.31.7	300 mm diameter	Meter	8722.00	9520.00	10297.00
8.31.8	350 mm diameter	Meter	10981.00	11892.00	12877.00
8.31.9	400 mm diameter	Meter	13363.00	14576.00	15714.00
8.31.10	450 mm diameter	Meter	16110.00	17667.00	19031.00
8.31.11	500 mm diameter	Meter	18863.00	20512.00	22162.00
8.31.12	600 mm diameter	Meter	25143.00	27398.00	29637.00
8.31.13	700 mm diameter	Meter	32902.00	35617.00	38192.00
8.31.14	750 mm diameter	Meter	36500.00	39566.00	42616.00
8.31.15	800 mm diameter	Meter	42426.00	45721.00	48998.00
8.31.16	900 mm diameter	Meter	50643.00	54725.00	58810.00
8.31.17	1000 mm diameter	Meter	59140.00	64840.00	69590.00
8.32	Labour for laying in position including testing following cast iron tyton pipes.		Class LA	Class A	Class B
8.32.1	80 mm diameter	Meter	25.00	27.00	29.00
8.32.2	100 mm diameter	Meter	31.00	34.00	36.00
8.32.3	125 mm diameter	Meter	40.00	43.00	47.00
8.32.4	150 mm diameter	Meter	50.00	55.00	58.00
8.32.5	200 mm diameter	Meter	73.00	79.00	85.00
8.32.6	250 mm diameter	Meter	100.00	109.00	117.00
8.32.7	300 mm diameter	Meter	129.00	140.00	151.00
8.32.8	350 mm diameter	Meter	165.00	177.00	191.00
8.32.9	400 mm diameter	Meter	200.00	217.00	232.00
8.32.10	450 mm diameter	Meter	243.00	265.00	283.00
8.32.11	500 mm diameter	Meter	281.00	304.00	326.00
8.32.12	600 mm diameter	Meter	375.00	407.00	438.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)		
8.32.13	700 mm diameter	Meter	477.00	516.00	555.00
8.32.14	750 mm diameter	Meter	529.00	575.00	619.00
8.32.15	800 mm diameter	Meter	588.00	637.00	687.00
8.32.16	900 mm diameter	Meter	725.00	787.00	848.00
8.32.17	1000 mm diameter	Meter	878.00	952.00	1024.00
8.33	Providing tyton joints to following tyton pipes of class 'LA' 'A' and 'B' including testing of joints and cost of jointing materials (i.e. Rubber Gasket and Soap solution etc.).				
8.33.1	80 mm diameter	Each	59.00		
8.33.2	100 mm diameter	Each	73.00		
8.33.3	125 mm diameter	Each	92.00		
8.33.4	150 mm diameter	Each	111.00		
8.33.5	200 mm diameter	Each	225.00		
8.33.6	250 mm diameter	Each	267.00		
8.33.7	300 mm diameter	Each	300.00		
8.33.8	350 mm diameter	Each	321.00		
8.33.9	400 mm diameter	Each	396.00		
8.33.10	450 mm diameter	Each	455.00		
8.33.11	500 mm diameter	Each	560.00		
8.33.12	600 mm diameter	Each	773.00		
8.33.13	700 mm diameter	Each	981.00		
8.33.14	750 mm diameter	Each	1098.00		
8.33.15	800 mm diameter	Each	1228.00		
8.33.16	900 mm diameter	Each	1497.00		
8.33.17	1000 mm diameter	Each	1717.00		
8.34	Labour for providing tyton joints to following tyton pipes class 'LA' 'A' and 'B' including testing of joints but excluding cost of Rubber Gasket.				
8.34.1	80 mm diameter	Each	29.00		
8.34.2	100 mm diameter	Each	29.00		
8.34.3	125 mm diameter	Each	56.00		
8.34.4	150 mm diameter	Each	55.00		
8.34.5	200 mm diameter	Each	74.00		
8.34.6	250 mm diameter	Each	92.00		
8.34.7	300 mm diameter	Each	110.00		
8.34.8	350 mm diameter	Each	110.00		
8.34.9	400 mm diameter	Each	146.00		
8.34.10	450 mm diameter	Each	164.00		
8.34.11	500 mm diameter	Each	172.00		

S.No.	Particulars of Items	Unit	Rates (in Rs.)
8.34.12	600 mm diameter	Each	235.00
8.34.13	700 mm diameter	Each	278.00
8.34.14	750 mm diameter	Each	288.00
8.34.15	800 mm diameter	Each	305.00
8.34.16	900 mm diameter	Each	358.00
8.34.17	1000 mm diameter	Each	393.00
8.35	Providing, fixing and testing following double flanged cast iron (horizontal cast) pipe per IS : 7181 of One Meter length.		
8.35.1	80 mm diameter	Each	2029.00
8.35.2	100 mm diameter	Each	2520.00
8.35.3	125 mm diameter	Each	3258.00
8.35.4	150 mm diameter	Each	3803.00
8.35.5	200 mm diameter	Each	5443.00
8.35.6	250 mm diameter	Each	7309.00
8.35.7	300 mm diameter	Each	9373.00
8.35.8	350 mm diameter	Each	12792.00
8.35.9	400 mm diameter	Each	15618.00
8.35.10	450 mm diameter	Each	18648.00
8.35.11	500 mm diameter	Each	21889.00
8.35.12	600 mm diameter	Each	29423.00
8.35.13	700 mm diameter	Each	38333.00
8.35.14	750 mm diameter	Each	43481.00
8.36	Labour only for fixing including testing following double flanged cast iron (horizontal cast) pipe per IS : 7181 of One Meter length.		
8.36.1	80 mm diameter	Each	68.00
8.36.2	100 mm diameter	Each	84.00
8.36.3	125 mm diameter	Each	109.00
8.36.4	150 mm diameter	Each	127.00
8.36.5	200 mm diameter	Each	182.00
8.36.6	250 mm diameter	Each	244.00
8.36.7	300 mm diameter	Each	311.00
8.36.8	350 mm diameter	Each	427.00
8.36.9	400 mm diameter	Each	521.00
8.36.10	450 mm diameter	Each	622.00
8.36.11	500 mm diameter	Each	731.00
8.36.12	600 mm diameter	Each	982.00
8.36.13	700 mm diameter	Each	1280.00
8.36.14	750 mm diameter	Each	1452.00
8.37	Providing, fixing including		

S.No.	Particulars of Items	Unit	Rates (in Rs.)
	testing following double flanged cast iron (horizontal cast) pipe per IS : 7181 of Two Meter length.		
8.37.1	80 mm diameter	Each	3506.00
8.37.2	100 mm diameter	Each	4415.00
8.37.3	125 mm diameter	Each	5727.00
8.37.4	150 mm diameter	Each	6786.00
8.37.5	200 mm diameter	Each	9723.00
8.37.6	250 mm diameter	Each	13278.00
8.37.7	300 mm diameter	Each	17213.00
8.37.8	350 mm diameter	Each	22752.00
8.37.9	400 mm diameter	Each	27749.00
8.37.10	450 mm diameter	Each	33347.00
8.37.11	500 mm diameter	Each	38995.00
8.37.12	600 mm diameter	Each	52289.00
8.37.13	700 mm diameter	Each	67741.00
8.37.14	750 mm diameter	Each	76577.00
8.38	Labour only for fixing including testing following double flanged cast iron (horizontal cast) pipe per IS : 7181 of Two Meter length.		
8.38.1	80 mm diameter	Each	117.00
8.38.2	100 mm diameter	Each	147.00
8.38.3	125 mm diameter	Each	191.00
8.38.4	150 mm diameter	Each	227.00
8.38.5	200 mm diameter	Each	324.00
8.38.6	250 mm diameter	Each	443.00
8.38.7	300 mm diameter	Each	573.00
8.38.8	350 mm diameter	Each	759.00
8.38.9	400 mm diameter	Each	926.00
8.38.10	450 mm diameter	Each	1113.00
8.38.11	500 mm diameter	Each	1301.00
8.38.12	600 mm diameter	Each	1745.00
8.38.13	700 mm diameter	Each	2261.00
8.38.14	750 mm diameter	Each	2556.00
8.39	Providing, fixing including testing following double flanged cast iron (horizontal cast) pipe per IS:7181 of 2.75 M length.		
8.39.1	80 mm diameter	Each	4618.00
8.39.2	100 mm diameter	Each	5840.00
8.39.3	125 mm diameter	Each	7577.00
8.39.4	150 mm diameter	Each	9081.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)
8.39.5	200 mm diameter	Each	13005.00
8.39.6	250 mm diameter	Each	17679.00
8.39.7	300 mm diameter	Each	23152.00
8.39.8	350 mm diameter	Each	30221.00
8.39.9	400 mm diameter	Each	36851.00
8.39.10	450 mm diameter	Each	44376.00
8.39.11	500 mm diameter	Each	51826.00
8.39.12	600 mm diameter	Each	69441.00
8.39.13	700 mm diameter	Each	89795.00
8.39.14	750 mm diameter	Each	101402.00
8.40	Labour only for fixing including testing following double flanged cast iron (horizontal cast) pipe per IS:7181 of 2.75 Meter length.		
8.40.1	80 mm diameter	Each	154.00
8.40.2	100 mm diameter	Each	195.00
8.40.3	125 mm diameter	Each	253.00
8.40.4	150 mm diameter	Each	301.00
8.40.5	200 mm diameter	Each	433.00
8.40.6	250 mm diameter	Each	590.00
8.40.7	300 mm diameter	Each	772.00
8.40.8	350 mm diameter	Each	1008.00
8.40.9	400 mm diameter	Each	1230.00
8.40.10	450 mm diameter	Each	1481.00
8.40.11	500 mm diameter	Each	1730.00
8.40.12	600 mm diameter	Each	2317.00
8.40.13	700 mm diameter	Each	2997.00
8.40.14	750 mm diameter	Each	3385.00
8.41	Providing flanged joints to following double flanged cast iron (horizontal cast) pipes and specials class 'A' and 'B' including labour & cost of jointing materials (i.e. Bolt, Nuts and Rubber insertions) including testing of joint etc. complete		
8.41.1	80 mm diameter	Each	138.00
8.41.2	100 mm diameter	Each	229.00
8.41.3	125 mm diameter	Each	263.00
8.41.4	150 mm diameter	Each	304.00
8.41.5	200 mm diameter	Each	350.00
8.41.6	250 mm diameter	Each	486.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)	
8.41.7	300 mm diameter	Each	502.00	
8.41.8	350 mm diameter	Each	632.00	
8.41.9	400 mm diameter	Each	922.00	
8.41.10	450 mm diameter	Each	1032.00	
8.41.11	500 mm diameter	Each	1174.00	
8.41.12	600 mm diameter	Each	1451.00	
8.41.13	700 mm diameter	Each	1748.00	
8.41.14	750 mm diameter	Each	2092.00	
8.42	Labour for Providing Flanged joint to following flanged cast iron pipes and specials class 'A' and 'B' including testing of joints but excluding cost of jointing materials (i.e. Bolts & Nut, Rubber insertion)			
8.42.1	80 mm diameter	Each	48.00	
8.42.2	100 mm diameter	Each	66.00	
8.42.3	125 mm diameter	Each	79.00	
8.42.4	150 mm diameter	Each	92.00	
8.42.5	200 mm diameter	Each	105.00	
8.42.6	250 mm diameter	Each	132.00	
8.42.7	300 mm diameter	Each	137.00	
8.42.8	350 mm diameter	Each	158.00	
8.42.9	400 mm diameter	Each	175.00	
8.42.10	450 mm diameter	Each	180.00	
8.42.11	500 mm diameter	Each	184.00	
8.42.12	600 mm diameter	Each	203.00	
8.42.13	700 mm diameter	Each	216.00	
8.42.14	750 mm diameter	Each	234.00	
8.43	Labour only for providing flanged joints to following double flanged horizontally cast iron pipes and specials in vertical or inclined direction including testing of joints but excluding cost or jointing materials (i.e. bolts, nuts and rubber insertion sheet)			
8.43.1	80 mm to 750 mm dia in truly vertical position	200% above the rates provided vide item No. 8.2, 8.4 & 8.6		
8.43.2	In inclined position at inclination 45% & above	100% above rates provided vide item No. 8.2, 8.4 & 8.6		
8.43.3	In inclined position at inclination less than 45%	Same as rates provided vide item No. 8.2, 8.4 & 8.6		
8.44	Providing & laying in position		Medium	Heavy Class

S.No.	Particulars of Items	Unit	Rates (in Rs.)	
	including testing following cast iron flanged sockets (all sizes in mm) conforming to IS 1538		Class	
8.44.1	80 mm diameter	Each	823.00	972.00
8.44.2	100 mm diameter	Each	972.00	1197.00
8.44.3	125 mm diameter	Each	1272.00	1496.00
8.44.4	150 mm diameter	Each	1571.00	1945.00
8.44.5	200 mm diameter	Each	2618.00	2768.00
8.44.6	250 mm diameter	Each	3516.00	4638.00
8.44.7	300 mm diameter	Each	4488.00	5910.00
8.44.8	350 mm diameter	Each	5950.00	7829.00
8.44.9	400 mm diameter	Each	7203.00	9630.00
8.44.10	450 mm diameter	Each	8534.00	11117.00
8.44.11	500 mm diameter	Each	10178.00	13544.00
8.44.12	600 mm diameter	Each	15736.00	18320.00
8.44.13	700 mm diameter	Each	21040.00	24668.00
8.44.14	750 mm diameter	Each	23861.00	27973.00
8.45	Providing and laying in position including testing following cast iron flanged spigot (tail piece)		Heavy Class	
8.45.1	80 mm diameter	Each	898.00	
8.45.2	100 mm diameter	Each	1047.00	
8.45.3	125 mm diameter	Each	1421.00	
8.45.4	150 mm diameter	Each	1721.00	
8.45.5	200 mm diameter	Each	2917.00	
8.45.6	250 mm diameter	Each	3965.00	
8.45.7	300 mm diameter	Each	5087.00	
8.45.8	350 mm diameter	Each	6655.00	
8.45.9	400 mm diameter	Each	8142.00	
8.45.10	450 mm diameter	Each	9630.00	
8.45.11	500 mm diameter	Each	11430.00	
8.45.12	600 mm diameter	Each	17772.00	
8.45.13	700 mm diameter	Each	23781.00	
8.45.14	750 mm diameter	Each	26925.00	
8.46	Providing and laying in position including testing following cast iron double flanged 90° bends (all sizes in mm)		Medium Class	Heavy Class
8.46.1	80 mm diameter	Each	898.00	972.00
8.46.2	100 mm diameter	Each	1197.00	1272.00
8.46.3	125 mm diameter	Each	1571.00	1721.00
8.46.4	150 mm diameter	Each	2169.00	2319.00



S.No.	Particulars of Items	Unit	Rates (in Rs.)	
8.46.5	200 mm diameter	Each	3366.00	3665.00
8.46.6	250 mm diameter	Each	4862.00	5386.00
8.46.7	300 mm diameter	Each	6733.00	7481.00
8.46.8	350 mm diameter	Each	9630.00	10726.00
8.46.9	400 mm diameter	Each	12683.00	14171.00
8.46.10	450 mm diameter	Each	15736.00	17694.00
8.46.11	500 mm diameter	Each	20199.00	22704.00
8.46.12	600 mm diameter	Each	30690.00	34604.00
8.46.13	700 mm diameter	Each	45627.00	51512.00
8.46.14	750 mm diameter	Each	53850.00	60863.00
8.47	Providing and laying in position including testing following cast iron double flanged 45° bends (all sizes in mm)			
8.47.1	80 mm diameter	Each	1047.00	
8.47.2	100 mm diameter	Each	1347.00	
8.47.3	125 mm diameter	Each	1870.00	
8.47.4	150 mm diameter	Each	2543.00	
8.47.5	200 mm diameter	Each	4040.00	
8.47.6	250 mm diameter	Each	5984.00	
8.47.7	300 mm diameter	Each	8378.00	
8.47.8	350 mm diameter	Each	9003.00	
8.47.9	400 mm diameter	Each	11665.00	
8.47.10	450 mm diameter	Each	14484.00	
8.47.11	500 mm diameter	Each	18085.00	
8.47.12	600 mm diameter	Each	26775.00	
8.47.13	700 mm diameter	Each	39097.00	
8.47.14	750 mm diameter	Each	46111.00	
8.48	Providing and laying in position including testing following cast iron double flanged 90° Duck Foot Bend			
8.48.1	80 mm diameter	Each	1496.00	1571.00
8.48.2	100 mm diameter	Each	1870.00	1945.00
8.48.3	125 mm diameter	Each	2543.00	2693.00
8.48.4	150 mm diameter	Each	3366.00	3516.00
8.48.5	200 mm diameter	Each	5236.00	5536.00
8.48.6	250 mm diameter	Each	7780.00	8303.00
8.48.7	300 mm diameter	Each	10922.00	11670.00
8.48.8	350 mm diameter	Each	15658.00	16754.00
8.48.9	400 mm diameter	Each	20512.00	22000.00
8.48.10	450 mm diameter	Each	25444.00	27402.00
8.48.11	500 mm diameter	Each	32412.00	34917.00
8.48.12	600 mm diameter	Each	49088.00	53002.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)	
8.49	Providing and laying in position including testing following cast iron all flanged Tees (all sizes in mm) Body x Branch			
8.49.1	80 mm x 80 mm	Each	1496.00	1571.00
8.49.2	100 mm x 80 mm	Each	1721.00	1870.00
8.49.3	100 mm x 100 mm	Each	1795.00	1945.00
8.49.4	125 mm x 80 mm	Each	2169.00	2394.00
8.49.5	125 mm x 100 mm	Each	2394.00	2543.00
8.49.6	125 mm x 125 mm	Each	2469.00	2693.00
8.49.7	150 mm x 80 mm	Each	2843.00	3067.00
8.49.8	150 mm x 100 mm	Each	2917.00	3142.00
8.49.9	150 mm x 125 mm	Each	3067.00	3366.00
8.49.10	150 mm x 150 mm	Each	3217.00	3516.00
8.49.11	200 mm x 80 mm	Each	4189.00	4638.00
8.49.12	200 mm x 100 mm	Each	4264.00	4713.00
8.49.13	200 mm x 125 mm	Each	4488.00	4937.00
8.49.14	200 mm x 150 mm	Each	4638.00	5087.00
8.49.15	200 mm x 200 mm	Each	5012.00	5536.00
8.49.16	250 mm x 80 mm	Each	5984.00	6658.00
8.49.17	250 mm x 100 mm	Each	6059.00	6733.00
8.49.18	250 mm x 125 mm	Each	6284.00	6957.00
8.49.19	250 mm x 150 mm	Each	6508.00	7181.00
8.49.20	250 mm x 200 mm	Each	6882.00	7630.00
8.49.21	250 mm x 250 mm	Each	7406.00	8154.00
8.49.22	300 mm x 80 mm	Each	8154.00	9126.00
8.49.23	300 mm x 100 mm	Each	8303.00	9276.00
8.49.24	300 mm x 125 mm	Each	8453.00	9426.00
8.49.25	300 mm x 150 mm	Each	8677.00	9650.00
8.49.26	300 mm x 200 mm	Each	9126.00	10174.00
8.49.27	300 mm x 250 mm	Each	9650.00	10697.00
8.49.28	300 mm x 300 mm	Each	10174.00	11296.00
8.49.29	350 mm x 200 mm	Each	11900.00	13231.00
8.49.30	350 mm x 250 mm	Each	12213.00	13544.00
8.49.31	350 mm x 300 mm	Each	13309.00	14719.00
8.49.32	350 mm x 350 mm	Each	13701.00	15267.00
8.49.33	400 mm x 200 mm	Each	14797.00	16519.00
8.49.34	400 mm x 250 mm	Each	15110.00	16832.00
8.49.35	400 mm x 300 mm	Each	16284.00	18163.00
8.49.36	400 mm x 350 mm	Each	16754.00	18711.00
8.49.37	400 mm x 400 mm	Each	17302.00	19259.00
8.49.38	450 mm x 250 mm	Each	18163.00	20355.00
8.49.39	450 mm x 300 mm	Each	19338.00	21686.00
8.49.40	450 mm x 350 mm	Each	19807.00	22234.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)	
8.49.41	450 mm x 400 mm	Each	20277.00	22704.00
8.49.42	450 mm x 450 mm	Each	20747.00	23174.00
8.49.43	500 mm x 250 mm	Each	22000.00	24661.00
8.49.44	500 mm x 300 mm	Each	23330.00	26149.00
8.49.45	500 mm x 350 mm	Each	23878.00	26775.00
8.49.46	500 mm x 400 mm	Each	24427.00	27323.00
8.49.47	500 mm x 450 mm	Each	24896.00	27871.00
8.49.48	500 mm x 500 mm	Each	25444.00	28419.00
8.49.49	600 mm x 300 mm	Each	32412.00	36483.00
8.49.50	600 mm x 350 mm	Each	33195.00	37188.00
8.49.51	600 mm x 400 mm	Each	33821.00	37971.00
8.49.52	600 mm x 450 mm	Each	34291.00	38519.00
8.49.53	600 mm x 500 mm	Each	34839.00	39067.00
8.49.54	600 mm x 600 mm	Each	36092.00	40398.00
8.49.55	700 mm x 350 mm	Each	44625.00	50262.00
8.49.56	700 mm x 400 mm	Each	45252.00	50967.00
8.49.57	700 mm x 450 mm	Each	45956.00	51671.00
8.49.58	700 mm x 500 mm	Each	46583.00	52376.00
8.49.59	700 mm x 600 mm	Each	47835.00	53707.00
8.49.60	700 mm x 700 mm	Each	49479.00	55351.00
8.49.61	750 mm x 400 mm	Each	51828.00	58404.00
8.49.62	750 mm x 450 mm	Each	52454.00	59031.00
8.49.63	750 mm x 500 mm	Each	53316.00	59970.00
8.49.64	750 mm x 600 mm	Each	54333.00	60988.00
8.49.65	750 mm x 700 mm	Each	55351.00	62006.00
8.49.66	750 mm x 750 mm	Each	56369.00	63024.00
8.49.67	800 mm x 400 mm	Each	61427.00	69166.00
8.49.68	800 mm x 450 mm	Each	62072.00	69892.00
8.49.69	800 mm x 500 mm	Each	62798.00	70698.00
8.49.70	800 mm x 600 mm	Each	64329.00	72310.00
8.49.71	800 mm x 700 mm	Each	65861.00	73842.00
8.49.72	800 mm x 750 mm	Each	66748.00	74809.00
8.49.73	800 mm x 800 mm	Each	67796.00	75857.00
8.49.74	900 mm x 450 mm	Each	77872.00	87949.00
8.49.75	900 mm x 500 mm	Each	79001.00	89158.00
8.49.76	900 mm x 600 mm	Each	80613.00	90932.00
8.49.77	900 mm x 700 mm	Each	82225.00	92624.00
8.49.78	900 mm x 750 mm	Each	83193.00	93592.00
8.49.79	900 mm x 800 mm	Each	84160.00	94559.00
8.49.80	900 mm x 900 mm	Each	85531.00	95930.00
8.50	Providing and laying in position including testing following cast iron double flanged Tapers (all size in mm) Body x Branch			

S.No.	Particulars of Items	Unit	Rates (in Rs.)	
8.50.1	100 mm x 80 mm	Each	823.00	898.00
8.50.2	125 mm x 80 mm	Each	1347.00	1496.00
8.50.3	125 mm x 100 mm	Each	1496.00	1646.00
8.50.4	150 mm x 80 mm	Each	1571.00	1721.00
8.50.5	150 mm x 100 mm	Each	1721.00	1870.00
8.50.6	150 mm x 125 mm	Each	1870.00	2020.00
8.50.7	200 mm x 100 mm	Each	2169.00	2319.00
8.50.8	200 mm x 125 mm	Each	2319.00	2543.00
8.50.9	200 mm x 150 mm	Each	2543.00	2768.00
8.50.10	250 mm x 125 mm	Each	2843.00	3067.00
8.50.11	250 mm x 150 mm	Each	2992.00	3291.00
8.50.12	250 mm x 200 mm	Each	3441.00	3740.00
8.50.13	300 mm x 150 mm	Each	3516.00	3815.00
8.50.14	300 mm x 200 mm	Each	3965.00	4339.00
8.50.15	300 mm x 250 mm	Each	4488.00	4862.00
8.50.16	350 mm x 200 mm	Each	6185.00	6811.00
8.50.17	350 mm x 250 mm	Each	6811.00	7516.00
8.50.18	350 mm x 300 mm	Each	7516.00	8299.00
8.50.19	400 mm x 250 mm	Each	7672.00	8534.00
8.50.20	400 mm x 300 mm	Each	8455.00	9395.00
8.50.21	400 mm x 350 mm	Each	9317.00	10334.00
8.50.22	450 mm x 300 mm	Each	9160.00	10178.00
8.50.23	450 mm x 350 mm	Each	10256.00	11352.00
8.50.24	450 mm x 400 mm	Each	11195.00	12370.00
8.50.25	500 mm x 350 mm	Each	11274.00	12526.00
8.50.26	500 mm x 400 mm	Each	12292.00	13622.00
8.50.27	500 mm x 450 mm	Each	13153.00	14562.00
8.50.28	600 mm x 400 mm	Each	14875.00	16441.00
8.50.29	600 mm x 450 mm	Each	15658.00	17380.00
8.50.30	600 mm x 500 mm	Each	16911.00	18711.00
8.50.31	700 mm x 500 mm	Each	19886.00	22000.00
8.50.32	700 mm x 600 mm	Each	22469.00	24818.00
8.50.33	750 mm x 600 mm	Each	23957.00	26462.00
8.50.34	750 mm x 700 mm	Each	26932.00	29750.00
8.50.35	800 mm x 600 mm	Each	26925.00	29666.00
8.50.36	800 mm x 700 mm	Each	29988.00	33051.00
8.50.37	800 mm x 750 mm	Each	31278.00	34502.00
8.50.38	900 mm x 700 mm	Each	33454.00	36921.00
8.50.39	900 mm x 750 mm	Each	34905.00	38533.00
8.50.40	900 mm x 800 mm	Each	37163.00	40951.00
8.50.41	1000 mm x 800 mm	Each	41758.00	45949.00
8.50.42	1000 mm x 900 mm	Each	45143.00	49738.00
8.51	Providing and laying in position including testing			

S.No.	Particulars of Items	Unit	Rates (in Rs.)	
	following all flanged cast iron crosses (all sizes in mm)			
8.51.1	80 mm diameter	Each	1870.00	2020.00
8.51.2	100 mm diameter	Each	2319.00	2543.00
8.51.3	125 mm diameter	Each	3067.00	3441.00
8.51.4	150 mm diameter	Each	4040.00	4488.00
8.51.5	200 mm diameter	Each	6284.00	6957.00
8.51.6	250 mm diameter	Each	9126.00	10099.00
8.51.7	300 mm diameter	Each	12343.00	13465.00
8.52	Providing and laying in position including testing following all flanged cast iron blank flanges (all sizes in mm)			
8.52.1	80 mm diameter	Each		391.00
8.52.2	100 mm diameter	Each		470.00
8.52.3	125 mm diameter	Each		626.00
8.52.4	150 mm diameter	Each		861.00
8.52.5	200 mm diameter	Each		1253.00
8.52.6	250 mm diameter	Each		1801.00
8.52.7	300 mm diameter	Each		2505.00
8.52.8	350 mm diameter	Each		3466.00
8.52.9	400 mm diameter	Each		4434.00
8.52.10	450 mm diameter	Each		5401.00
8.52.11	500 mm diameter	Each		6852.00
8.52.12	600 mm diameter	Each		10157.00
8.52.13	700 mm diameter	Each		14269.00
8.52.14	750 mm diameter	Each		16687.00
8.52.15	800 mm diameter	Each		19750.00
8.52.16	900 mm diameter	Each		25232.00
8.52.17	1000 mm diameter	Each		32729.00
8.53	Labour for laying in position including testing following cast iron flanged sockets (all sizes in mm)			
8.53.1	80 mm diameter	Each	34.00	36.00
8.53.2	100 mm diameter	Each	42.00	45.00
8.53.3	125 mm diameter	Each	53.00	56.00
8.53.4	150 mm diameter	Each	70.00	73.00
8.53.5	200 mm diameter	Each	101.00	103.00
8.53.6	250 mm diameter	Each	162.00	173.00
8.53.7	300 mm diameter	Each	207.00	221.00
8.53.8	350 mm diameter	Each	263.00	279.00
8.53.9	400 mm diameter	Each	324.00	343.00
8.53.10	450 mm diameter	Each	374.00	397.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)	
8.53.11	500 mm diameter	Each	455.00	483.00
8.53.12	600 mm diameter	Each	617.00	653.00
8.53.13	700 mm diameter	Each	807.00	855.00
8.53.14	750 mm diameter	Each	916.00	969.00
8.54	Labour for laying in position including testing following cast iron flanged Spigot (all sizes in mm)			
8.54.1	80 mm diameter	Each	31.00	34.00
8.54.2	100 mm diameter	Each	36.00	39.00
8.54.3	125 mm diameter	Each	47.00	53.00
8.54.4	150 mm diameter	Each	59.00	64.00
8.54.5	200 mm diameter	Each	98.00	109.00
8.54.6	250 mm diameter	Each	131.00	148.00
8.54.7	300 mm diameter	Each	168.00	190.00
8.54.8	350 mm diameter	Each	212.00	237.00
8.54.9	400 mm diameter	Each	257.00	290.00
8.54.10	450 mm diameter	Each	304.00	343.00
8.54.11	500 mm diameter	Each	363.00	408.00
8.54.12	600 mm diameter	Each	561.00	634.00
8.54.13	700 mm diameter	Each	729.00	824.00
8.54.14	750 mm diameter	Each	827.00	933.00
8.55	Labour for laying in position including testing following cast iron double flanged 90° Bend (all sizes in mm)			
8.55.1	80 mm diameter	Each	34.00	36.00
8.55.2	100 mm diameter	Each	45.00	47.00
8.55.3	125 mm diameter	Each	59.00	64.00
8.55.4	150 mm diameter	Each	81.00	87.00
8.55.5	200 mm diameter	Each	126.00	137.00
8.55.6	250 mm diameter	Each	182.00	201.00
8.55.7	300 mm diameter	Each	251.00	279.00
8.55.8	350 mm diameter	Each	343.00	383.00
8.55.9	400 mm diameter	Each	452.00	505.00
8.55.10	450 mm diameter	Each	561.00	631.00
8.55.11	500 mm diameter	Each	720.00	810.00
8.55.12	600 mm diameter	Each	1095.00	1234.00
8.55.13	700 mm diameter	Each	1581.00	1784.00
8.55.14	750 mm diameter	Each	1865.00	2108.00
8.56	Labour for laying in position including testing following cast iron double flanged 45° bend (all sizes in mm)			
8.56.1	80 mm diameter	Each	39.00	

S.No.	Particulars of Items	Unit	Rates (in Rs.)	
8.56.2	100 mm diameter	Each	50.00	
8.56.3	125 mm diameter	Each	70.00	
8.56.4	150 mm diameter	Each	95.00	
8.56.5	200 mm diameter	Each	151.00	
8.56.6	250 mm diameter	Each	223.00	
8.56.7	300 mm diameter	Each	313.00	
8.56.8	350 mm diameter	Each	321.00	
8.56.9	400 mm diameter	Each	416.00	
8.56.10	450 mm diameter	Each	517.00	
8.56.11	500 mm diameter	Each	645.00	
8.56.12	600 mm diameter	Each	955.00	
8.56.13	700 mm diameter	Each	1354.00	
8.56.14	750 mm diameter	Each	1597.00	
8.57	Labour for laying in position including testing following cast iron double flanged 90° duck foot bend. (all sizes in mm)			
8.57.1	80 mm diameter	Each	56.00	59.00
8.57.2	100 mm diameter	Each	70.00	73.00
8.57.3	125 mm diameter	Each	95.00	101.00
8.57.4	150 mm diameter	Each	126.00	131.00
8.57.5	200 mm diameter	Each	195.00	207.00
8.57.6	250 mm diameter	Each	290.00	310.00
8.57.7	300 mm diameter	Each	408.00	436.00
8.57.8	350 mm diameter	Each	559.00	598.00
8.57.9	400 mm diameter	Each	732.00	785.00
8.57.10	450 mm diameter	Each	908.00	977.00
8.57.11	500 mm diameter	Each	1156.00	1246.00
8.57.12	600 mm diameter	Each	1751.00	1891.00
8.58	Labour for laying in position including testing following cast iron all flanged tees (all sizes in mm) Body x Branch			
8.58.1	80 mm x 80 mm	Each	56.00	59.00
8.58.2	100 mm x 80 mm	Each	64.00	70.00
8.58.3	100 mm x 100 mm	Each	67.00	73.00
8.58.4	125 mm x 80 mm	Each	81.00	89.00
8.58.5	125 mm x 100 mm	Each	89.00	95.00
8.58.6	125 mm x 125 mm	Each	92.00	101.00
8.58.7	150 mm x 80 mm	Each	106.00	114.00
8.58.8	150 mm x 100 mm	Each	109.00	117.00
8.58.9	150 mm x 125 mm	Each	114.00	126.00
8.58.10	150 mm x 150 mm	Each	120.00	131.00
8.58.11	200 mm x 80 mm	Each	156.00	173.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)	
8.58.12	200 mm x 100 mm	Each	159.00	176.00
8.58.13	200 mm x 125 mm	Each	168.00	184.00
8.58.14	200 mm x 150 mm	Each	173.00	190.00
8.58.15	200 mm x 200 mm	Each	187.00	207.00
8.58.16	250 mm x 80 mm	Each	223.00	249.00
8.58.17	250 mm x 100 mm	Each	226.00	251.00
8.58.18	250 mm x 125 mm	Each	235.00	260.00
8.58.19	250 mm x 150 mm	Each	243.00	268.00
8.58.20	250 mm x 200 mm	Each	257.00	285.00
8.58.21	250 mm x 250 mm	Each	276.00	304.00
8.58.22	300 mm x 80 mm	Each	304.00	341.00
8.58.23	300 mm x 100 mm	Each	310.00	346.00
8.58.24	300 mm x 125 mm	Each	316.00	352.00
8.58.25	300 mm x 150 mm	Each	324.00	360.00
8.58.26	300 mm x 200 mm	Each	341.00	380.00
8.58.27	300 mm x 250 mm	Each	360.00	399.00
8.58.28	300 mm x 300 mm	Each	380.00	422.00
8.58.29	350 mm x 200 mm	Each	424.00	472.00
8.58.30	350 mm x 250 mm	Each	436.00	483.00
8.58.31	350 mm x 300 mm	Each	475.00	525.00
8.58.32	350 mm x 350 mm	Each	489.00	545.00
8.58.33	400 mm x 200 mm	Each	528.00	589.00
8.58.34	400 mm x 250 mm	Each	539.00	600.00
8.58.35	400 mm x 300 mm	Each	581.00	648.00
8.58.36	400 mm x 350 mm	Each	598.00	667.00
8.58.37	400 mm x 400 mm	Each	617.00	687.00
8.58.38	450 mm x 250 mm	Each	648.00	726.00
8.58.39	450 mm x 300 mm	Each	690.00	774.00
8.58.40	450 mm x 350 mm	Each	707.00	793.00
8.58.41	450 mm x 400 mm	Each	723.00	810.00
8.58.42	450 mm x 450 mm	Each	740.00	827.00
8.58.43	500 mm x 250 mm	Each	785.00	880.00
8.58.44	500 mm x 300 mm	Each	832.00	933.00
8.58.45	500 mm x 350 mm	Each	852.00	955.00
8.58.46	500 mm x 400 mm	Each	871.00	975.00
8.58.47	500 mm x 450 mm	Each	888.00	994.00
8.58.48	500 mm x 500 mm	Each	908.00	1014.00
8.58.49	600 mm x 300 mm	Each	1156.00	1301.00
8.58.50	600 mm x 350 mm	Each	1184.00	1326.00
8.58.51	600 mm x 400 mm	Each	1206.00	1354.00
8.58.52	600 mm x 450 mm	Each	1223.00	1374.00
8.58.53	600 mm x 500 mm	Each	1243.00	1394.00
8.58.54	600 mm x 600 mm	Each	1287.00	1441.00
8.58.55	700 mm x 350 mm	Each	1592.00	1793.00



S.No.	Particulars of Items	Unit	Rates (in Rs.)	
8.58.56	700 mm x 400 mm	Each	1614.00	1818.00
8.58.57	700 mm x 450 mm	Each	1639.00	1843.00
8.58.58	700 mm x 500 mm	Each	1662.00	1868.00
8.58.59	700 mm x 600 mm	Each	1706.00	1916.00
8.58.60	700 mm x 700 mm	Each	1765.00	1974.00
8.58.61	750 mm x 400 mm	Each	1849.00	2083.00
8.58.62	750 mm x 450 mm	Each	1871.00	2106.00
8.58.63	750 mm x 500 mm	Each	1902.00	2139.00
8.58.64	750 mm x 600 mm	Each	1938.00	2175.00
8.58.65	750 mm x 700 mm	Each	1974.00	2212.00
8.58.66	750 mm x 750 mm	Each	2011.00	2248.00
8.58.67	800 mm x 400 mm	Each	2128.00	2396.00
8.58.68	800 mm x 450 mm	Each	2150.00	2421.00
8.58.69	800 mm x 500 mm	Each	2175.00	2449.00
8.58.70	800 mm x 600 mm	Each	2229.00	2505.00
8.58.71	800 mm x 700 mm	Each	2282.00	2558.00
8.58.72	800 mm x 750 mm	Each	2312.00	2592.00
8.58.73	800 mm x 800 mm	Each	2349.00	2628.00
8.58.74	900 mm x 450 mm	Each	2698.00	3047.00
8.58.75	900 mm x 500 mm	Each	2737.00	3089.00
8.58.76	900 mm x 600 mm	Each	2793.00	3150.00
8.58.77	900 mm x 700 mm	Each	2848.00	3209.00
8.58.78	900 mm x 750 mm	Each	2882.00	3242.00
8.58.79	900 mm x 800 mm	Each	2915.00	3276.00
8.58.80	900 mm x 900 mm	Each	2963.00	3323.00
8.59	Labour for laying in position including testing following cast iron double flanged Tapers (all sizes in mm) Body x Branch			
8.59.1	100 mm x 80 mm	Each	31.00	34.00
8.59.2	125 mm x 80 mm	Each	50.00	56.00
8.59.3	125 mm x 100 mm	Each	56.00	61.00
8.59.4	150 mm x 80 mm	Each	59.00	64.00
8.59.5	150 mm x 100 mm	Each	64.00	70.00
8.59.6	150 mm x 125 mm	Each	70.00	75.00
8.59.7	200 mm x 100 mm	Each	81.00	87.00
8.59.8	200 mm x 125 mm	Each	87.00	95.00
8.59.9	200 mm x 150 mm	Each	95.00	103.00
8.59.10	250 mm x 125 mm	Each	106.00	114.00
8.59.11	250 mm x 150 mm	Each	112.00	123.00
8.59.12	250 mm x 200 mm	Each	128.00	140.00
8.59.13	300 mm x 150 mm	Each	131.00	142.00
8.59.14	300 mm x 200 mm	Each	148.00	162.00
8.59.15	300 mm x 250 mm	Each	168.00	182.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)	
8.59.16	350 mm x 200 mm	Each	221.00	243.00
8.59.17	350 mm x 250 mm	Each	243.00	268.00
8.59.18	350 mm x 300 mm	Each	268.00	296.00
8.59.19	400 mm x 250 mm	Each	274.00	304.00
8.59.20	400 mm x 300 mm	Each	302.00	335.00
8.59.21	400 mm x 350 mm	Each	332.00	369.00
8.59.22	450 mm x 300 mm	Each	327.00	363.00
8.59.23	450 mm x 350 mm	Each	366.00	405.00
8.59.24	450 mm x 400 mm	Each	399.00	441.00
8.59.25	500 mm x 350 mm	Each	402.00	447.00
8.59.26	500 mm x 400 mm	Each	438.00	486.00
8.59.27	500 mm x 450 mm	Each	469.00	519.00
8.59.28	600 mm x 400 mm	Each	531.00	586.00
8.59.29	600 mm x 450 mm	Each	559.00	620.00
8.59.30	600 mm x 500 mm	Each	603.00	667.00
8.59.31	700 mm x 500 mm	Each	709.00	785.00
8.59.32	700 mm x 600 mm	Each	801.00	885.00
8.59.33	750 mm x 600 mm	Each	855.00	944.00
8.59.34	750 mm x 700 mm	Each	961.00	1061.00
8.59.35	800 mm x 600 mm	Each	933.00	1028.00
8.59.36	800 mm x 700 mm	Each	1039.00	1145.00
8.59.37	800 mm x 750 mm	Each	1084.00	1195.00
8.59.38	900 mm x 700 mm	Each	1159.00	1279.00
8.59.39	900 mm x 750 mm	Each	1209.00	1335.00
8.59.40	900 mm x 800 mm	Each	1287.00	1419.00
8.59.41	1000 mm x 800 mm	Each	1447.00	1592.00
8.59.42	1000 mm x 900 mm	Each	1564.00	1723.00
8.60	Labour for laying in position including testing following all flanged cast iron crosses (all sizes in mm)			
8.60.1	80 mm diameter	Each	70.00	75.00
8.60.2	100 mm diameter	Each	87.00	95.00
8.60.3	125 mm diameter	Each	114.00	128.00
8.60.4	150 mm diameter	Each	151.00	168.00
8.60.5	200 mm diameter	Each	235.00	260.00
8.60.6	250 mm diameter	Each	341.00	377.00
8.60.7	300 mm diameter	Each	461.00	503.00
8.61	Providing and laying in position including testing following sizes of flanged cast iron standard specials class medium or heavy which does not appear in above items of the schedule.			

S.No.	Particulars of Items	Unit	Rates (in Rs.)	
8.61.1	80 mm to 300 mm dia	Kg	74.00	74.00
8.61.2	Above 300mm Dia	Kg	77.00	77.00
8.62	Providing & fixing of following Cast iron double flanged sluice valves as per I.S.:14846-2000 fitted with cast iron cap including jointing & testing with cost of jointing material such as bolts, nuts, rubber insertions etc. all complete.		PN-1.0	PN-1.6
8.62.1	50 mm dia	Each	2855.00	3647.00
8.62.2	65 mm dia	Each	3005.00	5008.00
8.62.3	80 mm dia	Each	3863.00	5148.00
8.62.4	100 mm dia	Each	5097.00	7102.00
8.62.5	125 mm dia	Each	6369.00	8528.00
8.62.6	150 mm dia	Each	7915.00	10168.00
8.62.7	200 mm dia	Each	13989.00	18153.00
8.62.8	250 mm dia	Each	21719.00	29921.00
8.62.9	300 mm dia	Each	25389.00	37470.00
8.63	Fixing of following Cast iron double flanged sluice valves fitted with cast iron cap testing with cost of jointing material such as bolts, nuts, rubber insertions etc. all complete (only valve to be supplied by department free of cost.		PN-1.0	
8.63.1	50 mm dia	Each	258.00	
8.63.2	65 mm dia	Each	270.00	
8.63.3	80 mm dia	Each	281.00	
8.63.4	100 mm dia	Each	465.00	
8.63.5	125 mm dia	Each	497.00	
8.63.6	150 mm dia	Each	657.00	
8.63.7	200 mm dia	Each	1036.00	
8.63.8	250 mm dia	Each	1198.00	
8.63.9	300 mm dia	Each	1329.00	
8.63.10	350 mm dia	Each	2157.00	
8.63.11	400 mm dia	Each	3324.00	
8.63.12	450 mm dia	Each	4114.00	
8.63.13	500 mm dia	Each	5057.00	
8.63.14	600 mm dia	Each	7939.00	
8.63.15	700 mm dia	Each	8791.00	
8.63.16	750 mm dia	Each	9263.00	
8.63.17	800 mm dia	Each	12242.00	

S.No.	Particulars of Items	Unit	Rates (in Rs.)	
8.63.18	900 mm dia	Each	14023.00	
8.63.19	1000 mm dia	Each	16101.00	
8.64	Labour for laying and fixing of following cast iron double flanged sluice valves (vide item no.1) including jointing and testing but without cost of Jointing materials.		PN-1.6	
8.64.1	50 mm dia	Each	92.00	
8.64.2	65 mm dia	Each	100.00	
8.64.3	80 mm dia	Each	111.00	
8.64.4	100 mm dia	Each	162.00	
8.64.5	125 mm dia	Each	192.00	
8.64.6	150 mm dia	Each	237.00	
8.64.7	200 mm dia	Each	347.00	
8.64.8	250 mm dia	Each	512.00	
8.64.9	300 mm dia	Each	642.00	
8.64.10	350 mm dia	Each	1131.00	
8.64.11	400 mm dia	Each	1353.00	
8.64.12	450 mm dia	Each	1576.00	
8.64.13	500 mm dia	Each	1936.00	
8.64.14	600 mm dia	Each	2809.00	
8.64.15	700 mm dia	Each	3237.00	
8.64.16	750 mm dia	Each	3400.00	
8.64.17	800 mm dia	Each	3835.00	
8.65(a)	Providing & fixing following cast iron double flanged single door reflux (non return) valves including jointing & testing with cost of jointing material such as bolts, nuts and rubber insertion all complete as per IS :5312 (Part I)		PN- 1.0	
8.65(a).1	50 mm dia	Each	1854.00	
8.65(a).2	65 mm dia	Each	2409.00	
8.65(a).3	80 mm dia	Each	2931.00	
8.65(a).4	100 mm dia	Each	4185.00	
8.65(a).5	150 mm dia	Each	6862.00	
8.65(a).6	200 mm dia	Each	12345.00	
8.65(a).7	250 mm dia	Each	17508.00	
8.65(a).8	300 mm dia	Each	24393.00	
8.65(a).9	350 mm dia	Each	44652.00	
8.65(b)	Providing & fixing following cast iron double flanged multi door reflux (non return)		PN- 1.0	PN-1.6

S.No.	Particulars of Items	Unit	Rates (in Rs.)	
	valves including jointing & testing with cost of jointing material such as bolts,nuts and rubber insertion all complete as per IS : 5312 (Part II).			
8.65(b).1	400 mm dia	Each	63606.00	70513.00
8.65(b).2	450 mm dia	Each	80667.00	87574.00
8.65(b).3	500 mm dia	Each	112669.00	134419.00
8.65(b).4	600 mm dia	Each	168244.00	191123.00
8.65(b).5	700 mm dia	Each	197669.00	265145.00
8.65(b).6	750 mm dia	Each	305666.00	321024.00
8.65(b).7	800 mm dia	Each	349799.00	379219.00
8.66	Labour for laying and fixing of following Cast Iron Double Flanged reflux (non return) valves including jointing & testing but without cost of jointing materials.		PN- 1.0	
8.66.1	50 mm dia	Each	78.00	
8.66.2	65 mm dia	Each	89.00	
8.66.3	80 mm dia	Each	96.00	
8.66.4	100 mm dia	Each	130.00	
8.66.5	150 mm dia	Each	191.00	
8.66.6	200 mm dia	Each	283.00	
8.66.7	250 mm dia	Each	386.00	
8.66.8	300 mm dia	Each	503.00	
8.66.9	350 mm dia	Each	795.00	
8.66.10	400 mm dia	Each	1066.00	
8.66.11	450 mm dia	Each	1201.00	
8.66.12	500 mm dia	Each	1507.00	
8.66.13	600 mm dia	Each	2307.00	
8.66.14	700 mm dia	Each	2658.00	
8.66.15	750 mm dia	Each	2758.00	
8.66.16	800 mm dia	Each	3052.00	
8.66.17	900 mm dia	Each	3344.00	
8.66.18	1000 mm dia	Each	3548.00	
	<b>Butterfly Valve</b>			
8.67	Providing & fixing following cast iron butterfly valves including jointing & testing with cost of jointing material such as bolts, nuts and rubber insertion all complete as per IS :13095-1991.		PN- 1.0	PN- 1.6
8.67.1	50 mm dia	Each	1963.00	2017.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)	
8.67.2	65 mm dia	Each	2395.00	2405.00
8.67.3	80 mm dia	Each	2532.00	2600.00
8.67.4	100 mm dia	Each	3217.00	3305.00
8.67.5	150 mm dia	Each	4858.00	4996.00
8.67.6	200 mm dia	Each	9618.00	9893.00
8.67.7	250 mm dia	Each	13575.00	13964.00
8.67.8	300 mm dia	Each	16600.00	17074.00
8.68	Labour for laying and fixing of following Cast Iron butterfly valves including jointing & testing but without cost of jointing materials.			
8.68.1	50 mm dia	Each		78.00
8.68.2	65 mm dia	Each		89.00
8.68.3	80 mm dia	Each		96.00
8.68.4	100 mm dia	Each		130.00
8.68.5	150 mm dia	Each		191.00
8.68.6	200 mm dia	Each		226.00
8.68.7	250 mm dia	Each		283.00
8.68.8	300 mm dia	Each		442.00
8.69	Providing & fixing following cast iron single air valves, small orifice with screwed end as per IS: 14845-2000 including jointing & testing with cost of jointing material and rubber insertion all complete as per IS :13095-1991.		PN- 1.0	PN- 1.6
8.69.1	25 mm dia	Each	736.00	819.00
8.69.2	40 mm dia	Each	894.00	963.00
8.70	Labour for laying and fixing of following Cast Iron Air valves small orifice with screwed end i/c jointing & testing but without cost of jointing material.			
8.70.1	25 mm dia	Each		33.00
8.70.1	40 mm dia	Each		38.00
8.71	Providing & fixing following cast iron single acting air valves, large orifice with screwed end as per IS : 14845-2000 including jointing & testing with cost of jointing material and rubber insertion all complete as per		PN- 1.0	PN- 1.6

S.No.	Particulars of Items	Unit	Rates (in Rs.)	
	IS :13095-1991.			
8.71.1	25 mm dia	Each	943.00	1095.00
8.71.2	40 mm dia	Each	963.00	1364.00
8.71.3	50 mm dia	Each	1210.00	1417.00
8.72	Labour for laying and fixing of following Cast Iron Air valves large orifice with screwed end i/c jointing & testing but without cost of jointing material. .			
8.72.1	25 mm dia	Each		33.00
8.72.2	40 mm dia	Each		38.00
8.72.3	50 mm dia	Each		69.00
8.73	Providing & fixing following cast iron double acting air valves, flanged without inbuilt isolating valve as per IS: 14845-2000 including jointing & testing with cost of jointing material and rubber insertion all complete as per IS :13095-1991.		PN- 1.0	PN- 1.6
8.73.1	40 mm dia	Each	1794.00	1877.00
8.73.2	50 mm dia	Each	2270.00	2477.00
8.73.3	65 mm dia	Each	2955.00	2984.00
8.73.4	80 mm dia	Each	3156.00	3239.00
8.73.5	100 mm dia	Each	3977.00	4045.00
8.73.6	150 mm dia	Each	6383.00	6729.00
8.73.7	200 mm dia	Each	9338.00	10650.00
8.74	Labour for laying and fixing including testing following Cast Iron double acting air valves, flanged without inbuilt isolating valve.			PN- 1.0
8.74.1	40 mm dia	Each		47.00
8.74.2	50 mm dia	Each		84.00
8.74.3	65 mm dia	Each		105.00
8.74.4	80 mm dia	Each		108.00
8.74.5	100 mm dia	Each		140.00
8.74.6	150 mm dia	Each		191.00
8.74.7	200 mm dia	Each		301.00
8.75	Providing & fixing following cast iron double acting air valves, flanged with inbuilt isolating valve as per IS : 14845- 2000 including jointing & testing with cost of		PN- 1.0	PN- 1.6

S.No.	Particulars of Items	Unit	Rates (in Rs.)	
	jointing material and rubber insertion all complete as per IS :13095-1991.			
8.75.1	40 mm dia	Each	1734.00	1942.00
8.75.2	80 mm dia	Each	2272.00	2617.00
8.75.3	100 mm dia	Each	2663.00	7846.00
8.75.4	150 mm dia	Each	2721.00	13431.00
8.75.5	200 mm dia	Each	10097.00	21843.00
8.76	Labour for laying and fixing, including testing following Cast Iron double acting air valves, flanged with in-built isolating valve.			
8.76.1	40 mm dia	Each	47.00	
8.76.2	80 mm dia	Each	101.00	
8.76.3	100 mm dia	Each	140.00	
8.76.4	150 mm dia	Each	191.00	
8.76.5	200 mm dia	Each	301.00	



# **CHAPTER - 09**

## **CONSUMER SERVICE CONNECTION**

## CHAPTER – 09

### CONSUMER SERVICE CONNECTION

S.No.	Items	Unit	Rates (In Rs.)
9.1	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & coldwater supply including all CPVC plain and brass threaded fitting i/c fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and testing of joints complete as per direction of Engineer in Charge. Internal work - Exposed on wall.		
9.1.1	15 mm nominal outer dia. Pipes.	Meter	182.00
9.1.2	20 mm nominal outer dia. Pipes.	Meter	245.00
9.1.3	25 mm nominal outer dia. Pipes.	Meter	323.00
9.1.4	32 mm nominal outer dia. Pipes.	Meter	453.00
9.1.5	40 mm nominal outer dia. Pipes.	Meter	617.00
9.1.6	50 mm nominal outer dia. Pipes.	Meter	941.00
9.2	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & coldwater supply including all CPVC plain & brass threaded fittings i/c fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and the cost of cutting chases and making good the same including testing of joints complete as per direction of Engineer in Charge. Concealed work including cutting chases and making good the walls etc.		
9.2.1	15 mm nominal outer dia. Pipes.	Meter	319.00
9.2.2	20 mm nominal outer dia. Pipes.	Meter	408.00
9.2.3	25 mm nominal outer dia. Pipes.	Meter	532.00
9.2.4	32 mm nominal outer dia. Pipes.	Meter	717.00
9.3	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & coldwater supply including all CPVC plain & brass threaded fittings This includes jointing of pipes & fittings with one step CPVC solvent cement, trenching, refilling & testing of joints complete as per direction of Engineer in Charge. External work		
9.3.1	15 mm nominal outer dia. Pipes.	Meter	106.00
9.3.2	20 mm nominal outer dia. Pipes.	Meter	124.00
9.3.3	25 mm nominal outer dia. Pipes.	Meter	154.00
9.3.4	32 mm nominal outer dia. Pipes.	Meter	187.00
9.3.5	40 mm nominal outer dia. Pipes.	Meter	279.00
9.3.6	50 mm nominal outer dia. Pipes.	Meter	392.00
9.3.7	62.50 mm nominal inner dia. Pipes.	Meter	1194.00
9.3.8	75 mm nominal inner dia. Pipes.	Meter	1541.00

S.No.	Items	Unit	Rates (In Rs.)
9.3.9	100 mm nominal inner dia. Pipes.	Meter	2133.00
9.3.10	150 mm nominal inner dia. Pipes.	Meter	3690.00
9.4	Providing and fixing medium grade G.I. pipes medium class (ISI mark) complete with G.I. fittings (ISI mark) and clamps, including cutting and making good the walls etc. Internal work – Exposed on wall.		
9.4.1	15 mm dia. nominal bore	Meter	172.00
9.4.2	20 mm dia. nominal bore	Meter	217.00
9.4.3	25 mm dia. nominal bore	Meter	288.00
9.4.4	32 mm dia. nominal bore	Meter	355.00
9.4.5	40 mm dia. nominal bore	Meter	429.00
9.4.6	50 mm dia. nominal bore	Meter	543.00
9.5	Concealed pipe including painting with anti-corrosive bitumastic paint, cutting chases and making good the wall.		
9.5.1	15 mm dia nominal bore	Meter	266.00
9.5.2	20 mm dia nominal bore	Meter	300.00
9.6	Providing and fixing G.I. pipes medium class complete with G.I. fittings as per IS: 1239 (Part-2) including trenching and refilling etc. External work		
9.6.1	15 mm dia. nominal bore	Meter	144.00
9.6.2	20 mm dia. nominal bore	Meter	170.00
9.6.3	25 mm dia. nominal bore	Meter	227.00
9.6.4	32 mm dia. nominal bore	Meter	271.00
9.6.5	40 mm dia. nominal bore	Meter	317.00
9.6.6	50 mm dia. nominal bore	Meter	389.00
9.6.7	65 mm dia. nominal bore	Meter	490.00
9.6.8	80 mm dia. nominal bore	Meter	626.00
9.7	Making connection of G.I. distribution branch with G.I. main of following sizes by providing and fixing tee, including cutting and threading the pipe etc. complete:		
9.7.1	25 to 40 mm nominal bore	Each	319.00
9.7.2	50 to 80 mm nominal bore	Each	738.00
9.8	Fixing water meter and stop cock in G.I. pipe line including cutting and threading the pipe and making long screws etc. complete (cost of water meter and stop cock to be paid separately).	Each	270.00
	<b>BRASS FITTINGS</b>		
9.9	Providing and fixing brass bib cock of approved quality:		
9.9.1	15 mm nominal bore 0.40kg	Each	230.00
9.9.2	20 mm nominal bore 0.75kg	Each	275.00
9.10	Providing and fixing brass stop cock of approved quality:		
9.10.1	15 mm nominal bore 0.40kg	Each	230.00

S.No.	Items	Unit	Rates (In Rs.)
9.10.2	20 mm nominal bore 0.75kg	Each	275.00
9.11	Providing and fixing gun metal gate valve with C.I. wheel of approved quality (screwed end):		
9.11.1	15 mm nominal bore	Each	140.00
9.11.2	20 mm nominal bore	Each	217.00
9.11.3	25 mm nominal bore	Each	251.00
9.11.4	32 mm nominal bore.	Each	380.00
9.11.5	40 mm nominal bore	Each	503.00
9.11.6	50 mm nominal bore	Each	759.00
9.11.7	65 mm nominal bore	Each	1432.00
9.11.8	80 mm nominal bore	Each	2246.00
9.12	Providing and fixing ball valve (brass) of approved quality, High or low pressure, with plastic floats complete:		
9.12.1	15 mm nominal bore	Each	277.00
9.12.2	20 mm nominal bore	Each	398.00
9.12.3	25 mm nominal bore	Each	463.00
9.13	Providing and fixing gun metal non- return valve of approved quality (screwed end) :		
9.13.1	<b>25 mm nominal bore</b>		
9.13.1.1	Horizontal	Each	353.00
9.13.1.2	Vertical	Each	385.00
9.13.2	<b>32 mm nominal bore</b>		
9.13.2.1	Horizontal	Each	445.00
9.13.2.2	Vertical	Each	554.00
9.13.3	<b>40 mm nominal bore</b>		
9.13.3.1	Horizontal	Each	589.00
9.13.3.2	Vertical	Each	717.00
9.13.4	<b>50 mm nominal bore</b>		
9.13.4.1	Horizontal	Each	874.00
9.13.4.2	Vertical	Each	995.00
9.13.5	<b>65 mm nominal bore</b>		
9.13.5.1	Horizontal	Each	1484.00
9.13.5.2	Vertical	Each	1701.00
9.13.6	<b>80 mm nominal bore</b>		
9.13.6.1	Horizontal	Each	2113.00
9.13.6.2	Vertical	Each	2765.00
9.14	Providing and fixing brass ferrule with C.I. mouth cover including boring and tapping the main :		
9.14.1	15 mm nominal bore	Each	208.00
9.14.2	20 mm nominal bore	Each	270.00
9.14.3	25 mm nominal bore	Each	342.00
9.15	Providing and fixing unplasticized PVC connection pipe with brass unions		
9.15.1	<b>30 cm length</b>		
9.15.1.1	15 mm nominal bore	Each	54.00

S.No.	Items	Unit	Rates (In Rs.)
9.15.1.2	20 mm nominal bore	Each	63.00
9.15.2	<b>45 cm length</b>		
9.15.2.1	15 mm nominal bore	Each	67.00
9.15.2.2	20 mm nominal bore	Each	81.00
9.16	Providing and fixing C.P. brass shower rose with 15 or 20 mm inlet:		
9.16.1	100 mm diameter	Each	592.00
9.16.2	150 mm diameter	Each	786.00
9.17	Painting G.I. pipes and fittings with synthetic enamel white paint over a ready mixed priming coat, both of approved quality for new work:		
9.17.1	15 mm diameter pipe.	Meter	9.00
9.17.2	20 mm diameter pipe.	Meter	10.00
9.17.3	25 mm diameter pipe.	Meter	14.00
9.17.4	32 mm diameter pipe.	Meter	16.00
9.17.5	40 mm diameter pipe.	Meter	19.00
9.17.6	50 mm diameter pipe.	Meter	22.00
9.18	Repainting G.I. pipes and fittings with synthetic enamel white paint of approved quality:		
9.18.1	15 mm diameter pipe.	Meter	5.00
9.18.2	20 mm diameter pipe.	Meter	5.00
9.18.3	25 mm diameter pipe	Meter	7.00
9.18.4	32 mm diameter pipe	Meter	8.00
9.18.5	40 mm diameter pipe	Meter	9.00
9.18.6	50 mm diameter pipe	Meter	11.00
9.19	Painting G.I. pipes and fittings with two coats of anticorrosive bitumastic paint of approved quality:		
9.19.1	15 mm diameter pipe	Meter	5.00
9.19.2	20 mm diameter pipe	Meter	6.00
9.19.3	25 mm diameter pipe	Meter	8.00
9.19.4	32 mm diameter pipe	Meter	9.00
9.19.5	40 mm diameter pipe	Meter	11.00
9.19.6	50 mm diameter pipe	Meter	13.00
9.19.7	65 mm diameter pipe	Meter	15.00
9.19.8	80 mm diameter pipe	Meter	18.00
9.20	Providing and fixing G.I. Union (ISI mark) in G.I. pipe line including cutting and threading the pipe and making long screws etc complete <b>(new work)</b> :		
9.20.1	15 mm nominal bore.	Each	129.00
9.20.2	20 mm nominal bore.	Each	153.00
9.20.3	25 mm nominal bore.	Each	165.00
9.20.4	32 mm nominal bore.	Each	184.00
9.20.5	40 mm nominal bore.	Each	230.00
9.20.6	50 mm nominal bore.	Each	300.00
9.20.7	65 mm nominal bore.	Each	498.00
9.20.8	80 mm nominal bore.	Each	614.00

S.No.	Items	Unit	Rates (In Rs.)
9.21	Providing and fixing G.I. Union (ISI mark) in existing G.I. pipe line, cutting and threading the pipe and making long screws including excavation, refilling the earth or cutting of wall and making good the same complete wherever required:		
9.21.1	15 mm nominal bore.	Each	232.00
9.21.2	20 mm nominal bore.	Each	256.00
9.21.3	25 mm nominal bore.	Each	267.00
9.21.4	32 mm nominal bore.	Each	286.00
9.21.5	40 mm nominal bore.	Each	332.00
9.21.6	50 mm nominal bore.	Each	467.00
9.21.7	65 mm nominal bore.	Each	689.00
9.21.8	80 mm nominal bore.	Each	781.00
9.22	Providing and placing on at all floor levels high design HDPE (polyethylene) water storage tank IS: 12701 marked with cover and suitable locking arrangement and making necessary holes for inlet, outlet and making necessary holes for inlet, outlet and overflow pipes but without fittings and the base support for tank.	Ltr.	8.00
	<b>C.P. BRASS FITTINGS.</b>		
9.23	Providing and fixing C.P. brass bib cock of approved quality conforming to IS:8931		
9.23.1	15 mm nominal bore.	Each	375.00
9.24	Providing and fixing C.P. brass long nose bib cock of approved quality conforming to IS standards and weighing not less than 810 gms.		
9.24.1	15 mm nominal bore.	Each	335.00
9.25	Providing and fixing C.P. brass long body bib cock of approved quality conforming to IS standards and weighing not less than 690 gms.		
9.25.1	15 mm nominal bore	Each	380.00
9.26	Providing and fixing C.P. brass stop cock (concealed) of standard design and of approved will quality make conforming to IS:8931.		
9.26.1	15 mm nominal bore.	Each	375.00
9.27	Providing and fixing C.P. brass angle valve for basin mixer and geyser points of approved quality conforming to IS:8931		
9.27.1	15 mm nominal bore	Each	415.00
9.28	Providing and fixing C.P. brass pillar cock of approved quality and make conforming to IS: specification.		
9.28.1	15 mm nominal bore 125 mm long foam flow	Each	619.00
9.29	Providing and fixing C.P. brass base and mixer of approved quality and make conforming to IS: specification.		

S.No.	Items	Unit	Rates (In Rs.)
9.29.1	15 mm nominal bore.	Each	1905.00
9.30	Providing and fixing C.P. brass wall mixer of approved quality and make conforming to IS: specification.		
9.30.1	15 mm nominal bore.	Each	2160.00
9.31	Providing and fixing C.P. brass sink mixer of approved quality and make conforming to IS: specification.		
9.31.1	15 mm nominal bore.	Each	1905.00
9.32	Providing and fixing C.P. brass grating of approved quality and make conforming to IS: specification.		
9.32.1	100 mm dia.	Each	53.00
9.33	Cutting holes up to 30x30 cm in walls including making good the same <b>With Modular bricks</b>	per hole	189.00
9.34	Cutting holes up to 15x15 cm in R.C.C. floors and roofs for passing drain pipe etc. and repairing the hole after insertion of drain pipe etc. with cement concrete grade M-15 (Nominal Mix with 20mm maximum size of stone aggregate) including finishing complete so as to make it leak proof.	Each	168.00
9.35	Making chases up to 7.5 x 7.5 cm in walls including making good and finishing with matching surface after housing G.I. pipe etc.	Meter	66.00
9.36	Making chases up to 20 x 20 cm and embedding pipes up to 150 mm diameter in masonry and filling with cement concrete grade M-10 (Nominal Mix with 20mm maximum size of stone aggregate) including disposal of malba (wastage).	Meter	95.00
9.37	Providing and making Consumer Service connection (Functional House Hold Taps Connection) from HDPE pipe with the help of electro fusion machine including all labour and material such as Electro Fusion Saddle, brass ferrule (Not less than 100 gm in weight)/MDPE ferrule/flow control valve, double compression elbow, male/female threaded adopter with metal insert, sockets, MDPE unions 20mm dia/GI union 15 mm dia (medium class), brass/ss tap etc. all complete and all Rates also include excavation, cutting of road if required, refilling the trenches and restoration of road with minimum M-20 (1:1.5 :3) grade CC or equivalent grade of existing CC cutting for providing tap connection (whichever is richer), construction of Platform and grouting of circular post neat and finished as per the drawing attached, testing all complete items.		
9.37.1	For connection with 20mm dia MDPE Pipe upto 5 meter and CONCRETE ROAD CROSSING is	Each	3375.00

S.No.	Items	Unit	Rates (In Rs.)
	necessary		
9.37.2	For Connection with 20mm dia MDPE Pipe more than 5 meter and CONCRETE ROAD CROSSING is necessary	Each	3596.00
9.37.3	For connection with 20mm dia MDPE pipe upto 5 meter and road crossing is not required. (Distribution pipe line is on the same side of house)	Each	2441.00
9.37.4	For connection with 20mm dia MDPE pipe upto 5 meter and road (OTHER THAN CONCRETE ROAD) crossing is necessary	Each	2519.00
9.37.5	For connection with 20mm dia MDPE pipe more than 5 meter & upto 10 meter and road (Other than concrete road) crossing is necessary	Each	2655.00
9.38	Providing and making Consumer Service Connection (Functional House Hold Taps Connection) from HDPE pipe with the help of electro fusion machine including all labour and material such as Electro fusion Saddle, brass ferrule (Note less than 100 gm in weight) /MDPE, ferrule/flow control valve, double compression elbow, male/female threaded adopter with metal insert sockets MDPE union 20mm dia/ GI union 15mm dia (medium class), brass /SS tap etc all complete and all items/fittings shall be complying with the relevant BIS Codes. Rates also include excavation, cutting of road if required, refilling the trenches and restoration of road with minimum M-20 (1:1.5:3) grade CC or equivalent grade of existing CC cutting for providing tap connection (whichever is richer), construction of Platform and grouting of circular post neat finished as per the drawing attached, testing all complete items.		
9.38.1	For connection with 15mm dia GI pipe upto 5 meter and CONCRETE ROAD CROSSING is necessary.	Each	3521.00
9.38.2	For connection with 15mm dia GI pipe more than 5 meter & upto 10 meter and CONCRETE ROAD CROSSING is necessary.	Each	4063.00
9.38.3	For connection with 15mm dia GI pipe up to 5 meter and road crossing is not required. (Distribution pipe line is on the same side of house)	Each	2685.00
9.38.4	For connection with 15mm dia GI pipe upto 5 meter and road (OTHER THAN CONCRETE ROAD) crossing is necessary.	Each	2907.00
9.38.5	For connection with 15mm dia GI pipe than 5 meter & upto 10 meter and road (OTHER THAN CONCRETE ROAD) crossing is necessary.	Each	3139.00
9.39	Providing and making Consumer Service Connection (Functional House Hold Taps Connection) from CI/DI/GI pipe with the help of		



S.No.	Items	Unit	Rates (In Rs.)
	electro fusion machine including all labour and material such as Electro fusion Saddle, brass ferrule (Note less than 100 gm in weight) /MDPE, ferrule/flow control valve, double compression elbow, male/female threaded adopter with metal insert sockets MDPE union 20mm dia/ GI union 15mm dia (medium class), brass /SS tap etc all complete and all items/fittings shall be complying with the relevant BIS Codes. Rates also include excavation, cutting of road if required, refilling the trenches and restoration of road with minimum M-20 (1:1.5:3) grade CC or equivalent grade of existing CC cutting for providing tap connection (whichever is richer), construction of Platform and grouting of circular post neat finished as per the drawing attached, testing all complete items.		
9.39.1	For connection with 20mm dia MDPE pipe upto 5 meter and CONCRETE ROAD CROSSING is necessary	Each	3058.00
9.39.2	For connection with 20mm dia MDPE pipe more than 5 meter & upto 10 meter and CONCRETE ROAD CROSSING is necessary	Each	3259.00
9.39.3	For connection with 20mm dia MDPE pipe upto 5 meter and road crossing is not required. (Distribution pipe line is on the same side of house	Each	2145.00
9.39.4	For connection with 20mm dia MDPE pipe upto 5 meter and road (OTHER THAN CONCRETE ROAD) crossing is necessary	Each	2245.00
9.39.5	For connection with 20mm dia MDPE pipe more than 5 meter & upto 10 meter and road (OTHER THAN CONCRETE ROAD) crossing is necessary	Each	2362.00
9.40	Providing and making Consumer Service Connection (House Hold Connection) from CI/DI/GI pipe with including all labour and material such as connection clamp, brass ferrule (note less than 100 gm)/flow control valve, double compression elbow, male/female threaded adopter with metal insert sockets, union 20mm dia MDPE / 15mm dia GI pipe (medium class), brass /SS tape etc all complete and complying with the relevant BIS specifications. Rates also include excavation, cutting of road if required, refilling the trenches and restoration of road with minimum M-20 (1:1.5:3) grade CC or equivalent grade of existing CC cutting for providing tap connection (whichever is richer), construction of Platform and grouting of circular post neat finished as per the drawing attached, testing all complete items.		
9.40.1	For connection with 15mm dia GI pipe upto 5 meter	Each	3409.00

S.No.	Items	Unit	Rates (In Rs.)
	and CONCRETE ROAD CROSSING is necessary.		
9.40.2	For connection with 15mm dia GI pipe more than 5 meter & upto 10 meter and CONCRETE ROAD CROSSING is necessary.	Each	3941.00
9.40.3	For connection with 15mm dia GI pipe upto 5 meter and road crossing is not required. (Distribution pipe line is on the same side of house)	Each	2571.00
9.40.4	For connection with 15mm dia GI pipe upto 5 meter and road (OTHER THAN CONCRETE ROAD) crossing is necessary.	Each	2844.00
9.40.5	For connection with 15mm dia GI pipe than 5 meter & upto 10 meter and road (OTHER THAN CONCRETE ROAD) crossing is necessary.	Each	3022.00
9.40.6	Deduct from Item No.- 9.37 to 9.40 if platform and parapet is not constructed.	Each	436.00
9.40.7	Deduct from Item No.- 9.37 to 9.40 if grouting in post not done.	Each	429.00
9.41	Fabrication, providing and fixing of typical information board of size 2.40 m x 1.80 m made out as detailed below -1. Three vertical supports made out from 100 mm x 50 mm, 6.0 mm thick channel. This shall be minimum 1.0 m below GL and 3.00 m above GL. The Channel shall be erected on 600 mm x 600 mm x 1000 mm foundation blocks at appropriate depth made of cement concrete 1:2:4.2. The board shall be fabricated from 1.6 mm thick MS sheet of size 2.40 m x 1.80 m. The frame of board shall be fabricated with 50 mm x 50 mm x 5 thick angle with one horizontal additional support in centre with same angle.3. Whole structure shall be painted by standard colour with lettering border, heading and logo etc using synthetic enamel paint of superior quality including welding, excavation, concreting, painting of base, border and lettering, painting and other required details etc. complete as directed by Engineer-in-charge.	Job	19399

# **CHAPTER - 10**

## **WATER HAMMER DEVICES**

## **CHAPTER- 10**

### **WATER HAMMER DEVICES**

#### **Notes:**

1. Providing and supply items for zero velocity valves and air cushion valves conforming with the norms are to be used after third party quality assurance certificate.

#### **2. SURGE PROTECTION WORKS**

- 2.1 Providing and supply of zero velocity valves and air cushion valves Shall be Conforming to relevant Indian Standard with third party quality assurance certificate.

##### **2.2 Zero Velocity Valve**

- 2.2.1 The principle behind the design of this valve is to arrest the forward moving water column at zero momentum i.e. when its velocity is zero and before any return velocity is established.
- 2.2.2 The valve fitted in the pipeline consists of an outer shell and an inner fixed dome leaving a streamlined annular passage for water. A closing disc is mounted on central and peripheral guide rods and is held in the closed position by one or more springs when there is no flow of water.
- 2.2.3 A bypass connects the upstream and downstream sides of the disc. The springs are so designed that the disc remains in fully open position for velocity of water equal to 25% of the designed maximum velocity in the pipeline.
- 2.2.4 With sudden stoppage of pumps the forward velocity of water column goes on decreasing due to friction and gravity. When the forward velocity becomes less than 25% of the maximum, the flap starts closing at the same rate as the velocity of water.
- 2.2.5 The flap comes to the fully closed position when forward velocity approaches zero magnitude, water column on the upstream side of the valve is thus prevented from acquiring a revised velocity and taking part in creating surge pressures. The bypass valve maintains balanced pressures on the disc and also avoids vacuum on the downstream side of valve if that column experiences.  
The main advantages of zero velocity valves are:  
Controlled closing characteristics, and  
Low loss of head due to streamlined design.

##### **2.3 Air Cushion Valve**

- 2.3.1 The principle of this valve is to allow large quantities of air in the pumping main during separation, entrap the air, compress it with the returning air column and expel the air under controlled pressure so as to dissipate the energy of the returning water column. An effective air cushion is thus provided.
- 2.3.2 The valve is mounted on TEE-joint on the rising main at locations where water column separation is likely. The valve has a spring loaded air inlet port, an outlet normally closed by a float, a spring loaded outlet poppet valve and an adjustable needle valve control orifice.
- 2.3.3 When there is sudden stoppage of pump due to power failure, partial vacuum is created in the main. With differential pressure, the spring loaded port opens and admits outside air into the main.
- 2.3.4 When the pressure in the main becomes near atmospheric pressure, the inlet valve closes under spring pressure. The

entrapped air is then compressed by the returning water column till the poppet valve opens. With float in dropped position, the air is expelled through poppet valve and controlled orifice under predetermined pressure thus dissipating the energy of the returning water column.

**3. Measurement**

Zero velocity valves and Air cushion valves shall be enumerated.

**4. Rates**

The rate shall include cost of all the materials and labour involved in the all the operation described in the item.

**WATER HAMMER DEVICES**

S.No.	Particulars of Items	Unit	Rate (in Rs.)
10.1	Providing and supply of Zero Velocity Valves of renowned make duly tested exclusive of GST but inclusive of all cost of inspection charges, transportation charges, transit insurance, loading/ unloading and stacking at site/ store etc, complete.		
10.1.1	100 mm 10 kg/cm <sup>2</sup>	Each	59295.00
10.1.2	100 mm 15 kg/cm <sup>2</sup>	Each	63818.00
10.1.3	100 mm 20 kg/cm <sup>2</sup>	Each	65325.00
10.1.4	100 mm 25 kg/cm <sup>2</sup>	Each	74973.00
10.1.5	150 mm 10 kg/cm <sup>2</sup>	Each	76280.00
10.1.6	150 mm 15 kg/cm <sup>2</sup>	Each	82008.00
10.1.7	150 mm 20 kg/cm <sup>2</sup>	Each	90249.00
10.1.8	150 mm 25 kg/cm <sup>2</sup>	Each	103716.00
10.1.9	200 mm 10 kg/cm <sup>2</sup>	Each	79697.00
10.1.10	200 mm 15 kg/cm <sup>2</sup>	Each	85727.00
10.1.11	200 mm 20 kg/cm <sup>2</sup>	Each	94269.00
10.1.12	200 mm 25 kg/cm <sup>2</sup>	Each	108540.00
10.1.13	250 mm 10 kg/cm <sup>2</sup>	Each	89948.00
10.1.14	250 mm 15 kg/cm <sup>2</sup>	Each	96782.00
10.1.15	250 mm 20 kg/cm <sup>2</sup>	Each	106329.00
10.1.16	250 mm 25 kg/cm <sup>2</sup>	Each	122309.00
10.1.17	300 mm 10 kg/cm <sup>2</sup>	Each	101304.00
10.1.18	300 mm 15 kg/cm <sup>2</sup>	Each	108842.00
10.1.19	300 mm 20 kg/cm <sup>2</sup>	Each	119696.00
10.1.20	300 mm 25 kg/cm <sup>2</sup>	Each	137484.00
10.1.21	350 mm 10 kg/cm <sup>2</sup>	Each	104922.00
10.1.22	350 mm 15 kg/cm <sup>2</sup>	Each	112862.00
10.1.23	350 mm 20 kg/cm <sup>2</sup>	Each	124017.00
10.1.24	350 mm 25 kg/cm <sup>2</sup>	Each	142710.00
10.1.25	400 mm 10 kg/cm <sup>2</sup>	Each	115977.00
10.1.26	400 mm 15 kg/cm <sup>2</sup>	Each	124620.00
10.1.27	400 mm 20 kg/cm <sup>2</sup>	Each	137183.00
10.1.28	400 mm 25 kg/cm <sup>2</sup>	Each	157785.00

<b>S.No.</b>	<b>Particulars of Items</b>	<b>Unit</b>	<b>Rate (in Rs.)</b>
10.1.29	450 mm 10 kg/cm2	Each	134871.00
10.1.30	450 mm 15 kg/cm2	Each	145022.00
10.1.31	450 mm 20 kg/cm2	Each	159494.00
10.1.32	450 mm 25 kg/cm2	Each	183513.00
10.1.33	500 mm 10 kg/cm2	Each	155876.00
10.1.34	500 mm 15 kg/cm2	Each	167534.00
10.1.35	500 mm 20 kg/cm2	Each	184418.00
10.1.36	500 mm 25 kg/cm2	Each	212156.00
10.1.37	600 mm 10 kg/cm2	Each	191051.00
10.1.38	600 mm 15 kg/cm2	Each	205422.00
10.1.39	600 mm 20 kg/cm2	Each	225924.00
10.1.40	600 mm 25 kg/cm2	Each	259793.00
10.1.41	700 mm 10 kg/cm2	Each	269441.00
10.1.42	700 mm 15 kg/cm2	Each	289641.00
10.1.43	700 mm 20 kg/cm2	Each	318585.00
10.1.44	700 mm 25 kg/cm2	Each	366423.00
10.1.45	750 mm 10 kg/cm2	Each	304716.00
10.1.46	750 mm 15 kg/cm2	Each	327630.00
10.1.47	750 mm 20 kg/cm2	Each	360293.00
10.1.48	750 mm 25 kg/cm2	Each	414462.00
10.1.49	800 mm 10 kg/cm2	Each	336273.00
10.1.50	800 mm 15 kg/cm2	Each	361499.00
10.1.51	800 mm 20 kg/cm2	Each	395367.00
10.1.52	800 mm 25 kg/cm2	Each	457476.00
10.1.53	900 mm 10 kg/cm2	Each	399789.00
10.1.54	900 mm 15 kg/cm2	Each	429839.00
10.1.55	900 mm 20 kg/cm2	Each	472652.00
10.1.56	900 mm 25 kg/cm2	Each	543705.00
10.1.57	1000 mm 10 kg/cm2	Each	508329.00
10.1.58	1000 mm 15 kg/cm2	Each	546419.00
10.1.59	1000 mm 20 kg/cm2	Each	600990.00
10.1.60	1000 mm 25 kg/cm2	Each	691340.00
10.1.61	1100 mm 10 kg/cm2	Each	623603.00
10.1.62	1100 mm 15 kg/cm2	Each	670436.00
10.1.63	1100 mm 20 kg/cm2	Each	737469.00
10.1.64	1100 mm 25 kg/cm2	Each	848120.00
10.1.65	1200 mm 10 kg/cm2	Each	769328.00
10.1.66	1200 mm 15 kg/cm2	Each	827115.00
10.1.67	1200 mm 20 kg/cm2	Each	909726.00
10.1.68	1200 mm 25 kg/cm2	Each	1046306.00
10.1.69	1300 mm 10 kg/cm2	Each	1107912.00
10.1.70	1300 mm 15 kg/cm2	Each	1177760.00
10.1.71	1300 mm 20 kg/cm2	Each	1254039.00
10.1.72	1300 mm 25 kg/cm2	Each	1377956.00
10.1.73	1400 mm 10 kg/cm2	Each	1209216.00

S.No.	Particulars of Items	Unit	Rate (in Rs.)
10.1.74	1400 mm 15 kg/cm <sup>2</sup>	Each	1299867.00
10.1.75	1400 mm 20 kg/cm <sup>2</sup>	Each	1429814.00
10.1.76	1400 mm 25 kg/cm <sup>2</sup>	Each	1644381.00
10.1.77	1500 mm 10 kg/cm <sup>2</sup>	Each	1541168.00
10.1.78	1500 mm 15 kg/cm <sup>2</sup>	Each	1656642.00
10.1.79	1500 mm 20 kg/cm <sup>2</sup>	Each	1822266.00
10.1.80	1500 mm 25 kg/cm <sup>2</sup>	Each	2095727.00
10.2	Providing and supply of Air cushion Valves of renowned make. The cost such as testing, inspection charges, transportation upto site, transit insurance, loading, unloading, stacking etc. all complete.		
10.2.1	Air cushion valves 100 mm TP 10 kg/cm <sup>2</sup>	Each	66129.00
10.2.2	Air cushion valves 100 mm TP 15 kg/cm <sup>2</sup>	Each	72662.00
10.2.3	Air cushion valves 100 mm TP 20 kg/cm <sup>2</sup>	Each	79898.00
10.2.4	Air cushion valves 100 mm TP 25 kg/cm <sup>2</sup>	Each	91958.00
10.2.5	Air cushion valves 150 mm TP 10 kg/cm <sup>2</sup>	Each	100299.00
10.2.6	Air cushion valves 150 mm TP 15 kg/cm <sup>2</sup>	Each	110249.00
10.2.7	Air cushion valves 150 mm TP 20 kg/cm <sup>2</sup>	Each	121304.00
10.2.8	Air cushion valves 150 mm TP 25 kg/cm <sup>2</sup>	Each	139494.00
10.2.9	Air cushion valves 200 mm TP 10 kg/cm <sup>2</sup>	Each	107033.00
10.2.10	Air cushion valves 200 mm TP 15 kg/cm <sup>2</sup>	Each	117786.00
10.2.11	Air cushion valves 200 mm TP 20 kg/cm <sup>2</sup>	Each	129545.00
10.2.12	Air cushion valves 200 mm TP 25 kg/cm <sup>2</sup>	Each	148841.00
10.2.13	Air cushion valves 300 mm TP 10 kg/cm <sup>2</sup>	Each	150549.00
10.2.14	Air cushion valves 300 mm TP 15 kg/cm <sup>2</sup>	Each	165725.00
10.2.15	Air cushion valves 300 mm TP 20 kg/cm <sup>2</sup>	Each	190548.00
10.2.16	Air cushion valves 300 mm TP 25 kg/cm <sup>2</sup>	Each	219090.00

# **CHAPTER - 11**

## **PUMPS**



## CHAPTER – 11 PUMPS

### Notes:

#### 1. Scope

This Specification covers the requirements for designing, supplying, erecting, fixing & testing of different types of pumps for water supply & sewerage system.

#### 2. Applicable Codes

IS – 6595 (Part 1) : 2018	Horizontal centrifugal pumps for clear, cold water
IS 8035:2022	Shallow well hand pumps
IS 9301:1990	Deep well hand pumps (second revision)
IS 11004:1992	Code of practice for installation and maintenance of deep wellband pumps (Part 1: Installation, Part 2: Maintenance).
IS 1520:1980	Horizontal centrifugal pumps for clear, cold, fresh water (second revision)
IS 1710:2021	Vertical turbine pumps for clear, cold, fresh water (first revision)
IS 6595:2018	Horizontal centrifugal pumps for clear, cold, fresh water for centrifugal purposes (first revision)
IS 8034:2018	Submersible pump sets for clear, cold, fresh water IS 8418: 1999: Horizontal centrifugal self priming pumps
IS 8472:2019	Regenerative self priming pumps for clear, cold, fresh water IS 9079: 2018: Monoset pumps for clear, cold, fresh water for agricultural purposes
IS 9137:2019	Code for acceptance test for centrifugal mixed flow and axial pumps – Class C
IS 9542:1980	Horizontal centrifugal mono set pumps for cold, fresh water.
IS 9694	Code of practice for selection, installation, operation and maintenance for horizontal centrifugal pumps for agricultural applications.
Part 1 : 1987	Selection
Part 2 : 1980	Installation
Part 3 : 1980	Operation
Part 4 : 1980	Maintenance
IS 10572:1983	Methods of sampling pumps
IS 10804:2018	Recommendation pumping systems for agricultural purposes(first revision)
IS 10805:2022	Foot valves, reflux valves or non return valves and bore valves to be used in suction lines of agricultural pumping systems (first revision)
IS 10981:1983	Code for acceptance test for centrifugal mixed flow and axialpumps – Class B
IS 11346:2002	Testing set up for agricultural pumps.
IS 12225:1997	Technical requirements for jet, centrifugal pump combination.
IS 5120:1977	Technical requirements for roto dynamic special purpose pumps
IS 12933-1:2003,	requirements: Solar flat plate collector

(Part 1)	
IS 12933-2:2003, (Part 2)	components: Solar flat plate collector
IS 12933-5:2003, (Part 5)	Methods: Solar flat plate collector
IS 12976:1990	Solar water heating systems - code of practice
IS 15450:2022	Polyethylene/ aluminium / polyethylene composite pressure pipes for hot and cold water supplies
IS 2062:2011	Mounting structure steel
IS 4759	Galvanization of mounting structure IEC 61215: PV modules certificate
IEC 61730 :2016	Safety qualification testing for PV modules
IEC 61701 :2011	Salt mist corrosion testing for PV modules
IS 325:1996	Single phase small A.C. and universal electric motors IS 900: 1965: Guide for testing three phase induction motors
IS 7538:1996	Three phase squirrel cage induction motors for centrifugal pumps for agricultural application
IS 4029:2010	Valves of performance characteristics for three phase induction motors.
IS 9283:2013	Motors for submersible pump sets.
IS 10001:1981	Performance requirement for constant speed compression ignition (diesel) engines for general purposes (up to 20 Kw).
IS 11170:1985	Performance requirements for constant speed compression ignition (diesel) engines for agricultural purposes (up to 20 Kw)
IS 11501:1986	Engine mono set pumps for clear, cold, fresh water for agricultural purposes.

### 3. Rates

The rate shall include the cost of providing, supplying, fixing and testing of pumps except for the items of some pumps as ISSR is not prepared due to wide variation in rates per horse power as per duty conditions and type of material. For some pumps, the rates required shall be worked out on the basis of quotations, offers from manufacturers, distributors, dealers in individual case.

4. Other relevant IS which are not mentioned but applicable, shall also be applied.

### 5. Cable

1. Minimum Length of suitable Cable for submersible pump will be the designated head (H) of pump plus 3 meter = (H+3) meter.
2. Cost of cable having length of ( H+3) meter is included in the cost of Individual pump shown in the chapter - 11.

The specification and size of cable for different capacity submersible motor-pumps shall be as follows-

**Single Phase, 50 Hz, 230V, deep well submersible pump Three & Five Star Rating ( DOL Starter)**

S/No	Particulars of Item	Cable Size 3Core,Copper Plate Submersible )
11.1.1	0.5 HP Head Mt. 46-13 Discharge LPM 10-55	2.5 Sqmm
11.1.2	1 HP Head Mt. 35-15 Discharge LPM 40-125	2.5 Sqmm
11.1.3	1 HP Head Mt. 61-18 Discharge LPM 25-90	2.5 Sqmm
11.1.4	1 HP Head Mt. 74 - 21 Discharge LPM 15-55	2.5 Sqmm
11.1.5	1 HP Head Mt. 91-28 Discharge LPM 10-45	2.5 Sqmm
11.1.6	1.5 HP Head Mt. 42 - 17 Discharge LPM 65-150	2.5 Sqmm
11.1.7	1.5 HP Head Mt. 56-21 Discharge LPM 40-125	2.5 Sqmm
11.1.8	1.5HP Head Mt. 84-26 Discharge LPM 25-90	2.5 Sqmm
11.1.9	1.5 HP Head Mt. 114-33 Discharge LPM 15-55	2.5 Sqmm
11.1.10	1.5 HP Head Mt. 130-14 Discharge LPM 10-45	2.5 Sqmm
11.1.11	2 HP Head Mt. 56- 16 Discharge LPM 65-205	2.5 Sqmm
11.1.12	2 HP Head Mt. 77-30 Discharge LPM 40-125	2.5 Sqmm
11.1.13	2 HP Head Mt. 114-36 Discharge LPM 25-90	2.5 Sqmm
11.1.14	2 HP Head Mt. 147-42Discharge LPM 15-55	2.5 Sqmm
11.1.15	2 HP Head Mt. 163-58Discharge LPM 10-45	2.5 Sqmm
11.1.16	3 HP Head Mt. 84-23Discharge LPM 65-205	2.5 Sqmm
11.1.17	3 HP Head Mt. 119-45 Discharge LPM 40-125	2.5 Sqmm
11.1.18	3 HP Head Mt. 119-45 Discharge LPM 25-90	2.5 Sqmm

**Three Phase, 50 Hz, 415V, deep well submersible pump Three & Five Star Rating ( DOL Starter)**

11.3.1	3 HP Head Mt. 55-7 Discharge LPM 60-510	2.5 Sqmm
11.3.2	5 HP Head Mt. 55-13 Discharge LPM 120-510	4.0 Sqmm
11.3.3	5 HP Head Mt. 83-82 Discharge LPM 60-270	4.0 Sqmm
11.3.4	5 HP Head Mt. 101-40 Discharge LPM 60-270	4.0 Sqmm
11.3.5	7.5 HP Head Mt. 117-31 Discharge LPM 60-240	4.0 Sqmm
11.3.6	7.5 HP Head Mt. 129-52 Discharge LPM 60-270	4.0 Sqmm
11.3.7	7.5 HP Head Mt. 138-60 Discharge LPM 60-270	4.0 Sqmm
11.3.8	10 HP Head Mt. 147-64 Discharge LPM 60-270	6.0 Sqmm
11.3.9	10 HP Head Mt. 184-80 Discharge LPM 60-270	6.0 Sqmm
11.3.10	12.5 HP Head Mt. 45-315 Discharge LPM 330-50	6.0 Sqmm
11.3.11	15 HP Head Mt. 102-254 Discharge LPM 300-100	6.0 Sqmm

**Three Phase, 50 Hz, 415V, deep well submersible pump Three & Five Star Rating (Star Delta Starter) 2 Nos Power Cable for each starter**

11.3.1	3 HP Head Mt. 55-7 Discharge LPM 60-510	2.5 Sqmm
11.3.2	5 HP Head Mt. 55-13 Discharge LPM 120-510	4.0 Sqmm
11.3.3	5 HP Head Mt. 83-82 Discharge LPM 60-270	4.0 Sqmm
11.3.4	5 HP Head Mt. 101-40 Discharge LPM 60-270	4.0 Sqmm
11.3.5	7.5 HP Head Mt. 117-31 Discharge LPM 60-240	4.0 Sqmm
11.3.6	7.5 HP Head Mt. 129-52 Discharge LPM 60-270	4.0 Sqmm

11.3.7	7.5 HP Head Mt. 138-60 Discharge LPM 60-270	4.0 Sqmm
11.3.8	10 HP Head Mt. 147-64 Discharge LPM 60-270	6.0 Sqmm
11.3.9	10 HP Head Mt. 184-80 Discharge LPM 60-270	6.0 Sqmm
11.3.10	12.5 HP Head Mt. 45-315 Discharge LPM 330-50	6.0 Sqmm
11.3.11	15 HP Head Mt. 102-254 Discharge LPM 300-100	6.0 Sqmm

**Note-**

Size of cable shall be the minimum of either above mentioned size or the size recommended by the manufacturer of pump.

## CHAPTER – 11 PUMPS

S.No.	Particulars of Items	Unit	Rate (in Rs.)
11.1	Supplying & Installation of Energy efficient Three Star BEE rating ISI Marked required capacity single phase, 50 Hz, 220V, deep well submersible pump Stainless Steel body, suitable for 4"/6" tube well with Control Panel Starter suitable for Submersible pump with dry run protection, connections, including submersible flat cable ISI marked 3 core copper wire, length equal to head of the pump at duty point + 3mtr. in single or double run (as per requirement of the set/control panel. The size of the cable should be so selected that voltage drop at motor terminal does not exceed the limit of the rated voltage) clamps, bore cap etc. as required as per specifications but excluding pipe, SS/ Nylon wire rope.		
11.1.1	0.5 HP Head Mt. 46-13 Discharge LPM 10-55	Each	13760.00
11.1.2	1 HP Head Mt. 35-15 Discharge LPM 40-125	Each	14896.00
11.1.3	1 HP Head Mt. 61-18 Discharge LPM 25-90	Each	14960.00
11.1.4	1 HP Head Mt. 74 - 21 Discharge LPM 15-55	Each	15936.00
11.1.5	1 HP Head Mt. 91-28 Discharge LPM 10-45	Each	17336.00
11.1.6	1.5 HP Head Mt. 42 - 17 Discharge LPM 65-150	Each	17696.00
11.1.7	1.5 HP Head Mt. 56-21 Discharge LPM 40-125	Each	18802.00
11.1.8	1.5HP Head Mt. 84-26 Discharge LPM 25-90	Each	18821.00
11.1.9	1.5 HP Head Mt. 114-33 Discharge LPM 15-55	Each	19590.00
11.1.10	1.5 HP Head Mt. 130-14 Discharge LPM 10-45	Each	20303.00
11.1.11	2 HP Head Mt. 56- 16 Discharge LPM 65-205	Each	19476.00
11.1.12	2 HP Head Mt. 77-30 Discharge LPM 40-125	Each	19656.00
11.1.13	2 HP Head Mt. 114-36 Discharge LPM 25-90	Each	21216.00
11.1.14	2 HP Head Mt. 147-42Discharge LPM 15-55	Each	21900.00
11.1.15	2 HP Head Mt. 163-58Discharge LPM 10-45	Each	23320.00
11.1.16	3 HP Head Mt. 84-23Discharge LPM 65-205	Each	22580.00
11.1.17	3 HP Head Mt. 119-45 Discharge LPM 40-125	Each	23020.00
11.1.18	3 HP Head Mt. 119-45 Discharge LPM 25-90	Each	23340.00
11.2	Supplying & Installation of Energy efficient Five Star		

S.No.	Particulars of Items	Unit	Rate (in Rs.)
	BEE rating ISI Marked required capacity single phase, 50 Hz, 220V, deep well submersible pump Stainless Steel body, suitable for 4"/6" tube well with Contral Panel Starter suitable for Submersible pump with dry run protection, connections, including submersible flat cable ISI marked 3 core copper wire, length equal to head of the pump at duty point + 3mtr. in single or double run (as per requirement of the set/control panel. The size of the cable should be so selected that voltage drop at motor terminal does not exceed the limit of the rated voltage) clamps, bore cap etc. as required as per specifications but excluding pipe, SS/ Nylon wire rope.		
11.2.1	0.5 HP Head Mt. 46-13 Discharge LPM 10-55	Each	18921.00
11.2.2	1 HP Head Mt. 35-15 Discharge LPM 40-125	Each	20392.00
11.2.3	1 HP Head Mt. 61-18 Discharge LPM 25-90	Each	20790.00
11.2.4	1 HP Head Mt. 74 - 21 Discharge LPM 15-55	Each	21399.00
11.2.5	1 HP Head Mt. 91-28 Discharge LPM 10-45	Each	21622.00
11.2.6	1.5 HP Head Mt. 42 - 17 Discharge LPM 65-150	Each	22513.00
11.2.7	1.5 HP Head Mt. 56-21 Discharge LPM 40-125	Each	22682.00
11.2.8	1.5HP Head Mt. 84-26 Discharge LPM 25-90	Each	23555.00
11.2.9	1.5 HP Head Mt. 114-33 Discharge LPM 15-55	Each	24114.00
11.2.10	1.5 HP Head Mt. 130-14 Discharge LPM 10-45	Each	25102.00
11.2.11	2 HP Head Mt. 56- 16 Discharge LPM 65-205	Each	24955.00
11.2.12	2 HP Head Mt. 77-30 Discharge LPM 40-125	Each	25548.00
11.2.13	2 HP Head Mt. 114-36 Discharge LPM 25-90	Each	26159.00
11.2.14	2 HP Head Mt. 147-42Discharge LPM 15-55	Each	27099.00
11.2.15	2 HP Head Mt. 163-58Discharge LPM 10-45	Each	27897.00
11.2.16	3 HP Head Mt. 84-23Discharge LPM 65-205	Each	30727.00
11.2.17	3 HP Head Mt. 119-45 Discharge LPM 40-125	Each	32507.00
11.2.18	3 HP Head Mt. 119-45 Discharge LPM 25-90	Each	33109.00
11.3	Supplying & Installation of Energy efficient five star BEE rating ISI Marked required capacity of Three Phase, 50 Hz, 415V, deep well submersible pump Steel body, suitable for 6" tube well with Control Panel Starter suitable for Submersible pump with dry run protection, single phase preventer, connections, including 3 mtr. submersible flat cable ISI marked 3 core copper wire, length equal to head of the pump at duty point + 3mtr. in single or double run (as per requirement of the set/control panel. The size of the cable should be so selected that voltage drop at motor terminal does not exceed the limit of the rated voltage) clamps, bore cap etc. as required as per specifications but excluding pipe, SS/ Nylon wire rope.		
11.3.1	3 HP Head Mt. 55-7 Discharge LPM 60-510	Each	37528.00

S.No.	Particulars of Items	Unit	Rate (in Rs.)
11.3.2	5 HP Head Mt. 55-13 Discharge LPM 120-510	Each	44470.00
11.3.3	5 HP Head Mt. 83-82 Discharge LPM 60-270	Each	47725.00
11.3.4	5 HP Head Mt. 101-40 Discharge LPM 60-270	Each	49349.00
11.3.5	7.5 HP Head Mt. 117-31 Discharge LPM 60-240	Each	55090.00
11.3.6	7.5 HP Head Mt. 129-52 Discharge LPM 60-270	Each	59518.00
11.3.7	7.5 HP Head Mt. 138-60 Discharge LPM 60-270	Each	60485.00
11.3.8	10 HP Head Mt. 147-64 Discharge LPM 60-270	Each	70518.00
11.3.9	10 HP Head Mt. 184-80 Discharge LPM 60-270	Each	74061.00
11.3.10	12.5 HP Head Mt. 45-315 Discharge LPM 330-50	Each	78541.00
11.3.11	15 HP Head Mt. 102-254 Discharge LPM 300-100	Each	88553.00
11.4	Supplying & Installation of Energy efficient Three star BEE rating ISI Marked required capacity of Three Phase, 50 Hz, 415V, deep well submersible pump Steel body, suitable for 6" tube well with Control Panel Starter suitable for Submersible pump with dry run protection, single phase preventer, connections, including 3 mtr. submersible flat cable ISI marked 3 core copper wire, length equal to head of the pump at duty point + 3mtr. in single or double run (as per requirement of the set/control panel. The size of the cable should be so selected that voltage drop at motor terminal does not exceed the limit of the rated voltage) clamps, bore cap etc. as required as per specifications but excluding pipe, SS/ Nylon wire rope.		
11.4.1	3 HP Head Mt. 55-7 Discharge LPM 60-510	Each	33775.00
11.4.2	5 HP Head Mt. 55-13 Discharge LPM 120-510	Each	40023.00
11.4.3	5 HP Head Mt. 83-82 Discharge LPM 60-270	Each	42953.00
11.4.4	5 HP Head Mt. 101-40 Discharge LPM 60-270	Each	44414.00
11.4.5	7.5 HP Head Mt. 117-31 Discharge LPM 60-240	Each	49581.00
11.4.6	7.5 HP Head Mt. 129-52 Discharge LPM 60-270	Each	53566.00
11.4.7	7.5 HP Head Mt. 138-60 Discharge LPM 60-270	Each	54437.00
11.4.8	10 HP Head Mt. 147-64 Discharge LPM 60-270	Each	63466.00
11.4.9	10 HP Head Mt. 184-80 Discharge LPM 60-270	Each	66655.00
11.4.10	12.5 HP Head Mt. 45-315 Discharge LPM 330-50	Each	70687.00
11.4.11	15 HP Head Mt. 102-254 Discharge LPM 300-100	Each	79698.00
11.5	Supplying and laying of submersible flat cable ISI marked 3 core copper wire of suitable size with proper clamping of approved make.		
11.5.1	2.5 Sq.mm multi strand	P.Mtr	119.00
11.5.2	4.0 Sq.mm multi strand	P.Mtr	167.00
11.5.3	6.0 Sq.mm multi strand	P.Mtr	247.00
11.5.4	10.0 Sq.mm multi strand	P.Mtr	398.00
11.6	Supplying and laying of approved Make Nylon rope 12mm thick complete with binding for support of pump and motor	P.Mtr	60.00

S.No.	Particulars of Items	Unit	Rate (in Rs.)
11.7	Supplying and laying of approved make stainless steel wire rope 6 mm thick complete with binding for support of pump and motor	P. Mtr	137.00
11.8	Supplying and Installation of approved Make required capacity single phase, 50 Hz, 220V, Centrifugal Mono-block pump self priming, with Starter, connections, base channel foundation etc. as required as per specifications but excluding Pipe and connection cable.		
11.8.1	1 H.P. Head Mt. 6-30, Discharge LPH 2400-900	Each	11803.00
11.8.2	1 H.P. Head Mt. 21-45, Discharge LPH 1800-400 (Domestic Model)	Each	7330.00
11.9	Supplying & Installation of approved Make required capacity single phase, 50 Hz, 240V, Centrifugal Mono-block pump, with Starter, connections, base channel foundation etc. as required as per specifications but excluding Pipe and connection cable.		
11.9.1	1.0 H.P. Head Mt. 3-24, Discharge LPH 27000-1500	Each	11315.00
11.9.2	1.5 H.P. Head Mt. 3-21, Discharge LPH 39600-6000	Each	13592.00
11.9.3	2.0 H.P. Head Mt. 3-18, Discharge LPH 48600-3000	Each	15088.00
11.10	Supplying & Installation of approved Make required capacity 3 phase, 50 Hz, 415V, Centrifugal Monoblock pump, with Starter, i/c single phase preventor, connections, base channel foundation etc. as required as per specifications but excluding Pipe and connection cable.		
11.10.1	3.0 H.P. Head Mt. 6-15, Discharge LPH 740-465	Each	19076.00
11.10.2	5.0 H.P. Head Mt. 6-33, Discharge LPH 1380-450	Each	23370.00
11.10.3	7.5 H.P. Head Mt. 24-37, Discharge LPH 780-320	Each	29917.00
11.11	Supplying & Installation of Five star BEE rating ISI Marked required capacity of Three phase, 50 Hz, 415V, Open well Submersible pump, with Control Panel Starter with Dry Run Protection, single phase preventer, including submersible flat cable ISI marked 3 core copper wire of suitable size, SS/ Nylon wire rope, clamps etc. but excluding pipe and connection cable.		
11.11.1	3.0 H.P. Head Mt. 15-24, Discharge LPH 615-195	Each	22252.00
11.11.2	5.0 H.P. Head Mt. 15-24, Discharge LPH 930-420	Each	23917.00
11.12	Supply, delivery at site with necessary packing, receiving, unloading, shifting, storing, installation, testing and commissioning of Horizontal Centrifugal Split Casing pumps with motor, CI casing and casing ring, SS 316 impeller, SS 410 Shaft and shaft sleeve, coupling guard, common base plate, foundation bolts etc. complete with all respect as per the specification		
11.12.1	Discharge 20 to 30 LPS and head 20 to 30 M	Each	132135.00

<b>S.No.</b>	<b>Particulars of Items</b>	<b>Unit</b>	<b>Rate (in Rs.)</b>
11.12.2	Discharge 20 to 30 LPS and head 31 to 40 M	Each	132135.00
11.12.3	Discharge 20 to 30 LPS and head 41 to 50 M	Each	148350.00
11.12.4	Discharge 20 to 30 LPS and head 51 to 60 M	Each	148350.00
11.12.5	Discharge 20 to 30 LPS and head 61 to 70 M	Each	148350.00
11.12.6	Discharge 31 to 40 LPS and head 20 to 30 M	Each	156170.00
11.12.7	Discharge 31 to 40 LPS and head 31 to 40 M	Each	156170.00
11.12.8	Discharge 31 to 40 LPS and head 41 to 50 M	Each	175145.00
11.12.9	Discharge 31 to 40 LPS and head 51 to 60 M	Each	221720.00
11.12.10	Discharge 31 to 40 LPS and head 61 to 70 M	Each	232875.00
11.12.11	Discharge 41 to 50 LPS and head 20 to 30 M	Each	175145.00
11.12.12	Discharge 41 to 50 LPS and head 31 to 40 M	Each	175145.00
11.12.13	Discharge 41 to 50 LPS and head 41 to 50 M	Each	189405.00
11.12.14	Discharge 41 to 50 LPS and head 51 to 60 M	Each	245525.00
11.12.15	Discharge 41 to 50 LPS and head 61 to 70 M	Each	245525.00
11.12.16	Discharge 51 to 60 LPS and head 20 to 30 M	Each	202285.00
11.12.17	Discharge 51 to 60 LPS and head 31 to 40 M	Each	202285.00
11.12.18	Discharge 51 to 60 LPS and head 41 to 50 M	Each	234945.00
11.12.19	Discharge 51 to 60 LPS and head 51 to 60 M	Each	283705.00
11.12.20	Discharge 51 to 60 LPS and head 61 to 70 M	Each	283705.00
11.12.21	Discharge 61 to 70 LPS and head 20 to 30 M	Each	202285.00
11.12.22	Discharge 61 to 70 LPS and head 31 to 40 M	Each	202285.00
11.12.23	Discharge 61 to 70 LPS and head 41 to 50 M	Each	234945.00
11.12.24	Discharge 61 to 70 LPS and head 51 to 60 M	Each	283705.00
11.12.25	Discharge 61 to 70 LPS and head 61 to 70 M	Each	283705.00
11.12.26	Discharge 71 to 80 LPS and head 20 to 30 M	Each	202285.00
11.12.27	Discharge 71 to 80 LPS and head 31 to 40 M	Each	218385.00
11.12.28	Discharge 71 to 80 LPS and head 41 to 50 M	Each	276805.00
11.12.29	Discharge 71 to 80 LPS and head 51 to 60 M	Each	276805.00
11.12.30	Discharge 71 to 80 LPS and head 61 to 70 M	Each	348565.00
11.12.31	Discharge 81 to 90 LPS and head 20 to 30 M	Each	297390.00
11.12.32	Discharge 81 to 90 LPS and head 31 to 40 M	Each	297390.00
11.12.33	Discharge 81 to 90 LPS and head 41 to 50 M	Each	342815.00
11.12.34	Discharge 81 to 90 LPS and head 51 to 60 M	Each	396635.00
11.12.35	Discharge 81 to 90 LPS and head 61 to 70 M	Each	396635.00
11.12.36	Discharge 91 to 100 LPS and head 20 to 30 M	Each	367080.00
11.12.37	Discharge 91 to 100 LPS and head 31 to 40 M	Each	415380.00
11.12.38	Discharge 91 to 100 LPS and head 41 to 50 M	Each	520375.00
11.12.39	Discharge 91 to 100 LPS and head 51 to 60 M	Each	556485.00
11.12.40	Discharge 91 to 100 LPS and head 61 to 70 M	Each	608120.00
11.12.41	Discharge 101 to 120 LPS and head 20 to 30 M	Each	371105.00
11.12.42	Discharge 102 to 120 LPS and head 31 to 40 M	Each	452525.00
11.12.43	Discharge 103 to 120 LPS and head 41 to 50 M	Each	556485.00
11.12.44	Discharge 104 to 120 LPS and head 51 to 60 M	Each	608120.00
11.12.45	Discharge 105 to 120 LPS and head 61 to 70 M	Each	778665.00



S.No.	Particulars of Items	Unit	Rate (in Rs.)
11.12.46	Discharge 121 to 140 LPS and head 20 to 30 M	Each	418485.00
11.12.47	Discharge 121 to 140 LPS and head 31 to 40 M	Each	547975.00
11.12.48	Discharge 121 to 140 LPS and head 41 to 50 M	Each	595125.00
11.12.49	Discharge 121 to 140 LPS and head 51 to 60 M	Each	637560.00
11.12.50	Discharge 121 to 140 LPS and head 61 to 70 M	Each	920690.00
11.12.51	Discharge 141 to 160 LPS and head 20 to 30 M	Each	581440.00
11.12.52	Discharge 141 to 160 LPS and head 31 to 40 M	Each	581440.00
11.12.53	Discharge 141 to 160 LPS and head 41 to 50 M	Each	637560.00
11.12.54	Discharge 141 to 160 LPS and head 51 to 60 M	Each	679535.00
11.12.55	Discharge 141 to 160 LPS and head 61 to 70 M	Each	920690.00
11.12.56	Discharge 161 to 180 LPS and head 20 to 30 M	Each	573505.00
11.12.57	Discharge 161 to 180 LPS and head 31 to 40 M	Each	581440.00
11.12.58	Discharge 161 to 180 LPS and head 41 to 50 M	Each	581440.00
11.12.59	Discharge 161 to 180 LPS and head 51 to 60 M	Each	744280.00
11.12.60	Discharge 161 to 180 LPS and head 61 to 70 M	Each	965080.00
11.12.61	Discharge 181 to 200 LPS and head 20 to 30 M	Each	573505.00
11.12.62	Discharge 181 to 200 LPS and head 31 to 40 M	Each	706445.00
11.12.63	Discharge 181 to 200 LPS and head 41 to 50 M	Each	752905.00
11.12.64	Discharge 181 to 200 LPS and head 51 to 60 M	Each	933455.00
11.12.65	Discharge 181 to 200 LPS and head 61 to 70 M	Each	965080.00
11.13	Supply, delivery at site with necessary packing, receiving, unloading, shifting, storing, installation, testing and commissioning of Horizontal Centrifugal Split Casing pumps with motor, CI casing and casing ring, SS 316 impeller, SS 410 Shaft and shaft sleeve, coupling guard, common base plate, foundation bolts etc. complete with all respect as per the specification		
11.13.1	Discharge 201 to 220 LPS and head 20 to 30 M	Each	638710.00
11.13.2	Discharge 201 to 220 LPS and head 31 to 40 M	Each	702075.00
11.13.3	Discharge 201 to 220 LPS and head 41 to 50 M	Each	933455.00
11.13.4	Discharge 201 to 220 LPS and head 51 to 60 M	Each	965080.00
11.13.5	Discharge 201 to 220 LPS and head 61 to 70 M	Each	1001190.00
11.13.6	Discharge 221 to 240 LPS and head 20 to 30 M	Each	642850.00
11.13.7	Discharge 221 to 240 LPS and head 31 to 40 M	Each	731400.00
11.13.8	Discharge 221 to 240 LPS and head 41 to 50 M	Each	939550.00
11.13.9	Discharge 221 to 240 LPS and head 51 to 60 M	Each	971865.00
11.13.10	Discharge 221 to 240 LPS and head 61 to 70 M	Each	1001190.00
11.13.11	Discharge 241 to 260 LPS and head 20 to 30 M	Each	686435.00
11.13.12	Discharge 241 to 260 LPS and head 31 to 40 M	Each	740255.00
11.13.13	Discharge 241 to 260 LPS and head 41 to 50 M	Each	945185.00
11.13.14	Discharge 241 to 260 LPS and head 51 to 60 M	Each	1001190.00
11.13.15	Discharge 241 to 260 LPS and head 61 to 70 M	Each	1013380.00
11.13.16	Discharge 261 to 280 LPS and head 20 to 30 M	Each	699775.00
11.13.17	Discharge 261 to 280 LPS and head 31 to 40 M	Each	790855.00

<b>S.No.</b>	<b>Particulars of Items</b>	<b>Unit</b>	<b>Rate (in Rs.)</b>
11.13.18	Discharge 261 to 280 LPS and head 41 to 50 M	Each	945185.00
11.13.19	Discharge 261 to 280 LPS and head 51 to 60 M	Each	1001190.00
11.13.20	Discharge 261 to 280 LPS and head 61 to 70 M	Each	1013380.00
11.13.21	Discharge 281 to 300 LPS and head 20 to 30 M	Each	699775.00
11.13.22	Discharge 281 to 300 LPS and head 31 to 40 M	Each	790855.00
11.13.23	Discharge 281 to 300 LPS and head 41 to 50 M	Each	971865.00
11.13.24	Discharge 281 to 300 LPS and head 51 to 60 M	Each	1013380.00
11.13.25	Discharge 281 to 300 LPS and head 61 to 70 M	Each	1082150.00
11.13.26	Discharge 301 to 325 LPS and head 20 to 30 M	Each	732895.00
11.13.27	Discharge 301 to 325 LPS and head 31 to 40 M	Each	826045.00
11.13.28	Discharge 301 to 325 LPS and head 41 to 50 M	Each	1107105.00
11.13.29	Discharge 301 to 325 LPS and head 51 to 60 M	Each	1132175.00
11.13.30	Discharge 301 to 325 LPS and head 61 to 70 M	Each	1190135.00
11.13.31	Discharge 326 to 350 LPS and head 20 to 30 M	Each	750835.00
11.13.32	Discharge 326 to 350 LPS and head 31 to 40 M	Each	862040.00
11.13.33	Discharge 326 to 350 LPS and head 41 to 50 M	Each	1107105.00
11.13.34	Discharge 326 to 350 LPS and head 51 to 60 M	Each	1190135.00
11.13.35	Discharge 326 to 350 LPS and head 61 to 70 M	Each	1190135.00
11.13.36	Discharge 351 to 400 LPS and head 20 to 30 M	Each	830185.00
11.13.37	Discharge 351 to 400 LPS and head 31 to 40 M	Each	898955.00
11.13.38	Discharge 351 to 400 LPS and head 41 to 50 M	Each	1132175.00
11.13.39	Discharge 351 to 400 LPS and head 51 to 60 M	Each	1190135.00

**CHAPTER - 12**  
**SUPERVISORY CONTROL AND DATA**  
**ACQUISITION (SCADA)**

## **CHAPTER – 12**

### **SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA)**

Standard Schedule of Rates (SOR) of SCADA / PLC/ INSTRUMENTS for Monitoring & Control various components of water supply scheme

The SCADA system shall be of highest reliability & based on the state of the art technology. It shall be capable of Monitoring & Controlling of Various components of Water Supply Scheme wired & wirelessly like Intake/Jack Well, WTP, Raw & Clear Water Pump Houses, MBR, BPT, Service reservoir, etc. The SCADA system is capable of Collecting, Storing, Displaying and Analysing data as per requirement.

The SCADA System consist of a number of sub system like Hardware, Software, equipment like RTU, computers and other communication interface devices. SCADA system mainly comprises of:

#### **1. SCADA System:**

- a. Operator & Engineering work station (Server),
- b. Remote Station Communication Link,
- c. Printer

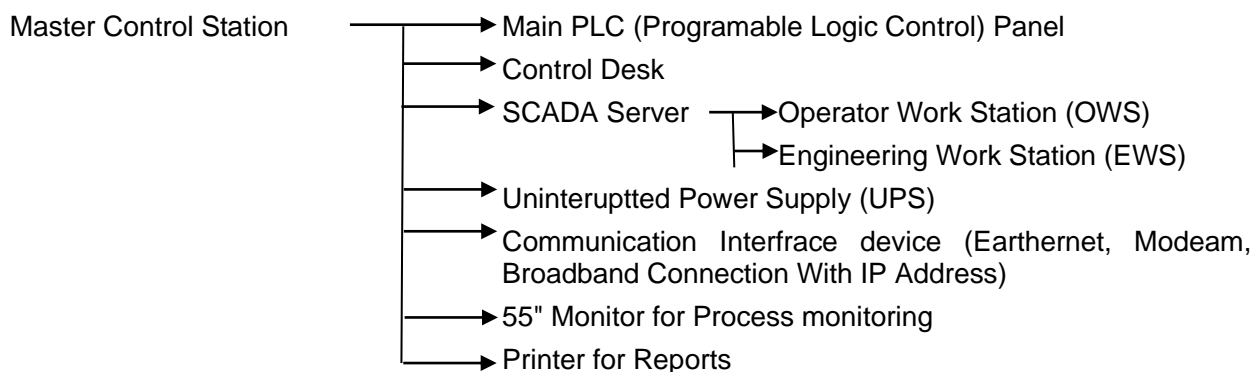
#### **2. Programmable logic controller (PLC)**

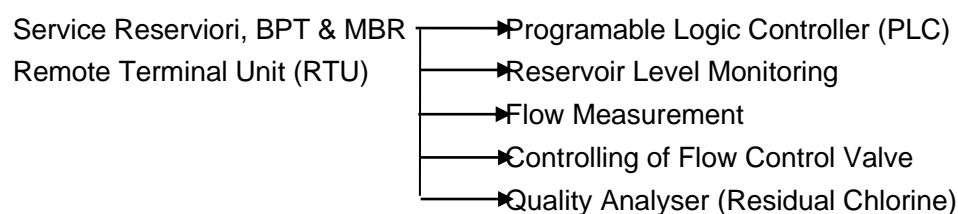
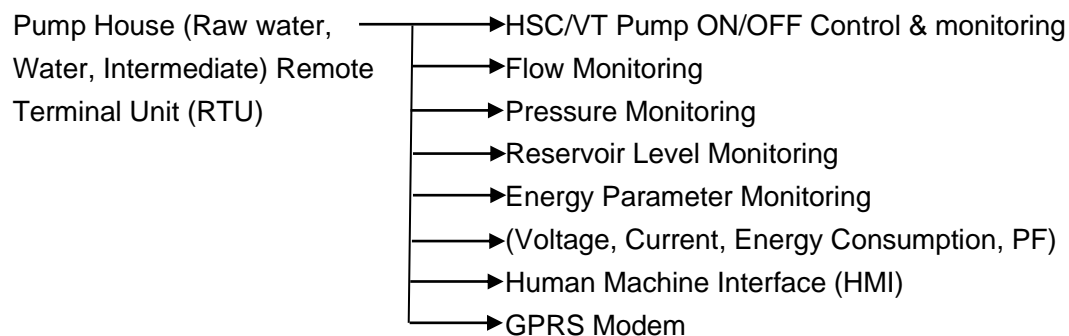
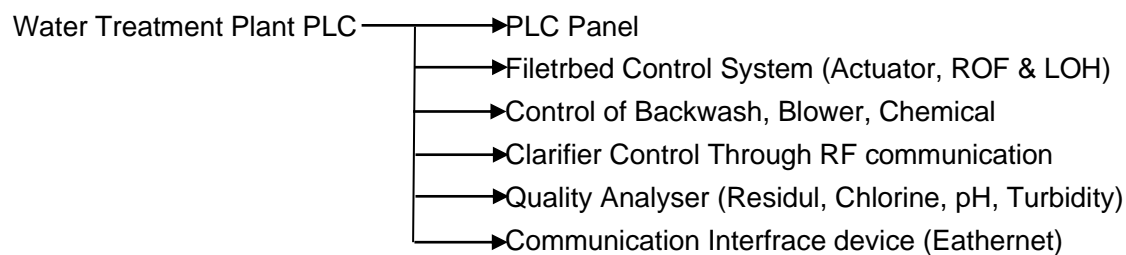
- a. Main PLC control panel at centralized control panel
- b. RF Trans – Receiver controller at clarifier unit for wireless communication
- c. Remote terminal unit (RTU) at Pump Houses Well, OHT, MBR, BPT etc

#### **3. Field Instruments**

- a. Monitoring & Control server Unit at Master Control Center.
- b. Level Instrument- Ultrasonic /Radar Type
- c. Flow Instrument- Electromagnetic Flow meter
- d. Pressure Instrument
- e. Quality Analysers (Residual Chlorine, Turbidity, pH etc)
- f. Rate of Flow (ROF)
- g. Energy Monitoring
- h. Loss of Head (by Filter bed Level Measurement)

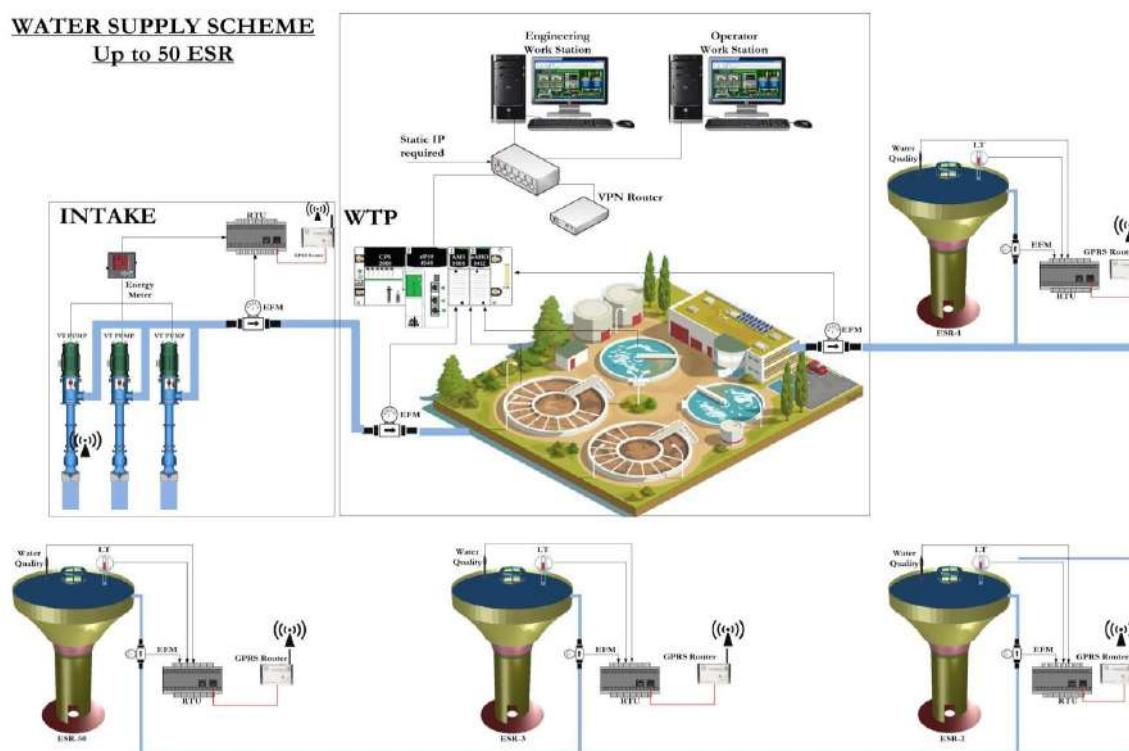
#### **SCADA SYSTEM**





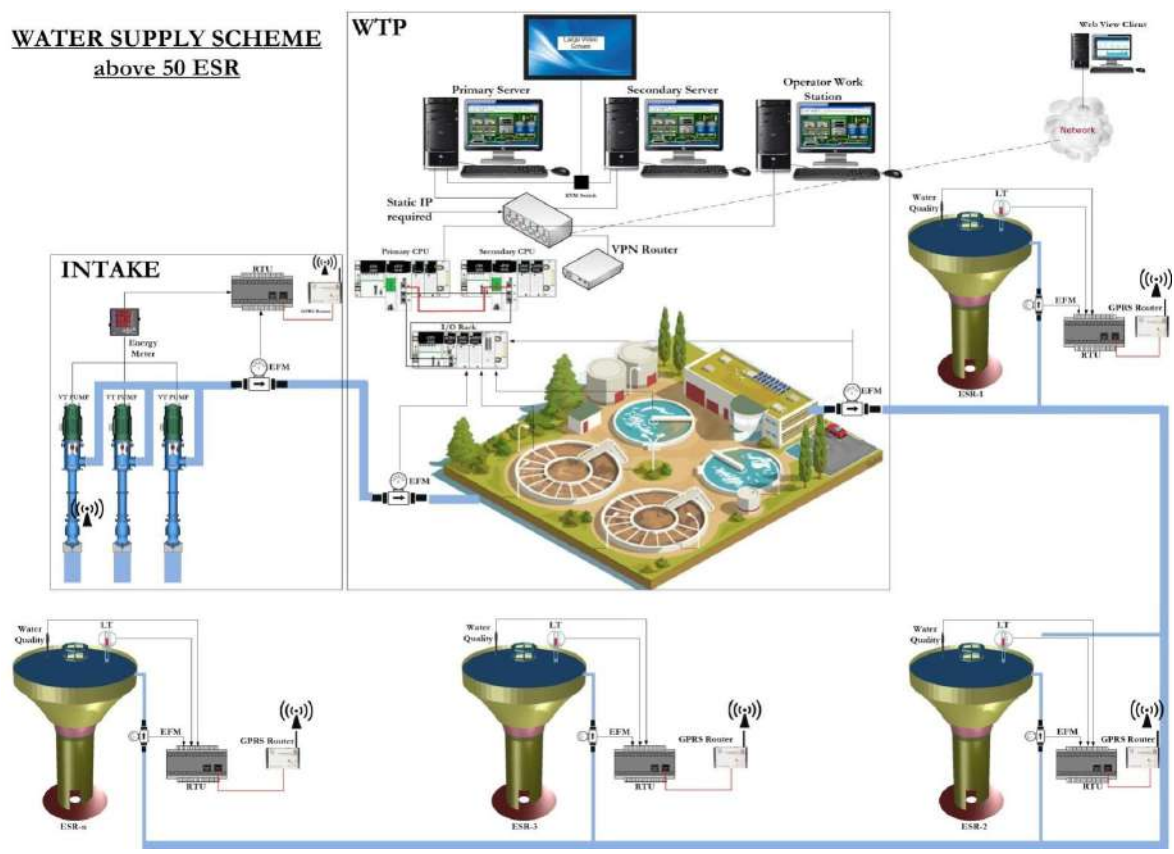
### System Architecture

#### WATER SUPPLY SCHEME Up to 50 ESR



System Architecture

WATER SUPPLY SCHEME  
above 50 ESR



## **Tender Specifications of PLC – SCADA system for Water Supply Scheme**

### **Programmable Logic Controller (PLC) for WTP**

#### **General**

The Control System is dedicated micro processors based automation control system. Its function is to control and monitor the whole process behavior at the water treatment plant in real time. The PLC is needed in order to ensure the process behaviors and performance at the facilities is complied with the process design and control philosophy accordingly. The process design and control philosophy is pre-determined and will be provided during the detail engineering phase by the end user and or consultant.

The objective of the control system is to permit the operator to start-up, run and shutdown the production facilities in the water treatment plant with certain parameters and conditions to ensure that the final water product quality is in accordance with the pre-determined standard and the quantity of water products also meets the intended plant design.

The final quality of the water will be automatically and constantly monitored, the water which does not comply with the specifications cannot be delivered at any point in time, and will be automatically diverted to the discharge channels.

In the normal water treatment plant operation, the process control system shall be completely run in automatic mode requiring limited operator action. Automation and manual operation mode shall be available as an option or selectable mode, the operator, according to his/her access level, can easily change the operation mode at any time accordingly.

The control system consists of:

- Main controller module
- Communication modules
- Power supply module
- IO modules
- Interface modules
- Racks or backplanes

#### **Central Processor Unit (CPU) for PLC System**

The main processor module (CPU module) at the controller level shall be in hot standby configuration. One of the processor modules act as a primary controller and the other one act as the hot standby module and always be ready to take control if something wrong with the primary CPU module. The changeover from primary to the hot standby controller shall be bumpless must not affect the controlled process.

The hot standby configuration hardware shall be based on two separate identical hardware configuration set. It means the primary and the hot standby controller modules shall be located at two separate back planes with identical hardware. Two back planes are configured with identical hardware, software and firmware.

The Hot-standby function must be the inherent properties at the processor operating system level. User programming workaround for redundancy functionality, for example switch over function, will not be acceptable.

The synchronizing between the primary and hot standby controllers shall utilize a dedicated synchlink port at the CPU module with 1 Gbps transmission speed and shall be available in FO cable or TP copper cable.

The CPU module shall also have the integrated communication functionality port for communication with the IO drop communication modules at the IO rack. The communication with IO modules has to be handled by the CPU module. The system shall not require a special module for communication with the IO drop module at the IO rack.

The microprocessor of the CPU module shall be based on SPEAr 32 bit dual core multifunction ARM microprocessor architecture runs at 600 Mhz and shall carry the latest error correction (ECC) technology.

The microprocessor shall implement the execution of the logic application program in one core and in parallel handle the communication in another core. This separation execution result the faster code execution and bring down the scan time to minimum.

The Hot Standby system shall detect a switchover causal event within 15 ms. the time to complete a switchover time shall below 15 ms and shall be bumpless. After the switchover, the former hot standby controller becomes the primary.

The CPU module shall have a real time clock with 1 ms resolution. The accuracy of the real-time clock shall be maintained for 4 week when the CPU power is turned off when the operational temperature is below 45o C. The real time clock shall be enabled to:

- provide the current date and time
- display the date and time of the last application shut-down



The CPU module shall be able to be configured as NTP master. The real time clock of the CPU module is used as a time reference in the NTP services. All the node in the Ethernet will use the CPU module time as a time reference for synchronization.

The real time clock of the CPU module shall be able to be synchronized with the external time server through the NTP protocol. In this configuration the CPU module is act as the NTP client.

### **Memory and Data Storage**

The CPU module shall have integrated flash memory using NAND Flash technology on its motherboard to back up the application, keep the data intact and general context of the controller. The NAND flash technology does not required battery and provides a long storage period in the ideal working condition.

The CPU module shall have total 8 Mb internal memory capacity for programming process application and data storage. The data capacity for transfer data from primary CPU module to the hot standby CPU module is 4096 Kb.

The CPU module shall also has the optional 4 GB SD card to double the storage capacity and as a storage backup. This optional SD card is using the same technology NAND Flash. The removable cartridge / SD card shall be of industrial grade and from the same manufacturer of the processor.

### **Integrated Communication Port**

The main processor module shall have the integrated ports:

#### ***Mini-B USB port***

The Mini-USB port is a high speed mini-B USB connector version 2.0 (480 Mbps) that can be used to connect with the engineering workstation. The mini USB port is for the first time program download and to assign the desired IP address.

#### ***RJ-45 Ethernet Service Port***

The RJ-45 Service port can be used for:

- Access the diagnostics web server
- Communicate with engineering workstation
- Communicate with other system

#### ***RJ-45 Dual Port Ethernet IO Network***

The RJ-45 dual port Ethernet IO network is for communication with the remote IO modules. The Ethernet port shall support the ring topology with the RSTP protocol to ensure the 50 ms recovery time, in case there is a break in line at the IO ring connection.

### ***Synchronization port***

The port is used for synchronizing link between the Primary CPU module and the Standby CPU module. The CPU module shall have the option for the synchronization link cable either the FO cable link or copper cable link.

### ***SD external memory card slot.***

The SD external memory card slot is for the optional external SD memory card. This card can be used for application and data storage. It is a 4 GB; Class A card rated for industrial use and shall be manufactured from the same automation vendor.

### **Programming**

The controller platform shall have the ability to change the configuration on the fly without stopping the process. The user shall be able to change the configuration online while the system is running normally without stopping the process such as:

- Adding the new IO modules.
- Deleting the IO modules.
- Hot swap faulty IO modules without stopping the process.
- Adding the new backplane.
- Adding the new control block.
- Deleting the unused control block.
- Change the parameters of the function block.

The controller shall comply with the Five IEC 61131-3 programming languages. The languages are:

- Function Block Diagram
- Ladder Logic Diagram
- Instruction List
- Statement List
- Sequential Function Chart

These five languages shall use the standard set of instructions compliant with IEC standard 61131-3 to create the control applications which can be transferred from one platform to another (for example to the bigger/powerful CPU model reference).

The software for configuring the controller shall have a standard function and function block libraries manager contains the elements provided. Functions and function blocks are organized into libraries, which themselves consist of families. However, the “Base Lib” library contains a set of functions and function blocks, for the majority of which compatibility is independent of the platforms. In particular, it contains the blocks compliant with IEC 61131-3.

The “Base Lib” library is structured into families:

- Timers and counters
- Process control on integers
- Table management
- Comparison
- Date and time management
- Logic processing
- Mathematical processing
- Statistical processing
- Character string processing
- Type-to-type data conversion
- PID

### **FDT/ DTM Technology**

The software facilitates the integration of field bus architectures into engineering control systems using FDT/DTM technology:

- FDT (Field Device Tool) is the container which supports the device DTMs.
- DTM (Device Type Manager) is the configuration tool for devices with integrated graphic interfaces. It contains the properties specific to each device.

The use of the Master DTM allows the software to perform the following actions:

- Manage the I/O scan
- Create the application variables based on the description of the process objects available from the connected DTM devices
- Manage synchronization with the controller configuration
- Create a generic DTM from the description files (GSD or EDS)

The DTM configuration is stored in the controller memory so that the application can be downloaded in its entirety. It is also saved in the controller project file (STU), the archive file (STA), and the full application exchange file (ZEF).

A third-party DTM can be installed in the DTM hardware catalog. The DTM hardware catalog can be used to sort or filter the DTMs according to various criteria such as Device, Vendor, Groups or Protocols.

### **Security**

The control system shall have the protection from cyber-attack. The access to the process control system shall be limited and protected against the unauthorized access and other cyber threats. The protection shall be a combination of cryptographic and protocol security mechanism. The system must be able to secure communication between controller and system server providing authentication and integrity of data.

The CPU module shall have the option to enable or disable the Ethernet services to increase protection from cyber-attack and from unauthorized access to the controller. The Ethernet services are:

- FPP
- TFTP
- HTTP
- Access Control
- DHCP/ BOOTP
- SNMP
- Ethernet IP
- Port 502

The goal of secured communication is to protect the communication channels that allow remote access to the CPU control system application logic and firmware. Any modification of the operating mode of the CPU module (Run / Stop / Program modifications) must be authenticated and logged.

The PLC CPU module shall be certified with the Achilles Level 2 Certification. The Achilles Level 2 test employs more tests, Denial of Service tests at higher link rates, and more pass/fail requirements.

## **IO Architecture Topology**

The communication from the CPU module to the IO rack shall be based on open and standard Ethernet ring technology with 100 Mbps transmission speed. The CPU module shall be able to handle the communication with the IO rack without additional dedicated communication modules. The Ethernet ring topology shall support the RSTP communication protocol to ensure high availability of the system with recovery time less than 50 ms.

## **IO Modules**

Each input/output signal counting shall be provided with at least 20 percent spare inputs and outputs of each type or one spare card of individual type whichever is higher. Spare I/O shall be installed, wired, and interfaced properly to the terminal strip.

The discrete and analog input/output modules of the controller IO family shall be in standard format modules occupying one single position at the backplane, fitted with either:

- one 20-pin terminal block or
- one or two 40-pin connectors

at the front of the module, to allow removal of modules without disconnecting individual wires, and has a galvanic isolation.

A wide range of discrete inputs/outputs module shall be available to make it possible to meet the following requirements:

- functional: direct or alternating inputs/outputs, with positive or negative logic
- Modularity: 8, 16, 32, or 64 channels per module.

The IO communication adapters exchange data via an I/O scanner service, which resides in the CPU module on the main local rack of your PAC system:

- The input data from the I/O drop is collected and published to the I/O scanner.
- The output modules are updated with the data received from the I/O scanner.
- The protocol used for exchange is Ether Net/IP.
- The exchanges are deterministic, which means that the remote I/O logic is scanned regularly in a scheduled and predictable manner.

### **Digital Inputs**

The discrete input modules shall be equipped with a display block featuring LEDs that displays the module channels status the overall module status. The LED display shows:

- Run Status, to show the input module is operating normally
- Error Status, to show the internal error inside the module
- IO, to show the external event: overload, short-circuit, sensor error. All input modules contain a device for checking sensor voltage for all module channels. This device checks that sensor and module power supply voltages are of a sufficiently high level for correct operation of the module's input channels. When sensor voltage is less than or equal to the defined threshold, the status is shown by the I/O LED lighting up on front panel of the module.
- Channel Status, to show the logic true or false at the input channel (lit when true logic has).

The discrete input modules shall be 24 VDC sink, in 32 input channels modularity. The required technical detail for the digital inputs module:

Type			24 VDC positive logic
Number of Channel			32
Nominal Input Values		Voltage	24 VDC
		Current	2.5 mA
Threshold input values	At 1	Voltage	$\geq 11\text{ V}$
		Current	$>2\text{ mA}$
	At 0	Voltage	5V
		Current	$<1.5\text{ mA}$
	Sensor supply		19-30 V
Input Impedance	At nominal U		9.6 kOhm
Response time	Typical		4 ms
	Maximum		7 ms
Reverse polarity			Protected

IEC 1131-2 Compliance		Type 3
Dielectric Strength	Primary/Secondary	1500 V actual 50/60 Hz for 1 min
	Between channel groups	500 VDC
Resistance of insulation		>10 Mohm
Type of input		Current sink
Paralleling of input		No
Sensor voltage: monitoring threshold	Ok	>18 VDC
	Error	<14 VDC
Sensor voltage monitoring response time	On appearance	1 ms<T<3ms
	On Disappearance	8 ms<T<30 ms
Hot Swap		Yes
Standards	CSA C22.2 No 142	
	IEC 1131-2	
	IEC 664	
	NF C 63-850	
	UL 508	
	UL 746C	

### ***Digital Outputs***

The discrete output modules shall be equipped with a display block featuring LEDs that displays the module channels status the overall module status. The LED display shall at least shows:

- Run Status, to show the input module is operating normally
- Error Status, to show the internal error inside the module
- IO, to show the external event: overload, short-circuit, sensor error.
- Channel Status, to show the logic true or false at the input channel (lit when true logic has).

Every module shall have a protection device which allows the following to be detected when an output is active:

- An overload or short circuit. Events such as these cause the output to be deactivated (tripped) and the event to be indicated on the display on the front panel of the module (the LED corresponding to the channel flashes, the I/O LED comes on).
- Reversal of polarity. An event such as this causes the power supply to short circuit without damaging the module. In order to obtain optimal protection, a quick-blow fuse must be installed on the power supply and upstream from the pre-actuators.
- Inductive overvoltage. Each output is individually protected against inductive overvoltage and has a fast electro-magnet demagnetization circuit using a zener diode which allows the mechanical cycle of certain fast machines to be reduced.

The discrete output modules shall be 24 VDC source, in 32 input channels modularity. The required technical detail for the digital output module:

Type		24 VDC positive logic
Number of Channel		32
Nominal Input Values	Voltage	24 VDC
	Current	0.1 A
Threshold input values	Voltage	19...30
	Current /Channel	0.125A
	Current / Module	3.2 A
Leakage current	At 0	100 microA for U=30V
Voltage drop	At 1	<1.5 V for I=0.1A
Load Impedance		220 ohm
Response Time		1.2ms
Compability with IEC1131-2 DC		Yes type 3
Built in protection	Against overvoltage	Yes by Transistor diode
	Against inversion	Yes by inverted diode
	Against short-circuits and overloads	Yes by current limiter and electriccircuit-breaker 0.125A<Id<0.185A
Pre-actuator voltage: monitoring threshold	Ok	>18 V
	Error	<14 V
Pre-actuator voltage: monitoring responsetime	On appearance	1 ms<T<3ms
	On disappearance	8 ms<T<30ms
Hot swap		Yes
Standards	CSA C22.2 No 142	
	IEC 1131-2	
	IEC 664	
	NF C 63-850	
	UL 508	
	UL 746C	

### **Analog Inputs**

The analog input module shall be 4-20mA, 8 channel isolated analog channels. The module uses a 4-20 mA analog signal to perform monitoring and measurement functions.

The required technical detail for the analog input module:

Number of channels	8
Type of Inputs	High density inputs
Nominal range full scale	4-20 mA
Maximum conversion range	0.16 ... 29.92 mA
Measurement accuracy for module:	
▪ At 25°C	0.15% of full scale
▪ At 0...60° celcius	0.3% of full scale
Temperature drift	50 ppm/°C
Display resolution	15 bit plus sign bit
Isolation	
▪ Between channels	50 VDC
▪ Between channels and bus	1400 VDC
▪ Between channels and ground	1400 VDC
Vibration	10 mm/3g/x10 (per IEC60068-2-6)
Shock	30g/11 ms/x3 (per IEC60068-2-27)
Field device support	2 wire / 4 wire
Response Time	9ms for 8 Channels
Input impedance	250 Ohm
Hot Swap	Yes

### **Analog Outputs**

The analog output module shall have at least 4/8 analog channels. The module uses a 4-20 mA analog signal to perform continuous process control functions.

The required technical detail for the analog output module:

Number of channels	4
Type of Inputs	Current configured by software
Nominal range full scale	4-20 mA
Maximum conversion range	0...20 mA
Measurement accuracy for module:	
▪ At 25o	0.1% of full scale
▪ At 0...60 celcius	<=0.25% of full scale
Temperature drift	45 ppm/°C
Display resolution	15 bit plus sign bit
Isolation	
▪ Between channels	50 VDC
▪ Between channels and bus	1400 VDC
▪ Between channels and ground	1400 VDC
Vibration	10 mm/3g/x10 (per IEC60068-2-6)
Shock	30g/11 ms/x3 (per IEC60068-2-27)
Field device support	2 wire
Conversion Time	<=4ms
Input impedance	350 Ohm
Hot Swap	Yes



## PLC Hardware and Certification

The hardware controllers, IO modules, communication modules and backplane used for the watertreatment process control system shall comply with the principal national and international standards concerning electronic equipment for industrial automation systems:

- Requirements specific to programmable controllers: functional characteristics, immunity, resistance, safety, etc.: IEC/EN 61131-2 and IEC/EN 61010-2-201, UL and CSA standards for industry (UL 61010-2-201, CSA C22.2 No. 61010-2-201)
- Requirements specific to power utility automation systems: IEC/EN 61850-3
- Merchant navy requirements of the major international organizations: unified in IACS(International Association of Classification Societies)
- Compliance with European Directives for e marking:
- Low Voltage: 2006/95/EC and 2014/35/EU from April 2016
- Electromagnetic Compatibility: 2004/108/EC and 2014/30/EU from April 2016

All components of the controllers shall be capable of continuous operation at least at ambient temperatures of 0-60°C and humidity of 5-95%, altitude between 0 – 2,000 meters and has option for the conformal coating type which are able to withstand harsh and corrosive industrial environment as a standard product, without special requirement for heating, cooling or electrical filtering.

Service conditions:

Parameter	Measurement	Standard Environment
Operation Temperature	°C	0 ... +60
Storage Temperature	°C	0 ... +85
Cyclical Humidity	%	5 ... +95 up to 55°C
Continues Humidity	%	5 ... +93 up to 55°C
Altitude Operation	m	0...2,000 (full specification: temperature and isolation). 2,000 ... 5,000 (temperature derating: 1 °C/400 m, isolation lost: 150 V c/1,000 m)

The available AC or DC power supply module shall be capable of accepting a +/- 20% input voltage variation from nominal voltage without shutting down.

The hardware components must have product certification for:

- UL
- CSA
- RCM
- EAC
- Hazardous location Clas 1 Div 2(CSA Hazardous Location according to ANSI/ISA 12.12.01, CSA 22.2 No. 213, and FM 3611.)
- IEC, IECEx, Ex ( zone 2/22)one

The hardware components must also conform to the main certifications relating to marine classification:

- BV (Bureau Veritas/France)
- DNV (Det Norske Veritas/Norway)
- GL (Germanischer Lloyd/Germany)
- LR (Lloyd's Register/United Kingdom)
- RINA (Registro Italiano Navale/Italy)
- ABS (American Bureau of Shipping / USA)
- RMRoS (Russian Maritime Register of Shipping / Russia)

All major components in plant control system items including (central processors modules, I/O modules, servers, network components, and any major panel accessories shall have CoO (Certificate of Origin) to maintain high quality of the product.

**Technical Specifications – Remote Terminal Unit (RTU) for Intake,  
Clarifloculator, IPS, MBR and ESR (OHT)**

The Bidder shall have complied following Technical Specifications for RTU, RTU Panel and GPRSRouter.

**Remote Terminal Unit**

The RTU shall be an intelligent, modular unit, capable of both data acquisition and local data processing. It shall monitor and control local equipment in a standalone mode as well as being an intelligent node in a distributed system. It shall be based on multiprocessor architecture, in which a co-processor is used for handling on-board input/output channels. To facilitate initial installation, maintenance and future expansion, all external input/output modules shall connect to the basic RTU using a high-speed bus.

The RTU shall be configured with a modern Windows application and programmed with open standard IEC 61131-3 programming languages. Programs shall be developed and downloaded either directly to the RTU using a standard RS-232 interface cable, USB, Ethernet, or remotely through the communication network media such as phone lines, dedicated lines, mobile IP systems or wireless radios.

The RTU shall be supplied with the number and type of input/output modules and communication ports as indicated elsewhere in the specifications. Expansion shall be by plugging in additional input/output modules to the I/O bus.

## **Central Processing Unit (CPU)**

The central processing unit shall consist of a high speed 32-bit microprocessor with 32-bit internal and external bus. The design should incorporate a separate co-processor for controlling input/output channels.

The CPU shall be equipped with at least 256 MB RAM for application programs, system parameters and configuration and at least 256 MB FLASH Memory for firmware, application programs and filesystem.

The CPU shall include a real-time clock/calendar, accurate to within one minute per month, with lithium battery backup. The battery will maintain the memory and clock/calendar for two years of power off time. The RTU shall provide an adjustable period for updating time from SCADA protocols in order to achieve accurate clock time.

The CPU shall include an internal clock with at least 10mS resolution and be capable of applying timestamps at this resolution to internal and externally obtained data.

Diagnostic LEDs shall be included for the following:

- a. RTU Status
- b. Wide area communication link activity such as transmit, receive
- c. Local peripheral communication link activity
- d. I/O point indication for all DI & DO points (as a minimum)

The RTU shall include a built-in power supply with wide range input, at least 12VDC - 30VDC. The power supply shall be capable of providing 24VDC output to power field transmitters.

## **Mixed process input/output**

The RTU shall be available in several basic configurations. As a minimum, the following are required in devices with minimum footprint. Further I/O shall be available through I/O module expansion.

- 4 digital inputs, 4 analog inputs, 2 relay outputs, 4 counter inputs (shared with DI)

Digital inputs shall be provided with 11 – 24 VDC range and shall tolerate 150% over-voltage. Digital inputs shall be configurable for reporting of time-stamped events (including unsolicited reporting of state changes), and alarm time dead bands. Digital input changes on the RTU's local I/O shall be time-stamped to at least 200mS accuracy of actual input change, with an internal resolution of 10mS between detectable events. State change and timestamp shall be reported through DNP3 Level 4 SCADA protocols.

The RTU shall include at least three high speed counters (up to 5 KHz) rated at 12/24 VDC. Counter input points shall include point quality such that an I/O module or other failure will indicate bad point quality if the point values cannot be updated. User logic shall also be able to derive bad point quality on a per-point basis. Point quality shall be indicated in the point database and through status flags on

individual points in DNP3 Level 4 SCADA protocols. Digital outputs shared with digital inputs shall be dry contact (closure to ground) type inputs.

Individual digital outputs shall use integrated relays with the following specifications:

- Form A with common ground for each group of five outputs
- Maximum operating voltage of at least 115 Vrms
- Minimum 1000 Vrms contact to logic isolation

Digital outputs shall be configurable for pulse output trains controlled by both protocol messages and user programming.

Digital Output points shall include point quality such that I/O module or other failure will indicate bad point quality. User logic shall also be able to derive bad point quality on a per-point basis. Point quality shall be indicated in the point database and through status flags on individual points in DNP3 Level 4 and SCADA protocols.

Analog inputs shall support HART pass through and be able to be selected as 0-5V, 1-5V, 0-20mA and 4-20mA on any channel, 14 bit resolution,  $\pm 0.2\%$  accuracy over the operating temperature range,  $\pm 0.1\%$  accuracy at 77 °F (25 °C). Analog Inputs shall be single ended.

Analog input changes on the RTU's local I/O shall be time-stamped to at least 200mS resolution, with an internal resolution of 10mS between detectable events. Value and timestamp change shall be accessible by a user application and reported through DNP3 Level 4 SCADA protocols.

Analog Input points shall include point quality such that I/O module or other failure will indicate bad point quality. User logic shall also be able to derive bad point quality on a per-point basis. Point quality shall be indicated in the point database and through status flags on individual points in DNP3 Level 4 SCADA protocols.

Analog outputs shall support HART Pass through with minimum 12 bit resolution, 0-20mA and 4-20mA selection on any channel,  $\pm 0.25\%$  accuracy over the operating temperature range,  $\pm 0.15\%$  accuracy at 77 °F (25 °C).

The RTU I/O shall be controlled by an independent co-processor.

The state of digital and analog outputs shall be configurable to hold their last output value or go to the OFF condition when the application program is stopped.

## **Communication**

The RTU shall possess a minimum of Seven built-in communication ports with the following characteristics:

- Two Ethernet port 10BaseT / 100BaseT with individual Mac Address with DNP3 and ModbusTCP/IP configurable simultaneously.
- Ethernet Service port and Remote IO ports shall not be considered for SCADA and Third-party communications.
- One USB device port
- Four Serial Port, software controlled to 115200 baud rate. At least two of these ports shall be software selectable for RS-232, and RS-485 2-wire operation. Serial ports shall support speeds from 300 to 115200 baud

## **Mechanical Design**

The RTU shall be DIN rail mount. Front access to all controls, indicators, communication ports and power supply connection shall be provided. RS-232 and Ethernet communication ports shall use standard RJ style connectors to allow easy access using standard cables.

All boards shall be coated with conformal coating, for protection against humidity and corrosion.

Where sockets are used, they shall be machined type and be gold plated. Bifurcated or leaf contacts will not be accepted. All system components shall be constructed of corrosion resistant zinc plated steel with removable metal covers.

## **Environment**

The RTU shall operate over an ambient temperature range of -40°C to 70°C (-40°F to 158°F) with a relative humidity 5% to 95%, non-condensing.

The RTU shall operate from nominal power supplies 12-30 VDC, but shall tolerate a wider range than this. 115/240 VAC operation shall be provided through the use of an optional power supply.

## **Certifications and Standards**

- The RTU shall be certified with CE Mark
- Hazardous locations Class I, Division 2, groups A, B, C, and D T4 and Class I, Zone 2, IIC according to CSA C22.2 No. 213-17 and ANSI/ISA 12.12.01
- All inputs and outputs (except the serial communication ports) shall survive ANSI/IEEE C37.90 surge withstand capability (SWC) tests without damage.
- RTU serial ports shall be static protected to +/- 15kV as conforming to IEC 801-2 and 2.5kV surge withstand capability as per ANSI/IEEE C37.90.1-1989.
- The RTU shall be certified to meet or exceed the following standards:
 

RF emission compatibility	: FCC title 13 part 15, Subpart B, Class A, CISPR22
Class A Electrical safety classification	: c(CSA)us, CAN/CSA-C22.2 No. 61010-1
Hazardous area classification	: CSA Class 1, Division 2, Group A, B, C, D
Discharge Immunity	: EN61000-4-2

Radiated immunity	: EN61000-4-3
Fast transient immunity	: EN61000-4-4
Surge immunity	: EN61000-4-5

## **Communication Protocols**

The RTU shall support open standard protocols & following industry standard protocols:

- DNP3 Level 4-Level 4 conformant Master and Slave serial and DNP3 Level 4 over IP,
- DNP3 Level 4 Slave is required to have the ability to send DNP3 Level 4 Master Read and Control requests to a peer Slave RTU
- Modbus RTU Master, Modbus RTU Slave
- Open Modbus/TCP Client, Open Modbus/TCP Server

## **Protocol Capabilities**

Allow up to 65500 stations to be addressed in one system.

- Ability to transfer complete configurations and IEC61131-3 application programs and data over the communication network to the RTU using DNP3 Level 4 protocols. The RTU shall support these facilities via RS232, RS485, TCP/IP PPP serial links, TCP/IP Ethernet, PSTN, radio, cellular IP, etc.
- Support for multiple master's capability for all Slave protocols
- Proprietary protocols shall not be used for remote communication with the device.

## **Flexible Communications**

The RTU shall be able to intelligently route DNP3 Level 4 messages across all its communication ports and interfaces. This shall include the ability to filter messages based on source port, source and destination addressing, and include connection information for the destination device such as communications port, PSTN telephone number, IP address, UDP port number, etc.

## **Data concentrator capability**

Data concentration shall include as a minimum:

- DNP3 Level 4 serial protocol as a master, DNP3 Level 4 over IP (TCP and UDP) as a master
- Ability to put remote device communications in service and out of service on an individual device basis
- Accept Unsolicited message reports from remote devices
- Full support for integrating point quality and event timestamps from remote device in to the RTU's database without loss of information
- Ability to select data concentrator to stop collecting data when event buffers are full
- Communication status for each remote device available in the RTU's point database
- Communication statistics for polling and unsolicited messages available in the RTU's point database
- Provision for user program or protocol commands to the RTU to force an event poll, integrity poll, or remote device restart.

## **Time synchronization**

When operating as a slave the RTU shall be capable of updating its time from the following timesources:

- DNP3 Level 4 protocol serial time sync method over IP communications (TCP and UDP)
- NTP over IP communications

## **Multitasking**

The software shall be based on a multi-tasking executive system optimized for real-time environment. This shall include:

- RTU Hardware watchdog management
- Individual software task watchdog management

## **Firmware Upgrades**

The operating system firmware shall be capable of being upgraded locally and remotely, utilizing compression techniques to minimize the communications transaction size for loading of firmware patches or a new firmware image. The firmware upgrade shall not commence until complete reception of the firmware image. RTU operation shall not be interrupted during the communications transfer of the firmware image.

## **TCP/IP Communications**

The operating system shall include TCP/IP services that encompass, but are not limited, to the following:

- TCP socket interface for open protocols (Open Modbus/TCP)
- Both TCP and UDP socket interfaces for DNP3 Level 4 open protocol
- TCP socket interface for IEC61131-3 programming interface
- ICMP (ping) management as a client and server
- Telnet to RTU diagnostics stream
- FTP file transfer to RTU file system
- IP network table supporting Gateway, Host, Sub-network entries

The following IP services shall be disabled by default as a security measure:

Telnet, FTP, NTP, BOOTP

## **Diagnostics**

Detailed diagnostics shall be available from the RTU including the following features:

- Command line interface for interacting with the RTU's file system and diagnostics.
- Command line via serial port connection using a generic terminal application. (The serial port shall also be selectable for purposes other than dedicated command line)
- Command line from configuration application via USB, Telnet
- Command line via DNP3 Level 4 Protocol Virtual Terminal

## **User Programming Software:**

The RTU shall support all five IEC 61131-3 programming languages:

- a) Sequential Function Chart (SFC)
- b) Functional Block Diagram (FBD)
- c) Ladder Diagram (LD)
- d) Structured Text (ST)

The RTU configuration and programming software shall be accessible from a single user interface. The software shall allow the user to develop and then download the application and system configuration locally via USB, serial port or Ethernet interface, and over the communication network via TCP/IP, DNP3 Level 4 protocols.

## **Event Capability**

The RTU shall natively support event facilities without the need for user programming.

Open protocol event capabilities for DNP3 Level 4 shall be fully integrated with the RTU's event facilities. The number of events stored by the RTU shall be configurable, with a maximum up to at least 100,000 events.

The RTU shall provide the following capabilities:

- Generate events from physical or derived data objects
- Accept, process and chronologically sort events from external devices
- Merge external events using the original timestamp information provided by an external device
- Where a timestamp is not supplied externally, the RTU shall add a timestamp to all event data
- Report Binary, Counter, Integer analog and Floating-point analog events as a minimum
- Report events for analog points on rate of rise exceeded, rate of fall exceeded and no change after a period. This functionality shall be provided natively without the need for user programming.
- Event configuration for each data object shall include an event priority
- Individual event configurations (e.g. each alarm limit) shall provide a selection for enabling an unsolicited communication transaction when the event is generated

## **Data Logging functionality**

The RTU is required to have the following data logging functionality in addition to its event capabilities. The RTU shall support both event and data log operation simultaneously, including both event generation and logging on the same RTU data objects.

Logging shall be selectable on digital input, digital output, analog input and analog output data objects. Analog logging shall be by 32-bit floating point engineering values.

Logging shall be configurable to include current value and summary statistics at a defined interval, including average, maximum and minimum logging trends.

Logging frequency shall be selectable by the user for each logging trend and vary from 1 second to 1 year.



All data shall be able to be retrieved and made available as a .csv file for use in Excel, Access, or HMI software. Data uploaded to a PC shall be supported using direct serial connection, leased telephone lines, radio, dial-up modem, external memory media and via the SCADA communication link.

## **Security**

RTU shall support next generation Cybersecurity features such as RTU security access control, individually addressable Ethernet Ports, IP White-listing, and are tested to meet cyber security communications robustness.

The RTU shall provide communications security using recognized SCADA security open standards. Communication link security shall be provided for the DNP3 Level 4 open protocol as a minimum, supporting operation on serial and network links. This shall include DNP3 Level 4 Secure Authentication V2 as a minimum with an option for data encryption.

Security standards shall be aligned to FIPS-120 standards and include AES-128 encryption and HMACSHA-256 hash algorithms as a minimum.

A secure administration application shall be provided for the Security Administrator to issue and track security keys, users and configuration computer nodes.

The administrator application shall provide the capability of specifying security configuration for groups of RTUs, users (via username/password) and individual configuration.

## **PLC system cabinet / Control Desk**

### **General**

Control Panel shall be CNC machine prefabricated out of CRCA sheet steel of thickness not less than 2 mm, modular in construction, properly reinforced, powder coated and having rigid frame structure. Internal mounting plate including the gland plate shall be 3 mm thick. The control panel shall have dimensions as per system requirement. However, the control panel height shall not exceed 2200 mm.

The exterior corners and edges shall be rounded to give a smooth overall appearance with projections kept to a minimum. Lifting lugs shall be provided for installation purposes and shall be replaced with corrosion resistant bolts after installation. Control Panel shall be completely metal enclosed and shall be dust, moisture and vermin proof. Panel enclosures shall provide a degree of protection not less than IP 54 in accordance with IS: 13947 Part-I. Control Panel shall be freestanding type. There shall be sufficient reinforcement to provide level surfaces, resistance to vibrations and rigidity during transportation and installation. Metal sills in the form of metal channels properly drilled shall be furnished along with anchor bolts and necessary hardware for mounting the control panels. Cable entries to the panels shall be from the bottom. Control panels shall be provided with louvers along with washable micron filters AIRIN – AIROUT fans will be provided.

### **Mounting**

All equipment on front of panel shall be mounted flush or semi-flush. In case of semi-flush mounting, only flange or bezel shall be visible from the front. Equipment shall be mounted such that removal and replacement can be accomplished individually without interruption of service to adjacent equipment. Equipment mounted inside the panel shall be so located that terminals and adjacent devices are readily accessible without the use of special tools. Terminal markings shall be clearly visible.

### **Earthing for Instruments**

The panel shall be equipped with an earth bus securely fixed along the inside base of panel. All metallic cases of instruments and other panel mounted equipment shall be connected to the instrument earth bus. Looping of earth connections which would result in loss of earth connection to other devices when the loop is broken shall not be permitted. However, looping of earth connections between equipment to create alternative paths to earth bus shall be provided. A separate instrument earth bus will be created which will be floating and all the cable shields will be terminated onto this bus. This bus will be connected to an electronic earth pit.

### **Frame Earthing**

All metal parts other than those forming part of an electrical circuit shall be connected to a copper earth bar run along the inside bottom of the panel. The minimum section of the earth bar shall be 25 mm x 3 mm. A 15 mm diameter hole is to be provided at each end of the bar. Connection of the

earth bar to the station earth shall be carried out by Contractor.

### **Space Heater**

Strip type space heaters of adequate capacity shall be provided inside control panels to prevent moisture condensation on the wiring and panel mounted equipment when the panel is not in operation. The heaters shall operate on 230 V AC. Heaters inside the panels shall not be mounted close to the wiring or any panel mounted equipment. The operation of heaters shall be controlled by thermostats.

### **Interior Lighting and Receptacles**

Each panel shall be provided with either a CFL lighting fixture rated for 11 watt, 230V, 1 phase, 50Hz supply for the interior illumination of the panel during maintenance. The illumination lamp shall be operated by door switch or manual switch. Each panel section shall be provided with separate lighting. Each panel shall be provided with 230V, 1 phase, 50 Hz, combined 5 amps and 15 amps, 3pin receptacle with a switch and neon. The receptacle with switch shall be mounted inside the panel at a convenient location. If the panel has front and rear doors then maintenance socket shall be provided at both locations.

### **Voltage Level and Power Supply Units**

Generally, voltage levels for control schemes and power supply for instruments in the panels, shall be limited to 24 V DC. In case the instruments require power supply other than 24 V DC, Contractor shall provide necessary transformers, converters, inverters and other associated hardware required to generate the requisite power supply. The power supply distribution board for panel mounted and field mounted instruments shall be provided. Power supply to all the instruments mounted outside the control panel shall be provided from the power supply units in the control panel. The power supply to all the instruments shall be without interruption and shall be continued even in case of failure of 230 V A.C. power supply. UPS sizing should take this into consideration.

### **Labels**

All the equipment mounted on the front facia of control panel as well as equipment mounted inside the panels shall be provided with individual labels with equipment designation engraved. The labels shall be mounted directly below the respective equipment. Also the panel shall be provided at the top with a label engraved with panel designation.

### **Switches and Miniature Circuit Breakers (MCBs)**

Each control panel shall be provided with necessary arrangement for receiving, distributing, isolating and protecting of DC and AC supplies for various control, signaling, lighting and space heater circuits. The incoming and sub-circuits shall be separately provided with Miniature Circuit Breakers (MCBs). Potential circuits for relaying and metering also shall be protected by MCBs. All Important MCBs will be provided with an auxiliary contact to be used for providing MCB tripped alarm.

### **Intra-panel (i.e. Panel Internal) Wiring**

Connections within a panel, between panel mounted devices and terminal blocks or between two panel mounted devices will be made by 660 volt grade, stranded copper conductor insulated with PVC and designed for a minimum conductor temperature of 90 degrees centigrade. The wires shall be shielded, where necessary. Panels shall be supplied completely wired internally, with a colour coding scheme decided mutually between the department and the Contractor, to equipment and terminal blocks and ready for external cable connections at the terminal blocks. Wires within the panel shall be continuous i.e. without splicing and shall comprise stranded copper conductors. Internal wiring or wiring between the two assemblies shall be commensurate with mechanical safety. Wire termination shall be made with solderless crimping type of tinned copper lugs which firmly grip the conductor and insulation. Insulated sleeves shall be provided at all the wire terminations. Engraved core identification plastic ferrules, marked to correspond with panel wiring diagram shall be fitted at both ends of each wire. Ferrules shall fit tightly on the wires and shall not fall off when the wire is disconnected from terminal blocks. The ferrule system shall adopt single tube printed arrangement so that all the characters remain on one line always & hence easily readable.

### **Terminal Blocks**

Terminal blocks for power connection shall be 660V grade, 10 amps rated, one-piece moulded, complete with stud type terminals, washers, nuts and lock nuts and identification markings. Markings on the terminal strips shall correspond to wire numbers on the wiring diagrams. All control output terminals will be fused type and all other input signal terminals will be clip on shrouded type. Spare contacts and terminals of the panel mounted equipment and devices shall be wired to terminal blocks as required. There shall be a clearance of 250 mm between the first row of terminal blocks and the associated cable gland plate. Also the clearance between two rows of terminal blocks shall be 250 mm. Panel internal wiring shall not be looped directly from instrument to instrument. The same shall be looped through the panel terminal block only. If accidental shortcircuiting of certain wires is likely to result in malfunction of equipment, such as closing or tripping of a breaker or positive and negative wires, these wires shall not be terminated on adjacent terminal blocks.

### **Cable Supports**

All external cables shall present a neat appearance and shall be suitably braced, placed in troughing clipped or laced to prevent effects of vibration.

### **Terminal/Identification**

Every terminal and test plug shall be uniquely identified within the terminal cabinet by means of a terminal number. Appropriate labels shall be used to permit quick and unambiguous identification of each terminal and test plug.

### **Painting of System Cabinet/ Control Desk**

All sheet steelwork shall be phosphated in accordance with the following procedure:

- The pre treatment shall be hot process with running water for rinsing.
- Oil, grease, dirt and swarf shall be thoroughly removed by emulsion cleaning.
- Rust and scale shall be removed by trickling with clean water followed by final rinsing with dilute dichromate solution.
- The control panel shall be powder coated. Thickness of coating of minimum 60 microns. QA test certificate shall be furnished for thickness, adhesion and hardening of powder coating.

## **Technical Specification SCADA**

### **Architecture**

The SCADA architecture shall provide the following:

- Client / Server architecture.
- Symmetric main-standby & capacity for triple standby server functionality.
- Additional servers for user load-sharing.
- Fully automated data transfer between servers to provide complete server redundancy. This transfer shall include configuration, real-time data, historic data and event lists. Database updates shall be on an incremental basis.
- A scalable, fully distributable architecture providing:
  - Unlimited number of server systems.
  - Unlimited number of display clients.
- Where multiple servers are deployed, the system shall be capable of being configurable from a single client.
- All redundancy shall be handled by the database, with the operational state of systems preserved through a server changeover. The system shall not rely on driver redundancy for data transfer when providing redundant server. The system shall present a uniform view of data including communication status after a server change-over.
- Configurable compression of data communications between client/server and server/server to allow optimisation of communications performance over WAN networks.
- Change reporting on Client/Server and Server/Server links rather than polled communication to permit operation on WAN networks.
- Capable of operating Client/Server and Server/Server links over low to medium speed channels depending upon database size (e.g. 128K)
- Support for DMZ (read-only)

servers Operation is required on:

32- Bit Machines Desktop Hardware:

- Windows 10 (Professional and Enterprise Editions)
- Windows 8 / 8.1 (Professional and Enterprise editions)
- Windows 7 (Professional and Ultimate editions) - Service

#### Pack 164-Bit Machines

#### Server Hardware:

- Windows Server 2016 (Standard and Datacenter editions)
- Windows Server 2012 Release 2 (Standard and Datacenter editions)
- Windows Server 2012 (Standard and Datacenter editions)
- Windows Server 2008 Release 2 (Standard and Enterprise editions) –

#### Service Pack 1 Desktop Hardware:

- Windows 10 (Professional and Enterprise Editions)
- Windows 8 / 8.1 (Professional and Enterprise editions)
- Windows 7 (Professional and Ultimate editions) - Service Pack 1

Operation shall be supported on both physical and virtual infrastructure, and when hosted on the latter it shall allow interfacing with shared storage and other peripherals.

### **Database**

The SCADA database shall be of true relational database design and optimised for real-time SCADA operation. The database shall be object-oriented and organised in a hierarchical structure. It shall support user-created “Templates” that allows management of common configuration from a single point in the database. Instances of templates shall be used for repetitive, standard configuration.

Templates of standard configuration shall support multiple object types including, but not limited to:

- Point objects
- PLC or RTU objects
- Mimics
- Trends
- Maps
- 3D Plots
- Logic objects
- Schedules
- Link objects
- Linked tables

Templates shall support the ability for the value of object's property within an instance to be calculated by the system using an expression.

The database shall enable the user to perform automatic (scheduled) or manual database backup. While the backup is in progress, the database shall continue to operate; processing values, storing updates in memory and synchronizing updates to the standby. When the backup is complete, all updates shall be flushed to disk.

The backup task shall copy the following files:

- Database: Metadata, Structure, Configuration and Data
- Historic Data
- Event Journal Data
- Configuration Change Data
- Alarm Summary Data
- Registry Settings

Backup of historically stored records includes a configurable time range to allow the amount of historic backed up to be tuned to control both the backup size and execution to be kept within sensible limits on systems with large quantities of historic data

## **Operator Interface**

- SCADA software shall provide the ability to support multiple local and remote display clients.
- Display facilities shall be available via LAN, WAN and dial-up connection.
- Integrated Web Server capability shall be available, providing all display and operational facilities of the Rich Client without the need for additional software to be installed.
- Web Clients shall allow users to view Mimics, Trends & Plots, Database Objects, and Reports as well as perform control functions using a standard web browser.
- Changes made to the SCADA server shall require no additional steps to be performed in order for those changes to be available to Rich Clients and Web Clients.
- Full function display clients shall automatically detect & reconnect to a redundant server node when server change-over occurs.
- Display clients shall support a minimum of 6 monitors (multi-monitor)
- Web client shall provide support for Internet Explorer 9, 10 and 11, and allow access to view data, alarms, events, trends and query results from any HTML5 browser

## **Mimics**

SCADA system Mimics shall support a wide range of graphical facilities. Scalable vector graphics are required in order to permit operation of the SCADA system with different resolution clients operating simultaneously. Fixed resolution bitmap graphics are not acceptable.

Mimics shall be multi-layered, object oriented and permit mimics to be embedded in other mimics.

Objects embedded and displayed on any mimic shall be viewable through both the full function client and web client displays.

## **Trends**

The Trending System shall include facilities to display pre-configured and ad-hoc graph displays.

The colors of variable traces shall be allocated by automatically, which may then be changed by the user. The color of X and Y axes shall also be configurable.

It shall be possible to combine data from different parameters, from different time/days and different data sources, in order to perform calculations within the trending display (e.g. display the result of subtracting variable B from variable A). It shall be possible to apply a configurable multiplier to the variable. It shall be possible to select from a number of pre-configured algorithms including (but not limited to) Average, Max, Min, Time Average, Start, End, Sum, Count, Total, Variance, Standard Deviation, and Delta. It shall be possible to configure additional accumulating or moving algorithms for selection within the trending interface. It shall be possible to select from a number of pre-defined columns to display algorithm data for all configured traces, including Count, Sum, Total, Minimum, Maximum, Mean, Range, Delta, Standard Deviation, and Variance.

The facility to select logarithmic scales and/or inverted scales for the Y-axis shall be provided.

It shall be possible to superimpose more than 50 variables onto graphs showing the trace with its alarm limits. It shall be possible to enable/disable the display of any configured variable without the need for reconfiguration.

It shall be possible to display from both historic and current data on the same display. The time-axis shall support continuous scrolling mode to display new data as it comes into the system.

It shall be possible to export the data displayed within a graph, for example to CSV, MS Excel, MS Word.

## **Location Support & Maps**

All database objects shall be able to store static or dynamic WGS84 coordinates which can include Latitude, Longitude, Height, Accuracy (XY and Z), and Date/Time of last location update.

The system shall allow for native creation of geographical regions by either configuring a pre-defined circle or rectangle, or by specific definition of a polygon. User accounts shall be able to be linked to geographical regions for the purpose of automatic alarm notification. The system shall support filtering of alarms by configured region(s)

## **Alarm Management**

The alarm system shall provide facilities where actions can be triggered by alarms. These facilities shall be provided as a built-in integrated part of the system and shall include, but not be limited to the following:



- Configuration criteria for alarm actions
- Escalate Alarm priority
- Delivery of alarm to users via SMS
- Delivery of alarm to users via E-mail
- Trigger other actions including sequences

Full function Clients & Web clients shall provide audible indication of alarm condition, with the ability to change alarm tone, color, and other attributes based on alarm priority. Support for Consequential Alarms (alarm suppression) shall be provided.

The system shall provide, as a built-in feature and without the requirement for custom or external software, a built-in Alarm Summary to summarize key alarm information into a table with all related alarm information contained within a single record.

### **Historical Data**

The SCADA system shall provide a built-in data historian with the following facilities as standard features. These shall be provided without the addition of external software modules:

- Time-series relational database
- ODBC / SQL interface to historical (trend) data
- Historical data to be stored with time-stamp, point quality, alarm status
- Historic storage is to be based on configurable criteria including time between samples, alarm state change
- Compression capability

Historical files supporting fixed interval sampling only will not be accepted.

Where historic data can be retrieved through communication devices such as PLC/RTUs, the historic data sub-system shall natively provide the capability to backfill this data in to the historian.

Loss of data or gaps in data as a result of communication or server failure shall not be accepted. The vendor must demonstrate its ability to ensure data integrity and history data recovery.

### **System Security and Access**

The SCADA system shall provide a high level of inherent security. To this end the SCADA software shall provide security access down to data point level, and support individual Users, User Groups and a matrix of system capability and access to any level of the SCADA database.

Full-function Rich & Web client interfaces shall require explicit administrative configuration to valid connection to the SCADA server.

Client interfaces shall provide the ability to restrict access to sensitive system information based on user privilege.

The system shall support a delayed lockout of user access after a consecutive number of failed logons. The delayed lockout restriction shall automatically expire after a configurable duration, re- allowing user access.

Web interface facilities shall provide the capability to operate the Web interface using SSL and encrypted data. Changes in configuration to the SCADA system shall not require additional steps in order to provide modified information to the SCADA Web interface.

## **Open Connectivity**

To provide easy access for customized reports and external data manipulation the SCADA software shall provide inherent OPC and ODBC database connectivity without the need for additional software options or modules. Integration with desktop Microsoft products is essential.

The following Open interfaces shall be provided as integrated components of the SCADA system are required:

- OPC Data Access (OPC-DA) to the SCADA server real-time and configuration database
- ODBC to the SCADA server real-time / configuration database
- OPC Historic Data Access (OPC-HDA) to historian
- OPC Alarm & Event (OPC-AE) to event sub-system
- OLE Automation interface to the SCADA server database
- .NET support
- ODBC / SQL to the SCADA historical database
- ODBC / SQL to the SCADA event database
- Support for specific database packages (e.g. Oracle)
- SQL Export for creating csv files

## **Reports**

An integrated reporting package shall be able to generate, print and export reports:

- Triggered by SCADA events
- On user demand
- On timed schedules

Report generation shall use latest technology in database access and be capable of combining data from multiple databases via ODBC/SQL. This shall include SCADA and non-SCADA databases

Reports shall be able to be generated in a number of formats including:

- HTML for viewing via Web interface
- PDF format
- CSV format

- MS Office® suite format
- Crystal Reports

Generated reports shall be able to be:

- Printed on a local or network printer
- Stored on disk file, locally or remotely
- e-mailed to assigned users

## Logic

The SCADA system shall support logic sequences with full access to all SCADA system services at run time. Programming of sequences shall be to the IEC61131-3 international standard and support as a minimum the following languages:

- Ladder Diagrams
- Function Blocks
- Structured Text
- Sequential Function Charts

The ability to store custom calculations and data via Data Grids/Data Tables/Data Sets shall be provided, including the ability to integrate elements of these Data Sets into individual Templates/Instances.

## Technical Specification Rack Server

Rack based redundant server shall be required to for Centralized SCADA System. The bidder shall follow the minimum required specification for Rack Server as given below.

Processor	2 x Intel Xeon Bronze 3106 ( 1.7 G, 16C/16T, 22 MB cache)
RAM	4 x 16 GB DDR4, 16 Nos DiMM Slot available for Expansion
Storage	4 x 1.8TB SAS 2.5" 10K RPM hot plug, (Max 8 nos 2.5" Bay) Raid0,1,5 with H330 Raid Controller
Display	21" LED Display
DVD R/W	DVD Read and Writer
Power Supply	Dual Redundant Hot swappable Power Supply
OS	Server Grade Operating system
Additional Item	Keyboard, Mouse, Ethernet Port – 2 Nos. 1GBPS
Additional Software	MS Office Home & Business 2016
Antivirus	Server grade Antivirus
Graphic Card	PCI Graphics Card 4 GB DDR3

### **Technical Specification Work Station**

Work Station (2 Nos.) shall be required to operate Centralized SCADA System. The bidder shall follow the minimum required specification as given below. The bidder shall consider industrial grade control desk and chair (2 for each work station) for work station.

Processor	Intel® Xeon® Processor with 3.0GHz, 8M Cache
RAM	16 GB DDR4
Storage	3*1TB 6G SATA 7.2K 3.5in NHP Hard drive, Intel RST SATARAID
Display	21" LED Display
DVD R/W	DVD Read and Writer
Power Supply	300W Power Supply
OS	Server Grade Operating system
Additional Item	Keyboard, Mouse, Ethernet Port – 2 Nos. 1GBPS
Additional Software	MS Office Home & Business 2016
Antivirus	Server grade Antivirus
Graphic Card	PCI Graphics Card 2 GB DDR3

### **Technical Specification 55" LED Display**

Bidder shall consider KVM switch and other required accessories for 55" LED display. The bidder shall follow the minimum required specification as given below.

<b>Panel</b>	
Diagonal Size	55"
Type	60Hz D-LED BLU
Resolution	1920 x 1080 (16:9)
Brightness (Typ.)	330 nits
Contrast Ratio (Typ.)	5000:1
Viewing Angle (H / V)	178:178
Response Time (G-to-G)	6ms
Orientation	Portrait / Landscape
<b>Sound</b>	Built in Speaker (10W + 10W)
<b>Connectivity</b>	
Input	
RGB	Analog D-SUB, DVI-D
Video	HDMI1, HDMI2, CVBS
Audio	Stereo Mini Jack / RGB / DVI / HDMI / CVBS
USB	USB 2.0 x 1
<b>Output</b>	
Audio	Stereo Mini Jack
External Control	RS232C (In / Out) thru Stereo Jack, RJ45
External Sensor	IR

<b>Power</b>	
Type	Internal
Power Supply	AC 100 - 240 V~ (+/- 10 %), 50/60 Hz
<b>Power Consumption</b>	
Max [W / H]	176W
Typical [W / H]	55W
Sleep Mode	< 0.5W
Off Mode	< 0.5W
<b>Dimensions</b>	
Set	48.4" x 27.8" x 1.96"
Package	53.1" x 31.9" x 5.8"
Bezel Width (mm)	9.5 (Top / Side), 15.0 (Bottom)
<b>Weight</b>	
Set	32.5 lbs
Package	42.4 lbs
<b>Features</b>	

VESA Mount	400 x 400mm
Stand Type	Foot Stand (Optional)
Media Player Option Type	Embedded (Lite SoC), Setback Box (Attachable)
<b>Special</b>	
<b>Hardware</b>	Super Clear Coating, Temperature Sensor, Pivot Display, Button Lock, Clock Battery (168 Hrs Clock Keeping), Built in Speaker (10W x 2)
<b>Software</b>	Auto Source Switching & Recovery, RS232C / RJ45 MDC, Plug and Play (DDC2B), Built In MagicInfo Lite, Firmware Update by Network, LFD New Home Screen
<b>Tuner</b>	Yes
<b>Internal Media Player</b>	MIPS 24K, 128KB L2 Cache, 650MHz processor, 512MB Main Memory Interface, Samsung Proprietary OS (VD Linux), 179 MB Storage
<b>Environmental Conditions</b>	
Operating Temperature	0°C ~ 40°C
Operating Humidity	10~80%
<b>Green Management</b>	
Emission Standard	EMC
ENERGY STAR Compliant	ENERGY STAR 7.0 (USA)
RoHS Compliant	Yes
Packaging Recyclability	Packing Materials Recyclable
<b>Service</b>	
Standard Warranty	3 Years Onsite (Parts / Labor / Backlight)

### **Technical Specification A4 printer**

The bidder shall follow the minimum required specification as given below.

Functions	Print
Print speed (A4)	Up to 16/16 ppm (black/color)
Control panel	7 segment ICON LCD with 6 buttons (Up, Down, Colour Copy, Monochrome Copy, Setting, Cancel) and 6 indicator light (Ready, Error, CMYK toner low)
Networking	Fast Ethernet
<b>Print</b>	
Print technology	Laser
Print speed <sup>1</sup>	Black (A4, normal): Up to 16 ppm; Colour (A4, normal): Up to 16 ppm
First page out <sup>2</sup>	Black (A4, ready): As fast as 11.8 sec; Colour (A4, ready): As fast as 13.7 sec; Black (A4, sleep): As fast as 12.9 sec; Colour (A4, sleep): As fast as 14.2 sec
Print resolution	Black (best): Up to 600 x 600 dpi; Colour (best): Up to 600 x 600 dpi;
Monthly duty cycle	Up to 30,000 pages (A4); Recommended monthly page volume: 150 to 1,500
Fonts and typefaces	84 scalable TrueType fonts
Print area	Print margins: Top: 5 mm, Bottom: 5 mm, Left: 5 mm, Right: 5 mm; Maximum print area: 216 x 356 mm
Duplex printing	Manual (driver support provided)
Processor speed	800 MHz
<b>Connectivity</b>	
Standard	Hi-Speed USB 2.0 port; Built-in Fast Ethernet 10/100 Base-TX network port
Network capabilities	Yes, via built-in 10/100 Base-TX Ethernet
Memory	Standard: 256 MB DDR, 128 MB Flash; Maximum : 256 MB DDR, 128 MB Flash
Dimensions and Weight Printer dimensions (W x D x H)	Minimum: 420 x 380 x 292.6 mm; Maximum: 420 x 435 x 295 mm
Printer weight	15.7 kg
Operating environment	Temperature: 15 to 30°C; Humidity: 30 to 70% RH
Storage	Temperature: -20 to 40°C; Humidity: 0 to 95% RH
Power	Requirements: Input voltage: 220 to 240 VAC (+/- 10%), 50 Hz (+/- 3 Hz), 60 Hz (+/- 3 Hz) Consumption: 337 watts (Active Printing), 8.0 watts (Ready), 1.0 watts (Sleep), 0.1 watts (Manual-Off), 0.1 watts (Auto- Off/Manual-On), 1.0 watts (Auto-Off/Wake on LAN); Typical Electricity Consumption (TEC) 6:

	Energy Star: 0.493 kWh/Week; Blue Angel: 0.531 kWh/Week; Power supply type: Internal (Built-in) power supply
Certifications	CISPR 22:2008, CISPR 32:2012/EN 55032:2012 - Class B; EN 61000-3-2:2014; EN 61000-3-3:2013; EN 55024:2010, ENERGY STAR® qualified Blue Angel compliant: Yes, Blue Angel RAL-UZ 205

### **Technical Specification Ethernet Switch**

Bidder shall consider 2 nos. of industrial grade Ethernet Switches at CSS. The bidder shall follow the minimum required specification as given below.

<b>Physical Ports</b>	
10/100 Base-T(X) Ports in RJ45 Auto MDI/MDIX	16 Ports
<b>Technology</b>	
Ethernet Standards	IEEE 802.3 for 10Base-T
	IEEE 802.3u for 100Base-TX and 100Base-FX
	IEEE 802.3z for 1000Base-X
	IEEE 802.3ab for 1000Base-TX
	IEEE 802.3x for Flow control
	IEEE 802.3ad for LACP (Link Aggregation Control Protocol )
	IEEE 802.1D for STP (Spanning Tree Protocol)
	IEEE 802.1p for COS (Class of Service)
	IEEE 802.1Q for VLAN Tagging
	IEEE 802.1w for RSTP (Rapid Spanning Tree Protocol)
	IEEE 802.1s for MSTP (Multiple Spanning Tree Protocol)
	IEEE 802.1x for Authentication
	IEEE 802.1AB for LLDP (Link Layer Discovery Protocol)
<b>MAC Table</b>	8192 MAC addresses
<b>Priority Queues</b>	4
<b>Processing</b>	Store-and-Forward
<b>Switch Properties</b>	Switching latency : 9 $\mu$ s
	Switching bandwidth : 7.2Gbps
	Max. Number of Available VLANs : 4096
	IGMP multicast groups : 1024
	Port rate limiting : User Define
<b>Security Features</b>	Enable/disable ports, MAC based port security
	Port based network access control (802.1x)

	VLAN (802.1Q ) to segregate and secure network traffic
	Supports Q-in-Q VLAN for performance & security to expand the VLAN space
	Radius centralized password management

	SNMP V1/V2c/V3 encrypted authentication and access security
<b>Software Features</b>	STP/RSTP/MSTP (IEEE 802.1D/w/s)
	Redundant Ring (O-Ring) with recovery time less than 10ms over 250 units
	TOS/Diffserv supported
	Quality of Service (802.1p) for real-time traffic
	VLAN (802.1Q) with VLAN tagging and GVRP supported
	IGMP v2/v3 (IGMP snooping support) for multicast filtering
	Port configuration, status, statistics, monitoring, security
	SNTP for synchronizing of clocks over network
	Support PTP Client (Precision Time Protocol) clock synchronization
	DHCP Server / Client support
	Port Trunk support
	MVR (Multicast VLAN Registration) support
<b>Network Redundancy</b>	O-Ring
	Open-Ring
	O-RSTP
	STP
	RSTP
	MSTP
<b>Warning / Monitoring System</b>	Relay output for fault event alarming
	Syslog server / client to record and view events
	Include SMTP for event warning notification via email
	Event selection support
<b>RS-232 Serial Console Port</b>	RS-232 in RJ45 connector with console cable. 9600bps, 8, N, 1
<b>LED Indicators</b>	
Power Indicator	Green : Power LED x 3
R.M. Indicator	Green : Indicates that the system is operating in O-Ring master mode
Fault Indicator	Amber : Indicates unexpected event occurred
10/100Base-T(X) RJ45 Port Indicator	Green for port Link/Act. Amber for Duplex/Collision



10/100/1000Base-T(X) RJ45 Port Indicator	Green for port Link/Act. Amber for 100Mbps indicator
<b>Fault Contact</b>	

Relay	Relay output to carry capacity of 1A at 24VDC
<b>Power</b>	
Redundant Input Power	Dual DC inputs. 12~48VDC on 6-pin terminal block
Power Consumption (Typ.)	12 Watts
Overload Current Protection	Present
Reverse Polarity Protection	Present on terminal block
<b>Physical Characteristics</b>	
Enclosure	IP-30
Dimensions (W x D x H)	96.4(W)x108.5(D)x154(H) mm (3.8 x 4.27 x 6.06 inch)
Weight (g)	1220 g
<b>Environmental</b>	
Storage Temperature	-40 to 85°C (-40 to 185°F)
Operating Temperature	-40 to 70°C (-40 to 158°F)
Operating Humidity	5% to 95% Non-condensing
<b>Regulatory Approvals</b>	
EMI	FCC Part 15, CISPR (EN55022) class A
EMS	EN61000-4-2 (ESD), EN61000-4-3 (RS), EN61000-4-4 (EFT), EN61000-4-5 (Surge), EN61000-4-6 (CS), EN61000-4-8,EN61000-4-11
Shock	IEC60068-2-27
Free Fall	IEC60068-2-32
Vibration	IEC60068-2-6
Safety	EN60950-1

### **Technical Specification GPRS Router**

Bidder shall consider industrial grade GPRS Router with minimum specifications as given below.

<b>Cellular Interface</b>	Standards: GSM/GPRS/EDGE/UMTS/HSPA+/FDD LTE
	FDD LTE: max. 150 / 50 Mbps (DL/UL)
	TDD LTE: max.112 / 10 Mbps (DL/UL)
	DC-HSPA+: 42 / 5.76 Mbps (DL/UL)
	HSPA+: max. 21.6 / 5.76 Mbps (DL/UL)
	EDGE: 236.8 kbps (DL/UL)
	GPRS: 85.6 kbps (DL/UL)
	SIM: 2 x (3V & 1.8V)
	Antenna Interface: SMA Female(1xMAIN and 1xAUX)

<b>Ethernet Interface</b>	Number of Ports: 2xLAN or 1 x LAN, 1xWAN (10 /100Mbps)
	Magnet Isolation Protection: 1.5KV
<b>System</b>	Reset button
	LED Indicators: RUN, PPP, USR, 3 x RSSI
<b>CPU &amp; Memory</b>	CPU: 535MHz
	SDRAM: 64MB
	FLASH: 16MB
<b>Software</b>	Network protocols: PPP, TCP, UDP, DHCP, ICMP,NAT, DMZ, DDNS, VRRP, HTTP, HTTPs, DNS, ARP, SNTP, Telnet, etc
	VPN tunnel: IPSec/OpenVPN/GRE
	Firewall: SPI, anti-DoS, Filter, Access Control
	Management: Web, SMS, CLI
<b>Power Supply and Consumption</b>	Power Supply Interface: 3.5mm terminal block
	Input Voltage: 9 to 26 VDC
	Power Consumption: Idle: 100 mA @ 12 V Data Link: 500 mA (peak) @ 12 V
<b>Physical Characteristics</b>	Housing & Weight: Metal, 300g
	Dimension: (L x W x H) 127.5mm x 82.5mm x 29.5mm
	Installation: 35mm Din-Rail or wall mounting or desktop
<b>Operating Environment</b>	-20 to +65°C/ 5 to 95% RH
<b>Regulatory and Type Approvals</b>	Approval & Detective: CE, R&TTE, RoHS, WEEE
	EMI : EN 55022 (2006 / A1: 2007) Class B
	EMC: EN 61000-4-2 (ESD) Level 3, EN 61000-4-3 (RS) Level 4 EN 61000-4-4 (EFT) Level 3, EN 61000-4-5 (Surge) Level 3 EN 61000-4-6 (CS) Level 3, EN 61000-4-8 Level 4

### **Technical Specification 5kVA UPS with 8 hour Battery Backup**

The bidder shall follow the minimum required specification as given below.

<b>Rating (in KVA)</b>	<b>5 KVA / 5 KW</b>
<b>Input</b>	
Nominal Voltage	230 V AC
Nominal Frequency	50 Hz
Input Power Factor	0.99
Input Voltage Range	160 ~ 275 VAC
Frequency Range	45 to 55 Hz
<b>Output</b>	
Invertor Design	IGBT Based Technology
Voltage	208 V / 220 V / 230V / 240 VAC

Voltage Regulation	< 2%
Waveform	Pure Sine wave
Total Harmonic Distortion	< 1% for linear load & ≤5 % for non linear load
Crest Factor	3 :1
Overload capacity	105% ~ 125% for 10 min, 125% ~ 150% for 30 Sec.
<b>Environmental</b>	
Operational Temperature	0 to 40 Deg.
Relative Humidity	0 ~ 95% (Non Condensing)
<b>Physical</b>	
Enclosure Protection	IP 20
Cooling	Forced Air Cooling
<b>Bypass</b>	
Static Bypass	Auto & Manual
Maintenance Switch	Facility required
Transfer	No Break
<b>Battery</b>	
Type	Sealed Maintenance Free
Recharge Time	8-10 hrs
VAH Required	36000 VAH
Approx. Battery Backup	8 hours
Battery Charger	up to 12 Amp
<b>General</b>	
Overall Efficiency on Full load	94%
High Efficiency mode	98%
Acoustic Noise (in dbA)	< 65 dbA @ 1 Meter
Alarms	Audible Alarm required for Mains Failure, Low Battery, Inverter Trip, Over Temperature, Over Load

Display Panel	LCD Display with Measurements (Input / Output/BypassV & Hz, Battery Voltage & % Capacity)
Battery Rack	M.S. Angle with upper Cover
Parallel Option up to 3 units	Yes
<b>Communications</b>	
Power Management Software	Software CD
Connection type	USB / RS232
SNMP Interface	Intelligent slot for SNMP / AS400/ Modbus

## 1. Open Channel Ultrasonic

**Flow meter: Unit Price: INR**

**80,000 + GST 18%**

- a) Ultrasonic flow measuring system shall consist of a flow sensor, flow transmitter cum computing unit, prefabricated cable connecting the sensor and transmitter, and any other item required for completing the flow measurement system.
- b) The flow sensor shall be suitable for flange or bracket mounting as required. It shall have ambient temperature compensation and adjustable datum setting facilities.
- c) The flow transmitter cum computing unit shall be provided in an enclosure conforming to IP 66/67. It shall be programmable with an integral programming keyboard and shall provide an isolated 4-20 mA HART.

<b>Ultrasonic Flow transmitter Service: Water, Non-contact type</b>	
<b><u>Transmitter:</u></b>	
Type	Open channel Ultrasonic flowmeter
Principle	Pulse Time of flight
Output	4-220 mA HART
Number of sensor inputs	1
Material	Polycarbonate for field housing / Die cast Aluminum
Ingress Protection	IP66 / IP 67 field housing
Accuracy	+/- 0.2% of the maximum span of the sensor
Power supply	12-48 VDC
Temperature	from 0 deg C to 50 deg C
Display (If required)	LCD graphic display. Menu guided operation.
Configuration	Using Keypad on display
<b><u>Sensor</u></b>	
Range	0 – 5m
Max Temperature	80 deg C
Max Pressure	4 bar abs
Materials	PVDF/PP
Process connection	G 1"/ 1" NPT or manufacturers standards
Degree of protection	IP67/IP68
Mounting	Top Mounted

## 2. Full bore Electromagnetic Flow Meter:

Technical Specifications for Full bore Electromagnetic Flow meter		
General		
1	Application (Suitable for)	Water / Sewage
2	Op Temperature	0 to 60 Deg C Max
3	Op Pressure	As per requirement
4	Measurement	Instantaneous water flow Rate, Totalized Flow
Flow Sensor		
5	Type	In-Line Full Bore Electromagnetic flow meter.
6	Power supply type	230 V AC & 24 V DC Universal Power Supply
7	Sizes ( mm ) /Qty	Refer Bill of Quantity for details
8	Sensor Type	Pulsed DC
9	Process Connection	Flanged type
10	Weather Protection Class	IP68
11	Full Scale Velocity	Up to 6 m/s, vendor to provide the detailed sizing calculations based on the process details.
12	Electrodes	Total Electrodes : 4 nos. Measuring electrodes – 2 Nos. Grounding electrode- 1 No. and Empty pipe detection electrode -1 No. MOC: For Raw/Drinking Water: SS316L For WasteWater/ Sewage: Alloy C22
13	Coil Housing	Powder-coated die-cast aluminium Anti corrosive grade
14	Flanges	Carbon Steel PN 10 as per EN 1092-1
15	Flow sensor Grounding	In- built Grounding Electrode SS316L is must. Grounding rings are also acceptable
16	Flow Tube material	SS304
17	Flow Tube Liner	For Raw / Drinking Water: Polyurethane or Hard Rubber For Waste Water/ Sewage: PTFE / PFA
Flow Transmitter Unit		
18	Type	Microprocessor based with facility to configure the range
19	Type of Display	2 -Line display with 3 optical keys (touch control Operation.)

20	Transmitter Type	Remote Wall Mounted with 20 cable glands, integrated fixing points for wall mounting, with sensor interface
21	Units For Display	Flow Rate m3/Hr ,Totalized Flow m3
22	Input	From Flow Tube
23	Accuracy	+/- 0.5 % of Measured Value
24	Operation	Via local display (Touch Control Operation)
25	Output	4-20mA HART / RS485
26	Power supply	230 VAC & 24 VDC Universal Power Supply.
27	Self-diagnostic feature	Required, following minimum diagnostic features shall be provided Empty pipe detection, event logbook, system diagnostic features
28	Transmitter Enclosure material	Non corrosive, polycarbonate.
29	Communication	HART or RS485
30	Memory	100% secure data storage
31	Weather Protection Class	IP 67 (NEMA 4X) for flow transmitter
33	Flow calibration rig	Duly Accredited According to ISO/IEC 17025 facilities in India

### 3. Radar Type Microwave Level transmitter:

Radar Level transmitter Service: Raw Water (Non-Contact Type)	
Transmitter	
Type	Radar Type Level Transmitter
Principle	Time of flight
Output	4-20 mA HART
Housing	Dual Compartment Housing of Die Cast Aluminum
Ingress Protection	IP 66/67
Accuracy	+/- 3 mm
Display	4 line LCD display. Menu guided operation.
Configuration	Using Keypad on display
Sensor	
Range	Liquids 0 to 30m
Temperature range	0°C ... +50°C
Max Pressure	3 bar abs
Materials	Sensor: PVDF Seal: VITON/EPDM

Process connection	Threaded or universal flange dependent on model selection
Degree of protection	IP68

#### 4. Ultrasonic Level transmitter:

Ultrasonic Level transmitter	
<u>Transmitter</u>	
Type	Ultrasonic
Principle	Time of flight
Output	4-20 mA HART
Housing	Die Cast Aluminum Housing
Ingress Protection	IP66/67
Accuracy	±0.2 % of the maximum span of the sensor
Area Classification	Non-Hazardous
Temperature range	0°C ... +50°C
Display	4 line LCD display. Menu guided operation.
Configuration	Using Keypad on display
<u>Sensor</u>	
Range	Liquids 0-5m, 0-8m, 0-10m As per requirement.
Temperature range	0°C ... +50°C
Materials	Sensor: PVDF/PP Seal: EPDM
Process connection	Threaded or universal flange dependent on model selection
Degree of protection	IP68

#### 5. Pressure Transmitters:

Sr. No	Specifications	Pressure Range 0 to 10 /20/50/ 100 Kg/cm2 g
1	Process Temperature range	0 to +50 deg.C.
2	Output Signal	4-20 mA HART
8	Supply voltage	24 V DC

11	Reference accuracy	± 0.1% of the set Span
13	Housing	Die Cast Alu. Housing
14	Diaphragm Material	SS316L
15	Display Operation	3 Key Push button for configuration COMMUNICATOR.A 4-line liquid crystal display (LCD) is used for display and operation
16	Long Term Stability	± 0.25% URL/year for 1 year, 5 year

## 6. Turbidity Measurement:

<b>Turbidity Measurement</b>	
<b><u>Transmitter</u></b>	
Type	Universal Transmitter for Turbidity / pH/Chlorine/DO
Principle	Light scattered at a 90°
Output	4-20 mA HART
Supply voltage	230 V AC
Material	Field Housing: ABS PC Non-corrosive type
Display	LC display with backlit. Multiline display for easy operation and understanding of errors.
Protection class of field housing	IP 66/67
Ambient temperature	0 ... +60 °C
Self-Diagnostic feature	Required
<b><u>Sensor</u></b>	
Measurement range	0 – 4000 NTU
Material	Sensor: Stainless steel 1.4404 window: sapphire O-Ring: EPDM
Max Process temperature	50°C
Max Process pressure	10bar
Connection	Fixed cable connection
Ingres protection	IP68
Additional Certifications	Calibration certification
Resolution	0.001 NTU, 0.01 ppm, 0.1 g/l, 0.1%
Measurement error	<2% of meas. value (min. 0.02 NTU)
Flow Through Assembly	OEM



## 7. pH Measurement:

<b>pH Measurement</b>	
<b><u>Transmitter</u></b>	
Type	Universal Transmitter for Turbidity/ pH/ Chlorine/ DO
Output	4-20 mA HART
Supply	230 V AC
Material	Field Housing: ABS Polycarbonate non-corrosive
Display	LC display with backlit. Multiline display for easy operation and understanding of errors.
Protection class of field housing	IP 66/67
Ambient temperature	0 ... +60 °C
Diagnostic feature	Required, 3 point calibration
<b><u>Sensor :</u></b>	
Measurement range	0 - 12 pH
Material	Glass
Max Process temperature	110°C
Max Process pressure	4bar
temperature sensor	Yes, Pt100
Connection	Inductive digital connection with Transmitter
Ingress protection	IP68
Resolution	0.01pH, Temp 0.1°C
Measurement Error	± 0.5% of Measuring range

## 8. Chlorine Measurement:

<b>Chlorine Measurement</b>	
<b><u>Transmitter</u></b>	
Type	Universal Transmitter for Turbidity/ pH/ Chlorine/ DO
Principle	Amperometric measurement of free chlorine with pH Compensation
Output	4-20 mA HART
Supply voltage	230 V AC

Material	Field Housing : Field Housing: ABS Polycarbonate non-corrosive
Display	LC display with backlit. Multiline display for easy operation and understanding of errors.
Protection class of field housing	IP 66/67
Ambient temperature	0 ... +60 °C
<b><u>Sensor</u></b>	
Measurement range	0,01 - 5ppm free chlorine
Material	Sensor shaft : PVC
	Membrane : PTFE
	Membrane cap :PBT (GF30); PVDF
Process temperature	2°C - 45°C
Max Process pressure	1 bar
temperature sensor	NTC / Pt100
Connection	Inductive digital connection with Transmitter/Analog cable connection
Ingres protection	IP68
Resolution	0.01mg/l
Measurement Error	± 0.5% of Measuring range
Flow through Assembly	OEM

## SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA)

Sr No.	Item Description	Qty	Unit Rates
1	<b>Main PLC Panel at Master Control Center with GPRS Router for components up to 50 Nos ( Including Intake well, WTP, IPS, MBR etc)</b> Supply, Installation, testing and commissioning of fully wired PLC panel along with 230VAC Input power supply, along with necessary protections and wiring of I/O signals with terminal blocks and all other required accessories as per specifications. The PLC shall be 32bit, Dual Core, controller having minimum 80DI/64DO/18AI modular IO's along with minimum 1 no. of RS485 Serial port to communicate with Modbus devices, 1 No. of Ethernet port for SCADA at Master Control Center. ( Complete in all respect like Indication ,Annunciator, Hooter ,Control Transformer, SPD, Input terminal block with fuse, SMPS etc...)	01 No	₹ 13,18,920.00
2	<b>Main PLC Panel at Master Control Center with GPRS Router for components More than 50 Nos( Including Intake well, WTP, IPS, MBR etc)</b> Supply, Installation, testing and commissioning of fully wired PLC panel along with 230VAC Input power supply, along with necessary protections and wiring of I/O signals with terminal blocks and all other required accessories as per specifications. The PLC shall be 32bit, Dual Core, controller having minimum 256DI/128DO/80AI modular IO's along with minimum 1 no. of RS485 Serial port to communicate with Modbus devices, 1 No. of Ethernet port for SCADA at Mater Control Station. ( Complete in all respect like Indication ,Annunciator, Hooter ,Control Transformer, SPD, Input terminal block with fuse, SMPS etc...)	01 No	₹ 36,59,600.00
3	<b>The modular Remote I/Os to control Panel ( Console Panel)</b> Filter bed operation having minimum 32DI/16DO/8AI IO's shall be required for each twin type filter bed with 7" Touch Screen HMI for local operation	1 No	₹ 4,77,600.00
4	<b>SCADA System along with Development Software at Master Control Control Center (for components up to 50 Nos)</b>	01 Set	₹ 44,43,480.00

Sr No.	Item Description	Qty	Unit Rates
	Supply, Installation, Testing and Commissioning of Supervisory Control and Data Acquisition (SCADA) system having capability to receive data on suitable protocol to support data backfilling (without third party software) facility, along with Historian and Data Analytics Tool, Remote access capability though concurrent client's development licences and SCADA server and operator licenses shall be required		
5	<b>SCADA Software along with Development Software at Master Control Control Center (for components above 50 to 200 Nos)</b> Supply, Installation, Testing and Commissioning of Supervisory Control and Data Acquisition (SCADA) system having capability to receive data on suitable protocol to support data backfilling (without third party software) facility, along with Historian and Data Analytics Tool, Remote access capability though concurrent client's development licences and SCADA server and operator licenses shall be required	01 Set	₹ 81,51,120.00
6	<b>Remote Terminal Unit with RF Trans- Receiver</b> Supply, Installation, testing and commissioning of fully wired RTU panel along with RF Trans-Receiver module having 230VAC Input power supply, along with necessary protections and wiring of I/O signals with terminal blocks, and all other required accessories as per specifications. The RTU shall be 32bit, Dual Core, conformal coated controller having minimum 4DI/4DO/4AI/2AO integrated IO's along with minimum 2 nos. of RS485 Serial port to communicate with Modbus devices, 2 Nos. of Ethernet port for RF Trans-Receiver Module to communicate with SCADA at Master Control Center on DNP3 Protocol with data backfilling facilities. Having capability of storing 1Lakh event and RTU should be integrated with suitable communication platform. RTU should be cyber secured and will be compliant with SAV2 secure authentication ( Complete in all respect like Indication ,Annunciator, Hooter ,Control Transformer, SPD, Input terminal block with fuse, SMPS etc.) with. IP65 Enclosure <b>Application - Rotating Equipment like Clarifier Unit ( WTP)</b>	1 Nos.	₹ 1,90,920.00
7	<b>Remote Terminal Unit along with GPRS Router</b>	01 No	₹ 2,78,160.00

Sr No.	Item Description	Qty	Unit Rates
	Supply, Installation, testing and commissioning of fully wired RTU panel along with GPRS Router having 230VAC Input power supply, along with necessary protections and wiring of I/O signals with terminal blocks, SIM Cards and all other required accessories. 7" Touch Screen Panel mounted HMI for local operation The RTU shall be 32bit, Dual Core, conformal coated controller having minimum 16DI/8DO/8AI integrated IO's along with minimum 2 nos. of RS485 Serial port to communicate with Modbus devices, 2 Nos. of Ethernet port for GPRS Router and SCADA at Master Control Center on DNP3 Protocol with data backfilling facilities. Having capability of storing 1Lakh event and RTU should be integrated with suitable communication platform. GPRS Router Industrial grade with 50C operating temperature and 2 nos. of SIM card slots with 4G/5G connectivity. RTU should be cyber secured and will be compliant with SAV2 secure authentication. All works shall be carried out complete in all respects and as per tender document.( Complete in all respect like Indication ,Annunciator, Hooter ,Control Transformer, SPD, Input terminal block with fuse, SMPS etc...) with .IP65 Enclosure Application- Raw Water/Clear Water Pump House/IPS		
8	<b>Control &amp; Monitoring system for Single Village Scheme</b> Supply, Installation, testing and commissioning of fully wired PLC panel having 230VAC Input power supply, along with necessary protections and wiring of I/O signals with terminal blocks, and all other required accessories . <b>10" Touch Screen</b> Panel mounted <b>HMI</b> for operation The PLC shall be 32bit, Dual Core, conformal coated controller having minimum <b>16DI/8DO/8AI</b> integrated IO's along with minimum 2 nos. of RS485 Serial port to communicate with Modbus devices, 2 Nos. of Ethernet port to GPRS Router and Central SCADA system on DNP3 protocol with data backfilling. Having capability of storing 1Lakh event and PLC should be integrated with suitable communication platform. All works shall be carried out complete in all respects and as per tender document. (Complete in all respect like Indication ,Annunciator, Hooter ,Control Transformer, SPD, Input terminal block with fuse, SMPS etc...) <b>Application- Single Village Scheme</b>	01 No	₹ 2,55,675.00
9	<b>Remote Terminal Unit along with GPRS Router</b>	01 No	₹ 1,87,320.00

Sr No.	Item Description	Qty	Unit Rates
	Supply, Installation, testing and commissioning of fully wired RTU panel along with GPRS Router having 230VAC Input power supply, along with necessary protections and wiring of I/O signals with terminal blocks, Sim Cards and all other required accessories as per specifications. 4" Touch Screen Panel mounted HMI for local operation. The RTU shall be 32bit, Dual Core, conformal coated controller having minimum 4DI/4DO/4AI integrated IO's along with minimum 2 nos. of RS485 Serial port to communicate with Modbus devices, 2 Nos. of Ethernet port for GPRS Router and SCADA at WTP on DNP3 Protocol with data backfilling facilities. Having capability of storing 1Lakh event and RTU should be integrated with suitable communication platform. GPRS Router Industrial grade with 50C operating temperature and 2 nos. of SIM card slots with 4G/5G connectivity. RTU should be cyber secured and will be compliant with SAV2 secure authentication.( Complete in all respect like Indication ,Annunciator, Hooter ,Control Transformer, SPD, Input terminal block with fuse, SMPS etc...) Application- Service Reservoir, MBR, BPT		
10	<b>Workstation Grade PC's</b> Supply, Installation, Testing and Commissioning of Intel Workstation Server grade PC with minimum 21" LED Display, RAM:16GB, HDD>2TB with required licenses of OS, Office and Antivirus and other hardware and software	01 No	₹ 1,76,500.00
11	<b>Server Grade PC's</b> Supply, Installation, Testing and Commissioning of Intel Xenon Server grade PC with minimum 21" LED Display, RAM:64G/5GB, HDD>2TB with required licenses of OS, Office and Antivirus and other hardware and software	01 No	₹ 3,30,900.00
12	<b>UPS and Battery</b> Supply, Installation, Testing and Commissioning of redundant Online UPS along with accessories suitable for 8hr battery backup for the IT hardware at the command centre. Battery will be maintenance free SMF type and with suitable mounting racks.		
13.1	1 KVA - (Redundant UPS with single Battery)	01 No	₹ 2,33,400.00
13.2	3 KVA ((Redundant UPS with single Battery)	01 No	₹ 5,00,000.00
13.3	5 KVA ((Redundant UPS with single Battery)	01 No	₹ 9,66,700.00
13.4	10 KVA (Redundant UPS with single Battery)	01 No	₹ 14,33,400.00
14	<b>Control Desk</b>	01	₹ 66,700.00

Sr No.	Item Description	Qty	Unit Rates
	Industrial Grade Control Desk MS power coated & having MDF top suitable for mounting of Workstation PC's and Printer.	Set	
16	<b>A4 size commercial laserjet printer for continouse duty</b>	01 No	₹ 46,700.00
17	<b>IO Extension Card</b>		
17.1	Supply, Installation, testing and commissioning of IO Extension in Exisiting PLC up to 4DI/4DO	01 No	₹ 26,550.00
17.2	Supply, Installation, testing and commissioning of IO Extension in Exisiting PLC up to 12DI/8DO	01No	₹ 26,550.00
18	Supply, Installation, testing and commissioning of Touch Screen Panel mounted <b>HMI</b> for Monitoring and control operation (for RTU Panels)		
18.1	4" HMT SCREEN	01 No	₹ 14,750.00
18.2	7"HMI Screen	01 No	₹ 35,750.00
18.3	10" HMI Screen	01 No	₹ 73,375.00
19	<b>Monthly Subscription Charges- Cloud Server Hosting Data</b>		
	Cloud Based Server for software hosting and Data storage, Data Traffic & Maintenance Charges		
19.1	No of OHT up to 50 Nos	1 Job	₹ 9,44,000.00
19.2	No. of OHT between 50 - 200 Nos	1 Job	₹ 15,68,000.00
19.3	No of OHT above 200Nos	1 Job	₹ 21,92,000.00
20	<b>AMC of SCADA Software &amp; Hardware System</b>		
	Annual Maintenance charges of Hardware & Soft ware supplied including remote communication hardware at Site, Hardware at MCC, Cloud server maintenance, Data Analytics, SCADA Software, Reporting software seviles, Monthly SIMCARD communication chages including trouble shooting and modification as per requirement.		
	a) Periodic Maintenance Visit- 3 times in a year (5 Man-Days per Visit) b) Emergency Maintenance Visit - 2 times in a year (5 Man-Days per Visit) c) Software Modification - 2 times in a year (3 man-days per call) d) Maintenance Over Call - 3 Time in a year (2 man-days per call)		
20.1	No of OHT up to 50 Nos	1 Job	₹ 20,24,000.00
20.2	No. of OHT between 50 - 200 Nos	1 Job	₹ 40,48,000.00
20.3	No of OHT above 200Nos	1 Job	₹ 60,72,000.00

Sr No.	Item Description	Qty	Unit Rates
21	<b>Web Client Software for Remote Monitoring</b>		
21.1	Single User	1No	₹ 2,18,475.00
21.2	Double User	1No	₹ 4,36,837.50
22	<b>RF Trans - Receiver</b>	01 No	₹ 72,900.00



# **CHAPTER - 13**

## **MEASURING DEVICES**

## CHAPTER – 13 MEASURING DEVICES

S.No.	Particulars of Items	Unit	Rate (in Rs.)
13.1	<b>Woltman Turbine Bulk Meters</b>		
	Supply of Woltman Turbine Bulk meters class B, multi jet, magnetically coupled as per specifications conforming to IS : 770/1994, ISO 4064/1 and EEC approved, including transportation to site, storage, safety, installation, testing, commissioning, making connections with existing pipeline, including excavation at site, dewatering and reinstating the same after completion of installation as per specifications and drawings including all taxes.		
13.1.1	Dia in mm		
13.1.2	50 mm	No	13684.00
13.1.3	65 mm	No	16780.00
13.1.4	80 mm	No	18919.00
13.1.5	100 mm	No	23032.00
13.1.6	125 mm	No	30435.00
13.1.7	150 mm	No	38661.00
13.1.8	200 mm	No	44419.00
13.1.9	250 mm	No	111046.00
13.1.10	300 mm	No	156288.00
13.1.11	400 mm	No	304350.00
13.2	<b>Dirt Box with S.S. Strainer</b>		
13.2.1	50 mm	No	3027.00
13.2.2	65 mm	No	3356.00
13.2.3	80 mm	No	4317.00
13.2.4	100 mm	No	5922.00
13.2.5	125 mm	No	10417.00
13.2.6	150 mm	No	12378.00
13.2.7	200 mm	No	18557.00
13.2.8	250 mm	No	32310.00
13.2.9	300 mm	No	47196.00
13.2.10	400 mm	No	78966.00
13.3	<b>Electromagnetic Bulk Flow Meters</b> Supply of Electromagnetic full bore meter complete as per specification including transportation to site, storage, safety, installation, testing, commissioning, making connections with existing pipe line, including excavation at site, cuts in the existing pipe system, dewatering and reinstating the same after completion of installation as per specification and drawings including all taxes. Accuracy of meter + 0.3% of measured value, Flange connection as per AWWA & IS, Liner:		

S.No.	Particulars of Items	Unit	Rate (in Rs.)
	Hard Rubber, Fully welded sensor housing complying to IP 68 standard, Electrodes SS 316, Sensor housing SS 304, Cable gland 1/2" NPT, Sensor housing fully welded SS 304 housing with protective Polyurethane paint, Flow Transmitter/ Converter: Microprocessor based, modular design display 2 line back lit LCD for indication of actual flow rate, forward, reverse, sum totalizer, Perfection category: IP 65 Output: One current output (4-20 mA) one scalable pulse output		
	Dia in mm		
13.3.1	50 mm	Each	97076.00
13.3.2	65 mm	Each	99289.00
13.3.3	80 mm	Each	103121.00
13.3.4	100 mm	Each	114031.00
13.3.5	150 mm	Each	120541.00
13.3.6	200 mm	Each	127746.00
13.3.7	250 mm	Each	155907.00
13.3.8	300 mm	Each	181444.00
13.3.9	400 mm	Each	211470.00
13.3.10	450 mm	Each	304842.00
13.3.11	500 mm	Each	380154.00
13.3.12	600 mm	Each	389824.00
13.3.13	700 mm	Each	500480.00
13.3.14	900 mm	Each	821368.00
13.3.15	1000 mm	Each	912242.00
13.3.16	1200 mm	Each	1072192.00
13.3.17	1400 mm	Each	1381977.00
13.3.18	2000 mm	Each	1485267.00
13.4	Supply & Installation of Lightening Arrester Unit (including Copper Earth plate, strip, G.I. Pipe, Funnel tinned brass bolts, nut, check nut, washer etc., Cover plate with hing and locking arrangement) in all respect.	Each	9920.00
13.5	MS Panel with Transmitter, Totalizer, etc as per specifications	Each	12552.00
13.6	Uninterruptible Power Supply [6hr Battery Backup (500 VA)]	Each	25105.00
13.7	Providing, erecting electric valve actuators totally enclosed, weather proof and dust proof construction with IP-67, protection class suitable for installation in any position without lubrication, leakage or other operational difficulty with special grease filled gear box and hand wheel for emergency manual operation which will automatically dis-engage on restoration of power to motor and with 10 watt single phase space heater and continuous local mechanical position indicator and individually replaceable counter gear assembly and with		

S.No.	Particulars of Items	Unit	Rate (in Rs.)
	two torque and four limit switches with S.S. flap and operated with gear driven cams and of rating 250 Volt, 5 Amp., AC/DC, torque switch dial and with TEFC squirrel cage induction motor working on 440 Volts +/- 10%, 3 phase, 50 Hz AC of intermittent duty rating S-2, insulation class "F" and temp rise restricted to class "B" with IP-67 protection class suitable for DOL starting and with three thermostat and 30% over load margin. The torque rating of reduction gear box shall be at least 1.5 times max. torque required for opening and closing of valve.		
	Electric Valve Actuator for non rising spindle type sluice valve, PN1 & PN 1.6 rating for Valve size (Without integral starter)		
13.7.1	40 mm diameter	Each	111969.00
13.7.2	50 mm diameter	Each	111969.00
13.7.3	65 mm diameter	Each	111969.00
13.7.4	80 mm diameter	Each	111969.00
13.7.5	100 mm diameter	Each	111969.00
13.7.6	125 mm diameter	Each	111969.00
13.7.7	150 mm diameter	Each	111969.00
13.7.8	200 mm diameter	Each	119644.00
13.7.9	250 mm diameter	Each	119644.00
13.7.10	300 mm diameter	Each	119644.00
13.7.11	350 mm diameter	Each	127183.00
13.7.12	400 mm diameter	Each	127183.00
13.7.13	450 mm diameter	Each	153405.00
13.7.14	500 mm diameter	Each	177964.00
13.7.15	600 mm diameter	Each	177964.00
13.8	Supplying & Installation of Domestic Water Meters of inferential type, multi jet, magnetically coupled, having dry dial, straight reading Class B conforming to IS: 779/1994, ISO and EEC approved, including transportation to site, storage, safety, installation, testing, commissioning, making connections with existing pipeline, including excavation at site, dewatering and reinstating the same after completion of installation as per specifications including all taxes.		
13.8.1	15mm dia nominal bore	Each	1152.00
13.8.2	20mm dia nominal bore	Each	1941.00
13.8.3	25mm dia nominal bore	Each	3488.00
13.8.4	40mm dia nominal bore	Each	6515.00

# **CHAPTER - 14**

## **MISCELLANEOUS (WATER SUPPLY)**

## **CHAPTER – 14**

### **MISCELLANEOUS (WATER SUPPLY)**

- 1 The works to be executed in accordance with the General specifications of therelevant IS codes for pipes/specials, jointing materials and laying works.
- 2 All materials shall conform to relevant IS.
- 3 Where cracked pipe or cut piece is required to be used on line to take a tyton ring joint, it is necessary to cut the cracked portion and chamfer the pipe. In a cut piece, only chamfering would be required. These rates have been introduced separately for cutting and chamfering. The rates include requirement of tools and plants, lead and lift etc.
- 4 During the course of execution, it sometimes becomes necessary to provide a non-standard special to fit into the pipeline. This can be conveniently made out of steel plates. An item to cover such emergency is also provided for in the schedule. Similarly, item to provide a mild steel flange has also been introduced to over the specific requirement during execution.
- 5 An item for laying and jointing steel pipes, incorporating field welding has also been introduced to cover the special requirements during execution.
- 6 All pavements, paved foot paths, curbing, gutters, shrubbery, fences, poles, rod or other property and surface structures removed or disturbed as a part of the work shall be restored to a condition equal to that before the work began, furnishing all labour and material incidental thereto. In restoring the pavement sound materials may be reuse. No Permanent pavement shall be restored unless and until, in the opinion of the Engineer in charge the condition of the backfill is such as to properly support the pavement.
- 7 Pavement and road surface may be removed as a part of the trench excavation and the amount removed shall depend upon the width of trench specified for the installation of the pipe and the width and length of the pavement area required to be removed for laying pipes. The width of pavement removal along the normal trench for the installation of the pipe shall not exceed the width of the trench specified by more then 15 cm on each side of the trench. Wherever in the opinion of the Engineer in charge existing conditions make it necessary or advisable to remove additional pavement, it shall be removed as directed by the Engineer in charge.
- 8 All construction material, and all tools and temporary structures shall be removed form the site as directed by the Engineer in charge. All dirt, rubbish and excess earth form the excavation shall be taken off to a specified dumping site as directed by Engineer in Charge and the construction site shall be kept clean to the satisfaction of the Engineer-in-charge.
- 9 Where any pavement, shrubbery, fence, poles or other property and surface structures have been damaged, removed or disturbed during the course of the work, such property and surface structures shall be replaced or repaired after completion of work.

**10 Measurements**

Measurement shall be made according to the actual work done and payment shall be made accordingly.

**11 Rates:**

The rate shall include the cost of the material and labour involved in all the operation described in the items. The rates include all plants, chain, pulley blocks, other appliances etc. required for execution of the works. Rates for items and making good roads etc. include lead for the materials.

**MISCELLANEOUS (WATER SUPPLY)**

<b>S. No.</b>	<b>Particulars of Items</b>	<b>Unit</b>	<b>Rates (in Rs.)</b>
14.1	Labour for cutting following cast iron pipes of any type and class.		
14.1.1	80 mm dia.	No	54.00
14.1.2	100 mm dia	No	69.00
14.1.3	150 mm dia.	No	125.00
14.1.4	200 mm dia.	No	167.00
14.1.5	250 mm dia.	No	210.00
14.1.6	300 mm dia.	No	295.00
14.1.7	350 mm dia.	No	333.00
14.1.8	400 mm dia.	No	380.00
14.1.9	450 mm dia.	No	417.00
14.1.10	500 mm dia.	No	510.00
14.1.11	600 mm dia.	No	585.00
14.1.12	700 mm dia.	No	636.00
14.1.13	750 mm dia.	No	674.00
14.1.14	800 mm dia.	No	776.00
14.1.15	900 mm dia.	No	837.00
14.1.16	1000 mm dia	No	893.00
14.2	Labour for cutting following Asbestos Cement Pressure Pipes of any type and class.		
14.2.1	80 mm dia.	No	28.00
14.2.2	100 mm dia.	No	37.00
14.2.3	150 mm dia.	No	69.00
14.2.4	200 mm dia.	No	92.00
14.2.5	250 mm dia	No	110.00
14.2.6	300 mm dia	No	151.00
14.2.7	350 mm dia	No	172.00
14.3	Labour for cutting following Ductile iron pipes of any type and class.		
14.3.1	80 mm dia.	No	50.00

S. No.	Particulars of Items	Unit	Rates (in Rs.)
14.3.2	100 mm dia.	No	63.00
14.3.3	150 mm dia.	No	116.00
14.3.4	200 mm dia.	No	154.00
14.3.5	250 mm dia.	No	191.00
14.3.6	300 mm dia.	No	274.00
14.3.7	350 mm dia.	No	302.00
14.3.8	400 mm dia.	No	340.00
14.3.9	450 mm dia.	No	378.00
14.3.10	500 mm dia.	No	453.00
14.3.11	600 mm dia.	No	533.00
14.3.12	700 mm dia.	No	566.00
14.3.13	750 mm dia.	No	604.00
14.3.14	800 mm dia.	No	678.00
14.3.15	900 mm dia.	No	752.00
14.3.16	1000 mm dia	No	800.00
14.4	Labour for cutting following Galvanised iron (MS) pipes of any type and class.		
14.4.1	15 mm dia.	No	9.00
14.4.2	20 mm dia.	No	15.00
14.4.3	25 mm dia.	No	21.00
14.4.4	32 mm dia.	No	23.00
14.4.5	40 mm dia.	No	30.00
14.4.6	50 mm dia.	No	35.00
14.4.7	65 mm dia.	No	41.00
14.4.8	80 mm dia.	No	44.00
14.4.9	100 mm dia.	No	54.00
14.4.10	125 mm dia.	No	62.00
14.4.11	150 mm dia.	No	69.00
14.5	Labour for cutting following P.V.C pipes of any type and class.		
14.5.1	90 mm dia	No	12.00
14.5.2	110 mm dia	No	17.00
14.5.3	140 mm dia	No	31.00
14.5.4	160 mm dia	No	33.00
14.5.5	180 mm dia	No	38.00
14.5.6	200mm dia	No	42.00
14.6	Chamfering cast iron pipes of all types and classes to make suitable for tyton joints.		
14.6.1	80mm to150 mm dia.	No	905.00
14.6.2	200 mm dia.	No	1119.00
14.6.3	250 mm dia.	No	1243.00



S. No.	Particulars of Items	Unit	Rates (in Rs.)
14.6.4	300 mm dia.	No	1385.00
14.6.5	400 mm dia.	No	1606.00
14.6.6	450 mm dia.	No	1830.00
14.6.7	500 mm dia.	No	1959.00
14.6.8	600 mm dia.	No	2168.00
14.6.9	700 mm dia.	No	2487.00
14.6.10	750 mm dia.	No	2665.00
14.6.11	800 mm dia.	No	3020.00
14.6.12	900 mm dia.	No	3180.00
14.6.13	1000 mm dia.	No	3500.00
14.7	Dismantling following old cast iron socket and spigot pipes class 'L.A.' 'A' & 'B' including breaking lead caulked joints, melting of lead and making it in to blocks including stacking of pipes at site lead upto 50 meters.		
14.7.1	80 mm dia.	Meter	11.00
14.7.2	100 mm dia.	Meter	13.00
14.7.3	125 mm dia.	Meter	18.00
14.7.4	150 mm dia.	Meter	21.00
14.7.5	200 mm dia.	Meter	29.00
14.7.6	250 mm dia.	Meter	40.00
14.7.7	300 mm dia.	Meter	53.00
14.7.8	350 mm dia.	Meter	65.00
14.7.9	400 mm dia.	Meter	78.00
14.7.10	450 mm dia.	Meter	90.00
14.7.11	500 mm dia.	Meter	103.00
14.7.12	600 mm dia.	Meter	139.00
14.7.13	700 mm dia.	Meter	171.00
14.7.14	750 mm dia.	Meter	191.00
14.6.15	800 mm dia	Meter	213.00
14.6.16	900 mm dia	Meter	243.00
14.7.17	1000 mm dia.	Meter	306.00
14.8	Manufacturing and supply of specials made out of M.S. steel plate or HR coil conforming to IS 3589-2001 or its latest revision/amendment, 5mm to 6mm thick plate in shapes and sizes required as per site conditions including cost of steel plate & other electrical & mechanical material, including Submerged Arc welded, including	Kg.	125.00

S. No.	Particulars of Items	Unit	Rates (in Rs.)
	cost of transportation, loading and unloading complete approved by Engineer-in-Charge. (This is applicable only when standard special are not available).		
14.9	Manufacturing, providing and supplying spirally welded/ERW/SAW/ fabricated M.S. Pipes (Commercial Quality) including procurements of plates, gas cutting to required size rolling, tack welding assembling in suitable lengths to form pipes, welding on automatic welding machine and forming "V" edge on both ends of pipes railway freight, insurance unloading from railway wagon, loading into truck, transport to stores /site unloading, stacking etc, complete as per IS 3589 and IS 5504 as applicable as per specifications (No negative tolerance in thickness is permissible).	Kg	112.00
14.10	Disinfecting C.I./D.I. water mains by flushing with water containing bleaching powder at 0.5 gms per liter of water and cleaning the same with fresh water, operation to be repeated three times including getting the sample of water from the disinfected main tested in the Govt. / Municipal/ Authorised laboratory:		
14.10.1	80 mm diameter	100 Meter	719.00
14.10.2	100 mm diameter	100 Meter	941.00
14.10.3	125 mm diameter	100 Meter	1173.00
14.10.4	150 mm diameter	100 Meter	1407.00
14.10.5	200 mm diameter	100 Meter	1875.00
14.10.6	250 mm diameter	100 Meter	2359.00
14.10.7	300 mm diameter	100 Meter	2631.00
14.10.8	350 mm diameter	100 Meter	2912.00
14.10.9	400 mm diameter	100 Meter	3210.00
14.10.10	450 mm diameter	100 Meter	3514.00
14.10.11	500 mm diameter	100 Meter	3835.00
14.10.12	600 mm diameter	100 Meter	4489.00
14.11	Extra for every operation of		

S. No.	Particulars of Items	Unit		Rates (in Rs.)
	disinfecting the C.I./D.I. main by flushing with water containing bleaching powder at 0.5 gms per litre of water and cleaning the same with fresh water, including the samples of water tested in the Govt. / Municipal/ Authorised laboratory:			
14.11.1	80 mm diameter	100 Meter		265.00
14.11.2	100 mm diameter	100 Meter		322.00
14.11.3	125 mm diameter	100 Meter		391.00
14.11.4	150 mm diameter	100 Meter		455.00
14.11.5	200 mm diameter	100 Meter		678.00
14.11.6	250 mm diameter	100 Meter		786.00
14.11.7	300 mm diameter	100 Meter		892.00
14.11.8	350 mm diameter	100 Meter		1047.00
14.11.9	400 mm diameter	100 Meter		1203.00
14.11.10	450 mm diameter	100 Meter		1366.00
14.11.11	500 mm diameter	100 Meter		1444.00
14.11.12	600 mm diameter	100 Meter		1863.00
14.12	Lime, Alum, Bleaching powder, murum, building rubbish (Malba)	Distance	Unit	
14.12.1	1. Distance	1 Km	Cum	86.00
14.12.2	2. Distance	2 Km	Cum	100.00
14.12.3	3. Distance	3 Km	Cum	114.00
14.12.4	4. Distance	4 Km	Cum	127.00
14.12.5	5. Distance	5 Km	Cum	140.00
14.12.6	6. Beyond 5 km upto 10km. Add per km	Per Km	Cum	12.00
14.12.7	7. Beyond 10 km, upto 20km add per km	Per Km	Cum	10.00
14.12.8	8. Beyond 20 km, add per km	Per Km	Cum	8.00
14.13	Earth			
14.13.1	1. Distance	1 Km	Cum	108.00
14.13.2	2. Distance	2 Km	Cum	125.00
14.13.3	3. Distance	3 Km	Cum	142.00
14.13.4	4. Distance	4 Km	Cum	159.00
14.13.5	5. Distance	5 Km	Cum	175.00
14.13.6	6. Beyond 5 km upto 10km. Add per km	Per Km	Cum	15.00
14.13.7	7. Beyond 10 km, upto 20km add per km	Per Km	Cum	13.00
14.13.8	8. Beyond 20 km, add per km	Per Km	Cum	10.00
14.14	G.I, C.I., D.I., CC, ACP pipes below 100mm dia and other			

S. No.	Particulars of Items	Unit		Rates (in Rs.)
	heavy material and machinery Cement, Stone blocks.			
14.14.1	1. Distance	1 Km	Per Tonne	77.00
14.14.2	2. Distance	2 Km	Per Tonne	89.00
14.14.3	3. Distance	3 Km	Per Tonne	101.00
14.14.4	4. Distance	4 Km	Per Tonne	113.00
14.14.5	5. Distance	5 Km	Per Tonne	124.00
14.14.6	6. Beyond 5 km upto 10km. Add per km	Per Km	Per Tonne	11.00
14.14.7	7. Beyond 10 km, upto 20km add per km	Per Km	Per Tonne	9.00
14.14.8	8. Beyond 20 km, add per km	Per Km	Per Tonne	7.00
14.15	Steel			
14.15.1	1. Distance	1 Km	Per Tonne	77.00
14.15.2	2. Distance	2 Km	Per Tonne	89.00
14.15.3	3. Distance	3 Km	Per Tonne	101.00
14.15.4	4. Distance	4 Km	Per Tonne	113.00
14.15.5	5. Distance	5 Km	Per Tonne	124.00
14.15.6	6. Beyond 5 km upto 10km. Add per km	Per Km	Per Tonne	11.00
14.15.7	7. Beyond 10 km, upto 20km add per km	Per Km	Per Tonne	9.00
14.15.8	8. Beyond 20 km, add per km	Per Km	Per Tonne	7.00
14.16	R.C.C., Pipes, Steel Pipes, ACP pipes, CI & DI Pipes			
14.16.1	100mm dia			
14.16.1.1	1. Distance	1 Km	Per Tonne	189.00
14.16.1.2	2. Distance	2 Km	Per Tonne	219.00
14.16.1.3	3. Distance	3 Km	Per Tonne	249.00
14.16.1.4	4. Distance	4 Km	Per Tonne	278.00
14.16.1.5	5. Distance	5 Km	Per Tonne	306.00
14.16.1.6	6. Beyond 5 km upto 10km. Add per km	Per Km	Per Tonne	26.00
14.16.1.7	7. Beyond 10 km, upto 20km add per km	Per Km	Per Tonne	22.00
14.16.1.8	8. Beyond 20 km, add per additional km	Per Km	Per Tonne	18.00
14.16.2	150mm dia			
14.16.2.1	1. Distance	1 Km	Per Tonne	315.00
14.16.2.2	2. Distance	2 Km	Per Tonne	365.00
14.16.2.3	3. Distance	3 Km	Per Tonne	415.00
14.16.2.4	4. Distance	4 Km	Per Tonne	463.00
14.16.2.5	5. Distance	5 Km	Per Tonne	509.00

S. No.	Particulars of Items	Unit		Rates (in Rs.)
14.16.2.6	6. Beyond 5 km upto 10km. Add per km	Per Km	Per Tonne	43.00
14.16.2.7	7. Beyond 10 km, upto 20km add per km	Per Km	Per Tonne	37.00
14.16.2.8	8. Beyond 20 km, add per additional km	Per Km	Per Tonne	29.00
14.16.3	200mm dia			
14.16.3.1	1. Distance	1 Km	Per Tonne	512.00
14.16.3.2	2. Distance	2 Km	Per Tonne	594.00
14.16.3.3	3. Distance	3 Km	Per Tonne	674.00
14.16.3.4	4. Distance	4 Km	Per Tonne	752.00
14.16.3.5	5. Distance	5 Km	Per Tonne	828.00
14.16.3.6	6. Beyond 5 km upto 10km. Add per km	Per Km	Per Tonne	70.00
14.16.3.7	7. Beyond 10 km, upto 20km add per km	Per Km	Per Tonne	60.00
14.16.3.8	8. Beyond 20 km, add per additional km	Per Km	Per Tonne	48.00
14.16.4	250mm dia			
14.16.4.1	1. Distance	1 Km	Per Tonne	727.00
14.16.4.2	2. Distance	2 Km	Per Tonne	844.00
14.16.4.3	3. Distance	3 Km	Per Tonne	958.00
14.16.4.4	4. Distance	4 Km	Per Tonne	1069.00
14.16.4.5	5. Distance	5 Km	Per Tonne	1177.00
14.16.4.6	6. Beyond 5 km upto 10km. Add per km	Per Km	Per Tonne	99.00
14.16.4.7	7. Beyond 10 km, upto 20km add per km	Per Km	Per Tonne	85.00
14.16.4.8	8. Beyond 20 km, add per additional km	Per Km	Per Tonne	68.00
14.16.5	300mm dia			
14.16.5.1	1. Distance	1 Km	Per Tonne	899.00
14.16.5.2	2. Distance	2 Km	Per Tonne	1043.00
14.16.5.3	3. Distance	3 Km	Per Tonne	1184.00
14.16.5.4	4. Distance	4 Km	Per Tonne	1322.00
14.16.5.5	5. Distance	5 Km	Per Tonne	1455.00
14.16.5.6	6. Beyond 5 km upto 10km. Add per km	Per Km	Per Tonne	123.00
14.16.5.7	7. Beyond 10 km, upto 20km add per km	Per Km	Per Tonne	105.00
14.16.5.8	8. Beyond 20 km, add per additional km	Per Km	Per Tonne	84.00
14.16.6	350mm dia			
14.16.6.1	1. Distance	1 Km	Per Tonne	1259.00

S. No.	Particulars of Items	Unit		Rates (in Rs.)
14.16.6.2	2. Distance	2 Km	Per Tonne	1460.00
14.16.6.3	3. Distance	3 Km	Per Tonne	1658.00
14.16.6.4	4. Distance	4 Km	Per Tonne	1850.00
14.16.6.5	5. Distance	5 Km	Per Tonne	2037.00
14.16.6.6	6. Beyond 5 km upto 10km. Add per km	Per Km	Per Tonne	172.00
14.16.6.7	7. Beyond 10 km, upto 20km add per km	Per Km	Per Tonne	147.00
14.16.6.8	8. Beyond 20 km, add per additional km	Per Km	Per Tonne	118.00
14.16.7	400mm dia			
14.16.7.1	1. Distance	1 Km	Per Tonne	1716.00
14.16.7.2	2. Distance	2 Km	Per Tonne	1991.00
14.16.7.3	3. Distance	3 Km	Per Tonne	2261.00
14.16.7.4	4. Distance	4 Km	Per Tonne	2523.00
14.16.7.5	5. Distance	5 Km	Per Tonne	2777.00
14.16.7.6	6. Beyond 5 km upto 10km. Add per km	Per Km	Per Tonne	235.00
14.16.7.7	7. Beyond 10 km, upto 20km add per km	Per Km	Per Tonne	201.00
14.16.7.8	8. Beyond 20 km, add per additional km	Per Km	Per Tonne	161.00
14.16.8	450mm & 500mm dia			
14.16.8.1	1. Distance	1 Km	Per Tonne	2098.00
14.16.8.2	2. Distance	2 Km	Per Tonne	2433.00
14.16.8.3	3. Distance	3 Km	Per Tonne	2764.00
14.16.8.4	4. Distance	4 Km	Per Tonne	3084.00
14.16.8.5	5. Distance	5 Km	Per Tonne	3394.00
14.16.8.6	6. Beyond 5 km upto 10km. Add per km	Per Km	Per Tonne	287.00
14.16.8.7	7. Beyond 10 km, upto 20km add per km	Per Km	Per Tonne	246.00
14.16.8.8	8. Beyond 20 km, add per additional km	Per Km	Per Tonne	197.00
14.16.9	600, 700, 750mm & 800mm dia			
14.16.9.1	1. Distance	1 Km	Per Tonne	3146.00
14.16.9.2	2. Distance	2 Km	Per Tonne	3649.00
14.16.9.3	3. Distance	3 Km	Per Tonne	4145.00
14.16.9.4	4. Distance	4 Km	Per Tonne	4626.00
14.16.9.5	5. Distance	5 Km	Per Tonne	5092.00
14.16.9.6	6. Beyond 5 km upto 10km. Add per km	Per Km	Per Tonne	430.00
14.16.9.7	7. Beyond 10 km, upto 20km add per km	Per Km	Per Tonne	368.00

S. No.	Particulars of Items	Unit		Rates (in Rs.)
14.16.9.8	8. Beyond 20 km, add per additional km	Per Km	Per Tonne	295.00
14.16.10	900mm dia			
14.16.10.1	1. Distance	1 Km	Per Tonne	4720.00
14.16.10.2	2. Distance	2 Km	Per Tonne	5474.00
14.16.10.3	3. Distance	3 Km	Per Tonne	6217.89
14.16.10.4	4. Distance	4 Km	Per Tonne	6938.00
14.16.10.5	5. Distance	5 Km	Per Tonne	7637.00
14.16.10.6	6. Beyond 5 km upto 10km. Add per km	Per Km	Per Tonne	645.00
14.16.10.7	7. Beyond 10 km, upto 20km add per km	Per Km	Per Tonne	553.00
14.16.10.8	8. Beyond 20 km, add per additional km	Per Km	Per Tonne	442.00
14.16.11	1000, 1100 and 1200mm dia			
14.16.11.1	1. Distance	1 Km	Per Tonne	6293.00
14.16.11.2	2. Distance	2 Km	Per Tonne	7299.00
14.16.11.3	3. Distance	3 Km	Per Tonne	8291.00
14.16.11.4	4. Distance	4 Km	Per Tonne	9251.00
14.16.11.5	5. Distance	5 Km	Per Tonne	10183.00
14.16.11.6	6. Beyond 5 km upto 10km. Add per km	Per Km	Per Tonne	861.00
14.16.11.7	7. Beyond 10 km, upto 20km add per km	Per Km	Per Tonne	737.00
14.16.11.8	8. Beyond 20 km, add per additional km	Per Km	Per Tonne	590.00
14.17	Providing and installation of automatic water level indicator for supervisory control cum auto on/off of motor pump assembly inclusive of control panel, 500 mtr long 2 core, 4 pair cable for small rural water supply scheme, having source within 500mtr as per approved specification and as directed by Engineer in charge. (In case of lesser length of cable, equivalent amount @ Rs 12 /-per meter of short length will be deducted from above rate)	1 Job		18000.00
14.18	Providing and installation of automatic water level indicator for supervisory control cum auto on/off panel of motor pump assembly, using GSM module based water level controller and	1 Job		25000.00

S. No.	Particulars of Items	Unit	Rates (in Rs.)
	accessories for small water supply scheme, having source more than 500mtr but within 10 Kms as per approved specification and as directed by Engineer in charge.		
	<b>RECTANGULAR CONCRETE BLOCK PAVEMENT</b>		
14.19	Manufacturing, laying of cement concrete blocks of cement Concrete (C.C.) M30 grade and spreading 25mm thick sand underneath and filling joints with sand on existing base including testing.		
(i)	Concrete M30 grade for block, (0.600 x 0.450 x 0.200) (Concrete M30 for edge block, (0.300 x 0.300 x 0.300))	Sqm	1462.00
(ii)	Concrete M30 grade for block, (0.450 x 0.300 x 0.150) (Concrete M30 edge for block, (0.300 x 0.300 x 0.300))	Sqm	1237.00
	<b>INTERLOCKING CONCRETE BLOCK PAVEMENT</b>		
14.20 (i)	Providing and Laying of Interlocking Concrete Block Pavements having thickness 80 mm over bedding sand conforming to table 1500.6 shall be uniformly laid to a compacted thickness of 30mm complete including testing.	Sqm	598.00
(ii)	Providing and Laying of Interlocking Concrete Block Pavements having thickness 60 mm over bedding sand conforming to table 1500.6 shall be uniformly laid to a compacted thickness of 25mm complete.	Sqm	517.00
14.21	Supply & erection of readymade mini pump house (control panel box) GI sheet of 18 gauge of size 90cmx90cm x60cm with 40x40x5mm angle Iron frame to fix it 200mm below ground level with hold fasts grouted in	Each	14850.00



S. No.	Particulars of Items	Unit	Rates (in Rs.)
	foundation and 300mm above ground level for clearance suitable for fixing of control panel, fuse unit, main switch etc. as per approved specification.		
14.22	Provision for Jointing of TW to Rising Main with cost of Material/ specials such as GI Union / CI Flange, GI Reducer UPVC MTA FTA etc. as per requirement of site i/c cost of labour etc. complete as per approved specification and as directed by Engineer in charge.	Job	2835.00
14.23	Provision for jointing of Rising main to sump well/OHT and OHT to Distribution pipe line with cost of material/specials such as Bends, MTA as per requirement of site i/c cost of labour with excavation, labour as per requirement complete as per approved specification and as directed by Engineer in charge	Job	4725.00
14.24	Providing and Installation of automatic water level controller (Auto switch off) with accessories i/c labour and material etc. complete, as per approved specification and directed by Engineer in charge.	Job	7920.00
14.25	Provision for inter connection of old to new pipe line with excavation of trench as per requirement/ repairing of leakage of pipe line of any diameter & type of pipe line in muddy area i/c searching of leakage point, dewatering the trench, repairing the leakage laying & jointing of pipe and specials, back filling the trench i/c testing of joints cost of labour & specials such as D-joints couplers, solvent cement etc. complete Job work as per approved specification and as directed by Engineer in charge.		
14.25.1	50mm dia	Job	1418.00
14.25.2	90mm dia	Job	1890.00

S. No.	Particulars of Items	Unit	Rates (in Rs.)
14.25.3	110mm dia	Job	2363.00
14.26	Provision for inter connection of old to new pipe line with excavation of trench as per requirement of any diameter & type of pipe line in muddy area i/c dewatering the trench laying & jointing of pipe and specials, back filling the trench i/c testing of joints cost of labour & specials such as D-Joints couplers, solvent cement etc, complete job work as per approved specification and as directed by Engineer in charge.		
14.26.1	50/90mm dia	Job	1654.00
14.26.2	90/110mm dia	Job	2126.00
14.26.3	110/110mm dia	Job	2363.00
14.26.4	90/90mm dia	Job	1890.00
14.27	Provision for Rewinding of submersible Motor of any diameter i/c cost of material, labour, transportation etc. complete in case of breakdown maintenance as per approved specification and as directed by Engineer in charge.	Job	4950.00
14.28	Provision for Repairing of submersible pump of any diameter i/c cost of material, labour, transportation etc. in case of breakdown maintenance as per approved specification and as directed by Engineer in charge.	Job	2475.00
14.29	Provision for Repairing of Starter/ control panel i/c cost of material, labour, transportation etc. complete as per approved specification and as directed by Engineer in charge	Job	1188.00
14.30	Provision for Repairing of old existing CI Sluice Valve i/c repairing of spindle, check nut, changing of gland, lathe work as per requirement, changing of nut bolt, rubber sheet etc. complete as per approved specification and as directed by Engineer in	Job	1375.00

S. No.	Particulars of Items	Unit	Rates (in Rs.)
	charge.		
	<b>BOUNDARY PILLAR</b>		
14.31	Reinforced cement concrete M15 grade boundary pillars/local stone of standard design, fixed in position including finishing and lettering but excluding painting.	Each	494.00
	<b>G.I. BARBED WIRE FENCING 1.2 M. HIGH</b>		
14.32	Providing and fixing 1.2 m high GI barbed wire fencing with 1.8 m RCC posts 150 mm x 150 mm placed every 3 m centre-to-centre founded in M15 grade cement concrete, 0.6 m below ground level, every 15th post, last but one end post and corner post shall be struted on both sides and end post on one side only and provided with 9 horizontal lines and 2 diagonals interwoven with horizontal wires, fixed with GI staples, turn buckles etc. complete.	Meter	411.00
	<b>G.I. BARBED WIRE FENCING 1.8 M. HIGH</b>		
14.33	Providing and fixing 1.8 m high GI barbed wire fencing with 2.4 m RCC M15 grade 150 mm x 150 mm concrete post placed every 3 m centre-to-centre founded in M15 grade cement concrete, 0.6 m below ground level, every 15th post, last but one end post and corner post shall be struted on both sides and end post on one side only and provided with 12 horizontal lines and 2 diagonals interwoven with horizontal wires, fixed with GI staples, turn buckles etc. complete.	Meter	578.00
	<b>SIGN BOARD</b>		
14.34	Providing and fixing of typical informatory sign board. Three MS Plates of 1.6 mm thick, top and middle plate duly welded with MS flat iron 25mm x 5m size on back on edges. The lower plate will be	Job	14960.00

S. No.	Particulars of Items	Unit	Rates (in Rs.)
	welded with MS angle iron frame of 25mm x 25mm x 5mm. The angle iron frame of the lower most plate and flat iron frame of middle plate will be welded to 2 nos. 75mm x 75 mm of 12 SWG sheet tubes posts duly embedded in cement concrete M-15 grade locks of 450mm x 450mm x 600mm, 600mm below ground level. The top most diamond plate will be welded to middle plate by 47mm x 47mm of 12 SWG steel plate tube. All M.S. will be stove enameled on both sides. Lettering and printing arrows, border etc. will be painted with ready mixed synthetic enamel paint of superior quality in required shade and colour. All sections of framed posts and steel tube will be painted with primer and two coats of epoxy paint complete.		
14.35	Construction of cement concrete information board in CC 1:2:4 (M15) with skin reinforcement of 8 mm dia HYSD bars @ 300 mm C/C both ways size including excavation, base concrete (M-15), priming, painting two coats synthetic enamel paint on new concrete surface including painting-figuring Logo and Slogan including writing of all information about the project etc. complete. As directed by the Engineer incharge.	Job	10067.00
14.36	Providing and fixing of typical information board made of 75mm square or 75mm dia. circular steel tube of 12 SWG 3.2 m height and cross member 2 Nos. 1m long, fixed with Angle iron 50 x 50 x 5 mm MS angle on the back side 2Nos vertical and 4 Nos horizontal. It is mounted by 2 plates of 1.6mm thick and size 900 x 750 mm, the pipe shall be erected on 600 x 600 x 750 mm	Job	19591.00

S. No.	Particulars of Items	Unit	Rates (in Rs.)
	foundation blocks at appropriate depth made of cement concrete 1:2:4, painted by standard colour with lettering, border, heading and logo etc. using synthetic enamel paint of superior quality including welding, excavation, concreting, painting of base, border and lettering, painting and other required details etc complete as directed by Engineer-in-charge.		
14.37	<p>Fabrication, providing and fixing of typical information board of size 1.50 m x 0.90 m made out as detailed below -</p> <p>1. Two vertical support (post) made out from ISA angle 50 mm x 50 mm, 6.0 mm this shall be minimum 0.75 m below GL and 2.25 m above GL. The vertical post shall be erected on 450mm x 450mm x1000mm foundation blocks (250mm above GL and 750mm below GL) made of cement concrete 1:2:4.</p> <p>2. The board shall be fabricated from 1.6 mm thick MS sheet of size 1.50 m x 0.90 m. The frame of board shall be fabricated with angle ISA 40x40x6 cross member support from behind and flat 20x5mm support all around board.</p> <p>3. Whole structure shall be painted by standard colour with lettering border, heading and logo etc using synthetic enamel paint of superior quality including welding, excavation, concreting, painting of base, border and lettering, painting and other required details etc. complete as directed by Engineer-in-charge.</p>	Job	9000.00
14.38	Providing and fixing G.I. chain link fabric fencing of required width in mesh size 50x50mm including strengthening with 4 mm dia wire or nuts, bolts and washers as	Sqm	770.00

S. No.	Particulars of Items	Unit	Rates (in Rs.)
	required complete as per the direction of Engineer-in-charge.		
14.39	Providing, placing and installation of polyethylene water tank ISI 12701 :1996 marked with cover and suitable locking arrangement and making necessary holes for inlet, outlet and over flow pipes but without fitting and the base support for tank on terrace (at all floor level).	Ltr.	7.00
	<b>Electro Chlorination System</b>		
14.40	<p>Providing, erecting, commissioning and giving test &amp; trial for a period of one month including one year free maintenance after commissioning of Electro chlorinator capable of generating chlorine from common salt by electrolysis using electrodes in form of sodium hypo chlorite solution containing 6-8 gms/lit of available chlorine in batch or continuous processes and capable of providing 8 hrs storage of hypochlorite in case of power failure. The electro chlorinator shall comprise of following.</p> <p>Electrolytic cell consisting dimensionally stable electrodes made from Gr I Titanium sheet with multi metal oxide coating.</p> <p>Electrolyzer tank made from PVC-FRP or Acrylic.</p> <p>Power pack consisting of transformer rectifier for generating suitable DC current from AC supply along with the control switch for dosing pumps etc. through MCB's contacts, relays and wiring.</p> <p>Control panel for the electro chlorinator consisting of DC voltage and current display income phase status unit on-off switches fuses etc.</p> <p>Dosing tank of suitable capacity made from PVC/FRP.</p>		

S. No.	Particulars of Items	Unit	Rates (in Rs.)
	Dosing pumps of specials quality (1W + 1S) suitable to handle hypo chlorite solution. Entire chlorine solution pipeline shall be of PVC Chlorine test kit suitable to measure residual chlorine up to 5 ppm.		
	25 gms/hr	Each	251486.00
	50 gms/hr	Each	306836.00
	100 gms/hr	Each	406763.00
	150 gms/hr	Each	447023.00
	250 gms/hr	Each	628716.00
	350 gms/hr	Each	758204.00
	500 gms/hr	Each	1015041.00
	750 gms/hr	Each	1301576.00
	1000 gms/hr	Each	1636668.00
	1500 gms/hr	Each	2152348.00
	2000 gms/hr	Each	2528241.00
	3000 gms/hr	Each	3492717.00

# **CHAPTER - 15**

## **ALLIED CIVIL WORKS**



## **CHAPTER – 15**

### **ALLIED CIVIL WORKS**

#### **Excavation And Preparation of Trench**

1. The rates for various items of civil works given in this chapter shall be applicable for the civil works connected with laying and jointing of water supply and sewerage pipeline works only. These rates shall not be applicable for the items of civil works for which the rates has already given in the relevant chapters.
2. The trenches shall run in perfectly straight line between points or manholes, as shown on the approved drawings.
3. The excavation of the trench shall be commenced at the downstream end of the sewer and be continued up the gradient.
4. The trench shall be excavated only so far in advance of pipe laying as specified by the Engineer in Charge. It shall usually be so regulated as to enable the excavation to be completed about one day in advance of pipe laying.
5. The trench shall be so shored and drained that the workmen may work there with safety & efficiency.
6. The trench shall be kept free from water. Excavation below water table shall be done after dewatering trenches. The discharge of the trench dewatering pumps shall be conveyed either to discharge channels or to natural drains.
7. The excavation shall be carried out with manual labour or with suitable mechanical equipment as approved by the Engineer in charge.
8. When the pipeline is under a roadway, a minimum cover of 100 cm is recommended for adoption but it may be modified to suit local conditions and in case of A.C. pipe a cover of at least 1.25 m is provided. Where the pipe line or drains crosses the road, the road crossing shall be excavated half at a time, the 2nd half being, commenced after the pipes have been laid in the 1st half and the trench refilled. Necessary safety measures for traffic as directed shall be adopted. All water mains; cables and any other such services etc. met within the course of excavation shall be carefully protected and supported. Care shall be taken not to disturb the electrical and communicator cable met with during course of excavation, removal of which if necessary shall be arranged by the engineer in charge.
9. Trench shall be of sufficient width to provide a free working space on either side of pipe. At the bottom between the faces, it shall be such as to provide not less than 200mm clearance on either side of pipe. Additional width shall have to be provided at position of sockets, flanges, D. Joints for jointing. Depth of pit at such places shall also be sufficient to permit finishing of joints.
10. In obtaining the formation of the bottom of the trenches in case of sewer line, the usual method of using sight rails and boning rods shall be adopted during the whole process. The sight rails shall be fixed at all change of direction or gradient and at suitable intervals, which may not be more than

15 meters apart, before excavation is started. The centre line shall be marked on each horizontal rail, which is fixed at true level.

11. The excavation shall be boned at least once in every 2 meters, the foot of the boning rod being set on a block of wood of the exact thickness of the material of the pipes.
12. Except where special foundations are to be provided, the trench shall be excavated in accordance with one of the following alternatives as may be considered appropriate by the Engineer in charge.
  - (a) The trench shall be excavated to the exact gradient specified so that no making of the sub grade by back filling is required and the concrete bed, where required, may be prepared with greatest ease giving a uniform and continuous bearing and support for the pipe
  - (b) When the bottom of the trench at the specified gradient is found unstable or to include ashes and cinders, all types of refuse, vegetable or other organic material, or large pieces or fragments of inorganic material shall be removed as per the satisfaction of the Engineer in charge. Before laying the concrete bed, where necessary, the specific gradient shall be attained by back filling with an approved material in compacted layers of 8 cm. The layers shall then be tamped as directed by the Engineer in Charge.
  - (c) The bed of the trench, if in soft or made up earth, shall be well watered and rammed before laying the pipes and the depression. If any shall be properly filled with approved earth and consolidated in 20 cm layer.
  - (d) The bed of the trench, if in B.C. Soil, shall be excavated 20cm more than the normal depth and then filled up by moorum or granular material.
13. If the sides of the trench are not vertical the toes of the side slopes shall end at the top of the pipe and practically, vertical sided trench shall be dug from these down to the sub grade.
14. The bottom of the trench shall be properly trimmed off to present a plain surface and all irregularities shall be levelled.
15. Where rock and large stone or boulders are encountered the trench shall be trimmed to a depth of at least 8 cm below the level at which the bottom of the barrel of the pipe is to be laid and the trench brought back to the required grade by filling with selected fine sand broken stone (passing sieve of 12.5mm aperture size) and compacted so as to provide a smooth bedding for the pipes.
16. After the Excavation of the trench is completed hollows shall be cut at required position to receive the socket of the pipe and these hollows shall be of sufficient depth to ensure that the bearer of the pipe shall rest throughout their entire length on the solid ground and that sufficient space left for joining the under side of the pipe joint. These socket holds shall be refilled with sand after joining the pipe.
17. Where the bottom of the trench at sub grade is found to consist of material which is unstable to such a degree that, in the opinion of the Engineer in

charge, it cannot be removed and replaced with an approved material thoroughly compacted in place to support the pipe properly, a suitable foundation for the consist of piling, timbers or other materials, in accordance with plan prepared by the Engineer in Charge shall be constructed.

18. Trench excavation in rock in inhabited areas should be done by hammering and chiselling or other appropriate mechanical means but not by blasting.
19. Excavation for trenches in rock by blasting shall be permitted only in open areas, with the written permission of the competent authority, after the Engineer in charge has satisfied himself that there is no danger to persons or property if blasting is done in that area. All necessary licenses etc shall be the responsibility of the contractor.
20. Proper precautions shall be taken for the protection of persons or property during blasting by the contractor after obtaining necessary permission for blasting from the concerned authorities.
21. The hours of blasting shall be fixed by the Engineer in charge in consultation with the concerned local authorities.
22. The procedure of blasting shall conform to the requirements of local administration controlling authorities.
23. Open cut deep trenches in bad ground shall be sheeted and braced as required by local municipal regulations and as may be necessary to protect life, property or the work. Payment shall be regulated as per the terms of agreement.
24. When close sheeting is required, it shall be so driven as to prevent adjacent soil from entering the trench either below or through such sheeting for which no extra payment shall be made.
25. Engineer in charge shall have the right to order the sheeting to be driven to the full depth of the trench or to such additional depths as may be required for the protection of the work, as per manual on water supply, sewage and sewage treatment (1993 Second edition) for which no extra payment shall be made.
26. Where the soil in the lower limits of a trench has the necessary stability, the Engineer in charge at his discretion, may permit stopping of the driving of sheeting at some designated elevation above the trench bottom for which no extra payment shall be made.
27. Sheeting done in trenches near heavy or important buildings shall be left in ground, if any settlement of the buildings is anticipated as per direction of Engineer in Charge and for which no extra payment shall be made.
28. Sheeting and bracing which have been ordered left in place should be removed for a distance of 90 cm. below the established street level or the existing surface of the street whichever is lower for which no extra payment shall be made.
29. Trench bracing, except that which has been left in place may be removed after the back filling has been completed or has been brought up to such an elevation as to permit its safe removal for which no extra payment shall be made.

30. Sheeting and bracing may be removed before filling the trench, but only in such manner as it will ensure the adequate protection of the completed work and adjacent structures.
31. All surface materials which in the opinion of the Engineer in charge, are suitable for reuse in restoring the surface, shall be kept separate from the general excavation material as directed by the Engineer in charge.
32. The excavated material shall be not placed within one meter or half of the depth of the trench, whichever is greater, from the edge of the trench. The excavated material shall be separated and stacked so that in refilling it may be re laid and compacted in the order to the satisfaction of the engineer in charge.
33. (a) If the hard rock is found throughout the depth, then the trench after pipe laying should be filled up with good excavated earth except B.C. soil, if available within 50m lead, on either side of pipe and up to 30cm above the pipe and remaining depth shall be filled up with excavated hard rock. The balance hard rock shall be compulsorily issued to the contractor at such issue rate, which are specified in the contract agreement after maintaining proper M.A.S. account. If good soil and hard rock in excavation is obtained, then suitable action as explained above shall be taken accordingly.
- If hard rock in excavation is obtained throughout the length and no good soil is obtained on either side within 50m of excavation then it shall be filled up by moorum and payment shall be made as per item No. 15.13. In this case overall rock shall be compulsorily issued at the rate of Rs 170 per cum to be specified in the contract agreement after maintaining proper M.A.S. account. Payment shall be regulated as per terms of agreement at appropriate rate.
- (b) In case of B.C. soil the side of pipe and filling above 30 cm of pipe shall be done by moorum and balance depth shall be filled up by excavated B.C. Soil.
34. Hydrants under pressure, surface boxes, fire or other utility controls shall be left unobstructed and accessible until the work is completed.
35. Gutters shall be kept clear of other satisfactory provisions made for street drainage and natural watercourses shall not be obstructed.
36. To protect person from injury and to avoid danger to property, adequate barricades, construction signs, torches, red lanterns and guards as required shall be placed and maintained during the progress of the construction work and until it is safe for traffic to use the road way.
37. All materials, piles, equipment and pipe which may serve as obstructions to traffic shall be enclosed by fences or barricade and shall be protected by proper lights when the visibility is poor.
38. The rules and regulations or the local authority regarding safety provisions shall be observed.
39. The work shall be carried in such a manner, which will cause the least interruption to traffic, and the road or street may be closed in such a manner that it causes the least interruption to the traffic.

40. Where it is necessary for traffic to cross open trenches, suitable cross over planks shall be provided.
41. Suitable signs indicating that a street is closed shall be placed and necessary detour signs for the proper maintenance of traffic shall be provided.
42. Temporary support, adequate protection and maintenance of all underground and surface structure, drains, sewers and other obstructions encountered in the progress of the work shall be provided under the direction of the Engineer in charge.
43. The structure, which may have to be disturbed, shall be restored upon completion of the work.
44. Trees, shrubbery, fences, poles and all other property and surface structures shall be protected unless their removal is shown on the drawing or authorised by the Engineer in charge.
45. Root of trees within a distance of about 0.5m from the site of the pipeline shall be removed or killed for which no extra payment shall be made.
46. No valve or other control of the existing serving shall be operated without the permission of the Engineer in charge.
47. The rates include the element of hire and running charges of all types of plants, machinery & equipment, required to complete the work, unless specified otherwise.
48. The rates also include the element of testing of samples of various materials brought by contractor for use on the work, as well as other necessary test for item of work as stipulated in the specifications.
49. The work should not be accepted in any case if the contractor fails to observe the instruction of department regarding testing of material.
50. Before making any payment, it will be responsibility of the officer making payment to assure that all tests are as per prescribed frequency have been carried out and found as per requirement.
51. The contractor shall have to provide bound ruled register named as Site Order Book it shall be kept in the charge of Deptt. Supervisory staff inspecting officer will enter their remarks in this book which will be noted by contractor or his authorized representative for compliance and report.  
  
As mentioned in para 12.9, the width of excavation shall be as per specification given in the relevant I.S. Specification. The bottom width, which shall be kept as minimum required for the work as per ISS and if the depth of the trench is more the top width shall depend on the angle of repose for a particular type of soil where the pipe line is to be laid.
52. The rate for cutting and making in the same condition include all lead of the material and also required work and equipment to complete the work as per specification and as directed by Engineer incharge.
53. The contractor shall be fully responsible to carry out the work in a most safe way and he shall be fully liable and responsible for any accidents due to any reason, during the currency of the contract.

## SPECIFICATION FOR CIVIL WORKS

All the civil works shall be done strictly as per relevant IS. Specifications and all the materials shall also conform to the relevant IS. Specifications. All the necessary tests of material and work shall be carried out for each work. Where applicable, the contractor shall also submit manufacturer's test certificates for materials to the Engineer in Charge.

### Materials Specification

(a) **Cement**

Cement to be used in the work shall be any of the following types with prior approval of Engineer-in-charge.

Ordinary Portland cement 43 or 53 grade conforming to IS: 8112-1489 or P.P.C. conforming to I.S. : 1489 bearing ISI mark.

(b) **Coarse Aggregate :**

Coarse aggregate consist of clear, hard, strong, dense, nonporous and durable pieces of crushed stone. They shall not consist pieces of elongated particles salt, alkali, vegetable matter or other deleterious material.

All coarse aggregate shall conform to IS:383 & tests for conformity shall be carried out as per IS:2386 Part I to VIII. The maximum value of flakiness index for coarse aggregate shall not exceed 35%. The coarse aggregate shall satisfy the following requirement of grading.

IS. Sieve	Percentage by Weight Passing the Sieve		
	40mm	20mm	15mm
63mm	100	--	--
40mm	95 – 100	100	--
20mm	30 – 70	95 – 100	100
12.5mm	--	--	90 – 100
10mm	10 – 35	25 – 55	40 – 85
4.75mm	0 – 5	0 – 10	0 – 10

(c) **Sand / Fine Aggregate :**

Sand shall not contain dust, lumps, soft or flaky materials fine aggregate having positive alkali silica reaction shall not be used. All fine aggregate shall conform to IS : 383 :2016. The fineness modulus of fine aggregate shall neither be less than 2.0 nor greater than 3.5. Sand to be used in work shall conform to IS-1542-1992 for plaster and IS-166-1965 for masonry work. Clay content should not be more than permissible limit.

(d) **Water :**

Water used for mixing and curing shall be clean and free from injurious amounts of oils, acids, salts, sugar, organic material or other substances that may be deleterious to concrete potable water is generally considered satisfactory for mixing and curing of concrete.

(e) **Steel :**

For R.C.C. works steel to be used shall conforms to IS-1786 : 2008. All steel be procured from original producer and no re-rolled steel shall be used in the

work. Only new steel shall be delivered to site. Brittle burnt, defective, cracked bar shall be discarded.

(f) **Concrete :**

Normally concrete shall be mixed either in a concrete mixer or in a batching & mixing plant. Hand mixing is prohibited and under unavoidable circumstances it should be done only with the prior permission of Engineer-in-charge. Mixing shall continue till materials are uniformly distributed and a uniform colour of entire mass is obtained and each particle of aggregate shows coating of cement. In no case mixing shall be done for less than 2 minutes. Concrete shall be transported and placed as near as practicable to its final position within 30 minutes of its discharge from the mixer.

- (i) Structural steel shall be of tested, standard quality conforming to IS-226-1975 and commercial quality shall conform to IS-1977-1996.
- (ii) Steel work riveted or bolted shall conform to IS-1148-2009 and IS-800-2007.
- (iii) Welding of steel shall be electric arc welding as per IS-816-1969 and shall be on the lines given in 800-2007.
- (iv) Rolled steel section for fabrication of steel shall conform to IS-7452-1990.
- (v) Rates of steel angle includes all forgoing, reducing to required size, shape and figure, drilling, tapping, punching etc. and every description of workmanship that may be necessary to fabricate, finish, erect and fix in position in perfect manner.

(g) **Bricks:**

- (i) The brick work shall be carried out as per relevant I.S. Specifications and the drawing, specification and direction by the Engineer-in-charge.
- (ii) Burnt clay bricks shall conform to the requirement of IS-1077 : 1992. They shall be free from cracks and flaws and nodules of free lime. The brick shall have smooth rectangular faces with sharp edges and corners.
- (iii) Cement mortar for work shall be as per the relevant specification.
- (iv) All bricks shall be thoroughly soaked in tank filled with water for minimum period of one hour prior to being laid Such soaked bricks shall be stacked on a clean place where they are not contaminated with earth / dirt etc.
- (v) The thickness of joint shall not exceed 10mm
- (vi) The Brick work shall be built in uniform layers.
- (vii) Brick work shall be done true to plumb in specified manner. All courses shall be laid truly horizontal and vertical joints shall be truly vertical.
- (viii) In case of vertical or inclined joints proper bond between old and new masonry has to be ensured by interlocking the bricks.

- (ix) Green work / fresh work shall be protected from rain by suitable covering and shall be kept constantly moist on all faces for minimum of 7 days.

(h) **Mortar:**

The mortar mixing shall preferably be done in mechanical mixer operated manually or by power. Hand mixing can be resorted to as long as uniform density of the mix and its strength are assured subject to prior approval of Engineer-in-charge. Hand mixing operation, if permitted, carried out on clean water tight platform when cement and sand shall be first mixed dry in required proportion several times till the mixture is uniform. Minimum quantity of water shall be added to bring the mortar to the consistency of still paste.

Mortar shall be mixed only in such quantity as required for immediate use. The mortar normally be considered to use within 30 minutes. Mortar after 30 minutes remains unused shall be rejected and removed from site.

(i) **Plaster:**

Plastering shall be done where shown as per drawing. Plastering shall be started from top and worked down. Wooden screeds 75mm wide and of the thickness of the plaster shall be fixed vertically 2.5 to 4 mt. apart to act as gauge and guide in applying plaster. The mortar shall be laid on the wall between the screeds using the plasterers float and pressing the mortar so that packed joints are properly filled. The plaster shall there be finished off with a wooden straight edge reaching across the screeds. The straight edge shall be worked on the screeds with small upward and side ways motion 50mm to 75mm at a time. Finally, the surface shall be finished off with a plasterers wooden float metal floats shall not be used.

Curing shall commence as soon as mortar used for finishing has hardened sufficiently not be damaged during curing. It shall be kept wet for a period of at least 7 days.

(j) **Form work:**

- (i) Form work shall include all temporary form for forming concrete of shape with all props, staging, centring required for support.
- (ii) All material shall conform to relevant I.S. specifications
- (iii) Form work shall be constructed with metal or timber, for metal all bolts should be counter sunk.
- (iv) The form work should be robust and strong and joint shall be leak proof, staging must have cross bracing and diagonal bracing in both direction.
- (v) The rate includes provision of gradient in form work for terrace roof and gradient shall be provided necessarily for water drained out quickly and effectively. Concrete shall not be freely dropped into place from height exceeding 1.50 mt. And it shall be compacted in



its final position within 30 minutes of its discharge from mixer. It shall be compacted thoroughly by vibration or other means during placing so as to produce a dense homogenous void free mass having required surface finish.

**This USOR contains the rates of all the items without GST. GST shall be paid separately as per prevailing government norms as claimed by the contractor in his bill. All the estimates based on this USOR will include GST as an extra amount as per prevailing rates on the sum of the estimate to arrive at the gross amount.**

## ALLIED CIVIL WORKS

S.No.	Particulars of Items	Unit	Rates (in Rs.)
	<b>EXCAVATION</b>		
15.1	Surface dressing of the ground including removal of vegetation and in-equalities not exceeding 15 cm deep and disposal of rubbish, lead up to 50 m and lift up to 1.5 m. All Kind of Soil	100 Sqm	1329.00
15.2	Clearing jungle including uprooting of rank vegetation, grass, brush wood, trees and saplings of girth up to 30 cm measured at a height of 1 m above ground level and removal of rubbish up to a distance of 50 m outside the periphery of the area cleared.	100 Sqm	685.00
15.3	Clearing grass and removal of the rubbish up to a distance of 50 m outside the periphery of the area cleared.	100 Sqm	351.00
15.4	Installation of HDPE pipe by Horizontal Direction Drilling Method including preparing and setting up the plant and equipment, making string of new pipe material, installing new pipe string and making the system ready for commissioning by HDD operation including drilling, stringing, remaining and pulling back the new pipe on the designed bore path alignment, proper disposal of drilling fluid, as per code of practice for horizontal direction drilling technique suiting Indian conditions. Required pipes/specials and other civil work shall be paid separately-in all types of soils. (This item shall be executed only after prior permission of Superintending Engineer)		
15.4.1	HDPE pipe of any class-90 mm outer dia	Meter	484.00
15.4.2	HDPE pipe of any class- 110 mm outer dia	Meter	594.00
15.5	Earth work in surface excavation not exceeding 30 cm in depth but exceeding 1.5 m disposal of excavated earth upto 50 m and lift upto 1.5 m, disposed soil to be levelled and neatly dressed.		
15.5.1	All kinds of soil	Sqm	51.00
15.6	Earth work in excavation for foundation, trenches for pipes/ cables, drains or in well excavation etc. by mechanical means/ manual means (exceeding 30cm in depth.) including ramming of bottom, dressing of sides disposal of excavated earth including of all lift and lead upto 50m. Disposed earth to be levelled and neatly dressed.		
15.6.1	All kinds of soil.	Cum	209.00
15.6.2	Muddy Area	Cum	251.00
15.6.3	Ordinary rock or soft rock with or without blasting	Cum	270.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)
15.6.4	Hard rock (requiring blasting)	Cum	491.00
15.6.5	Hard rock (requiring chiseling where blasting prohibited)	Cum	722.00
15.7	Earth work in excavation for foundation, in building works etc. by mechanical means/ manual means (exceeding 30cm in depth.) including ramming of bottom, dressing of sides disposal of excavated earth including of all lift and lead upto 50m. Disposed earth to be levelled and neatly dressed.		
15.7.1	All kinds of soil.	Cum	209.00
15.7.2	Muddy Area	Cum	251.00
15.7.3	Ordinary rock or soft rock with or without blasting	Cum	258.00
15.7.4	Hard rock (requiring blasting)	Cum	477.00
15.7.5	Hard rock (requiring chiseling where blasting prohibited)	Cum	699.00
15.8	Add in Item No.- 15.5 for lift.		
15.8.1	For Every 0.50m after 1.5m initial depth upto 6.0 m	Cum	18.00
15.8.2	For Every 0.50m after 6.0m initial depth upto 10.5 m	Cum	24.00
15.8.3	For Every 0.50m after 10.5m initial depth upto 15.0 m	Cum	30.00
15.9	Add in Item No.- 15.6 & 15.7 for lift.		
15.9.1	For Every 0.50m after 1.5m initial depth upto 6.0 m	Cum	27.00
15.9.2	For Every 0.50m after 6.0m initial depth upto 10.5 m	Cum	33.00
15.9.3	For Every 0.50m after 10.5m initial depth upto 15.0 m	Cum	42.00
15.10	Pumping out water caused by springs, tides or river seepage, broken water mains of drains or the like.	KL	87.00
15.11	Filling available excavated earth in trenches, plinth sides of foundation in layers not exceeding 20cm. in depth including consolidation of each layer by ramming watering, lead up to 50m and lift up to 1.5m in all kinds of soils	Cum	47.00
15.12	Filling available excavated earth in trenches, lead up to 50m and lift upto 1.5m in all kind of soil excluding watering and ramming.	Cum	31.00
15.13	Supplying & filling moorum for pipe bedding or over the pipe (including supply of moorum).	Cum	649.00
15.14	Supply & filling crusher stone dust for pipe bedding or over the pipe (including supply of crusher stone dust).	Cum	836.00
	<b>DISMANTLING &amp; DEMOLISHING</b>		
15.15	Demolishing Brick work in lime or cement mortar in any mix including stacking of serviceable material	Cum	740.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)
	and disposal of unserviceable material with in 50 meter lead as per direction of engineer-in-charge. (In cement mortar)		
15.16	Demolishing stone rubble masonry manually/ mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 meter lead as per direction of Engineer-in-charge. (In lime mortar)	Cum	453.00
15.17	Demolishing stone rubble masonry manually/ mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 meter lead as per direction of Engineer-in-charge. (In cement mortar)	Cum	961.00
15.18	Demolishing cement concrete manually / by mechanical means including disposal of material within 50 m lead as per direction of Engineer-in-charge.		
15.18.1	Nominal concrete 1:3:6 or richer mix (i/c equivalent design mix)	Cum	954.00
15.18.2	Nominal concrete 1:4:8 or Leaner mix (i/c equivalent design mix)	Cum	588.00
15.19	Dismantling of Cement Concrete Pavement by mechanical means using pneumatic tools i.e. concrete cutter and concrete braker cutter, breaking to pieces not exceeding 0.02 cum in volume and stock piling at designated locations and disposal of dismantled materials up to a lead of 1000 metres, stacking serviceable and unserviceable materials separately. (use of cement concrete cutter before breaking the concrete road is mandatory for this item).	Cum	1003.00
15.20	Demolishing of R.C.C. work manually / by mechanical means including stacking of steel bars and disposal of unserviceable material within 50 m lead as per direction of Engineer-in- charge.	Cum	1391.00
15.21	Dismantling old plaster or skirting raking out joints and cleaning the surface for plaster including disposal of rubbish to the dumping within 50 meters lead.	Sqm	18.00
15.22	Dismantling stone slab flooring laid in cement mortar including stacking of serviceable material and disposal of unserviceable material within 50 m lead.	Sqm	105.00
15.23	Dismantling kharanja of any thickness in cement mortar of any mix	Sqm	80.00
	<b>REPAIRS TO BUILDING/ ROAD WORK</b>		
15.24	Providing & fixing of stone slab 30 mm thick in cement mortar 1:6 (1 cement 6 sand)	Sqm	185.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)
15.25	Labour only for Fixing of stone slab 30 mm thick in cement mortar 1:6 (1 cement 6 sand)	Sqm	82.00
15.26	Providing & fixing of Kharanja of any thickness in C.M. 1:6 (1 cement 6 sand)	Sqm	580.00
15.27	Labour only for fixing of Kharanja of any thickness in C.M. 1:6 (1 cement 6 sand)	Sqm	164.00
15.28	Cutting of Water bound macadam road and making good the same including supply of extra quantities of materials i.e. aggregate, moorum screening and labour required including compaction inlayer by appropriate methods.	Cum	1278.00
15.29	Cutting of bituminous road and making good the same including supply of extra quantities of materials i.e. aggregate, moorum screening and labour required including compaction inlayer by appropriate methods.	Cum	2329.00
	<b>CEMENT CONCRETE</b>		
15.30	Providing and laying mechanically mixed cement concrete with crushed stone aggregate excluding centering and shuttering (with 40mm nominal size graded stone aggregate).		
15.30.1	In foundation and plinth		
15.30.1.1	1:5:10 (M-5)	Cum	4002.00
15.30.1.2	1:4:8 (M-7.5)	Cum	4465.00
15.30.1.3	1:3:6 (M-10)	Cum	4525.00
15.30.1.4	1:2:4 (M-15)	Cum	5256.00
15.30.2	In walls & Superstructure up to 4 mt. height above plinth (with 40mm nominal graded metal)		
15.30.2.1	1:3:6 (M-10)	Cum	4564.00
15.30.2.2	1:2:4 (M-15)	Cum	5487.00
15.31	Providing & laying mechanically mixed cement concrete 20mm nominal size graded crushed stone excluding cost of centering & shuttering.		
15.31.1	In Plinth & foundation		
15.31.1.1	1:3:6 (M-10)	Cum	4389.00
15.31.1.2	1:2:4 (M-15)	Cum	5363.00
15.31.1.3	1:1½:3 (M-20)	Cum	5961.00
15.31.1.4	1:1:2 (M-25)	Cum	7358.00
15.31.2	In walls and superstructure up to 4 mt. height above plinth (with 20mm nominal graded metal)		
15.31.2.1	1:3:6 (M-10)	Cum	4498.00
15.31.2.2	1:2:4 (M-15)	Cum	4935.00
15.31.2.3	1:1½:3 (M-20)	Cum	5510.00
15.31.2.4	1:1:2 (M-25)	Cum	6961.00
	<b>REINFORCED CEMENT CONCRETE</b>		

S.No.	Particulars of Items	Unit	Rates (in Rs.)
15.32	Providing & laying mechanically mixed R.C.C. excluding centering & shuttering and reinforcement in foundation/plinth (20mm graded metal)		
15.32.1	1:1.5:3 (M-20)	Cum	5916.00
15.32.2	1:1:2 (M-25)	Cum	6227.00
15.32.3	1:0.75:1.5 (M-30)	Cum	7320.00
15.33	Providing & laying mechanically mixed R.C.C. excluding centering & shuttering and reinforcement in superstructure up to 4 mtr. Height above plinth level (20mm graded metal)		
15.33.1	1:1.5:3 (M-20)	Cum	6133.00
15.33.2	1:1:2 (M-25)	Cum	6237.00
15.33.3	1:0.75:1.5 (M-30)	Cum	6386.00
	<b>STEEL</b>		
15.34	Providing and placing in position cold twisted steel and hot rolled deformed steel reinforcement for R.C.C. work i/c cutting, bending, binding etc. complete i/c cost of binding wire and wastage.		
15.34.1	Sub Structure	Kg	68.00
15.34.2	Super Structure	Kg	83.00
15.35	Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting fixing in position and applying a priming coat of approved steel primer all complete.	Kg	77.00
15.36	Structural steel work riveted, bolted or welded in built up section trusses and framed work i/c cutting /hoisting /fixing in position and applying a priming coat of approved steel primer all complete.	Kg.	77.00
15.37	Steel work in welded built-up section/ framed work, including cutting hoisting, fixing in position and applying a priming coat of approved steel primer using structural steel etc. as required.		
15.37.1	In stringers treads landings etc. of stair cases including use of chequered plate wherever required all complete.	Kg	83.00
15.37.2	In gratings, frames, guard bar, ladder, railings, brackets, gates and similar works	Kg	101.00
15.38	Providing and fixing 1mm thick M.S. sheet door shutters with frame and diagonal braces of 40x40x6 mm angle iron, 3mm M.S. gusset plates at the junctions and corners i/c all necessary fittings complete including applying a priming coat of approved steel. primer. with diagonal braces and central cross pieces of M.S. angle / flats as required	Sqm	3109.00
	<b>CEMENT MORTAR</b>		

S.No.	Particulars of Items	Unit	Rates (in Rs.)
15.39.1	Cement Mortar 1:3 (1 cement : 3 sand)	Cum	5093.00
15.39.2	Cement Mortar 1:4 (1 cement : 4 sand)	Cum	4200.00
15.39.3	Cement Mortar 1:5 (1 cement : 5 sand)	Cum	3720.00
15.39.4	Cement Mortar 1:6 (1 cement : 6 sand)	Cum	3307.00
15.39.5	Cement Mortar 1:8 (1 cement : 8 sand)	Cum	2958.00
	<b>BRICK WORK</b>		
15.40	Brick work with well burnt chimney bricks having crushing strength not less than 25 kg/cm <sup>2</sup> and water absorption not more than 20 % in foundation & plinth i/c curing etc. complete.		
15.40.1	In Cement Mortar 1:3	Cum	6653.00
15.40.2	In Cement Mortar 1:4	Cum	6226.00
15.40.3	In Cement Mortar 1:5	Cum	6087.00
15.40.4	In Cement Mortar 1:6	Cum	5967.00
15.41	Brick work with well burnt chimney bricks having crushing strength not less than 25 kg/cm <sup>2</sup> and water absorption not more than 20% in super structure above plinth level and up to floor two level i/c form work & curing etc. complete.		
15.41.1	In Cement Mortar 1:3	Cum	6577.00
15.41.2	In Cement Mortar 1:4	Cum	6318.00
15.41.3	In Cement Mortar 1:5	Cum	6178.00
15.41.4	In Cement Mortar 1:6	Cum	6058.00
15.42	Extra rate for Brick work in superstructure above floor two level for each additional floor or part thereof respective item.	Cum	163.00
15.43	Half brick masonry with well burnt chimney bricks crushing strength not less than 25kg/cm <sup>2</sup> and water absorption not more than 20% is superstructure above plinth level and up to floor two level.		
15.43.1	In Cement Mortar 1:3	Sqm	815.00
15.43.2	In Cement Mortar 1:4	Sqm	786.00
15.44	Brick work with open Bhatta bricks having crushing strength not less than 20 kg/cm <sup>2</sup> and water absorption not more than 25% in foundation & plinth i/c curing etc. complete.		
15.44.1	In Cement Mortar 1:3	Cum	6653.00
15.44.2	In Cement Mortar 1:4	Cum	6324.00
15.44.3	In Cement Mortar 1:5	Cum	6173.00
15.44.4	In Cement Mortar 1:6	Cum	6116.00
15.45	Brick work with open Bhatta bricks having crushing strength not less than 20 kg/cm <sup>2</sup> and water absorption not more than 25% in super structure above plinth level and up to floor two level i/c form work & curing etc. complete.		

S.No.	Particulars of Items	Unit	Rates (in Rs.)
15.45.1	In Cement Mortar 1:3	Cum	6577.00
15.45.2	In Cement Mortar 1:4	Cum	6318.00
15.45.3	In Cement Mortar 1:5	Cum	6178.00
15.45.4	In Cement Mortar 1:6	Cum	6058.00
	<b>PLASTER</b>		
15.46	12mm thick cement plaster in single coat including finishing even, smooth and curing complete.		
15.46.1	1:3 (1 cement : 3 sand)	Sqm	190.00
15.46.2	1:4 (1 cement : 4 sand)	Sqm	175.00
15.46.3	1:5 (1 cement : 5 sand)	Sqm	167.00
15.46.4	1:6 (1 cement : 6 sand)	Sqm	157.00
15.47	15mm thick cement plaster in single coat i/c finished even, smooth and curing complete		
15.47.1	in CM 1:3	Sqm	222.00
15.47.2	in CM 1:4	Sqm	204.00
15.47.3	in CM 1:5	Sqm	194.00
15.47.4	in CM 1:6	Sqm	186.00
15.48	Neat cement punning	Sqm	38.00
15.49	18mm thick cement plaster in 2 coats under layer 12mm CP 1:5 (1 cement:5 coarse sand) and top layer 6mm thick cement plaster 1:3 (1 cement:3 fine sand) finished even, smooth and curing complete.	Sqm	228.00
15.50	20 mm thick cement plaster in single coat i/c finishing even, smooth and curing complete		
15.50.1	in CM 1:3	Sqm	235.00
15.50.2	in CM 1:4	Sqm	177.00
15.50.3	in CM 1:5	Sqm	170.00
15.50.4	in CM 1:6	Sqm	163.00
	<b>FORM WORK</b>		
15.51	Providing & fixing form work i/c centering and shuttering including strutting, propping etc. and removal of form work for:		
15.51.1	Foundation, footing, bases of columns, etc for mass concrete	Sqm	203.00
15.51.2	Wall (any thickness) including attached pilasters, buttresses, plinth and string courses etc.	Sqm	374.00
15.51.3	Suspended floors, roofs, landings, balconies and access platform	Sqm	410.00
15.51.4	Lintels, beams, plinth beams, girders, bressumers and cantilevers.	Sqm	368.00
15.51.5	Columns, pillars, piers, Abutments, posts and Struts	Sqm	478.00
15.51.6	Stairs, (excluding landings) except spiral-staircases	Sqm	529.00



S.No.	Particulars of Items	Unit	Rates (in Rs.)
15.52	Close timbering in trenches including strutting, shoring and packing cavities (wherever required) complete (Measurement to be taken of the face area timbered).		
15.52.1	Depth not exceeding 1.5 mtr.	Sqm	158.00
15.52.2	Depth exceeding 1.5 mtr. but not exceeding 3.0 mtr	Sqm	163.00
15.52.3	Depth exceeding 3.0 mtr. but not exceeding 4.5 mtr	Sqm	167.00
15.52.4	Depth exceeding 4.5 mtr. but not exceeding 6.0 mtr.	Sqm	172.00
15.52.5	Depth exceeding 6.0 mtr. but not exceeding 7.5 mtr.	Sqm	177.00
15.52.6	Depth exceeding 7.5 mtr. but not exceeding 9.0 mtr.	Sqm	182.00
15.53	Close Timbering in case of shafts, wells, cesspits manholes and the like including strutting, shoring and packing cavities (wherever required) etc. complete (Measurements to be taken of the face area timbered)		
15.53.1	Depth not exceeding 1.5 mtr.	Sqm	165.00
15.53.2	Depth exceeding 1.5 mtr. but not exceeding 3.0 mtr	Sqm	175.00
15.53.3	Depth exceeding 3.0 mtr. but not exceeding 4.5 mtr	Sqm	185.00
15.53.4	Depth exceeding 4.5 mtr. but not exceeding 6.0 mtr.	Sqm	195.00
15.53.5	Depth exceeding 6.0 mtr. but not exceeding 7.5 mtr.	Sqm	205.00
15.53.6	Depth exceeding 7.5 mtr. but not exceeding 9.0 mtr.	Sqm	215.00
	<b>STONE WORK</b>		
15.54	Coursed rubble masonry (first sort) with hard stone in foundation and plinth cement mortar 1:6	Cum	5297.00
15.55	Coursed rubble masonry (Second sort) with hard stone in foundation and plinth Cement mortar 1:6	Cum	4934.00
15.56	Coursed rubble masonry with hard stone (first or Second sort) in Superstructure above plinth level and up to floor two level.		
15.56.1	Masonry work (first sort) in Cement mortar 1:6	Cum	6076.00
15.56.2	Masonry work (Second sort) in Cement mortar 1:6	Cum	5829.00
15.57	Extra Coursed rubble masonry with hard stone (first or Second sort) in Superstructure above floor II level for every floor's or part thereof.	Cum	128.00
15.58	Extra Coursed rubble masonry with hard stone (first or Second sort) in		
15.58.1	Square or rectangular pillars	Cum	409.00
15.58.2	Circular pillars	Cum	1475.00
15.59	Pointing on stone work with cement mortar 1:3 (1 cement : 3 fine sand)		

S.No.	Particulars of Items	Unit	Rates (in Rs.)
15.59.1	Flush / ruled pointing	Sqm	160.00
15.59.2	Raised and cut pointing	Sqm	291.00
	<b>FINISHING WORK</b>		
15.60	White washing with lime to give an even shade:		
15.60.1	New work (three or more coats)	Sqm	17.00
15.61	White washing with lime to give an even shade:		
15.61.1	Old work (two or more coats)	Sqm	10.00
15.61.2	Old work (One or more coats)	Sqm	6.00
15.62	Finishing walls with water proofing cement paint of required shade:		
15.62.1	New work (two or more coats applied @ 3.84 kg/10 sqm)	Sqm	63.00
15.63	Finishing walls with Acrylic Smooth exterior paint of required shade:		
15.63.1	New work (two or more coats applied @ 1.67 ltr/10 sqm over and including priming coat of exterior primer applied @ 2.20 kg/ 10sqm)	Sqm	95.00
15.64	Painting with synthetic enamel paint of approved brand and manufacture to give an even shade:		
15.64.1	(Two or more coats) on New work	Sqm	82.00
15.65	Painting with synthetic enamel paint of approved brand and manufacture to give an even shade:		
15.65.1	(One or more coats) on old work	Sqm	49.00
15.66	Construction of Brick masonry valve chamber with 20 cm thick wall in 1:6 C.M. with 12mm thick 1:4 Cement Plaster and base course 10 cm. thick in M-15. Inside Dimensions 110x80x100cm M-20 RCC chamber cover size 130x120cmx10cm including cost of materials, labour, finished with floating coat of neat cement etc. complete.	Each	9345.00

**CHAPTER - 16**  
**INTAKE WELL RELATED WORKS**

## **CHAPTER – 16**

### **INTAKE WELL RELATED WORKS**

**Notes:** (In this chapter items are only for estimating purpose, shall not be considered for the direct payment of the work to the contractor).

- 1 **Scope**
- 1.1 The Specification covers the requirements for Survey, structural design & Construction of Intake Well.
- 2 An intake is a structure constructed in a surface water / near surface water to obtain water from the source. The intake structures are built to draw water from rivers, streams, lakes, and reservoirs etc.
- 3 **Selection for Intake Site:** While taking a decision regarding the location of the intake site, the following points should be kept in view:
  - 3.1 The inflow point of the intake drawing water from a stream or a lake should be well below the water surface to prevent hydraulically wasteful air entrainment but sufficiently high enough from the bed to avoid entrapping of suspended solids.
  - 3.2 The location should provide the most suitable quality of water available.
  - 3.3 The site should have firm strata for good foundations.
  - 3.4 The site should avoid the existence of currents that may endanger the safety of the structure or deposit silt against or on it.
  - 3.5 The effect of floods at the proposed point should be studied and all precautions taken for the safety of the structure as well as safe working of the intake during floods.
  - 3.6 The distance from where the power is available should be considered.
  - 3.7 The distance of pumping station from the proposed site of intake also deserves consideration.
  - 3.8 In case of impounding reservoir, the intake should be located at the deepest point in reservoir, which is generally near the dam site, in order to take the optimum utility of the reservoir capacity.
  - 3.9 Excavation, PCC, RCC, steel & other works shall be paid as per items in the respective chapters of Sewage Water Supply ISSR.
  - 3.10 The payment for the dewatering shall be made only one time.
- 4 **Surveys needed for intake well:** Following surveys shall have to be conducted for preparation of detailed drawings & designing of intake well.
  - 4.1 River gauging
  - 4.2 Geological and soil investigation
  - 4.3 Cross sectional survey
  - 4.4 Contour survey of the area.
  - 4.5 Hydrological survey of the source.

- 4.6 Catchment area survey (the catchment area of the source should be located on the map).
- 4.7 Fixing of HFL etc.
- 4.8 **Sanitary survey.**
  - 4.8.1 Sanitary surveys at regular, intervals at field management levels and inspections at supervisory management level should be conducted. The catchment area of the source should be located on the maps. Potential sources of pollution observed in the catchment should be marked. The type of pollution e.g. industrial/domestic waste discharges, wastes of animal origin and agricultural run-offs should be determined.
  - 4.8.2 The reports of such survey should be promptly sent to the Pollution Control Authorities as well as water works authorities to promote corrective action. Procedure for monitoring of preventive action taken should be laid down and observed. An instant action plan for providing chlorination of raw-water should be available and brought into effect under such circumstances.
- 4.9 **Measurement of flow.**
  - 4.9.1 In cases of sources such as springs, rivers, canals, etc., there should be a permanent arrangement for recording daily flows near the intake works. Appropriate records in the form of graphs showing variation of flows in the source for each month in a year and for each year shall be maintained. Rain gauge stations should be established to record daily rainfall in the reservoir catchment and appropriate rainfall records should be built up and compared with discharges/ storages available. In case of reservoirs, the regime tables for filling and emptying of storages should be maintained for each year.
- 5 This USOR contains the rates of all the items without GST. GST shall be paid separately as per prevailing government norms as claimed by the contractor in his bill.  
All the estimates based on this USOR will include GST as an extra amount as per prevailing rates on the sum of the estimate to arrive at the gross amount.
- 6.0 **Measurement:**
  - 6.1 All the measurement shall be recorded under the relevant item of the work.
  - 6.2 Generally the work of survey, design & construction of intake well is awarded on turnkey basis and payment is made on lumpsum basis as per payment schedule given in the tender.
- 7 **Rates**

The rate shall include the cost of materials and labour involved in all the operations except for the items measured/ enumerated separately under clause 'Measurements', which shall be paid for separately.

## INTAKE WELL RELATED WORKS

S.No.	Particulars of Items	Unit	Rate (in Rs.)
16.1	Providing, constructing coffer dam in river basin/dam storages as per type design including excavation, filling the middle portion with B.C. soil (in gunny bags if required). Providing impervious/ semipervious materials on both side of B.C. soil (in gunny bags if required) including ramming, compacting to the satisfaction of Engineer-in-Charge, till the completion of work including dismantling coffer dam after completion of works and disposing off the material as directed by the Engineer-in-charge.	Cum	719.00
Note	Pay line maximum - Top width payable shall be 2 mtr. and maximum payable side slopes shall be 1.5 horizontal to 1 vertical, if the constructed top width of the side slopes are less, then the measurement at actual are payable. Extra top width or flatter slopes are not payable. Contractor is free to use ballies, plastic sheets, piles, pipes, CGI sheets for supporting hearting materials instead of impervious/semi-impervious hearting materials for which no extra payments shall be payable. 30% payment shall be withheld for dismantling of coffer dam. This foot note shall appear in tender condition.		
16.2	Excavation in general in soft material comprising of soft soil, soft moorum, sand, hard moorum with boulders in wet or dry condition for head works and allied works by well sinking process for average depth of 12 m and lead of 150m including shoring, barricading, guarding, refilling, disposing of surplus excavated stuff as directed by Engineer-in-charge, etc. complete		
a	Diameter upto and including 3M	Cum	842.00
b	Diameter more than 3M	Cum	751.00
16.3	Providing and fabricating at work shop, carting to site of work, including transport, loading, unloading, hoisting, lowering and setting out at actual site of sinking well, M.S. plate cutting edge for R.C.C. well curb consisting of 350 mm M.S. plate, 10 mm thick, champhering at bottom. Cutting edge should be provided in pieces not less than 2 m in length. Each joint should be plain from outside and jointed by gusset plate 400 x 200 x 12 mm thick M.S. plate with 12 nos. of 20 mm dia. Cru shank headed bolts (gusset plates from inside) with unequal angle of 90 x 60 x 10 mm should be welded from top of chamfered portion at 14 mm from bottom so that 15 mm side should be in contact with cutting edge with overlap of 300 mm joints. 16 mm dia bar should be welded to M.S. plate 200 mm below the top surface and length	Kg.	91.00

S.No.	Particulars of Items	Unit	Rate (in Rs.)
	should be 1.8 m above plate with a bend 300 mm from plate surface including 3 coats of anticorrosive paint as directed by Engineer-in-Charge.		
16.4	Providing and filling puddle (selected good impervious clay) in weirs in proper layers of 15 cm including watering, ramming and compaction etc. complete with all leads and lifts.	Cum	320.00
16.5	Providing and filling around the Intake well, boulders filling of selected variety and size of boulders including cost of all materials, labour, transportation etc. complete with all leads and lifts.	Cum	930.00
16.6	Providing and fixing 80 mm dia A.C./P.V.C. pipe weep holes at 1.5 m c/c staggered in abutment of the approach bridge/ramp including cost of all materials and labour involved with all leads and lifts etc. complete with all leads and lifts.	Meter	202.00
16.7	Providing and fixing M.S. chequer red plate flooring of following thickness supported on M.S. angles (25 x25 x 5 mm size) including welding, cutting and fabricating the plate to the required square or round shape, making holes in the plate, including providing and applying 3 coats of anticorrosive paint etc. complete as directed by Engineer-in-charge.		
16.7.1	6 mm thick	Sqm	3887.00
16.7.2	8 mm thick	Sqm	4924.00
16.8	Providing at site of works ISI standard RCC slotted pipes for collection of water into Intake well with R.C.C. collar of NP-3 class including cost of all central and local taxes, octroi, inspection, transportation etc. complete.		
16.8.1	450 mm dia	Meter	4129.00
16.8.2	600 mm dia	Meter	6413.00
16.9	Labour for lowering, laying and jointing RCC slotted pipes of following diameters including all leads and lifts, cost of jointing material, complete as directed by Engineer-in-charge.		
16.9.1	450 mm dia	Meter	234.00
16.9.2	600 mm dia	Meter	311.00
16.10	Labour for lowering, laying and jointing CI 'B' class / MS (cement mortar lined inside & epoxy coated on outside) pipe connecting mains with rubber gaskets including transportation of pipes from stores to site of works, cost of jointing materials, cost of rubber gasket with all leads and lifts etc. complete.		
	CI Class "B"		
16.10.1	300 mm dia	Meter	292.00
16.10.2	350 mm dia	Meter	349.00
16.10.3	400 mm dia	Meter	440.00

S.No.	Particulars of Items	Unit	Rate (in Rs.)
16.10.4	450 mm dia	Meter	460.00
16.10.5	500 mm dia	Meter	530.00
16.10.6	600 mm dia	Meter	736.00
16.10.7	700 mm dia	Meter	978.00
16.10.8	750 mm dia	Meter	1106.00
16.11	Providing, lowering, laying and placing in position, shrouding (covering) material for porous pipe gallery/slotted pipe gallery/trench gallery with all leads and lifts involved including transportation of materials to site of works, screening and washing of materials and placing in position with given section, etc. complete as directed by Engineer-in-charge.		
16.11.1	40 mm gauge pebbles	Cum	1646.00
16.11.2	12 mm to 20 mm gauge pebbles	Cum	1984.00
16.11.3	6 mm to 12 mm gauge pebbles	Cum	2262.00
16.11.4	Coarse sand (from river sand at site)	Cum	1044.00
16.11.5	Fine sand (from river sand at site)	Cum	1100.00
16.12	Providing and fixing in position C.I./ M.S. steps or 22 mm dia M.S. bar step with proper anchorage etc. and providing and applying 3 coats of anti-corrosive paint etc. complete as directed by Engineer-in-charge.	Each	499.00
16.13	Providing and fixing M.S. sluice gates PN 1.0 in position as per detailed drawing and specification including cost of all materials, labour, operating pedestal, connecting rod, painting with three coats of anti-corrosive paint etc. complete as directed by Engineer-in-charge.	Kg.	112.00
16.14	Providing and fixing in position C.I./M.S. rose pieces in intake wells including cost of all materials and labour, painting with three coats of anti-corrosive oil paint, etc. complete as directed by Engineer-in-charge.	Kg.	94.00
16.15	Providing and spreading around the well 1 mm thick polyethylene sheet complete as directed by Engineer-in-charge.	Sqm	28.00
16.16	Dewatering charges for estimation purpose for head works in river basin or dam:		
16.16.1	Approach channel	Meter	10000.00
16.16.2	Intake well of 3 m dia.	Each	95000.00
16.16.3	Inspection well of 2 m dia.	Each	60000.00
16.16.4	Connecting main	Meter	6000.00
16.16.5	Intake well of 6 m dia.	Each	300000.00
16.16.6	Approach Bridge	Meter	2000.00
Note	i) The contractor at his request may be allowed to start construction of masonry steining so as not to allow silting of well in on coming monsoon and while paying masonry 25% amount shall be withheld and		



S.No.	Particulars of Items	Unit	Rate (in Rs.)
	released only when excavation to the full depth is completed.		
	ii) Dewatering: Total dewatering charges are to be proposed in the tender as lump sum amount and 75% is payable for excavation and 25% is payable for construction of well/gallery. Out of 75% excavation, break-up shall be as under		
	25% for last 1 m depth		
	20% for 2 m depth which just above last 1 m depth		
	15% for 2 m depth which just above last 3 m depth		
	15% for the rest of depth from water table level.		
	iii) The provisions made for dewatering in the tender being on lump sum basis, the same shall have to be reduced/increased proportionately as the length of approach channel, connecting main or approach bridge reduces/increase during actual execution.		
	Condition No. (i) and (ii) shall appear in tender document.		
16.17	Carrying out recuperation/yield test for asserting the discharge of constructed well/excavated profile as directed by Engineer-in-charge. The test carried out by drawing down water from the well/profile below normal/subsoil water level up to full depth rise is water level is recorded. The normal water level/subsoil water level in the well/profile as well as strainer/suction level at pump as per design of W.S. scheme shall be recorded prior to the test including cost of all materials. overhead, labourers etc. completed as directed. (The test shall be carried out for 7 days.)		
16.17.1	Lps more than 25,000	Day	2850.00
16.17.2	Lps less than 25,000	Day	2052.00
16.18	Detailed physical survey, sanitary survey, Hydrological survey, Geological investigation including trial bores for soil investigation / test for preparation of river cross section, fixing of HFL, structural design & estimation for intake wall, approach bridge, coffer dam etc. complete as directed by the Engineer-in-charge in / near, river / stream / dam / lake / spring / canal etc. collection of data regarding design of complete item of intake well from relevant department etc. all level will be with reference to mean sea level including following work:-	Job	5% of estimated cost.
(i)	Preparation of Contour plan general arrangement drawing, layout of site, cross-section of site on proper scale as directed by the department.		
(ii)	Architectural/ Structural drawing having following items:		

<b>S.No.</b>	<b>Particulars of Items</b>	<b>Unit</b>	<b>Rate (in Rs.)</b>
(iii)	Layout plan. Elevation, cross-section i/c details of cofferdam, approach bridge, intake well, and different small element relevant to complete item of intake well.		
(iv)	Preparation of estimate on prevailing schedule of rates, architectural drawing / structural drawing for technical clearance from proper competent sanctioning authority state government or it may be central government department. Complete set of drawing and estimate will be submitted in 6 sets.		

# **CHAPTER - 17**

## **WATER TREATMENT PLANT**

## **CHAPTER-17**

### **WATER TREATMENT PLANT**

**Note.** (In this chapter items are only for estimating purpose, shall not be considered for the direct payment of the work to the contractor).

#### **General Scope of Work**

#### **1. CONVENTIONAL WTP**

- 1.1** Soil Investigation, Topographical Survey, Planning, Designing (aesthetically), providing and constructing , Testing, commissioning and trial run conventional Water Treatment Plant consisting of all Civil, works including cost of Providing and applying Epoxy paint to inside surface of water retaining structures in contact with chlorine and providing, ceramic tiles for flooring, Acrylic emulsion with silicon additives paint from outside, stainless steel railing, Mechanical and Electrical components of various sub-works as given below: including necessary hydraulic testing, structural testing equipment testing, trial run for a period of 3 months, etc. complete as per detail specification vide Appendix 'A' or as directed by Engineer-in-charge (turn-key job).
- 1.2 Aeration Fountain:** Plan area not less than 1.25 square meter per MLD.
- 1.3 Parshall Flume/ SS wier:** SS wier with necessary devices, consisting of simple mechanical indicator. (Pedestal type gauge) up to 10MLD capacity. For above 10MLD capacity Parshall flume shall be provided with ultrasonic flow indicator with flow totalizer.
- 1.4 Flash Mixer:** Rapid mixing device, detention time 60 seconds to give velocity gradient 300 to 400 sec-1 vane mixer type confirming to I.S. 7090 of 1985.
- 1.5 Flocculator:** The design criteria are as follows,
  - i. Depth of Tank should be 3 to 4.5m.
  - ii. Detention time should be 30min.
  - iii. Total paddles area should be 10 to 25% of the cross-sectional area of tank.
  - iv. Velocity of flow- 0.2 - 0.8m/s.
  - v. Confirming to I.S. 7208 of 1974 (Type-C).
- 1.6 Clarifier:** Horizontal flow circular tank, detention period 2 - 2.5 hours, surface loading 30-40m<sup>3</sup>/m<sup>2</sup>/day (to be specified), MS V-Notch shall be provided with Weir loading not more than 300 cubic metre per metre per day, with mechanical sludge scraper conforming to I.S. No.10313 -1982 with necessary inlet arrangements.
- 1.7 Rapid Sand Filters and Filter House:** Filter designed for filtration rate of 4800 liters per square metre per hour for normal run and it shall not exceed 6000 liters per square metre per hour with 20% overloading, minimum 2 beds for plant upto 10 MLD, for larger plants as specified, filters to be located in filter house, pipe gallery and platform minimum 2.5 metre in width

with constant rate filtration or declining rate filtration along with mechanical flow measuring device for the capacity up to 10MLD and ultrasonic flow transmitter for the capacity above 10MLD. All valve shall be glandless.

- 1.7.1 **Filter Sand** : Effective size 0.45 to 0.70 mm, uniformity coefficient not more than 1.7, nor less than 1.3, depth of water over sand 0.75 M, free board 50 cm, gravel 0.45 M in depth, sand and gravel conforming to I.S. 849 (i)-77, back wash by air wash, standard appurtenances
- 1.7.2 **Wash Water Tank**: Capacity to be specified and suitable to supply water to wash 1 filter beds at a time 10 minutes @ 600 lit/sqm/min under a head of 12m at under drain along with manhole cover, 450mm wide aluminum/ SS ladder, Float operated mechanical gauge etc.
- 1.7.3 **Wash Water Pumps**: Centrifugal type pump of capacity to fill water tank in 2 hours with 100 % standby along with NRV, Dismantling joint, Sluice/ BFV, Ci/ DI pipe and starter panel etc.
- 1.7.4 **Air Blowers**: Capable of delivering 600 LPM per square meter of free air, of filter area at 0.35 kg/square cm at the underdrains (100% stand by) for period of 5 min. Air blowers shall be adopted for WTP having capacity more than 3 mld only. Below 3 mld capacity, Air blowers shall not be adopted.
- 1.8 **Chemical House -**
  - 1.8.1 Accommodation for 90 days alum & lime requirement and sundry storage (Minimum 4 m height) along with adjoining space for Air blower
  - 1.8.2 First floor to accommodate alum and lime tanks. Chain pulley block etc. and laboratory (min. 5 m height) shall be provided. However, any other suitable arrangement/ plan for chemical house can also be adopted with min. area requirement to be fulfilled as per the following formula or as specified in the contract; which ever is more.
  - 1.8.3 Alum & Lime storage area (A) of required size in SQM shall be as follows-  

$$A = \frac{1.2 \times (D_A \times \text{MLD of plant} + D_L \times \text{MLD of plant}) \times 90}{\text{Alum density} \times 2 \text{ ( ht )}}$$

Where,  $D_A$  is rate of Alum dosing in PPM,  $D_L$  is rate of lime dosing in PPM.
- 1.9 **Solution tanks**: Minimum 2 tanks (one for preparation. and second for dosing), each tank capable of giving 8 hours maximum dose without interruption, minimum free board 0.30 M, trays for dissolving, level indicator, mechanical agitation devices, solution feed and drain lines, solution feed device (constant head/ Dosing pump device, strength of solution upto 10% for Alum & 5% for lime only) conforming to I.S. 9222 part-I/1979.
- 1.10 **Pure Water Sump and Pump House**
- 1.11 **Capacity of sump** : 45Min. Detention up to 10MLD capacity with can be negative suction and 60 min. detention for the plant above 10MLD with positive suction. This capacity will be divided in 2 compartments capable for isolation provided with scouring arrangement overflow arrangement, manholes, air ventilation cowels, ladders, etc., in case the capacity is greater than 500 KL.

### 1.12 Pump House

Pump house of required size over the sump or by the side. Size of Pump House shall be as follows;

$B = 4\text{m}$  Min. up to 10MLD and for above,  $B = (Q + 2.0 + \text{space for accommodation of valves \& header pipe}) M$

$L = (P \times N) + (N \times 0.75) + 2\text{m}$  Clearance from both sides. Where, B- Width of Pump House, L- Length of Pump house, P- length of pump foundation, Q- Width of Pump foundation, N- nos. of pump.

However minimum area for pumping equipment shall not be less than 35 Sqm and the minimum area for accommodate panel, store and office room shall be 50 Sqm or as specified in contract.

### 1.13 Electrical Panel room, Maintenance way, office, store etc. at Pump House. Minimum area shall be as follow or as specified in contract,

Sr. No.	Plant Capacity	Area of office room (M2)	Area of panel room (M2)	Area of store room (M2)	Area of maintenance way (M2)	Total area (M2)
1	Up to 5 MLD	15	10	15	10	50
2	Above 5 MLD & up to 10 MLD	200	15	15	10	60
3	Above 10 MLD & up to 20 MLD	25	20	20	15	80
4	Above 20 MLD & up to 50 MLD	30	25	25	20	100
5	Above 50 MLD & up to 100 MLD	30	30	25	30	115

### 1.13 Vacuum feed type chlorinators

1.13.1 Make to be approved by PHED MP. Confirming to I.S. 10533 - A Part-II 1983.

1.13.2 Rate of withdrawal of chlorine from container depends upon the size of container and the surrounding temperature, for guidance table given below may be followed.

Temperature 0c	Chlorine discharge per day in Kg.		
	Cylinders		Tonner Container
	(45 Kg)	(67 Kg)	
10	6.35	9.50	110
15	10.75	16.10	130
20	14.50	21.54	254
27 and above	18.70	28.12	315

1.13.3 When the gas discharge rate from a single container does not meet the requirements, two or more containers can be connected to a manifold and discharge simultaneously. It is advisable not to couple more than 4 containers to a manifold.

### 1.14 Chlorinator Equipment and Container room

□ Handling, storage and safety shall confirm to I.S. 10553 Part - I 1983.

- 100% Standby shall be provided.
  - 100 kg chlorine cylinder for capacity upto 5 mld and chlorine tonner for capacity above 5 mld.
  - ° Gaseous operated chlorinators for Disinfection 1 working +1 standby for Pre & post chlorination with max. dosing up to 2PPM and 3PPM of CL2 respectively 30 days storage.
  - ° Minimum area for chlorinator room shall be 12 Sqm or as per specified in contract.
- 1.15 **Tonner storage area of required size shall be as follows-**  
 B= 5m min ,  
 $L = ((0.8 \times N) + ((N-1) \times 0.60) + 1 + 3.5)$  meter.  
 Where B= width of tonner room , L= Length of tonner room and N= Number of tonners of cap 900 kg required as per MLD wise consumption of chlorine.
- 1.16 **By Pass arrangements:** (i) By passing all units of T.P. along by using suitable CI/MS sluice gates (ii) By passing Flash mixer , clarifloculator by using suitable CI/MS sluice gates.(iii) By passing flasah mixer, clarifloculator & filter units by using suitable CI/MS sluice gates.
- 1.17 **Disposal of waste/sludge from WTP:**  
 Safe disposal arrangement shall be provided. This provision shall be comprised of RCC NP-2 pipe of minimum 150mm dia or calculated with considering velocity 1.2 m/ sec. with manholes at an interval of 30m C/C. The manholes shall be of RCC/ brick chamber with RCC cover. The waste water/sludge disposal arrangements upto length of 100m is included and it should be safely disposed to nearby nallah.
- 1.18 **Electrical installation.** Both internal and external lightening.  
 (I) External Lightings should be Min. 60 LUX around up to 10 meter from WTP building. (II) Internal Lighting inside building shall be sufficiently illuminious as per relevant IS-3646 OR as specified in the tender .(III) All the electrical panles shall be manufactured of MS sheet of Min. thickness as 14 Gauge with Powered coating .  
 (IV) Motor starters shall be as follows -  
 UP TO 10 HP - DOL STARTER, UP TO 75 HP - STAR- DELTA STARTER, MORE THAN 75 HP - SAOFT STARTER
- 1.19 **Laboratory Equipment:** As per requirement of tender (or as per provisions made in the CPHEEO Manual- 1999–duly amended)
- 1.20 **Sanitary blocks :** Carpet area-15 square metre minimum upto 20 MLD and 25 square metre above 20 MLD.
- 1.21 **Administrative block:** To accommodate office room. laboratory room, Control room, Conference Room and toilets etc. Min area 24 Sqm shall be provide or as per contract.
- 1.22 **RCC Structures:** All water retaining structures shall be constructed in M-30 and other shall be in M-25 grade of concrete.
- 1.23 **Over loading Capacity:** All pipes and conduits channel with 25% overloading capacity except Filter pipes, which are to be designed for 10% loading .

1.24 **MS Steel structures:** All the structural steel work / fabrications are to be provided with application of Hot Dip Zinc coating according to specifications as per IS: 4759:1996 (Reaffirmed 2006)

1.25 **Railing :** All the treatment units e.g. Cascade aerator, Flash mixture, Clariflocculator, Filtration units should be connected with walkway of 1.2 m wide suitably have provision of 3 Row x25 mm dia. GI (medium class) railings and railing post of 100 Dia placed @ min. 2.0 m C/C .

#### 1.26 **Other Facilities**

1.26.1 **Automation :** PLC/SCADA shall be provided as per the requirement. Cost of PLC/ SCADA and Instruments is not included in the cost of WTP and shall be added separately.

1.26.2 **Boundary Wall :** The cost of Boundary wall, Internal road, Guard room, Rain water harvesting and Storm water site drainage is not included in cost of WTP.

#### 1.26.3 **Recycling of Waste Water Arrangement**

- WTP of capacity 5 MLD and above, it is mandatory to provide backwash water recycle arrangements which includes sump, pumping machinery, rising main etc. complete.
- However, provision of the same may also be made in the WTP of lower capacity.
- The cost of recycling arrangement is not included in the cost of WTP.

#### 1.27 **Notes:**

All the conditions from 1.1 to 1.25 shall form a part and partial of the tender document and must be incorporated in the draft NIT of conventional WTP.

#### 1.27.2 **Rates**

Below mentioned rates are for foundations, with individual footing with bearing capacity of 15 t/sqm. However, these rates shall be increased by:-

1. 10 % where safe bearing capacity (SBC) is less than or up to 5 t/sqm,
2. 7.5 % where SBC is more than 5 t/sqm and up to 10 t/sqm,
3. 5 % where SBC is more than 10 t/sqm. and up to 15 t/sqm,

Following rates are for seismic Zone – III. For Zone IV, these rates shall be increased by 5%. Concerned Executive Engineer shall confirm the seismic zone for the scheme from seismic zones plan before estimation and adopt appropriate rates as per actual seismic zones.

#### 1.27.2 **This USOR contains the rates of all the items without GST.**

#### 1.28 **Rates for Conventional Treatment Plants**



## WATER TREATMENT PLANT

Sr. No.	Particulars of Items	Unit	Rate (Rs. in Lakh)
<b>17.1</b>	<b>Water Treatment Plants - Conventional</b>		
17.1.1	Cost of 1 MLD Treatment Plant	Job	108.70
17.1.2	Cost above 1 MLD and upto 2 MLD Treatment Plant	Per MLD	52.00
17.1.3	Add per MLD above 2 MLD and Upto 5 MLD	Per MLD	35.50
17.1.4	Add per MLD above 5 MLD upto 10 MLD	Per MLD	31.50
17.1.5	Add per MLD above 10 MLD upto 20 MLD	Per MLD	31.40
17.1.6	Add per MLD above 20 MLD upto 50 MLD	Per MLD	31.30
17.1.7	Add per MLD above 50 MLD upto 100 MLD	Per MLD	28.60
17.1.8	Add per MLD above 100 MLD	Per MLD	20.00

**CHAPTER - 18**

**REINFORCED CEMENT CONCRETE ELEVATED  
SERVICE RESEROIRS (ESR)**

## CHAPTER-18

### REINFORCED CEMENT CONCRETE ELEVATED SERVICE RESEROIRS (ESR)

**Notes: (In this chapter items are only for estimating purpose, shall not be considered for the direct payment of the work to the contractor).**

1. Scope
  - 1.1 The Specification covers guidelines for layout for overhead water tanks / Ground Reservoir and Criteria for analysis for RCC staging for concrete tanks.
2. Applicable Codes

IS 3370 Part-I, II & IV	Code of practice for the Reinforced Concrete structure for the storage of liquids.
IS 456	Code of practice for the plain and Reinforced Concrete.
IS 269	Code of practice for Portland cement
IS 383	Code of practice for aggregates
IS 432 (Part-I)	Code of practice for Mild Steel and Medium tensile steel bars.
IS 1786	Code of practice for Cold twisted steel bars
IS 226	Code of practice for Structural steel sections
3. Excavation shall be done as per safety codes IS 3764: 1992
4. Concrete work shall be done as per IS 456: 2000
  - 4.1 As per IS 3370, Parts of structure neither in contact with liquid on any face nor enclosing the space above the liquid, concrete mix less than M 20 shall not be used.
  - 4.2 The minimum quantity of cement in the concrete mix shall not be less than 330 kg per cum and maximum quantity of cement in the concrete mix shall not exceed 530 kg per cum in reinforced concrete works
5. Cement shall be used as IS standard given below:
  - 5.1 When the strength of concrete required is up to M-20, then O.P.C. Conforming to IS 269-2015 or P.P.C. Conforming to IS:1489-2015 may be used.
  - 5.2 When the strength of concrete required is more than M-20 but up to M-30, then O.P.C. Conforming to IS: 8112 2013 shall be used:-
  - 5.3 Pozzolana cement is now being widely produced all over country. This may be used in structures in contact with water as per I.S. code. In specific cases requiring higher grade of strength, use of Ordinary Portland Cement (OPC) should invariably be ensured.
6. Sand
  - 6.1 Sand is the fine aggregate which is obtained either from natural source like river bank or from pits etc. Sand can also be produced by crushing stone are gravels. It should pass through 4.75 mm IS sieve.
  - 6.2 Sand should be free from clay, dust or silt. The permissible limit for the

same is 5% by weight.

- 6.3 Sand should be free from organic impurities as determined is in accordance with IS: 2386 (Part-II).
  - 6.4 For plaster sand used should Conform to IS: 1542/1992.
  - 6.5 For masonry work sand used should Conform to IS: 166/1965 2116/1980.
- 7. Other I.S. Codes not Specifically mentioned here but pertaining to the use of Electrically Welded Steel pipes shall form part of these Specifications.
  - 8. Capacity: Capacity of the tank shall be the volume of water it can store between the designed full supply level and lowest supply level (that is, the level of the lip of the outlet pipe). Due allowance shall be made for plastering the tank from inside if any when calculating the capacity of tank.
  - 9. Height of Staging: Height of staging is the difference between the lowest supply level of tank and the average ground level at the tank site.
  - 10. Water Depth: - Water depth in tank shall be difference of level between lowest supply level and full supply level of the tank.
  - 11. Seismic Forces: - When seismic loading is considered, following two cases may be considered:
    - 11.1 Tank empty:
    - 11.2 Tank full
  - 12. The seismic force acting on the support for the tank and its analysis shall be in accordance with IS: 1893 - 1984.
    - 12.1 Staging and other reinforced concrete members including foundation shall be designed in accordance with the requirements of IS: 456-2000. Increase in permissible stresses for column staging shall be as per IS: 456-2000.
    - 12.2 The staging height of 9mtr. has been considered for the computation of the rates of ESR.
  - 13. Generally, the shape and size of elevated concrete tanks for economical design depends upon the functional requirements such as:
    - 13.1 Maximum depth for water;
    - 13.2 Height of staging;
    - 13.3 Allowable bearing capacity of foundation strata and type of foundation suitable;
    - 13.4 Capacity of tank;
    - 13.5 Other site conditions.
  - 14. **Measurement:**
    - 14.1 All the measurement shall be recorded under the relevant item of the work.
  - 15. Rates
    - The rate shall be lump sum cost of OHT/ GSR including the cost of materials and labour involved in all the operations except for the items measured/ enumerated separately having under clause 'Measurements', which shall be paid for separately.
  - 16. **GENERAL SCOPE & SPECIFICATION FOR ESR / OHT**
    - 1. Preparation of structural design, drawing, construction, testing & commissioning and trial-run of RCC Elevated Service Reservoir/Over Head Tank (ESR/OHT) of

various capacities and staging/height Complying with provisions of relevant Indian standards and Engineer-In-Chief, MPPHED, guidelines issued vide circular No.8674 Date 05.10.2018 and Technical circular no.-8870, dated 15.10.2018 may be followed. Using latest Soil [investigation Report of proposed site, Seismic zone, Wind speed Zone. Including:

2. General guideline for construction of OHT (except design part) from E.N.C. PHED, Bhopal Circular no. 236, and Dated 21.05.1997 shall be followed along with IS 456:2000 and IS 3370-2009 Part I to IV.
3. List of Indian Standards for Design of ESR/ OHT:

**Note:** The structural design of ESR shall be in accordance with provisions of relevant Indian standards

- (i) I.S.3370 part I to IV 1965 or Its latest revision
  - (ii) IS 456-2000 Reaffirmed 2016
  - (iii) IS 11682- 1985 Reaffirmed 2003
  - (iv) IS 1893-2016 part I to V
  - (v) IS 13920-1993, or Its latest revision
  - (vi) IS 875 part I to III, 1987 or Its latest revision
  - (vii) IS 11089- 1984 Reaffirmed 2002.
4. Container shape of any suitable type (or as specified), preferably Circular.
  5. Water depth in container shall be adopted as per the requirement of capacity of Tank specified in the tender or as per required Design. Capacity shall be calculated as storage between the designed full supply Level excluding free board of the reservoir and Lowest supply Level (that is, the level of the lip of the outlet pipe).
  6. Staging consisting of column brace trestle / combination column- brace trestle as appropriate (or as specified)
  7. In case of column -brace trestle type staging having more than 6 columns internal horizontal bracing is obligatory. One bracing shall be at foundation level in case of individual footings.
  8. Min. size thickness of various components shall be provided as per design criteria /specifications / IS Code (or as per std. practice). Capacity of the ESR shall be considered excluding free board.
  9. Minimum dimensions specified for various components in tender data /specifications should be provided.
  10. Maximum spacing between horizontal bracings shall be 5 m (story height).
  11. For ESR-having staging height more than 15 m the spiral staircase shall be provided outside the staging with effective tie beams in more than one direction.
  12. Container bottom slab shall preferably be flat slab.

13. All types of labor & material charges of lowering, laying, erecting / hoisting & jointing of pipe assembly of Inlet, Outlet, overflow, washout and bye pass arrangement as per hydraulic design are including.
14. Providing and fixing of any accessories (specified), CI Manhole frame and covers, water level indicator, lightening conductor, GI Pipe railing around walk way, at roof level, at gallery and both sides of staircase. Adequate cowl type ventilators or lantern type ventilator with stainless steel Jali. Aluminum ladder to provide access inside the tank.
15. 14. The rate shall include providing and fixing pipes, specials, and valves required for inlet, outlet, washout, over flow and Bye- pass arrangement as stipulated in tender documents. The scope of work includes constructing supporting RCC Pedestal for Duck foot Bend, erecting, laying, fixing and joining pipes and special up to Min. 3 m length from face of staging (outer most columns). RCC chambers for valves. Drain out for scour Pipe/ Overflow Pipe min. up to boundary of campus
16. The rate shall include cost of dewatering during execution making all arrangement with any dewatering technique.
17. Scope of work includes constructing RCC spiral staircase with adequate tie beams, staircase footing, Ventilating shaft and ventilators as well as door after first flight of Staircase to prevent intruders SS grating to be provided to outlet pipe (inside container) for safety.
18. An outside Door/ GATE of minimum 1.8 m height to be provided at 1<sup>st</sup> landing of staircase in order to avoid entry of anti-social elements.
19. Water level indicator shall be provided and fixed float type /electronic (as specified).
20. This will also include cement plaster in CM 1:2 with approved water proofing compound all over inside container (i.e. walls, base, top slab/dome bottom etc. all). Including providing and applying three coats of all-weather exterior paint (as specified) to the whole structure.
21. It also includes satisfactory water tightness test as per relevant I.S. Code and painting name of scheme & capacity on the tank as per direction of Engineer in charge. Approval of design/drawing from Government Institution will be the responsibility of contractor, if provided by contractor.
22. The structure shall be designed properly for up lift due to Ground water table specified in data or GWT encountered during execution. No extra payment shall be paid for the same.
23. Agency shall engage qualified (at least graduate) consulting Engineer for designing the structure and he/she shall visit the site for guidance of work at all levels (i.e. below foundation, up to GL, above GL for all lifts up to container).

#### **24. Sand/ Fine Aggregate**

Fine Aggregate shall be consisting of naturally occurring (Crushed or uncrushed) stones, gravel and sand or combination thereof. They shall be hard, strong, dense, durable, clear and free from veins and adherent coating and free from injurious amount of disintegrated pieces, alkali, vegetable matter and other deleterious substances.

The sand shall be as per IS: 383. The preferable sand shall be Narmada

river sand. The sand for plaster shall be confirming IS: 1542.

The coarse sand should be free from soil. This can be checked easily by half filling a transparent glass with the sand sample and the other half by clean water. Stir the sand vigorously. Silt in the sand can then be easily seen in the top water portion. Use always tested sand.

## **25. Metal/ Coarse Aggregate-**

Coarse Aggregate shall be consisting of naturally occurring (Crushed or uncrushed) stones, gravel and sand or combination thereof. They shall be hard, strong, dense, durable, clear and free from veins and adherent coating and free from injurious amount of disintegrated pieces, alkali, vegetable matter and other deleterious substances.

Metals/ Coarse Aggregate shall be confirming to IS: 383.

It is advisable to use metal derived from igneous rock preferably of basaltic of granite origin.

## **26. Steel for Reinforcement**

All the iron and steel required for the work will be procured by the contractor at his own cost. The contractor shall be required to produce the test certificate of the manufacturers to the department before use of steel for the work. No untested steel will be allowed to be used under any circumstances. The Department however reserves the right to get the received/ supplied steel tested at the cost of the contractor. Steel for reinforcement shall be confirming to latest BIS specification IS: 1786 for Deformed Steel Bars and wires. All the steel above 6mm dia shall be deformed bars with strength grade of Fe-500. If the steel being used is of 6mm diameter bars at any place, then it shall be plain steel conforming to IS: 432. The contractor shall be required to produce the test certificate from manufacturer to the Engineer-in-Charge, before use of steel for the work. No untested steel shall be allowed to be used under any circumstance.

HYSD Fe 415/500 grade reinforcing bars confirming to I.S. 1786-2008 shall be considered in design. CRS/TMT bars shall be provided. In saline atmosphere corrosion resistance stainless steel/HCR rebar shall be provided. Any other steel can be used with approval of C.E./in the situation of non-availability in market without extra cost.

## **27. Cement**

In accordance to the instructions contained in Govt. of M.P. PHED, Bhopal, Memo No. F-16- 28/34 2/87 dated 28-1-1991 cement required for the work will be procured by the contractor at his own cost from time to time as per requirement. The cement to be used in the work shall be 43 grade Ordinary Portland Cement (OPC) conforming to IS: 8112 or IS: 12269 approved by the Engineer-in-Charge, for all important and water retaining structures. Minor works e.g. PCC, thrust blocks, anchor blocks, etc. may be constructed with OPC conforming to IS: 269 or PPC conforming to IS: 1489. It shall be tested for following test at contractor's cost. For under water concreting rapid hardening cement shall be used.

## **28. Concrete in water retaining structures:**

The Min. concrete grade for RCC shall be M-30 for water retaining structure and M-25 for remaining structure of concrete ingredients shall be as per Mix design using weigh batching.

All concrete shall be mixed in concrete mixer and compacted by mechanical

vibrators. Slump tests shall be carried out during concreting and sample test cubes prepared as per direction of Engineer-in-Charge tested by the contractor at his own cost. The results of the tests shall conform with the required standards and if the test results are not found satisfactory or otherwise also if the Engineer-in-Charge considers that a structural test is necessary, the same shall be carried out as instructed by the **Engineer-in-Charge** at contractor's expenses and if the results of this be unsatisfactory the contractor will be bound to dismantle and reconstruct the particular portion of work which has given unsatisfactory test results. The contractor shall make arrangement for testing of construction material and concrete at site itself. In general concrete shall be designed as per IS: 456 (latest edition) and concrete for water retaining structures shall be designed as per IS: 3370-Part-II (latest edition). All the components, which are in contact of water and its roof slabs or domes, shall be of minimum Grade M-30. All other components not in contact with water shall be of minimum M-25 Grade. The cement content per cubic meter of concrete shall not be less than the provisions of IS: 456 latest addition. The concrete shall be prepared as per mix design. All ingredients of concrete shall be weighed and mixed as per the mix design. All concrete shall be mixed by concrete mixer and compacted with concrete vibrator only.

The contractor shall setup a laboratory for testing of metal/ aggregate, concrete, cement etc. on the site. Slump test shall be carried out by contractor at its own cost. During concreting, sample test cube shall be prepared as per the frequency prescribed in IS: 456 and shall be tested by contractor at his own cost. To assess the strength of cube immediately, accelerated curing testing may also be conducted as required by the Engineer-in-Charge. If the result of the test shall not be in conformity with the required standard and if the Engineer-in-Charge considers that the structural test is necessary, the same shall be carried out by the contractor at its own cost. If the result of this comes unsatisfactory again then the contractor shall be bound to dismantle and reconstruct the particular portion of work.

It is extremely essential that the contractors undertaking the work should have a concrete mixer with them. No hand mixing should be allowed.

In no case the concrete should be laid without vibration. It is describable to keep two concrete vibrators at the construction site so that in case of a break down the other vibrator can be used. It is desirable that the divisions have with them at least two concrete vibrators, which is an essential T & P for laying concrete.

It is extremely important to make arrangements for supply of sufficient water at the construction site for curing of the concrete. Continuous and efficient curing for minimum required period is extremely important for development of good compressing strength in any concrete structure.

## **29. Testing of Construction Materials**

### **i. Testing of Sand: -**

Following test shall be conducted before the starting of construction work from any Engineering Collage/ NABL approved lab;



S. No.	Type of Test	Reference & latest amendments up to date
1.	Particle Size and shape	As per IS-2386- Part- I- 1963
2.	Fineness modulus	As per IS-2386- Part- I- 1963
3.	Bulking tests (Dry Bulk density)	As per IS-2386- Part- III- 1963
4.	Silt content	As per IS-2386- Part- I- 1963
5.	Specific Gravity	As per IS-2386- Part- III- 1963
7.	Soundness Test	As per IS-2386- Part- V- 1963
8.	Deleterious Materials	As per IS-2386- Part- II- 1963

**ii. Testing of Metal/ Coarse aggregate (20 mm Graded): -**

Following test shall be conducted before the starting of construction work from any Engineering Collage/ NABL approved lab;

S. No.	Type of Test	Reference & latest amendments up to date
1.	Aggregate impact value	As per IS-2386- Part- IV- 1963
2.	Particle size distribution (20mm graded)	As per IS-2386- Part- I- 1963
3.	Flakiness and Elongation Index Test	As per IS-2386- Part- I- 1963
4.	Specific Gravity & Water Absorption	As per IS-2386- Part- III- 1963
5.	Bulk Density	As per IS-2386- Part- III- 1963
7.	Los-Angeles abrasion value	As per IS-2386- Part- IV- 1963
8.	Soundness Test	As per IS-2386- Part- V- 1963

**iii. Testing of Cement: -**

Following test shall be conducted before the starting of construction work from any Engineering Collage/ NABL approved lab;

S. No.	Type of test	Reference & latest amendments up to date
a)	Test for initial and final setting time	As per IS: 4031- Part 5- 1988
b)	Test for determination of Compressive strength of cement as	As per IS: 4031- Part 6- 1988
c)	Specific Gravity	As per IS: 4031- Part 11- 1988
d)	Soundness	As per IS: 4031- Part 3- 1988

**iv. Water: -**

Following test shall be conducted before the starting of construction work from any Engineering Collage/ NABL approved lab;

S.NO.	Type of Test	Reference & latest amendments up to date
1.	ALKALINITY	As per IS-3025- Part- 23- 1986
2.	ACIDITY	As per IS-3025- Part- 22- 1986
3.	ORGANIC SOLIDS	As per IS-3025- Part- 17- 1984
4.	INORGANIC SOLID	As per IS-3025- Part- 17- 1984
5.	SULPHATE as Cl	As per IS-3025- Part- 28- 1988
6.	CHLORIDE as Cl	As per IS-3025- Part- 32- 1988
7.	SUSPENDED SOLID	As per IS-3025- Part- 17- 1984
8.	TOTAL HARDNESS	As per IS-3025- Part- 21- 1983

**v. Testing of Steel Reinforcement: -**

Following test shall be conducted before the starting of construction work from any Engineering Collage/ NABL approved lab;

S.NO.	Type of Test	Reference & latest amendments up to date
1.	Tensile Strength	As per IS-1786- 2008
2.	Elongation Test	As per IS-1786- 2008
3.	Bend & Re-bend Test	As per IS-1786- 2008
4.	Unit Weight	As per IS-1786- 2008

**vi. Testing of Concrete Mix: -**

FOR M-15 grade of concrete mix, nominal mix may be used with ratio of Cement – Sand – Metal @ 1:2:4

FOR M-25 & M-30 grade of Concrete, Mix to be designed for desired strength & workability as per IS 456:2000. Contractor may propose proportion of Trail mix limiting to minimum cement content & W/C ratio as per the E-IN-C PHED circular vide no.236, dated 21.05.1997. Such proposed mix may be verified by the engineer in charge at site before construction starts or A suitable concrete mix may be designed from any Govt. Engineering collage or polytechnic and same mix shall be verified for desired strength & workability by the Engineer in charge.

Concrete cube test for compressive strength & slump test shall be done for each concreting work at the frequency as per IS 456:2000.

**30.SBC & FOUNDATION & STRUCTURE UP TO GL –**

1. The Safe bearing capacity (SBC) /allowable pressure on soil shall be refined from latest SBC test report or tender datasheet. During execution. If poor soil strata or ground water table is encountered, the SBC shall have to bere-ascertained and the design should be revised accordingly.

2. Appropriate foundation system. This includes excavation in all types of soil strata (including hard rock), casting 100 mm thick P.C.C. leveling course in M-10, Refilling the pit with proper soil and disposing of the surplus stuff at all required lead and lift.
3. Before the starting of work the bearing capacity of soil must be tested/ verified and accordingly standard drawing shall be adopted. SBC shall be tested at the foundation level by Plate load test method as per IS 1888-1982 from any Engineering collage or NABL approved lab. For black cotton soil or filled up soil, in addition to plate load test, the SPT and any other laboratory test may be adopted as per IS 6304-1981 to find out the actual SBC for the purpose of design.
4. Staging height shall be considered from the bottom of GL brace. Bottom of GL brace shall be fixed at highest level of top of existing surrounding Road. Normally site should be selected at higher elevated places. So that it should be free from any chance of water accumulation and rain water or over flow etc can be easily drain out from the OHT boundary. However due to unavoidable reasons, if the location of OHT selected in depression then the depression should be filled up to GL brace by non-compressive soils like moorum / stone dust/ sand etc with proper compaction up to OMC about 98% but in all such cases the length of column below GL brace from top of foundation shall not be more than 4.0 m.
5. The minimum depth of foundation for all type soils (other than black cotton soil) shall be placed (-2.0) meter from the lowest Ground level, For Hard rock type soils the foundation can be placed at minimum 1.0 m below the top of hard rock & for the soils mixed partly with or fully black cotton soils, the Raft foundation shall be placed at minimum (-3.0) m from the lowest Ground level. In depressed area of OHT , filling is done up to such height that top of plinth protection should match with top of GL brace and bottom of GL brace fixed at highest level of surrounding Road. The maximum depression of selected site should not be below (- 4.0) m from the highest level of surrounding road.
6. Provide raft foundation for soil having S.B.C. below 10T/m<sup>2</sup> (for SBC ranging between 7.50 M/T<sup>2</sup> to 9.99 T/M<sup>2</sup>) & it shall be designed for min. SBC @ 7.5 T/m<sup>2</sup>. Sites having SBC below 7.50 T/ M<sup>2</sup> should be avoided for constructing OHT. If it is unavoidable then in such case for below SBC, separate design of raft foundation with complete OHT to be prepared after proper soil investigation.

### 31. Pipe line Arrangement:

- i Inlet, Outlet, Overflow, Scour Pipes, specials & valves i/c chambers etc. shall be as per the contract document. All the Pipes shall be supported on Duck foot Bend.

S. No.	Particulars	Type of Pipe	Internal Nominal Diameter in mm.
1.	Inlet pipe lines	C.I. D/F, IS 7181/1536 Class B or D.I. D/F Class K-9/ K-12 IS 8329-2000 latest version	As per Diameter of Incoming pipe.

S. No.	Particulars	Type of Pipe	Internal Nominal Diameter in mm.
2.	Outlet pipe lines	-do-	Next higher Diameter than inlet or size of main pipe of distribution network, whichever is higher
3.	Overflow pipe	-do-	Next higher Diameter than inlet
4.	Scour pipe	-do-	Min. 100 mm or above suitable to capacity

On the bottom floor of the water container cast iron or stainless-steel grate should be provided over the supply outlet and scour outlet. This is essential to prevent any accident for the labor attending to periodical cleaning of the tanks., Cast iron grates 20x20mm or stainless steel square 20x20mm can be used with square frames on top of the outlet.

The over flow outlets should not be connected to the distribution system. Connection of over flow pipe to the distribution system can result in over filling of the elevated service reservoirs in case supply valves of the distribution system are not open. The over flow outlet should always be kept open for draining any excess storage in the tank.

R.C.C. chamber with RCC cover surrounded outside by M. S. steel angle frame shall be designed for suitable size as tabulated below. For details refer drawing no. MPJNM\_OHT\_TYP\_VALVE CHAMBER.

S. No.	Dia. of Valve	Chamber Size		
		Length (mm)	Width (mm)	Depth (mm)
1.	500	1500	1500	1700
2.	450	1500	1500	1700
3.	400	1250	1250	1400
4.	300	1250	1250	1400
5.	200	1000	1000	1000
6.	150	1000	1000	1000
7.	100	1000	1000	1000

### 32. Lightning Arrestor:

Lightning arrestor shall be copper bar of 25mm dia. and 1.2m long with 5-pointed copper string at top connected by aluminum/ GI strip of 25mm width and 3mm thickness and the strip shall be connected to a 600x600x6mm thick copper/ GI plate embedded below ground with 40mm dia. GI pipe in earthing etc. complete. Lightning arrestor shall comply IS: 2309 & Earthing shall comply to IS: 3043.

### 33. Water Level Indicator:

Each tank should be provided with water level indicator. Water level indicator shall comprise of PVC float which should be 10cm more in diameter than outlet pipe. The plate shall have turned edged to accommodate and to make easy movement of counter weight made of iron pointer fixed with guide pulley

provided with white enamel paint write up with radium blue or black color letters. It shall be fixed on container wall.

**34. Ladder to access inside the tank:**

600 mm wide Aluminum ladder with rectangular section for vertical support of 100x40x3mm and for foot rest 80x38x3mm @ 300 c/c shall be provided.

**Or**

The stainless-steel ladder shall be of min. SS310 grade and provided from top of roof to the inside bottom of container. It shall comprise of not less than 600 mm long double round bar of 12mm dia. @ 250mm c/c. The ladder shall be rigidly fixed.

**35. M.S. Staircase/ ladder from gallery to top of tank:**

600 wide MS ladder with vertical support of 2x ISA 50x50x5 as stringer along with 16mm dia. round bar @ 300 c/c for foot rest shall be provided. A GI pipe railing of 20mm dia. at both side of ladder shall also be provided. All iron work/ railing shall be applied with 2 coats of approved quality and make enamel paint over a primer red oxide paint coat.

**Or**

M.S. Staircase from balcony to top of roof shall be provided. It shall be of 600 wide angle frames of 50X50X6, angle frame for steps of 40X40X6 with 50X6mm flat and with railing both sides. For typical drawing of MS staircase refer drawing no. MPJNM\_OHT\_TYP\_MA STAIRCASE.

**36. Railing:**

The railing, wherever provided shall consist of 1.2m high 100mm dia. RCC M-30 posts/ 50mm dia. medium class G.I pipe posts at 1.5m c/c welded with reinforcement and embedded in cement concrete with 3 rows of 32mm diameter medium class G.I pipes (@3.13kg/ Rmt) railing duly painted in two coats, so as to give smooth and even finish, with synthetic enamel paint over prime coat. The specification of GI pipe shall be as per IS 1239 part-1.

**37. Manhole covers:**

Manholes of minimum size 60cm x 75cm shall be provided. The covers shall comprise of 40x40x5 angle iron frame and 10-gauge thick M.S. sheet, crossed by suitable flat inside, with locking arrangement and a frame of 50x50x5 angle iron shall be grouted in concrete. For typical drawing of Manhole cover, refer drawing no. MPJNM\_OHT\_TYP\_MS MANHOLE COVER.

**38. Ventilators:**

1000 mm dia. 1000 high ventilation on top of roof. Side covered with mosquito proof stainless steel Wire/flies mesh and top covered with RCC cover. For details refer standard GA & Structural drawing of OHT.

**39. Painting & Finishing:**

Two coats of Weather Shield Apex painting on the entire civil works shall be done outside above ground level, while 2 coats enamel exterior oil painting shall be done on doors, windows, ventilator and all steel fabrication work i.e., railing, gantry girder, manhole cover etc. over one coat of primer. The number of coats may be more than the above specified coats to give

smooth and even surface. All MS items of works in contact with water shall have epoxy coating.

**40. MS Clamp:**

Clamping of inlet, outlet, overflow & scour pipe, with 75x8 MS flat hoops supports duly supported from RCC column.

**41. Waterproofing treatment:**

Cement based polymer modified waterproofing slurry Coating of thickness as recommended by approved IS or ISO/9001 recognized manufacturer or food grade epoxy may also be used on all concrete surface exposed to water/water vapors i.e. inside surface of tank wall, bottom and top dome after testing the tank for leakage/seepage.

**42. Protection work around Tank:**

Protection work all around the tank shall be provided. It shall be circular in shape and minimum 2.0 m in width around the outer edge of wall. It shall have 1:60 slope from center and a drain be constructed all around the tank. The protection work shall be with 50mm thick M-15 grade plain cement concrete over 100mm thick M-10 grade plain cement concrete. The drain shall have minimum dimension of 250x300 constructed in brick masonry in cement mortar 1:4 with cement plaster in 1:4 ratio over 100mm thick M-10 grade bed concrete. For details refer standard GA drawing of OHT.

**43. Water Tightness Test**

Testing of Tank shall be carried out as per IS 3370 part-I (with upto date amendment).

After the completion of structure it shall be tested for water tightness. Initially the tank shall be filled gradually to ensure uniform settlement all over the area. The full supply level should reach in a period of not less than 72 hours. At the time of testing verticality of tank structure should be checked by theodolite over water level at any horizontal line marked before filling. After seven days period for observation after filling with water the external face of sump should not show any sign of leakage and remain apparently dry.

**44. Following order or priority regarding specification shall be followed by the contractor,**

- i. Standard Design & Drawing of OHT issued by Department.
- ii. General Instruction note.
- iii. Circular of E.N.C. P.H.E.D., Bhopal vide circular no.236, dated 21.05.1997 and Technical circular no. 8674, 8870, dated 05.10.2018, 15.10.2018 respectively.
- iv. Relevant IS code with latest version. (IS 456, IS 3370 etc.)
- v. Specification in Contract document
- vi. Any other specification not covered under the above the said standard shall be fixed by the engineer in charge.

**45. Below mentioned rates in chapter 19 are for the open foundations, with individual footing with bearing capacity of 15 t/sqm and 9m staging. However, for raft foundations, these rates shall be increased by: -**

1. 10 % where safe bearing capacity (SBC) is less than or up to 5 t./sqm,
2. 7.5 % where SBC is more than 5 t/sqm and up to 10 t/sqm,
3. 5 % where SBC is more than 10 t/sqm. and up to 15 t/sqm,

This increase in basic rate by 10 % to 5% is applicable for estimation of cost of ESR. The basic rates of ESR is considered the estimated cost with 9m staging.

The rates shall be increased by 30% for bearing piles up to depth of 10 m & for further increased in depth by 5 m each, it shall be increased by another 10%. These rates are applicable where raft is not feasible. For pile foundations sulphate resistant cement shall only be used. Single pile for the column is not permitted group of piles shall be designed with pile cap for each column of ESR.

The basic rates are applicable for staging height of 9 m. These rates shall be increased or decreased for per meter variation in this staging height as below: -

4. More than 9 m to 15 m staging - 2 % per meter of the estimated rate of 9m staging tanks.
5. More than 15 m to 20 m staging - 3 % per meter of the estimated rate of 9m staging tanks.
6. More than 20 m staging - 4 % per meter of the estimated rate of 9m staging tanks.

Following rates are for seismic Zone – III (minimum applicable zone at all over state). For Zone IV, these rates shall be increased by 5%. Concerned Executive Engineer shall confirm the seismic zone for the scheme from seismic zones plan before estimation and adopt appropriate rates as per actual seismic zones.

#### **Standard approved drawing of ESR/ OHT (ESR 50 KL to 250 KL)**

To reduce the design drawing approval cycle time frame, the winning bidder/contractor can refer the attached model technical design drawings by visiting the link: <https://.....>

The Contractor can opt these model approved drawings for Construction of ESR / OHT structure based on the site conditions like various combination of capacities /staging/SBC/ Seismic zone Etc. (Capacity range for 50 KL to 200 KL)

These facilities chargeable at Rs. 10,000 /- per use per drawing.

#### **Disclaimer:**

- 1) Usage of these drawings does not by any means relieve the contractor from fulfilling his any of the contractual liabilities towards ensuring the safety, risk assessment of the Design & Structural Drawing and thereby construction of the OHT structure on the basis of these Drawings adopted to ensure Quality and safety of constructed structure in all respect as per the requirements of the contract.

- 2) By using these drawings, it is deemed assumed that the user contractor has done all the due diligence based on the relevant IS technical specifications, Geotechnical aspects as per site condition, contract scope & specifications required for the Design - Drawing as per the requirements of contract agreement. Contractor, himself should be fully satisfied with the same.
- 3) These drawings are intended to provide general reference and shall not be relied upon as a specific legal source or reference or used in any way as a basis of any claim by a contractor against any employer or vice versa under any contract for the execution of any works.
- 4) Once contractor adopts these standard Drawings for construction of OHT under any of his contract, Department (PHED) shall not accept or assume any liability or responsibility for any events or the consequences deriving from the use of these design drawing documents.

**Note:** The lump sum cost of ESR for intermediate capacities between any two-consecutive capacity ESR, will be derived by interpolating the proportionate cost from the cost of those two consecutive capacity tanks (previous lower and next higher capacity ESR) specified as above by using following formula-

Cost of intermediate capacity ESR

$$C_i = C_p + \frac{C_n - C_p}{V_n - V_p} \times V_i$$

(For All ESR are having same staging)

$C_i$  = Cost of Intermediate Capacity ESR  
 $V_i$  = Value of Intermediate Capacity ESR  
 $C_p$  = Cost of just previous Capacity ESR  
 $V_p$  = Volume of just previous Capacity ESR  
 $C_n$  = Cost of just next Capacity ESR  
 $V_n$  = Volume of just next Capacity ESR

**Following Stage wise Payment Breakup Schedule for ESR / OHT to be followed in the Standard Bid document.**

S. No.	Stage of payment	% of amount of Item to be paid	Cumulative Percentage
1	After casting of Leveling Course	3%	3%
2	After foundation including columns to 1 <sup>st</sup> brace level.	5%	8%
3	After casting 50% R.C.C. Staging	10%	18%
4	After full Staging	15%	33%
5	After Ring Beam Bottom Slab Casting	15%	48%
6	After Casting Vertical wall of tank	15%	63%
7	After Casting Stair-Case Including railing Work and Top Dome Slab	10%	73%



<b>S. No.</b>	<b>Stage of payment</b>	<b>% of amount of Item to be paid</b>	<b>Cumulative Percentage</b>
8	Supply of all Pipes, Specials and fixing complete	12%	85%
9	After G.L Protection Work Gate work Complete	5%	90%
10	After Finishing work, Testing, Commissioning and completion of work of this item in all respect	5%	95%
11	After Successful Trial-Run of Entire Scheme	5%	100%

This USOR contains the rates of all the items without GST.

**CHAPTER-19**  
**REINFORCED CEMENT CONCRETE ELEVATED SERVICE**  
**RESERVOIRS (ESR)**

Sr. No.	Particulars of Items	Rate in Rs./ KL	Unit	Rate (in Rs.)
<b>19</b>	Design, drawing, construction, testing and commissioning of RCC Elevated Service Reservoir/ Over Head Tank (ESR/OHT) with all necessary fitting as mentioned in relevant chapter of USOR, IS code and departmental guidelines. Complete turn key job for following capacities with 9/12/15 meter staging height from GL:-			
<b>18.1</b>	<b>9 Mtr. Staging</b>			
18.1.1	50 Kilo Litres	33.93	Each	1696432.00
18.1.2	75 Kilo Litres	24.91	Each	1868287.00
18.1.3	100 Kilo Litres	21.29	Each	2128573.00
18.1.4	125 Kilo Litres	19.16	Each	2394624.00
18.1.5	150 Kilo Litres	16.41	Each	2461735.00
18.1.6	175 Kilo Litres	16.66	Each	2916277.00
18.1.7	200 Kilo Litres	15.26	Each	3052403.00
18.1.8	225 Kilo Litres	14.21	Each	3198143.00
18.1.9	250 Kilo Litres	13.09	Each	3272346.00
18.1.10	275 Kilo Litres	12.86	Each	3536170.00
18.1.11	300 Kilo Litres	12.65	Each	3794658.00
18.1.12	325 Kilo Litres	12.54	Each	4076765.00
18.1.13	350 Kilo Litres	12.39	Each	4335253.00
18.1.14	375 Kilo Litres	12.28	Each	4605550.00
18.1.15	400 Kilo Litres	12.12	Each	4849605.00
18.1.16	425 Kilo Litres	11.97	Each	5085787.00
18.1.17	450 Kilo Litres	11.81	Each	5314096.00
18.1.18	475 Kilo Litres	11.65	Each	5534533.00
18.1.18	500 Kilo Litres	11.55	Each	5773339.00
18.1.19	750 Kilo Litres	10.76	Each	8069553.00
18.1.20	1000 Kilo Litres	9.97	Each	9972131.00
18.1.21	1500 Kilo Litres	9.66	Each	14485832.00
18.1.22	2000 Kilo Litres	9.18	Each	18369715.00
<b>18.2</b>	<b>12 Mtr. Staging</b>			

<b>Sr. No.</b>	<b>Particulars of Items</b>	<b>Rate in Rs./ KL</b>	<b>Unit</b>	<b>Rate (in Rs.)</b>
18.2.1	50 Kilo Litres	36.09	Each	1804715.00
18.2.2	75 Kilo Litres	26.50	Each	1987540.00
18.2.3	100 Kilo Litres	22.64	Each	2264440.00
18.2.4	125 Kilo Litres	20.38	Each	2547472.00
18.2.5	150 Kilo Litres	17.46	Each	2618867.00
18.2.6	175 Kilo Litres	17.73	Each	3102423.00
18.2.7	200 Kilo Litres	16.24	Each	3247237.00
18.2.8	225 Kilo Litres	15.12	Each	3402280.000
18.2.9	250 Kilo Litres	13.92	Each	3481220.00
18.2.10	275 Kilo Litres	13.68	Each	3761883.00
18.2.11	300 Kilo Litres	13.46	Each	4036871.00
18.2.12	325 Kilo Litres	13.34	Each	4336984.00
18.2.13	350 Kilo Litres	13.18	Each	4611971.00
18.2.14	375 Kilo Litres	13.07	Each	4899521.00
18.2.15	400 Kilo Litres	12.90	Each	5159154.00
18.2.16	425 Kilo Litres	12.73	Each	5410412.00
18.2.17	450 Kilo Litres	12.56	Each	5653294.00
18.2.18	475 Kilo Litres	12.40	Each	5887801.00
18.2.18	500 Kilo Litres	12.28	Each	6141850.00
18.2.19	750 Kilo Litres	11.45	Each	8584631.00
18.2.20	1000 Kilo Litres	10.61	Each	10608650.00
18.2.21	1500 Kilo Litres	10.27	Each	15410460.00
18.2.22	2000 Kilo Litres	9.77	Each	19542250.00
<b>19.3</b>	<b>15 Mtr. Staging</b>			
18.3.1	50 Kilo Litres	38.00	Each	1900003.00
18.3.2	75 Kilo Litres	27.90	Each	2092482.00
18.3.3	100 Kilo Litres	23.84	Each	2384002.00
18.3.4	125 Kilo Litres	21.46	Each	2681978.00
18.3.5	150 Kilo Litres	18.38	Each	2757143.00
18.3.6	175 Kilo Litres	18.66	Each	3266231.00
18.3.7	200 Kilo Litres	17.09	Each	3418692.00
18.3.8	225 Kilo Litres	15.92	Each	3581920.00
18.3.9	250 Kilo Litres	14.66	Each	3665028.00
18.3.10	275 Kilo Litres	14.40	Each	3960511.00

Sr. No.	Particulars of Items	Rate in Rs./ KL	Unit	Rate (in Rs.)
18.3.11	300 Kilo Litres	14.17	Each	4250017.00
18.3.12	325 Kilo Litres	14.05	Each	4565976.00
18.3.13	350 Kilo Litres	13.87	Each	4855483.00
18.3.14	375 Kilo Litres	13.76	Each	5158216.00
18.3.15	400 Kilo Litres	13.58	Each	5431557.00
18.3.16	425 Kilo Litres	13.40	Each	5696081.00
18.3.17	450 Kilo Litres	13.23	Each	5951788.00
18.3.18	475 Kilo Litres	13.05	Each	6198677.00
18.3.18	500 Kilo Litres	12.93	Each	6466140.00
18.3.19	750 Kilo Litres	12.05	Each	9037900.00
18.3.20	1000 Kilo Litres	11.17	Each	11168787.00
18.3.21	1500 Kilo Litres	10.82	Each	16224132.00
18.3.22	2000 Kilo Litres	10.29	Each	20574081.00
<b>18.4</b>	<b>18 Mtr. Staging</b>			
18.4.1	50 Kilo Litres	41.42	Each	2071004.00
18.4.2	75 Kilo Litres	30.41	Each	2280805.00
18.4.3	100 Kilo Litres	25.99	Each	2598562.00
18.4.4	125 Kilo Litres	23.39	Each	2923356.00
18.4.5	150 Kilo Litres	20.04	Each	3005286.00
18.4.6	175 Kilo Litres	20.34	Each	3560191.00
18.4.7	200 Kilo Litres	18.63	Each	3726374.00
18.4.8	225 Kilo Litres	17.35	Each	3904293.00
18.4.9	250 Kilo Litres	15.98	Each	3994881.00
18.4.10	275 Kilo Litres	15.70	Each	4316957.00
18.4.11	300 Kilo Litres	15.44	Each	4632519.00
18.4.12	325 Kilo Litres	15.31	Each	4976914.00
18.4.13	350 Kilo Litres	15.12	Each	5292477.00
18.4.14	375 Kilo Litres	14.99	Each	5622455.00
18.4.15	400 Kilo Litres	14.80	Each	5920398.00
18.4.16	425 Kilo Litres	14.61	Each	6208729.00
18.4.17	450 Kilo Litres	14.42	Each	6487449.00
18.4.18	475 Kilo Litres	14.22	Each	6756558.00
18.4.18	500 Kilo Litres	14.10	Each	7048092.00
18.4.19	750 Kilo Litres	13.14	Each	9851311.00

Sr. No.	Particulars of Items	Rate in Rs./ KL	Unit	Rate (in Rs.)
18.4.20	1000 Kilo Litres	12.17	Each	12173978.00
18.4.21	1500 Kilo Litres	11.79	Each	17684304.00
18.4.22	2000 Kilo Litres	11.21	Each	22425748.00
<b>19.5</b>	<b>21 Mtr. Staging</b>			
18.5.1	50 Kilo Litres	44.84	Each	2242004.00
18.5.2	75 Kilo Litres	32.92	Each	2469128.00
18.5.3	100 Kilo Litres	28.13	Each	2813123.00
18.5.4	125 Kilo Litres	25.32	Each	3164735.00
18.5.5	150 Kilo Litres	21.69	Each	3253429.00
18.5.6	175 Kilo Litres	22.02	Each	3854152.00
18.5.7	200 Kilo Litres	20.17	Each	4034056.00
18.5.8	225 Kilo Litres	18.79	Each	4226666.00
18.5.9	250 Kilo Litres	17.30	Each	4324733.00
18.5.10	275 Kilo Litres	16.99	Each	4673403.00
18.5.11	300 Kilo Litres	16.72	Each	5015020.00
18.5.12	325 Kilo Litres	16.58	Each	5387852.00
18.5.13	350 Kilo Litres	16.37	Each	5729470.00
18.5.14	375 Kilo Litres	16.23	Each	6086695.00
18.5.15	400 Kilo Litres	16.02	Each	6409238.00
18.5.16	425 Kilo Litres	15.82	Each	6721376.00
18.5.17	450 Kilo Litres	15.61	Each	7023109.00
18.5.18	475 Kilo Litres	15.40	Each	7314438.00
18.5.18	500 Kilo Litres	15.26	Each	7630045.00
18.5.19	750 Kilo Litres	14.22	Each	10664722.00
18.5.20	1000 Kilo Litres	13.18	Each	13179168.00
18.5.21	1500 Kilo Litres	12.76	Each	19144476.00
18.5.22	2000 Kilo Litres	12.14	Each	24277415.00
<b>19.6</b>	<b>24 Mtr. Staging</b>			
18.6.1	50 Kilo Litres	50.22	Each	2511045.00
18.6.2	75 Kilo Litres	36.87	Each	2765424.00
18.6.3	100 Kilo Litres	31.51	Each	3150697.00
18.6.4	125 Kilo Litres	28.36	Each	3544503.00
18.6.5	150 Kilo Litres	24.29	Each	3643840.00
18.6.6	175 Kilo Litres	24.67	Each	4316650.00

<b>Sr. No.</b>	<b>Particulars of Items</b>	<b>Rate in Rs./ KL</b>	<b>Unit</b>	<b>Rate (in Rs.)</b>
18.6.7	200 Kilo Litres	22.59	Each	4518143.00
18.6.8	225 Kilo Litres	21.04	Each	4733866.00
18.6.9	250 Kilo Litres	19.37	Each	4843701.00
18.6.10	275 Kilo Litres	19.03	Each	5234211.00
18.6.11	300 Kilo Litres	18.72	Each	5616823.00
18.6.12	325 Kilo Litres	18.57	Each	6034394.00
18.6.13	350 Kilo Litres	18.33	Each	6417006.00
18.6.14	375 Kilo Litres	18.18	Each	6817098.00
18.6.15	400 Kilo Litres	17.95	Each	7178346.00
18.6.16	425 Kilo Litres	17.71	Each	7527941.00
18.6.17	450 Kilo Litres	17.48	Each	7865883.00
18.6.18	475 Kilo Litres	17.25	Each	8192171.00
18.6.18	500 Kilo Litres	17.09	Each	8545650.00
18.6.19	750 Kilo Litres	15.93	Each	11944488.00
18.6.20	1000 Kilo Litres	14.76	Each	14760669.00
18.6.21	1500 Kilo Litres	14.29	Each	21441813.00
18.6.22	2000 Kilo Litres	13.60	Each	27190705.00

**CHAPTER - 19**  
**GROUND SERVICE RESERVOIR & SUMP**  
**TANKS (GSR)**

## CHAPTER-19

### GROUND SERVICE RESERVOIR & SUMP TANKS (GSR)

**Notes :** (In this chapter items are only for estimating purpose, shall not be considered for the direct payment of the work to the contractor).

#### **SPECIFICATION FOR GSR / SUMP**

**Note:** The General specifications for the construction of RCC Ground Service Reservoir shall be similar to the specification for construction of RCC OHT mentioned in chapter no. 18. Except below all other civil construction specification will be same as mentioned in the ESR / OHT chapter no. 18.

1. The structural design of GSR shall be in accordance with provisions relevant I.S standards. List of Indian Standards for Design of GSR / Sump well:
  - (I) IS : 3370 part I & II 2009 or its latest revision
  - (II) IS : 3370 part III & IV 1965 or its latest revision
  - (III) IS : 456-2000 Reaffirmed 2016
  - (III) IS : 1893-20 | 6 part I to V
  - (IV) IS : 875, Part - 1 to 3, 1987 or its latest revision.
2. Water depth in container shall be adopted as per data of tender. Capacity shall be calculated excluding free board of the reservoir. If water depth is not specified, the suitable water depth/acceptable to Engineer in Charge of the work shall be provided.
3. Shape of container (in plan) specified in Tender shall be adopted; in absence of any data circular shape shall be adopted.
4. Size shall be fixed as per availability of space (land area) at site / acceptable engineer in charge.
5. Effect of over lapping of pressure bulbs on soil due to nearby structure and proposed sump well should be considered.
6. Care shall be taken so that no damage occurs to nearby existing structure. Compensation shall be paid for the same by the contractor.
7. The minimum concrete grade for RCC shall be M-30.
8. HYSD Fe 41 5/500 grade reinforcing bars confirming to I.S. 1893-1984 shall be considered in
9. design. CRS/TMT bars shall be provided. In saline atmosphere corrosion resistance stainless steel/HCR rebar shall be provided. Any other steel can be used with approval of C.E./in the situation of non-availability in market without extra cost.
10. Minimum size (or thickness) of various components shall be provided as per tender criteria./specifications in absence as per I.S./ Std. practice of MPPHED Minimum dimensions specified for various components in tender data/specifications shall be provided without fail.



11. The safe bearing capacity (SBC) shall be referred from SBC test report. In absence of report it shall be referred from data sheet. If poor soil is found/water table is met with during excavation SBC shall be scientifically ascertained and design shall be revised. No extra shall be paid for increase in quantity.
12. Pipes and special shall only be used as stipulated in tender documents.
13. The rate shall include cost of dewatering during excavation making all arrangement when water table meets within depth.
14. The structure shall be designed properly to resist uplift due to ground water table specified in data or actual ground water table meets with during excavation.
15. 20 mm GI pipes railing in three rows with 100 mm vertical RCC Pole shall be provided over GSR periphery when CSR height is  $\geq 2$  meter above ground level.
16. RCC stair case / RCC Steps should be provided from GL to GSR tops slab (It will be applicable for GSR).
17. Aluminum ladder, main hole cover with lock to be provided.
18. Appearance of structure should be aesthetically good looking acceptable to authority.
19. Any change in size, shape, depth below GL, height above GL, water depth, F.B., size of member etc. can be permitted in exceptional case due to site condition or hydraulic design requirement by C.E.
20. No extra shall be paid for change.
21. Any change in data, dimensions, shape, and water depth, reduction in size if permitted by competent authority and if it reduces quantity then payment shall be reduced pro-rata.
22. When capacity of GSR/Sump capacity is  $> 10$  lakh liters two or suitable compartments acceptable to executive engineer shall be designed and provided.
23. Agency shall engage qualified (at least graduate) consulting engineer for designing the structure and he/she shall visit the site for guidance of work.
24. Rates for this item are for all seismic zone as prevailing in states of MP.
25. This chapter is introduced only for preparation of estimate for their item. The tenders for this item will be called on turn-key basis only.

**Note:** The lump sum cost of GSR for intermediate capacities between any two-consecutive capacity GSR, will be derived by interpolating the proportionate cost from the cost of those two consecutive capacity tanks (previous lower and next higher capacity GSR) specified in this chapter by using following formula-

$$\text{Cost of intermediate capacity GSR}$$

$$C_i = C_p + \frac{C_n - C_p}{V_n - V_p} \times V_i$$

$C_i$  = Cost of Intermediate Capacity GSR

$V_i$  = Value of Intermediate Capacity GSR

$C_p$  = Cost of immediate previous Capacity GSR

$V_p$  = Volume of immediate previous Capacity GSR

$C_n$  = Cost of immediate next Capacity GSR

$V_n$  = Volume of immediate next Capacity GSR

**Following Stage wise Payment Breakup Schedule for GSR / Sump Tank to be followed in the Standard Bid document.**

S. No.	Stage of payment	% of amount of BOQ Item	Cumulative Percentage
1	After casting of levelling Course	3%	3%
2	After construction of foundation slab	25%	28%
3	After construction of vertical walls	32%	60%
4	After casting of top slabs & installation of all fittings.	25%	85%
5	After Finishing work, Testing, Commissioning and completion of work of this item in all respect.	10%	95%
6	After Successful Trial-Run of Entire Scheme	5%	100%

This USOR contains the rates of all the items without GST.

## **CHAPTER-19**

### **GROUND SERVICE RESERVOIR & SUMP TANKS (GSR)**

Sr. No.	Description of items	Unit	Rate (in Rs.)
19.1	Design, drawing, construction, testing and commissioning of R.C.C. GSR/Sump well of following capacities with all necessary fitting and accessories as mentioned in the relevant chapter of USOR, IS codes and departmental circulars Complete turn key job for following capacities:		
19.1.1	20 Kilo Litres	Each	325322.00
19.1.2	30 Kilo Litres	Each	405000.00
19.1.3	40 Kilo Litres	Each	433387.00
19.1.4	50 Kilo Litres	Each	455901.00
19.1.5	75 Kilo Litres	Each	658523.00

Sr. No.	Description of items	Unit	Rate (in Rs.)
19.1.6	100 Kilo Litres	Each	838631.00
19.1.7	125 Kilo Litres	Each	1025000.00
19.1.8	150 Kilo Litres	Each	1200000.00
19.1.9	175 Kilo Litres	Each	1356250.00
19.1.10	200 Kilo Litres	Each	1500000.00
19.1.11	250 Kilo Litres	Each	1750000.00
19.1.12	300 Kilo Litres	Each	1950000.00
19.1.13	350 Kilo Litres	Each	1964182.00
19.1.14	400 Kilo Litres	Each	2180000.00
19.1.15	500 Kilo Litres	Each	2625000.00
19.1.16	750 Kilo Litres	Each	3562500.00
19.1.17	1000 Kilo Litres	Each	4264601.00
19.1.18	1500 Kilo Litres	Each	6176367.00
19.1.19	2000 Kilo Litres	Each	7885178.00
19.2	<b>Rate per litre</b>		
19.2.1	20 Kilo Litres	Per Ltr.	16.26
19.2.2	30 Kilo Litres	Per Ltr.	13.50
19.2.3	40 Kilo Litres	Per Ltr.	10.83
19.2.4	50 Kilo Litres	Per Ltr.	9.11
19.2.5	75 Kilo Litres	Per Ltr.	8.78
19.2.6	100 Kilo Litres	Per Ltr.	8.38
19.2.7	125 Kilo Litres	Per Ltr.	8.20
19.2.8	150 Kilo Litres	Per Ltr.	8.00
19.2.9	175 Kilo Litres	Per Ltr.	7.75
19.2.10	200 Kilo Litres	Per Ltr.	7.50
19.2.11	250 Kilo Litres	Per Ltr.	7.00
19.2.12	300 Kilo Litres	Per Ltr.	6.50
19.2.13	350 Kilo Litres	Per Ltr.	5.61
19.2.14	400 Kilo Litres	Per Ltr.	5.45
19.2.15	500 Kilo Litres	Per Ltr.	5.25
19.2.16	750 Kilo Litres	Per Ltr.	4.75
19.2.17	1000 Kilo Litres	Per Ltr.	4.26
19.2.18	1500 Kilo Litres	Per Ltr.	4.11
19.2.19	2000 Kilo Litres	Per Ltr.	3.94

## **CHAPTER - 20**

### **RESISTIVITY SURVEY**

## CHAPTER- 20 RESISTIVITY SURVEY

S.No.	Particulars of Items	Unit	Rate (In Rs.)
<b>A</b>	<b>Resistivity Survey</b>		
20.1	Carrying out the resistivity survey by VES method using Schlumberger configuration for locating the proper spot with three soundings for drilling of tube well within the selected Habitation, including photography, interpretation of resistivity data and submission of report in the desired format along with resistivity readings, necessary graph and photographs.	Per Successful point	1770.00
20.2	Geophysical & Hydrological Survey for lineament marking in field unconfined aquifer analysis, analysing ground water movement, estimation of SWI yield finalizing of recharging structure, inclusive of preparation of requisite map and final report as per hydro-geological specification for recharging shaft along with all activities.	1 Job	6585.00

## CHAPTER – 21 to 26 CONSTRUCTION OF TUBE WELL

### Notes :

1. The following Indian standard shall be referred to:-

S.No.	IS Number	Title
1	<b>IS 2800 (Part-I): 1991 (Reaffirmed 2001)</b>	Code of practice for construction & testing of tube wells/Bore wells
2	<b>IS 2800 (Part-II): 1991 (Reaffirmed 1999)</b>	Code of practice for construction & testing of tube wells/Bore wells.
3	<b>IS 4097-1988 (Reaffirmed 1999)</b>	Specification for Gravel for use as pack in tube wells
4	<b>IS 11189-1985 (Reaffirmed 1999)</b>	Methods of tubewell development.
5	<b>IS 1239 (Part-I)</b>	Mild steel tubes, tubular & other wrought steel fittings-specifications.
6.	<b>IS 12818:1992</b>	Unplasticized PVC screen and casing pipes for bore/tube well- specification.
7.	<b>IS 15500 (Part 1 to 8)</b>	Deep well hand pumps, components and special tools- specifications.

1. The rates for various items of drilling works given in this unified schedule of rates are based on average rates for whole of the Madhya Pradesh State. The market rates may vary from place to place in the state depending upon the local conditions. No contract shall, therefore be awarded directly at the rates given in this unified schedule of rates without inviting tenders as per rules.
2. Tube wells drilled shall be perfectly vertical. The rates for drilling are inclusive of the verticality test required to be conducted. All the relevant Indian standards specifications of the B.I.S. shall also be applicable.
3. The rates for drilling provided in the Unified Schedule of Rates are inclusive of depreciation charges of all the machinery, tools & plants required for drilling operation, transportation of drilling machine, erection of machine at site, removal of machine from site after completion, cost of water, cost of drilling mud, fuel, labour and all other unforeseen items for drilling work and clearance of site after completion of work.
4. For locating the proper site for tube well construction within the selected habitation, if resistivity survey is required then the resistivity survey shall be carried out by a well qualified and experienced geohydrologist using his own suitable resistivity meter.

5. In the ordinary tube wells the casing pipe of specified diameter shall be lowered up to a minimum depth of 9 meters below ground level. If the collapsible strata in overburden continues beyond 9 meters depth then the casing pipe shall be lowered up to rock level and embedded in rock in a depth of 0.15 meter. The casing pipe shall also be extended above ground level in a height of about 0.3 meter.
6. The diameter of ordinary tube wells constructed for installation of hand pumps shall be 125 mm up to bottom level of the casing pipe and 115 mm in the rock below the casing. Such tube wells shall be designated as 125/115 mm dia ordinary tube wells.
7. The ordinary tube wells constructed for installation of hand pumps in the basaltic rock area where intertrappean formation (collapsible strata between the rocks) is present. The nominal diameter of the tube well up to the level of intertrappean formation shall be 150 mm. The intertrappean formation shall be cased by 125 mm dia G.I. casing pipe. Therefore, the finished nominal diameter of tube well in the intertrappean formation shall be 125 mm but in the rock below the intertrappean formation, the nominal diameter of tube well shall be 115 mm. Such tube wells shall be designated as 150/125/115 mm dia ordinary tube wells.
8. The nominal diameter of ordinary tube wells constructed for installation of power pumps shall be 150 mm or 200 mm for the entire depth depending upon the type and size of pump to be installed in the tube well. Such tube wells shall be designated as 150 mm dia ordinary tube well & 200 mm dia ordinary tube wells.
9. The gravel packed tube wells shall be constructed in alluvial formations, suitable for such tube wells, in which the fine and uniform sand is present in the water bearing aquifer. Such tube wells shall be constructed by direct circulation rotary drilling method or reverse circulation rotary drilling method using suitable rotary drilling machine.
10. The diameters of boreholes for construction of 100 mm, 150 mm & 200 mm finished nominal diameter gravel packed tube wells shall be 300 mm, 350 mm and 400 mm respectively exclusive of pipe wall thickness. The thickness of the gravel shroud around the screen shall generally be not less than 10 cm. Such tube wells shall be designated as 300(100) mm dia, 350(150) mm dia, 400(200) mm dia gravel packed tube wells.
11. The gravel packed tube wells shall be constructed only after obtaining the technical clearance of drawing & design of gravel packed tube well from the concerned Chief Engineer.
12. The rates are inclusive of the preparation and submission of strata chart of the tube well constructed in the prescribed proforma.

13. It shall be the responsibility of the contractor to collect the water sample from completed tube well and send it to departmental laboratory for chemical and bacteriological analysis. The water sample for chemical analysis shall be collected in 2 liters plastic bottle and samples for bacteriological analysis shall be collected in 300 ml sterilized bottle as per the direction of Engineer in charge. Only testing charges will be borne by the department.
14. All risks of accidents Jamming and breaking of drilling tools etc. shall be contractor's liability. No extra charges shall be payable to the contractor on this account.
15. Contractor shall also make arrangements of first aid facilities for any accident. All care and precautions shall be taken and it shall be ensured that there shall be no accidents while drilling the borehole. Proper dress and equipments like gumboots, helmets etc. shall be provided by the contractor to the workmen at site.
16. During any operation carried out for construction of tube well, if any tool, pipe etc. falls down in the tube well then the contractor shall carry out the necessary fishing operation at his own cost. The contractor shall use his own equipment for such operation. If the tube well becomes useless due to any reason, it shall be treated as abandoned tube well and no payment shall be made for such abandoned tube well.

The contractor shall be fully responsible to fill up the abandoned bore hole with hard soil including compaction and watering so as to make top surface as good as original soil immediately and before shifting the drilling machine to prevent any accident. No payment would be made to the contractor on account of this.
17. If a tube well is found dry or with less yield and if it is not to be used for water supply due to any reason, the tube well shall be fitted with MS cap securely and a concrete block of 0.45m X 0.45m X 0.45m with M15 cement concrete would be constructed on it to prevent any accident or damage to the tube well and also to use the bore at any later stage for recharging or for any other purpose.
18. The Lowering and fixing of casing pipe in ordinary tube well and lowering of casing assembly in the gravel packed tube wells shall be done in the presence of authorised representative of the Engineer in Charge of work. The G.I. casing pipe to be lowered and fixed in intertrappean formation shall be jointed by welding only. In the case of gravel packed tube well it shall be ensured by the contractor that the slotted pipes or screened pipes shall be lowered in the tube well at the locations of water bearing aquifers as per design. The contractor shall also ensure that joints of the pipes in casing assembly are rigid and water tight and a bail plug is properly fixed in the bottom of casing assembly.



19. All the gravel to be used, as pack in gravel packed tube wells shall be as specified in IS 4097: 1988 (Reaffirmed - 1993).
20. The development of tube well shall be continued during drilling operation. At the time of flushing by compressor the discharge from tube well during the development process shall also be measured by 'V' notch for yield and shall be recorded on regular intervals for which no separate payment shall be made. In case of gravel packed tube wells, development by compressor for minimum eight hours after completion of drilling of tube well shall be done and paid as per item number 4 of chapter 5. The development of ordinary tubewells (other than gravel packed tubewells) shall be done by the drilling machines during the drilling operations and no separate payment for development of such ordinary tubewells shall be made. The development of all type of the tubewells shall be done as per IS specifications (IS11189 – 1985).
21. In case of ordinary tubewells (other than gravel packed tubewells) where power pump is to be installed, the yield test of tube well shall be conducted by suitable capacity single phase or three phase submersible pumping set to be operated by generator set or by taking temporary electric connection at site. It shall be the responsibility of the contractor to arrange for suitable capacity submersible pumping set, generator set, or temporary electrical connection, suitable measuring equipments for measuring the discharge and draw down of the tube well. The rates for item of yield test given in this unified schedule of rates include all such arrangements. The maximum duration of yield test shall be eight hours.
22. The tube well shall be disinfected after completion of yield test using bleaching powder solution as per the direction of Engineer in charge, and paid as per provision in the USOR.
23. The installation of hand pump over the tube well shall be carried out as per IS specifications (IS15500 PART 1 to 8– 2004). All the exterior parts of pump coming in contact with the water shall be thoroughly cleaned and dusted with bleaching powder. The hand pump after installation shall be tested for its proper installation by operating it continuously at least for four hour and measuring the rate of discharge from hand pump. The rates for the item of installation of hand pump and yield test by hand pump given in this unified schedule of rates shall be applicable.
24. For construction of platform and drain for the hand pump, the contractor shall use only steel plate frame shuttering designed as per the dimensional requirement of platform and drain. This shuttering shall be got approved from the Engineer-in-Charge. In case of construction of platforms in areas having black cotton soil, the top thirty centimeters of the black cotton soil shall be excavated and replaced with morrum boulder, duly rammed and watered in layers, prior to the construction of such platforms including drain, pedestal and washing platform. Rates for these works have been provided for in the USOR.

25. All contracts based on this unified schedule of rates shall be governed by the directions and other notes and conditions given in this unified schedule of rates, in addition to all the other conditions of the agreement. As the rates in this unified schedule of rates are linked to these conditions and directions, it shall not be necessary to attach the copies of these conditions to the contract agreement.
26. In the interpretation of description of items or rates of this unified schedule of rates and specifications, the decision of the Engineer-In-Chief shall be final.
27. The issue rates of casing pipes, hand pumps and other material given in Annexure-1 of this unified schedule rates are only for the purpose of preparing realistic estimates. These rates are not given for making purchases or for entering into any contracts.
28. The rates for various items of works given in this unified schedule of rates includes for 1% overhead and 10% contractor's profit. If the work is carried out departmentally then the rates applicable for departmental works shall be at-least 9.90%  $[(100 \times 11) / 111]$  less than the rates of various items given in this unified schedule of rates.
29. **This USOR contains the rates of all the items without GST. GST shall be paid separately as per prevailing government norms as claimed by the contractor in his bill.**

**All the estimates based on this USOR will include GST as an extra amount as per prevailing rates on the sum of the estimate to arrive at the gross amount.**

## **CHAPTER - 21**

# **CONSTRUCTION OF ORDINARY TUBE WELL**

**CHAPTER- 21**  
**CONSTRUCTION OF ORDINARY TUBE WELL**

S.No.	Particulars of Items	Unit	Rate (In Rs.)
21.1	Drilling of perfectly vertical bore hole of a diameter to receive 125 mm nominal diameter casing pipe upto desired depth below ground level inclusive of the labour charges for transporting, lowering and fixing of 125 mm nominal diameter M.S./ G. I. /U.P.V.C. casing pipe inside the bore hole including all works pertaining to drilling such as transportation, installation and removal of drilling machine etc. complete.		
21.1.1	in all types of collapsible strata consisting of soils, clays, sand, moorum, gravel, boulders etc.	Meter	580.00
21.1.2	in all types of rocks.	Meter	745.00
21.2	Drilling of perfectly vertical bore hole of 115 mm diameter up to desired depth below ground level in all types of rocks including all works pertaining to drilling such as transportation, installation and removal of drilling machine etc. complete.	Meter	707.00
21.3	Drilling of perfectly vertical bore hole of a diameter suitable to receive 150 mm nominal diameter casing pipe upto desired depth below ground level inclusive of the labour charges for transporting, lowering and fixing of 150 mm nominal diameter and fixing of 150 mm nominal diameter M.S./ G.I. / U.P.V.C. casing pipe inside the bore hole including all works pertaining to drilling such as transportation, installation and removal of drilling machine etc. complete.		
21.3.1	in all types of collapsible strata consisting of soils, clays, sand, moorum, gravel, boulders etc.	Meter	646.00
21.3.2	in all types of rocks.	Meter	800.00
21.4	Drilling of perfectly vertical bore hole of 150mm diameter upto desired depth below ground level in all types of rock including all works pertaining to drilling such as transportation, installation and removal of drilling machine etc. complete	Meter	769.00
21.5	Drilling of perfectly vertical bore hole of 165 m.m. diameter up to desired depth below ground level in all types of rock including all works pertaining to drilling such as transportation, installation and removal of drilling machine etc. complete.	Meter	777.00
21.6	Drilling of perfectly vertical bore hole of a diameter suitable to receive 200 mm nominal diameter casing pipe upto desired depth below ground level inclusive of the labour charges for transporting, lowering and		

S.No.	Particulars of Items	Unit	Rate (In Rs.)
	fixing of 200 mm nominal diameter M.S./ G.I. / U.P.V.C. casing pipe inside the bore hole including all works pertaining to drilling such as transportation, installation and removal of drilling machine etc. complete.		
21.6.1	in all types of collapsible strata consisting of soils, clays, sand, moorum, gravel, boulders etc.	Meter	666.00
21.6.2	in all types of rocks.	Meter	843.00
21.7.	Drilling of perfectly vertical bore hole of 200mm diameter upto desired depth below ground level including all works pertaining to drilling such as transportation, installation and removal of drilling machine etc. complete.		
21.7.1	In all types of collapsible strata (intertrappean formation) including charges for transportation, lowering and fixing of 150mm nominal diameter GI casing pipe, welded joints only.	Meter	722.00
21.7.2	in all types of rocks.	Meter	886.00
21.8	Drilling of perfectly vertical bore hole of 150 mm diameter up to desired depth below ground level un all types of strata including all works pertaining to drilling such as transportation installation and removal of drilling machine etc. complete in intertrappean formations (collapsible strata between rocks) including charges for transportation and making all necessary arrangements' etc, including lowering and fixing of 125 mm nominal diameter (G.I. or U.P.V.C. casing pipe.	Meter	803.00
21.9	Providing and fixing of well cap on top of the tube well for protection		
	M.S. Caps		
21.9.1	100mm dia	Each	287.00
21.9.2	125mm dia	Each	322.00
21.9.3	150mm dia	Each	389.00
21.9.4	200mm dia	Each	427.00
21.10	Construction of concrete block over dry tube wells for protection of size 0.45m x 0.45m x 0.45 m in M-15 cement concrete mix complete work.	Each	707.00

**CHAPTER - 22**  
**CONSTRUCTION OF GRAVEL PACKED TUBE**  
**WELL**

## CHAPTER- 22

### CONSTRUCTION OF GRAVEL PACKED TUBE WELL

S.No.	Particulars of Items	Unit	Rate (In Rs.)
22.1	Drilling of perfectly vertical bore hole of following diameters for construction of Gravel Packed tube well up to desired depth in alluvial formation consisting of Soils, Clays, Sand, Gravel, Moorum, Boulders etc. and retaining the bore hole by using suitable drilling mud or foam or temporary housing pipe including all works pertaining to drilling such as transportation, installation and removal of drilling machine etc. complete.		
22.1.1	300mm diameter	Meter	882.00
22.1.2	350mm diameter	Meter	937.00
22.1.3	400mm diameter	Meter	978.00
22.2	Labour charges for assembling, centering and lowering of properly designed casing pipe assembly inside the bore hole drilled for construction of Gravel Packed tube well including the cost of providing and fixing of centraliser, and transportation of casing assembly etc. complete.		
22.2.1	Casing assembly composed of 100mm diameter blank and slotted G.I. Casing pipes	Meter	56.00
22.2.2	Casing assembly composed of 150mm diameter blank and slotted G.I. Casing pipes	Meter	85.00
22.2.3	Casing assembly composed of 200mm diameter blank and slotted G.I. Casing pipes	Meter	104.00
22.2.4	Casing assembly composed of 100mm dia. UPVC blank and screened pipes.	Meter	39.00
22.2.5	Casing assembly composed of 150mm dia UPVC blank and screened pipes.	Meter	48.00
22.2.6	Casing assembly composed of 200mm dia UPVC blank and screened pipes.	Meter	62.00
22.3	Providing and fixing of M.S. bail plug as per I.S. 2800 (PART-I) 2019 in the bottom of casing assembly		
22.3.1	100mm dia	Each	292.00
22.3.2	150mm dia	Each	368.00
22.3.3	200mm dia	Each	450.00

S.No.	Particulars of Items	Unit	Rate (In Rs.)
22.4	Providing gravel packing with uniformly graded gravel as per I.S. 4097 of 2019 (revised up to date) in the annular space between outer wall of casing pipe assembly and inner wall of bore hole including cost of gravel, transportation, stacking, washing and packing in layers of suitable thickness including all lead and lifts complete.	Cum	4230.00
22.5	Providing gravel with uniformly graded gravel as per I.S.4097 of 2019 (revised up to date) for gravel packing.	Cum	4020.00
22.6	Providing and fixing of well cap on top of the tube well for protection.		
	M.S. Caps		
22.6.1	100mm dia	Each	287.00
22.6.2	125mm dia	Each	322.00
22.6.3	150mm dia	Each	389.00
22.6.4	200mm dia	Each	427.00
22.7	Construction of concrete block over dry tube wells for protection of size 0.45m x 0.45m x 0.45 in M-15 cement concrete mix complete work.	Each	707.00



**CHAPTER - 23**

**INSTALLATION OF HAND PUMPS AND  
CONSTRUCTION OF PLATFORM, DRAIN AND  
SOAKAGE PIT**

**CHAPTER- 23**  
**INSTALLATION OF HAND PUMPS AND CONSTRUCTION OF**  
**PLATFORM, DRAIN AND SOAKAGE PIT**

S.No.	Particulars of Items	Unit	Rate (In Rs.)
23.1	Labour charges for installation of India Mark II Hand Pump with 30 meter long 32mm dia riser pipe assembly and all other accessories including transportation of Hand Pump from specified departmental stores to site.	Each	1315.00
23.2	Add to Item No.-1, above for fixing the extra length of riser pipe assembly beyond 30 meters	Meter	27.00
23.3	Construction of 76 cm x 76 cm x 40 cm foundation block in 1:2:4 cement concrete for fixing the pedestal of Hand Pump including excavation, cost of material and labours etc. complete.	Each	1250.00
23.4	Construction of cement concrete platform as per design around the hand pump in 1:2:4 cement concrete including excavation, centering, shuttering, cost of all the materials and labours and curing etc. complete.	Each	3998.00
23.5	Construction of cement concrete platform as per design around the hand pump in 1:2:4 cement concrete including excavation, centering, shuttering, cost of all the materials and labour and curing etc. complete. Including filling in 30 cm depth after removing Black cotton soil including ramming, watering etc. complete in areas of Black cotton soils.	Each	4506.00
23.6	Construction of cement concrete drain as per design in 1:2:4 cement concrete including excavation, centering, shuttering, cost of all the materials and labour and curing etc. complete.	Meter	442.00
23.7	Construction of cement concrete drain as per design in 1:2:4 cement concrete including excavation, centering, shuttering, cost of all the materials and labour and curing etc. complete. Including filling in 30 cm depth after removing Black cotton soil including ramming, watering etc. complete in areas of Black cotton soils.	Meter	556.00
23.8	Construction of 1.20 m x 1.20 m x 0.20 m cement concrete washing platform in cement concrete 1:2:4 including excavation, centering, shuttering, cost of all the materials and labour and curing etc. complete.	Each	1716.00
23.9	Construction of 1.20 m x 1.20 m x 0.20 m cement concrete washing platform in cement concrete 1:2:4	Each	2067.00

S.No.	Particulars of Items	Unit	Rate (In Rs.)
	including excavation, centering, shuttering, cost of all the materials and labour and curing etc. complete. Including filling in 30 cm depth after removing Black cotton soil including ramming, watering etc. complete in areas of Black cotton soils.		
23.10	Construction of sokage pit of 70 cm dia. And 1.0 m deep including excavation, brick lining at top in 1:4 cement mortar, filling broken bricks etc. and cost of all the materials and labour and curing etc. complete.	Each	1359.00

**CHAPTER - 24**  
**DEVELOPMENT, YIELD TEST AND**  
**DISINFECTION OF TUBE WELL**

**CHAPTER- 24**  
**DEVELOPMENT, YIELD TEST AND DISINFECTION OF TUBE WELL**

S.No.	Particulars of Items	Unit	Rate (In Rs.)
24.1	Conducting the yield test of tube well by operating the pumping set continuously for a desired time period and measuring the discharge and drawdown of tube well at a suitable time interval as per the direction of Engineer in Charge including cost of energy, cost of installation of suitable measuring device and hire charges of pumping set etc. complete.		
24.1.1	Submersible pumping sets upto 2.2 kW.	Per Hour	796.00
24.1.2	Submersible pumping set upto 2.2 kW to 7.5 kW.	Per Hour	827.00
24.1.3	Submersible pumping set above 7.5 kW	Per Hour	934.00
24.2	Labour charges for taking out the submersible pumping set from tube well after completion of yield test or development of tube well.		
24.2.1	Submersible pumping sets upto 2.2 kW.	Each	1780.00
24.2.2	Submersible pumping set upto 2.2 kW to 7.5 kW.	Each	1941.00
24.2.3	Submersible pumping set above 7.5 kW	Each	2082.00
24.3	Development of gravel packed tube well by Air compressor of suitable capacity including hire charges for all the required tools and plants etc. complete, for maximum duration of eight hours.	Per Hour	1027.00
24.4	Measurement of yield of tube well by operating hand pump continuously for four hours manually.	Each	706.00
24.5	Disinfection of tube well using bleaching powder solution as per the direction of the Engineer-in-Charge including the cost of bleaching power and labour etc. complete	Each	87.00

## **CHAPTER - 25**

### **ODEX TYPE OF TUBE WELL**

**CHAPTER- 25**  
**ODEX TYPE OF TUBE WELL**

S.No.	Particulars of Items	Unit	Rate (In Rs.)
25.1	Drilling of perfectly vertical bore hole by odex method of a diameter to receive 125 mm nominal diameter casing pipe up to desired depth below ground level inclusive of the labour charges for transporting, lowering and fixing of 125 mm nominal diameter suitable for odex drilling M.S./G.I./ Seamless casing pipe inside the bore hole by welding joint including all works pertaining to drilling such as transportation, installation and removal of drilling machine etc. complete.		
25.1.1	In all type of collapsible strata consisting of soils, clays, sand, moorum, gravel, boulders etc.	Meter	1151.00
25.1.2	In all types of rocks.	Meter	1357.00
25.2	After completion of bore hole by odex method making of slots cutting on casing pipe at the aquifers level. The size of slots is 2mm wide x 7.5mm long in set of 4 slots around the length wise in casing pipe (G.I./MS/Seamless). Each meter length of casing should have 140 slots on total cylindrical portion of casing pipe.	Meter	530.00
25.3	Cost of casing shoe (Guide Bush) for odex drilling	Each	5060.00
25.4	Drilling of perfectly vertical bore hole by odex method of a diameter to receive 150 mm nominal diameter casing pipe up to desired depth below ground level inclusive of the labour charges for transporting, lowering and fixing of 125 mm nominal diameter suitable for odex drilling M.S./G.I./ Seamless casing pipe inside the bore hole by welding joint including all works pertaining to drilling such as transportation, installation and removal of drilling machine etc. complete.		
25.4.1	In all type of collapsible strata consisting of soils, clays, sand, moorum, gravel, boulders etc.	Meter	1250.00
25.4.2	In all types of rocks.	Meter	1895.00
25.5	After completion of bore hole by odex method making of slots cutting on casing pipe at the aquifers level. The size of slots is 2mm wide x 7.5mm long in set of 4 slots around length wise in casing pipe (G.I./ MS/ Seamless). Each meter length of casing should have 172 slots on total cylindrical portion of casing pipe.	Meter	652.00
25.6	Cost of casing shoe (Guide Bush) for odex drilling	Each	5850.00

**CHAPTER - 26**  
**MISCELLANEOUS ITEM OF TUBE WELL**



**CHAPTER- 26**  
**MISCELLANEOUS ITEM OF TUBE WELL**

S.No.	Particulars of items	Unit	Rate (in Rs.)
	<b>HYDROFRACTURING AND CLEANING OF TUBE WELL</b>		
26.1	Hydro fracturing of perfectly vertical bore hole for 200/150/115 mm diameter bore hole up to 90 m depth below ground level including yield testing before and after hydro fracture, transportation, installation and removing of hydro fracturing unit.	1 job	17927.00
26.2	Cleaning of perfectly vertical bore hole for 200/150/115 mm diameter bore hole up to 60 mtrs depth below ground level including transportation, installation and removing of drilling machine.	1 job	18930.00
26.3	Add to item no. 26.2 above cleaning beyond 60 m depth.	Per mtr.	210.00
26.4	Survey work dry/ low yield tube well hydro fracturing of tube well for detection of fracture zones in tube well by using the hole camera with monitor including transportation and providing c.d. & photographs.	Each	1616.00
26.5	Labour charges for taking out assembly from the tube well of india mark II hand pump with 30 meters long 32mm dia riser pipe assembly and all other accessories.	Each	921.00
26.6	Add to item no. 26.5 above for fixing extra length of pipe beyond 30 meters.	Per mtr	31.00
26.7	Labour charges for lowering the assembly with complete fittings of india mark II hand pump from the tube well with 32mm dia 30 meters long riser pipe assembly and other accessories	Each	745.00
26.8	Add to above item no. 26.7 for fixing extra length of riser pipe assembly beyond 30 meters.	Per mtr	25.00
	<b>CONSTRUCTION OF RECHARGING PIT IN SUBMERGENCE AREA</b>		
26.9	Construction of recharging pit of internal size 2.00 x 2.00x1.35 mtr. Near existing tube well, in submergence area of pond / reservoir including excavation, base concrete, brick masonry work and providing and filling filter media like boulders, gravels, sand and synthetic membrane below sand as per specifications, and drawing no.19 complete.	1 job	66448.00
	<b>CONSTRUCTION OF RECHARGING PIT AROUND EXISTING TUBE WELL GIVING LESS YIELD WITH STEINING AND CATCH DRAIN</b>		
26.10	Construction of recharging circular pit of 3.00 m outer	1 job	57360.00

S.No.	Particulars of items	Unit	Rate (in Rs.)
	dia and 2.00 mtrs depth around the existing tube well giving less yield perforation work in casing pipe and providing and fixing of nariyal rope around perforated area in full length, steening work and surrounding catch drain work with M-20 RCC, making 90 mm dia circular holes by fixing pieces of 90 mm dia pvc pipes @ 300 mm c/c before concreting of steening work of recharge pit just below G.L. To permit rain water to enter in to the pit from catch drain, providing and filling of recharge pit by filter media like boulders, gravels sand and synthetic membrane below sand as per specifications and drawing no. 20 complete.		
	<b>CONSTRUCTION OF RECHARGING PIT AROUND TUBE WELL GIVING LESS YIELD</b>		
26.11	Construction of recharging circular pit of 3.00 m dia and 2.00m depth around the dry tube well, perforation work in casing pipe and providing and fixing of nariyal rope around perforated area in full length, providing and filling of recharge pit by boulders, gravels sand as filter media, synthetic membrane below sand and making ground slope towards the constructed pit to divert the rain water (in soft/hard rock area) as per specifications and drawing no. 21 complete.	1 job	35168.00
	<b>REPAIRING OF HAND PUMP</b>		
26.12	Labour only for minor repairing work of india mark II hand pump including replacement of unserviceable parts i.e. chain, handle, axle either one or more parts as the case may be along with overhauling of hand pump set and transportation etc as per approved specifications inclusive of the free services of departmental technician (material will be supplied by the department).	1 job	515.00
26.13	Labour only for major repairing work of india mark II hand pump including replacement of unserviceable parts such as washer, cylinder, riser pipe, link rod either one or more parts as the case may be along with overhauling, minor repairing work and transportation etc as per approved specification inclusive of free services of departmental technician (material will be supplied by the department).	1 job	1126.00
26.14	Labour only for minor repairing work of india mark II hand pump including replacement of unserviceable parts i.e chain, handle, axle either one or more parts as the case may be along with overhauling of hand pump set and transportation etc as per approved specifications (material will be supplied by the department).	1 job	642.00

S.No.	Particulars of items	Unit	Rate (in Rs.)
26.15	Labour only for major repairing work of india mark II hand pump including replacement of unserviceable parts such as washer, cylinder, riser pipe, link rod either one or more parts as the case may be along with overhauling, minor repairing work and transportation etc as per approved specification (material will be supplied by the department).	1 job	1253.00
	<b>TAKING OUT FALLEN HAND PUMP PIPE LINE ASSEMBLY FROM TUBE WELL</b>		
26.16	Labour only for taking out of fallen hand pump pipe line assembly from tube well using special t&p required for the same i/c depositing all the obtained material in departmental store complete item. -depth up to 150 mtr.	1 job	2589.00
26.17	Removal of ordinarily fallen pipe line of hand pump from tube well i/c arrangement of labour, skilled person & arrangement of all tools and plant required for the job i/c all safety measures and transportation of recovered material from village to the departmental store or transportation of material required for hand pump installation from store to village, installation of handpump i/c loading, unloading etc. Complete.	1 job	6283.00
26.18	Removal of choked fallen pipe line of hand pump from tube well i/c arrangement of additional labour skilled person, arrangement of all special type tools and plant required for the job, i/c all safety measures etc. All complete. (this item will be paid in addition to item no. 26.16 if fallen pipe line is choked)	1 job	2356.00
	Removing of unserviceable		
	Handpump		
26.19	Removing of unserviceable hand pump along with assembly from existing tube well i/c excavation, cutting of casing pipe if necessary, dismantling cc around pedestal, capping of tube well i/c making of cement concrete block M-15 size 0.45x0.45x0.45 m and depositing all the obtained material in departmental store.	1 job	2238.00
	<b>LOWERING &amp; TAKING OUT OF SUB-MERSIBLE PUMP SET</b>		
26.20	Labour only for taking out of single phase submersible pumping set of capacity 1 to 3 hp from the tube well with flexible/ rigid pipe line assembly, electrical cable, nylon rope, testing etc. Complete including disconnecting the electrical cable from pump & starter - depth up to 150 mtr.	1 job	1604.00
26.21	Labour only for lowering of single phase submersible	1 job	2045.00

S.No.	Particulars of items	Unit	Rate (in Rs.)
	pumping set of capacity 1 to 3 hp in the tube well with flexible/ rigid pipe line assembly, electrical cable, nylon rope, testing etc. Complete including connecting the electrical cable from pump & starter - \depth up to 150 mtr.		
26.22	Labour only for taking out of three phase submersible pumping set from the tube well with pipe line assembly, electrical cable, testing etc. Complete including disconnecting the electrical cable from pump & starter.		
26.22.1	3 hp to 7.5 hp - depth up to 150 mtr.	1 job	2283.00
26.22.2	Above 7.5 hp to 12.5 hp - depth up to 150 mtr.	1 job	2586.00
26.22.3	Above 12.5 hp - depth up to 150 mtr.	1 job	2914.00
26.23	Labour only for lowering of three phase submersible pumping set in the tube well with pipe line assembly, electrical cable, testing etc. Complete including connecting the electrical cable from pump & starter.		
26.23.1	3 hp to 7.5 hp - depth up to 150 mtr.	1 job	2687.00
26.23.2	Above 7.5 hp to 12.5 hp - depth up to 150 mtr.	1 job	3129.00
26.23.3	Above 12.5 hp - depth up to 150 mtr.	1 job	3355.00
26.23.4	Above 12.5 hp - depth up to 200 mtr.	1 Job	5076.00
26.23.5	Above 12.5 hp - depth up to 250 mtr.	1 Job	6313.00
	<b>TAKING OUT FALLEN SUBMERSIBLE PUMPING SET FROM TUBE WELL</b>		
26.24	Labour only for taking out of fallen submersible pumping set from the tube well with pipe line assembly, electrical cable etc. Complete using special t&p required for the same i/c depositing all the obtained material in departmental store.		
26.24.1	1 to 3 hp - depth up to 150 mtr.	1 job	3031.00
26.24.2	3 to 7.5 hp - depth up to 150 mtr.	1 job	3205.00
26.24.3	7.5 to 12.5 hp - depth up to 150 mtr.	1 job	3521.00
26.24.4	Above 12.5 hp - depth up to 150 mtr.	1 job	3766.00
26.24.5	Above 12.5 HP to 15 HP - Depth up to 200 mtr.	1 Job	5205.00
26.24.6	Above 12.5 HP to 15 HP - Depth up to 250 mtr.	1 Job	6816.00
	<b>REPAIRING OF SUBMERSIBLE MOTOR PUMP SET</b>		
26.25	Removing the old burn winding from stator & cleaning of slot then complete rewinding of submersible motor by using PVC insulated ISI marked quality copper conductor with suitable gauge including insulating material like bamboo, strip, fire proof papers, leeve, cotton tape, pvc tape including cable jointing of motor.		
26.25.1	A. Single phase 100 mm dia		
26.25.1.1	1 hp	1 job	2094.00
26.25.1.2	2 hp	1 job	2624.00

S.No.	Particulars of items	Unit	Rate (in Rs.)
26.25.1.3	3 hp	1 job	2820.00
26.25.2	B. Three phase 100 mm & 150 mm dia.		
26.25.2.1	3 hp (100 mm dia.)	1 job	3114.00
26.25.2.2	4 hp (100 mm dia.)	1 job	3212.00
26.25.2.3	5 hp (100 mm dia.)	1 job	3605.00
26.25.2.4	3 hp (150 mm dia.)	1 job	3184.00
26.25.2.5	4 hp (150 mm dia.)	1 job	3283.00
26.25.2.6	5 hp (150mm dia.)	1 job	3745.00
26.25.2.7	6 hp (150mm dia.)	1 job	4096.00
26.25.2.8	Above 6.0 to 7.5 hp (150mm dia.)	1 job	5861.00
26.25.2.9	Above 7.5 to 10 hp (150mm dia.)	1 job	6535.00
26.25.2.10	Above 10.0 to 12.5 hp (150mm dia.)	1 job	7516.00
26.25.2.11	Above 12.5 to 15 hp (150mm dia.)	1 job	8006.00
26.25.3	Providing & fixing of non return valve body		
26.25.3.1	1 hp to 5 hp /100mm	1 job	453.00
26.25.3.2	3 hp to 15 hp / 150mm	1 job	653.00
26.25.4	Providing & fixing of discharge outlet		
26.25.4.1	1 hp to 5 hp /100mm	1 job	254.00
26.25.4.2	3 hp to 15 hp / 150mm	1 job	350.00
26.25.5	Providing & fixing of adjusting cap		
26.25.5.1	1 hp to 5 hp /100mm	1 job	70.00
26.25.5.2	3 hp to 15 hp / 150mm	1 job	75.00
26.25.6	Providing & fixing of In key BMM		
26.25.6.1	1 hp to 5 hp /100mm	1 job	25.00
26.25.6.2	3 hp to 15 hp / 150mm	1 job	31.00
26.25.7	Providing & fixing of bush for D O L		
26.25.7.1	1 hp to 5 hp /100mm	1 job	160.00
26.25.7.2	3 hp to 15 hp / 150mm	1 job	186.00
26.25.8	Providing & fixing of sleeve for D O L		
26.25.8.1	1 hp to 5 hp /100mm	1 job	140.00
26.25.8.2	3 hp to 15 hp / 150mm	1 job	155.00
26.25.9	Providing & fixing of stage case CI		
26.25.9.1	3 hp to 15 hp / 150mm	1 job	353.00
26.25.10	Providing & fixing of bowl bush GM		
26.25.10.1	3 hp to 15 hp / 150mm	1 job	195.00
26.25.11	Providing & fixing of bowl bush rubber		
26.25.11.1	3 hp to 15 hp / 150mm	1 job	114.00
26.25.12	Providing & fixing of neck ring GM		
26.25.12.1	3 hp to 15 hp / 150mm	1 job	165.00
26.25.13	Providing & fixing of pump sleeve SS		
26.25.13.1	3 hp to 15 hp / 150mm	1 job	125.00

S.No.	Particulars of items	Unit	Rate (in Rs.)
26.25.13.2	1 hp to 5 hp /100mm	1 job	405.00
26.25.13.3	3 hp to 15 hp / 150mm	1 job	500.00
26.25.14	Providing & fixing of motor bush rubber		
26.25.14.1	1 hp to 5 hp /100mm	1 job	280.00
26.25.14.2	3 hp to 15 hp / 150mm	1 job	331.00
26.25.15	Providing & fixing of impeller		
26.25.15.1	1 hp to 5 hp /100mm	1 job	66.00
26.25.15.2	3 hp to 15 hp / 150mm	1 job	430.00
26.25.16	Providing & fixing of diffuser GM		
26.25.16.1	3 hp to 15 hp / 150mm	1 job	272.00
26.25.17	Providing & fixing of diffuser PP		
26.25.17.1	1 hp to 5 hp /100mm	1 job	66.00
26.25.17.2	3 hp to 15 hp / 150mm	1 job	145.00
26.25.18	Providing & fixing of sand guard		
26.25.18.1	1 hp to 5 hp /100mm	1 job	66.00
26.25.18.2	3 hp to 15 hp / 150mm	1 job	145.00
26.25.19	Providing & fixing of distance piece		
26.25.19.1	1 hp to 5 hp /100mm	1 job	48.00
26.25.19.2	3 hp to 15 hp / 150mm	1 job	114.00
26.25.20	Providing & fixing of oil seal		
26.25.20.1	1 hp to 5 hp /100mm	1 job	51.00
26.25.20.2	3 hp to 15 hp / 150mm	1 job	55.00
26.25.21	Providing & fixing of oil seal sleeve		
26.25.21.1	1 hp to 5 hp /100mm	1 job	114.00
26.25.21.2	3 hp to 15 hp / 150mm	1 job	171.00
26.25.22	Providing & fixing of nylon nut		
26.25.22.1	1 hp to 5 hp /100mm	1 job	11.00
26.25.22.2	3 hp to 15 hp / 150mm	1 job	12.00
26.25.23	Providing & fixing of stud for suction		
26.25.23.1	1 hp to 5 hp /100mm	1 job	21.00
26.25.23.2	3 hp to 15 hp / 150mm	1 job	28.00
26.25.24	Providing & fixing of gm washer		
26.25.24.1	1 hp to 5 hp /100mm	1 job	7.00
26.25.24.2	3 hp to 15 hp / 150mm	1 job	13.00
26.25.25	Providing & fixing of grub screw		
26.25.25.1	1 hp to 5 hp /100mm	1 job	12.00
26.25.25.2	3 hp to 15 hp / 150mm	1 job	12.00
26.25.26	Providing & fixing of pump shaft (ss) per stage		
26.25.26.1	3 hp to 15 hp / 150mm	1 job	191.00
26.25.27	Providing & fixing of pump shaft key		
26.25.27.1	1 hp to 5 hp /100mm	1 job	55.00

S.No.	Particulars of items	Unit	Rate (in Rs.)
26.25.27.2	3 hp to 15 hp / 150mm	1 job	66.00
26.25.28	Providing & fixing of suction housing		
26.25.28.1	1 hp to 5 hp /100mm	1 job	250.00
26.25.28.2	3 hp to 15 hp / 150mm	1 job	359.00
26.25.29	Providing & fixing of pump coupling & motor coupling		
26.25.29.1	1 hp to 5 hp /100mm	1 job	379.00
26.25.29.2	3 hp to 15 hp / 150mm	1 job	560.00
26.25.30	Providing & fixing of suction housing plate		
26.25.30.1	3 hp to 15 hp / 150mm	1 job	253.00
26.25.31	Providing & fixing of intermediate suction case		
26.25.31.1	3 hp to 15 hp / 150mm	1 job	180.00
26.25.32	Providing & fixing of suction housing bush		
26.25.32.1	3 hp to 15 hp / 150mm	1 job	240.00
26.25.33	Providing & fixing of intermediate suction bush		
26.25.33.1	3 hp to 15 hp / 150mm	1 job	234.00
26.25.34	Providing & fixing of stud for motor flange upper		
26.25.34.1	1 hp to 5 hp /100mm	1 job	18.00
26.25.34.2	3 hp to 15 hp / 150mm	1 job	22.00
26.25.35	Providing & fixing of stud for motor flange lower		
26.25.35.1	1 hp to 5 hp /100mm	1 job	28.00
26.25.35.2	3 hp to 15 hp / 150mm	1 job	35.00
26.25.36	Providing & fixing of bearing housing upper		
26.25.36.1	1 hp to 5 hp /100mm	1 job	350.00
26.25.36.2	3 hp to 15 hp / 150mm	1 job	540.00
26.25.37	Providing & fixing of bearing housing lower		
26.25.37.1	1 hp to 5 hp /100mm	1 job	350.00
26.25.37.2	3 hp to 15 hp / 150mm	1 job	540.00
26.25.38	Providing & fixing of upper flange & lower flange		
26.25.38.1	1 hp to 5 hp /100mm	1 job	191.00
26.25.38.2	3 hp to 15 hp / 150mm	1 job	234.00
26.25.39	Providing & fixing of motor base		
26.25.39.1	1 hp to 5 hp /100mm	1 job	430.00
26.25.39.2	3 hp to 15 hp / 150mm	1 job	560.00
26.25.40	Providing & fixing of thrust bearing plate complete		
26.25.40.1	1 hp to 5 hp /100mm	1 job	734.00
26.25.40.2	3 hp to 15 hp / 150mm	1 job	833.00
26.25.41	Providing & fixing of thrust bearing (carbon)		
26.25.41.1	1 hp to 5 hp /100mm	1 job	500.00
26.25.41.2	3 hp to 15 hp / 150mm	1 job	620.00
26.25.42	Providing & fixing of revolving disk		
26.25.42.1	1 hp to 5 hp /100mm	1 job	359.00

S.No.	Particulars of items	Unit	Rate (in Rs.)
26.25.42.2	3 hp to 15 hp / 150mm	1 job	550.00
26.25.43	Providing & fixing of thrust bearing housing ci		
26.25.43.1	1 hp to 5 hp /100mm	1 job	140.00
26.25.43.2	3 hp to 15 hp / 150mm	1 job	215.00
26.25.44	Providing & fixing of rotor sleeve		
26.25.44.1	1 hp to 5 hp /100mm	1 job	180.00
26.25.44.2	3 hp to 15 hp / 150mm	1 job	219.00
26.25.45	Providing & fixing of rubber parts		
26.25.45.1	1 hp to 5 hp /100mm	1 job	60.00
26.25.45.2	3 hp to 15 hp / 150mm	1 job	80.00
26.25.46	Providing & fixing of intermediate coupling		
26.25.46.1	1 hp to 5 hp /100mm	1 job	300.00
26.25.46.2	3 hp to 15 hp / 150mm	1 job	331.00
26.25.47	Providing & fixing of flange locking		
26.25.47.1	1 hp to 5 hp /100mm	1 job	51.00
26.25.47.2	3 hp to 15 hp / 150mm	1 job	55.00
26.25.48	Providing & fixing of disk locking		
26.25.48.1	1 hp to 5 hp /100mm	1 job	20.00
26.25.48.2	3 hp to 15 hp / 150mm	1 job	22.00
26.25.49	Providing & fixing of chuck nut		
26.25.49.1	1 hp to 5 hp /100mm	1 job	38.00
26.25.49.2	3 hp to 15 hp / 150mm	1 job	51.00
26.25.50	Providing & fixing of 8 mm nut ss		
26.25.50.1	3 hp to 15 hp / 150mm	1 job	12.00
26.25.51	Providing & fixing of 10 mm nut ss		
26.25.51.1	1 hp to 5 hp /100mm	1 job	16.00
26.25.52	Providing & fixing of 12 mm nut ss		
26.25.52.1	1 hp to 5 hp /100mm	1 job	20.00
26.25.53	Providing & fixing of stud for suction		
26.25.53.1	1 hp to 5 hp /100mm	1 job	25.00
26.25.54	Providing & fixing of top bush & top sleeve		
26.25.54.1	1 hp to 5 hp /100mm	1 job	280.00
26.25.54.2	3 hp to 15 hp / 150mm	1 job	34.00
26.25.55	Providing & fixing of pump intermediate bush & sleeve		
26.25.55.1	1 hp to 5 hp /100mm	1 job	270.00
26.25.55.2	3 hp to 15 hp / 150mm	1 job	331.00
26.25.56	Providing & fixing of pump stainer		
26.25.56.1	1 hp to 5 hp /100mm	1 job	107.00
26.25.56.2	3 hp to 15 hp / 150mm	1 job	147.00
26.25.57	Providing & fixing of center d o		
26.25.57.1	1 hp to 5 hp /100mm	1 job	171.00



S.No.	Particulars of items	Unit	Rate (in Rs.)
26.25.57.2	3 hp to 15 hp / 150mm	1 job	350.00
26.25.58	Providing & fixing of new rotor		
26.25.58.1	1 hp (100 mm dia)	1 job	5198.00
26.25.58.2	2 hp (100 mm dia)	1 job	5598.00
26.25.58.3	3 hp (100 mm dia)	1 job	6297.00
26.25.58.4	4 hp (100 mm dia)	1 job	6897.00
26.25.58.5	5 hp (100 mm dia)	1 job	7497.00
26.25.58.6	3 hp (150 mm dia)	1 job	8396.00
26.25.58.7	4 hp (150 mm dia)	1 job	8497.00
26.25.58.8	5 hp (150 mm dia)	1 job	8696.00
26.25.58.9	6 hp (150 mm dia)	1 job	9296.00
26.25.58.10	Above 6.0 to 7.5 hp (150 mm)	1 job	10596.00
26.25.58.11	Above 7.5 to 10 hp (150 mm)	1 job	11695.00
26.25.58.12	Above 10.0 to 12.5 hp (150 mm)	1 job	15993.00
26.25.58.13	Above 12.5 to 15 hp (150 mm)	1 job	17992.00
26.25.59	Providing & fixing of adaptor piece		
26.25.59.1	1 hp to 5 hp /100mm	1 job	180.00
26.25.59.2	3 hp to 15 hp / 150mm	1 job	250.00
26.25.60	Providing & fixing of water drain plug		
26.25.60.1	1 hp to 5 hp /100mm	1 job	40.00
26.25.60.2	3 hp to 15 hp / 150mm	1 job	51.00
26.25.61	Providing & fixing of cable guard		
26.25.61.1	1 hp to 5 hp /100mm	1 job	118.00
26.25.61.2	3 hp to 15 hp / 150mm	1 job	147.00
26.25.62	Labour only for stator servicing :-		
26.25.62.1	1 hp to 5 hp /100mm	1 job	500.00
26.25.62.2	3 hp to 15 hp / 150mm	1 job	519.00
26.25.62.3	5 hp to 10 hp / 150mm	1 job	650.00
26.25.62.4	10 hp to 15 hp / 150mm	1 job	750.00
26.25.63	Labour only for rotor balancing :-		
26.25.63.1	1 hp to 5 hp /100mm	1 job	799.00
26.25.63.2	3 hp to 15 hp / 150mm	1 job	900.00
26.25.63.3	5 hp to 10 hp / 150mm	1 job	1099.00
26.25.63.4	10 hp to 15 hp / 150mm	1 job	1399.00
26.25.64	Labour only for impeller brass welding & turning	1 job	300.00
26.25.65	Labour only for motor rotor sleeve turning & grinding	1 job	650.00
26.25.66	Labour only for flange stud welding	1 job	40.00
26.25.67	Labour only for motor opening, servicing, fitting & testing	1 job	451.00
26.25.68	Labour only for copper welding, turning & grinding to enduring of rotor	1 job	799.00

S.No.	Particulars of items	Unit	Rate (in Rs.)
26.25.69	Labour only for welding turning key way cutting of coupling side of rotor	1 job	400.00
26.25.70	Labour only for pump opening & fitting	1 job	400.00
	<b>REPAIRING OF CONTROL PANEL</b>		
26.25.71	Providing & fixing of relay unit l&t type	1 job	595.00
26.25.72	Providing & fixing of relay unit bch type	1 job	1345.00
26.25.73	Providing & fixing of contactor l&t type - 16 amp	1 job	1145.00
26.25.74	Providing & fixing of contactor bch type - 16 amp	1 job	1644.00
26.25.75	Providing & fixing of contactor bch type - 25 amp	1 job	2144.00
26.25.76	Providing & fixing of kit point set l&t type	1 job	445.00
26.25.77	Providing & fixing of kit point set bch type -16 amp	1 job	845.00
26.25.78	Providing & fixing of kit point set bch type - 25 amp	1 job	644.00
26.25.79	Providing & fixing of no volt coil l&t type	1 job	445.00
26.25.80	Providing & fixing of no volt coil bch type	1 job	445.00
26.25.81	Providing & fixing of timer set l&t type	1 job	1345.00
26.25.82	Providing & fixing of timer set bch type	1 job	1644.00
26.25.83	Providing & fixing of auxillary switch	1 job	554.00
26.25.84	Providing & fixing of timer coil	1 job	414.00
26.25.85	Providing & fixing of amp meter (round)	1 job	130.00
26.25.86	Providing & fixing of volt meter (round)	1 job	130.00
26.25.87	Providing & fixing of amp meter (square)	1 job	180.00
26.25.88	Providing & fixing of volt meter (square)	1 job	180.00
26.25.89	Providing & fixing of on switch	1 job	90.00
26.25.90	Providing & fixing of off switch	1 job	90.00
26.25.91	Providing & fixing of terminal plate	1 job	145.00
26.25.92	Providing & fixing of indicator lamp	1 job	35.00
26.25.93	Providing & fixing of mcb -single pole - 16 -25 amp	1 job	114.00
26.25.94	Providing & Fixing of MCB -Three Pole - 32 Amp	1 job	686.00
26.25.95	Providing & Fixing of MCB -Three Pole - 40 Amp	1 job	644.00
26.25.96	Providing & Fixing of MCB -Three Pole - 63 Amp	1 job	694.00
26.25.97	Providing & Fixing of Capacitor 36 MFD	1 job	346.00
26.25.98	Providing & Fixing of Capacitor 50 MFD	1 job	346.00
26.25.99	Providing & Fixing of Capacitor 120-150 MFD	1 job	365.00
26.25.100	Providing & Fixing of Capacitor 200-250 MFD	1 job	385.00
	<b>REPLACEMENT OF FLAT COPPER CABLE</b>		
26.26	Providing and fixing of ISI marked pvc insulated three core flat copper cable.		
26.26.1	1.5 sq mm	1 job	54.00
26.26.2	2.5 sq mm	1 job	81.00
26.26.3	4.0 sq mm	1 job	121.00
26.26.4	6.0 sq mm	1 job	178.00

S.No.	Particulars of items	Unit	Rate (in Rs.)
	<b>HORIZONTAL / INCLINED / VERTICAL BORES INSIDE THE DUG WELL</b>		
26.27	Labour charges for lowering and taking out the drilling machine mast assembly, drill rods and drilling equipments etc. And installation of drilling machines mast inside the dug well complete work.	Each	3588.00
26.28	Drilling of horizontal / inclined / vertical bore hole of 115 mm diameter inside existing dug well up to desired depth with insertion of suitable perforated pvc/hdpe/ G.I. pipe provided by department in all types of strata i.e. Soil, rock, hard rock including all works pertaining to drilling such as transportation, installation and removal of drilling machine in side dug well etc. Complete.	Per meter	1063.00

**ISSUE RATES OF ISI MARK HAND PUMPS, G.I. RISER, G.I. CASING & UPVC CASING PIPES FOR PREPARATION OF ESTIMATES ONLY**

S. No.	Particulars of Items	Unit	Rate (In Rs.)
1	ISI mark India mark-II deep well hand pump complete with 10 Nos. MS connecting rods, (12mm x 3M long) Normal stand assembly.	Each	9921.00
2	ISI mark India mark -II deep well hand pump complete with 10 Nos. MS connecting rods, (12mm x 3M long) telescopic stand assembly.	Each	10173.00
3	ISI mark India Mark-II extra deep well hand pump complete with 20 Nos. MS connecting rods (12mm x 3M)2 counter weight electro galvanized & passivated normal stand assembly.	Each	15315.00
4	ISI mark India mark-II extra deep well hand pump complete with 20 Nos. MS connecting rods (12mm x 3m)2 counter weight electro galvanized & passivated telescopic stand assembly.	Each	15626.00
5	ISI Mark 32mm dia G.I. riser pipe in 3 meter length socketed on one end as per I.S. 1239 (Part-I) 2004 up-to-date amendments and socket as per I.S. 2062/1990 up-to-date amendment.	Meter	205.00
6	Supply of I.S.I. marked G.I. casing pipe (Plain) medium class in 4 to 7 meters length one end fitted with socket as per I.S. 1239 (Part-1 & Part-2) 2004/2011 with (Up-to-date amendments)		
	100mm dia	Meter	921.00
	125mm dia	Meter	1227.00
	150mm dia	Meter	1460.00
	175mm dia	Meter	1606.00
	200mm dia	Meter	1854.00
7	I.S.I. marked UPVC casing pipe conforming to IS 4985/2021 (with up-to-date amendments)		
	Screen pipes with ribs 100mm dia	Meter	469.00
	Screen pipes with ribs 125mm dia	Meter	605.00
	Screen pipes with ribs 150mm dia	Meter	798.00
	Screen pipes with ribs 200mm dia	Meter	1403.00
	CM casing pipes 100mm dia	Meter	519.00
	CM casing pipes 125mm dia	Meter	828.00
	CM casing pipes 150mm dia	Meter	1122.00
	CM casing pipes 200mm dia	Meter	2048.00

	CS casing pipes 150mm dia	Meter	1431.00
	CS casing pipes 200mm dia	Meter	2048.00

## **CHAPTER - 27**

# **UN-PLASTICIZED NON-PRESSURE POLYVINYL CHLORIDE (PVC-U) PIPES, DOUBLE WALL CORRUGATED (DWC) PIPES FOR USE IN UNDERGROUND SEWERAGE SYSTEM**

**CHAPTER- 27**  
**UN-PLASTICIZED NON-PRESSURE POLYVINYL CHLORIDE (PVC-U)**  
**PIPES, DOUBLE WALL CORRUGATED (DWC) PIPES FOR USE IN**  
**UNDERGROUND SEWERAGE SYSTEM**

- 1 Unplasticized polyvinyl chloride (PVC-U) pipes shall be as per IS 15328:2003(Reaffirmation year 2018) & having BIS Certification mark.
- 2 Laying of Unplasticized polyvinyl chloride (PVC-U) pipe shall be as per IS 7634 (Part-3) : 2003(Reaffirmation year 2018)
- 3 The solvent cement shall conform to the requirements laid down in IS 14182:1994(Reaffirmation year 2020)
- 4 Integral sockets for either solvent-cement welding or for jointing with elastomeric sealing rings pipes made of unplasticized polyvinyl chloride (PVC-U) of nominal outside diameters ranging from 110mm upto and including 630 mm, intended for underground (buried) non-pressure gravity drain and sewer applications for transportation of soil and waste discharge of domestic origin, surface water (storm water).
- 5 Dimensions of Pipes:
  - (i) Mean outside diameter:- The mean outside diameter, outside diameter at any point and tolerances shall be as give in the table 1 of IS 15328 and shall be measured according to the method in IS:12235 (part-1).
  - (ii) Wall thickness: The nominal wall thickness,  $e$ , shall be in accordance with table 2 of IS 15328. Tolerances in outside diameters shall be those given in IS 4985.
- 6 Marking:

The colour of marking shall be different from the basic colour of the pipe. It shall be as under.

  - (i) Identification of the source of manufacture.
  - (ii) Outside diameter,
  - (iii) Stiffness class, and
  - (iv) Batch or lot number
- 7 Joints:

Elastomeric Sealing rings: Elastomeric sealing rings shall be free from substances (for example, plasticizers) that can have a detrimental effect on the polyvinyl chloride of the pipe or fittings used in conjunction with the pipes.
- 8 Laying of pipes includes all precautions to guard against possible damaged to the existing structure/pipes lines, cables etc., taking precautions to prevent dirt from entering the pipe ends, lowering and laying pipes and specials in the trenches with specials arrangement such as cranes, tripods with chain pulley block, use of slings of canvas etc. to fit the ends of pipes and fittings/ specials to

lift and lower the same. Inspection of pipes and fittings for defects by striking with a light hammer while suspended. Laying of pipes perfectly true in alignment and to gradient etc.

9 Minimum Cover

9.1 A minimum cover of 0.9 m should be ensured when normal truck traffic is expected and 1.8m should ensured when heavy truck traffic is expected.

9.2 Bedding and backfill material must be free from boulders, sharp stones, flints etc.

9.3 Bedding should be prepared by laying on soft soil duly compacting and watering so that thickness of bedding is 100 mm to 150 mm. Please refer *Drawing No. 3*

10 Providing and supply of DWC PE pipes and fittings IS 16098 (Part-II): 2013 and class SN8 for non pressure underground sewerage drainage application as per EN: 13476-3 is also given in the given chapter. Pipes and fittings shall be as per relevant BIS/ISO specifications. Material should be used after obtaining third party quality assurance certificate

11 Work shall be executed in accordance with the relevant Indian Standard Specifications (Updated) and all the conditions of the agreement of the work.

12 This USOR contains the rates of all the items without GST. GST shall be paid separately as per prevailing government norms as claimed by the contractor in his bill. All the estimates based on this USOR will include GST as an extra amount as per prevailing rates on the sum of the estimate to arrive at the gross amount.

13 Measurement

All measurement should be of the finished work only. The net length of pipes as laid or fixed shall be measured in running meters correct to 10mm. The portion of the pipe inside the joints shall not be included in the length of pipe work. Excavation, refilling, masonry and concrete work wherever required shall be measured and paid for separately under relevant items of work.

14 Rates

The rate shall include the cost of material and labour involved in all the operation described above excluding the cost of concrete which shall be paid separately.

(ii) The rates include provision and use of all coverings etc. to protect the works from inclement weather etc. and from damages from fall of materials, and other causes.

(iii) The rate include provision of handling, storing under cover as required and returning of empty cases or container to U.A.D. Department stores without any extra cost, for such materials as may be supplied by the department.



**UN-PLASTICIZED NON-PRESSURE POLYVINYL CHLORIDE (PVC-U)  
PIPES, DOUBLE WALL CORRUGATED (DWC) PIPES FOR USE IN  
UNDERGROUND SEWERAGE SYSTEM**

S.No.	Particulars of Items	Unit	Rates (in Rs.)
27.1	Providing, laying and jointing following P.V.C. - U pipes with solvent cement joint for Non-pressure gravity drain and sewer applications including testing of joints, cost of jointing materials etc. complete in all respect. [Conform to IS 15328:2003, solvent cement shall conform to IS 14182].		
27.1.1	110 mm dia.	Per Meter	329.00
27.1.2	125 mm dia	Per Meter	694.00
27.1.3	160 mm dia	Per Meter	1085.00
27.1.4	200 mm dia	Per Meter	1669.00
27.1.5	250 mm dia	Per Meter	2057.00
27.2	Providing of DWC/ PE (Earlier HDPE) Pipes of renowned manufacturer duly tested and inspected i/c transportation charges, transit insurance, loading/ unloading and stacking at site/ store etc, complete.		
	Internal dia /Outer dia		
27.2.1	100 mm / 120 mm	Meter	171.00
27.2.2	135 mm / 160 mm	Meter	285.00
27.2.3	150 mm/ 180 mm	Meter	348.00
27.2.4	170 mm / 200 mm	Meter	381.00
27.2.5	200 mm / 238 mm	Meter	464.00
27.2.6	250 mm / 295 mm	Meter	727.00
27.2.7	300 mm / 345 mm	Meter	938.00
27.2.8	400 mm / 480 mm	Meter	1899.00
27.2.9	500 mm / 580 mm	Meter	2921.00
27.2.10	600 mm / 715 mm	Meter	5953.00
27.2.11	800 mm / 950 mm	Meter	7971.00
27.2.12	1000 mm / 1200 mm	Meter	12663.00
27.3	Laying and jointing of DWC /PE (HDPE) Pipes of renowned manufacturer duly tested, and inspected i/c transportation charges, transit insurance, loading/ unloading and stacking at site/ store etc, complete.		
	Internal dia /Outer dia		
27.3.1	100 mm / 120 mm	Meter	31.00
27.3.2	135 mm / 160 mm	Meter	40.00
27.3.3	150 mm/ 180 mm	Meter	46.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)
27.3.4	170 mm / 200 mm	Meter	50.00
27.3.5	200 mm / 238 mm	Meter	55.00
27.3.6	250 mm / 295 mm	Meter	62.00
27.3.7	300 mm / 345 mm	Meter	97.00
27.3.8	400 mm / 480 mm	Meter	102.00
27.3.9	500 mm / 580 mm	Meter	176.00
27.3.10	600 mm / 715 mm	Meter	188.00
27.3.11	800 mm / 950 mm	Meter	206.00
27.3.12	1000 mm / 1200 mm	Meter	278.00
27.4	Providing fittings for structural wall polyethylene piping systems (pipe with online/offline coupler and elastomeric sealing ring) with non-smooth external annular corrugated and smooth internal surfaces (double wall) for non – pressure underground sewerage, drainage as per IS 16098(PART- 2):2013&EN 13476-3.		
27.4.1	<b>Coupler</b>		
27.4.1.1	100 mm	Each	60.00
27.4.1.2	135 mm	Each	101.00
27.4.1.3	150 mm	Each	115.00
27.4.1.4	170 mm	Each	139.00
27.4.1.5	200 mm	Each	186.00
27.4.1.6	250 mm	Each	759.00
27.4.1.7	300 mm	Each	1118.00
27.4.1.8	400 mm	Each	1659.00
27.4.1.9	500 mm	Each	3243.00
27.4.1.10	600 mm	Each	4193.00
27.4.1.11	800 mm	Each	8881.00
27.4.1.12	1000 mm	Each	11669.00
27.4.2	<b>Bends</b>		
27.4.2.1	100 mm	Each	325.00
27.4.2.2	135 mm	Each	455.00
27.4.2.3	150 mm	Each	564.00
27.4.2.4	170 mm	Each	783.00
27.4.2.5	200 mm	Each	908.00
27.4.2.6	250 mm	Each	1775.00
27.4.2.7	300 mm	Each	6978.00
27.4.2.8	400 mm	Each	8362.00
27.4.2.9	500 mm	Each	17243.00
27.4.2.10	600 mm	Each	19556.00
27.4.2.11	800 mm	Each	39290.00
27.4.2.12	1000 mm	Each	56902.00

S.No.	Particulars of Items	Unit	Rates (in Rs.)
27.4.3	<b>Sealing Ring</b>		
27.4.3.1	100 mm	Each	21.00
27.4.3.2	135 mm	Each	27.00
27.4.3.3	150 mm	Each	35.00
27.4.3.4	170 mm	Each	45.00
27.4.3.5	200 mm	Each	78.00
27.4.3.6	250 mm	Each	160.00
27.4.3.7	300 mm	Each	402.00
27.4.3.8	400 mm	Each	620.00
27.4.3.9	500 mm	Each	937.00
27.4.3.10	600 mm	Each	2064.00
27.4.3.11	800 mm	Each	4953.00
27.4.3.12	1000 mm	Each	6981.00

# **CHAPTER - 28**

## **REINFORCED CEMENT CONCRETE PIPES**

## **CHAPTER- 28**

### **REINFORCED CEMENT CONCRETE PIPES**

#### **(PIPES CONFORMING TO IS : 458- 2021)**

#### **NOTES :**

All the pipes, specials, joints to be used in the work shall conform to relevant Indian Standards duly inspected and tested and having BIS certification mark.

#### **1.1 Laying:**

- 1.1.1 Reasonable care shall be exercised in loading, transporting and unloading concrete pipes. Handling shall be such as to avoid impact. Gradual unloading by inclined plane or by chain block is recommended.
- 1.1.2 Pipes shall be lowered in to the trench carefully by mechanical appliances. Under no circumstances shall the pipes be dropped or dumped in to the trench
- 1.1.3 All pipe sections and connections shall be inspected carefully before being laid. Broken or defective pipes or connections shall not be used.
- 1.1.4 All lumps, blisters and excess coating materials shall be removed gently from the ends of each pipe and they should be wiped clean and dry before the pipe inside.
- 1.1.5 In the case of pipes with joints to be made with loose collars, the collars shall be slipped on before the next pipe inside.
- 1.1.6 Every precaution shall be taken to prevent foreign materials from entering the pipe when it is being placed in the line.
- 1.1.7 Pipes shall be laid in true line and grade, as specified.
- 1.1.8 Sight rails provided at all change of directions or gradients and at distances of about 15 metered along. Straight lengths with centre line marked on each horizontal rail which is fixed at true level, shall be used for laying all inverts with the help of proper boning rods.
- 1.1.9 Laying of pipes shall always proceed upgrade of a slope. If the pipes have spigot and socket joints, the socket ends shall face upstream. In the cases of pipes with joints to be made with loose collars, the collars shall be slipped one before the next pipe is laid.
- 1.1.10 The pipe shall be secured in place with approved back fill material or concrete tamped under it except at the joint portion.
- 1.1.11 Precautions shall be taken to prevent dirt from entering the joint space.
- 1.1.12 When pipe laying is not in progress, the open ends of pipe shall be closed by a water tight plug or canvas or other means approved by the Engineer in charge.
- 1.1.13 Trench shall be kept free from water until the material in the joints has hardened

- 1.1.14 When the pipe is closed and the trench liable to be flooded by rain, care shall be taken to prevent the pipe from floating.
- 1.1.15 Walking or working on the completed pipe shall not be permitted until the trench has been back filled to a height of at least 30 CM over the pipe, except as may be necessary in tamping or backfilling.
- 1.1.16 The cutting of pipe for inserting, fittings or closure pieces shall be done in a neat and workmanlike manner without danger to the pipe so as to leave a smooth surface and at right angles to the axis of the pipe.
- 1.1.17 The Engineer-in-Charge should consult the appropriate authorities before preparing plans and specifications for pipe line crossing railway lines, Irrigation, channels or similar other works and services.
- 1.1.18 The connection to an existing sewer shall be done through manholes.
- 1.1.19 Before connecting a pipe to a manhole, a relieving arch or any other similar protection device should be made in the manhole for the safety of the pipe.
- 1.1.20 The pipe when laid should not be subjected to super imposed load beyond what the pipe can safety take up.

## 2.2 **Pipe Bedding**

- 2.2.1 In case where the foundation conditions are unsafe such as in the proximity of trees or poles, under existing or proposed tracks, under manholes etc; the pipe shall be encased, in low strength concrete bedding or compacted sand or gravel.
- 2.2.2 The following class of pipe beddings are recommended as per CPHEEO manual. The class of bedding depends upon the site condition and loading.

Class-A bedding It may either concrete cradle or concrete arch depend upon the design.

Class-B bedding It is having a shaped bottom or compacted granular bedding with a carefully compacted back fill

Class-C bedding It is ordinary bedding having a compacted granular bedding with a lightly compacted back fill.

- 2.2.3 The pipe bedding materials must remain firm and not permit displacement of pipes. Where rock or other unyielding foundation material is encountered, bedding shall be according to one of the classes A, B or C but with the following additional requirements. Class-A bedding-The hard unyielding material should be excavated down to the bottom of the concrete cradle. Class-B or C bedding: The hard unyielding material should be excavated below the bottom of the pipe and pipe bell to depth of at least 15cm. The width of trench should be at least 28.1.25 times the outside dia of pipe and it should be refilled with granular material.
- 2.2.4 When the pipe is laid in a trench in rock, hard clay, shale or other hard material, the space below the pipe shall be excavated and replaced with an equalising bed of concrete, sand or compacted earth. In no place the pipe shall be laid directly on such hard material.

- 2.2.5 The bedding shall be as per details given in chapter VI 'Structural design of buried sewer' given in CPHEEO manual on sewerage and sewage treatment (1993 second edition).

### **3.3 Jointing:**

- 3.3.1 The socket and spigot pipes are laid and jointed with rubber gasket.
- 3.3.2 In case of collar jointed pipe, the jointing shall be done with hemp yarn soaked in cement slurry tamped with just sufficient quantity of water to have a consistency of semi dry condition, well packed and thoroughly rammed with caulking tools and then filled with cement mortar 1:2. The joint shall be finished off with a fillet slopping at 45 degrees to the surface of the pipe. The finished joint shall be protected and cured for at least 24 hours. For jointing, procedure shall be followed as per I.S. 783 –1985.

### **4.4 Testing:**

- 4.4.1 Each section of sewer shall be tested for water tightness preferably between manholes.
- 4.4.2 In case of cement mortar joints, the sewer line shall be tested three days after the cement mortar joints have been made.
- 4.4.3 The pipe line shall be filled with water for about a week before commencing the application of pressure to allow for the absorption by pipe wall
- 4.4.4 The pipe line shall be tested by plugging the upper end with a provision for an air outlet pipe with stop cock. The water shall be filled through a funnel connected at the lower end provided with a plug. After expelling the air through the air outlet, the stop cock shall be closed and water level in the funnel shall be raised to 2.5 m above the invert at the upper end. Water level in the funnel is noted after 30 minutes and the quantity of water required to restore the original water level in the funnel is determined. The pipe line under pressure is then inspected while funnel is still in position. There shall not be any leaks in the pipe or joints (small sweating on the pipe surface is permitted).
- 4.4.5 Any sewer or part thereof that doesn't meet the test shall be emptied and repaired or re-laid as required and tested again.
- 4.4.6 The leakage or quantity of water to be supplied to maintain the test pressure during the period of 10 minutes should not exceed 0.2 liters/mm diameter of pipe per Km. length per day
- 4.4.7 For non pressure pipes the leakage should be observed for a period of 24 hours
- 4.4.8 Exfiltration test for detection of leakage shall be carried out at a time when the ground water table is low.
- 4.4.9 Air testing shall be done particularly in large diameter pipes when the required quantity of water is not available for testing subjected to the provisions made in the agreement. It is done as per procedure given in CPHEEO manual (1993 second edition).

## 5.5 Back filling of trenches:

- 5.5.1 The method of backfilling to be used shall vary with the width of trench, the character of material excavated, the method of excavation and degree of compaction required.
- 5.5.2 In open country, it shall be sufficient to mound the trench and after natural settlement return to regrade the area as.
- 5.5.3 In developed streets, it shall be compacted to minimize the load
- 5.5.4 Soft material screened free from stones or hard substances shall first be used and hand pressed under and around the pipes to half the height. Similar soft material shall then be put up to a height of 30 cm. above the top of pipe and this will be moistened with water and well rammed. The remaining trench can be filled with hard material, in layers each not exceeding 60 cm. At each stage the filling shall be well rammed, consolidated and completely saturated with water and then only further filling shall be continued.
- 5.6 **This USOR contains the rates of all the items without GST. GST shall be paid separately as per prevailing government norms as claimed by the contractor in his bill. All the estimates prepared on this USOR will include GST, as an extra amount as per prevailing rates on the sum of the estimate to arrive at the gross amount.**

## REINFORCED CEMENT CONCRETE PIPES (PIPES CONFORMING TO IS : 458- 2021)

SI NO.	Particulars of Items	Unit	Rate (in Rs.)
28.1	Providing and laying non-pressure (NP2) RCC socket & spigot pipes with rubber gasket joint including testing of joints.		
28.1.1	100 mm dia	Meter	444.00
28.1.2	150 mm dia	Meter	498.00
28.1.3	200 mm dia	Meter	524.00
28.1.4	250 mm dia	Meter	764.00
28.1.5	300 mm dia	Meter	989.00
28.1.6	350 mm dia	Meter	1137.00
28.1.7	400 mm dia	Meter	1154.00
28.1.8	450 mm dia	Meter	1399.00
28.1.9	500 mm dia	Meter	1527.00
28.1.10	600 mm dia	Meter	1925.00
28.1.11	700 mm dia	Meter	2528.00
28.1.12	800 mm dia	Meter	3357.00
28.1.13	900 mm dia	Meter	4154.00
28.1.14	1000 mm dia	Meter	4784.00
28.1.15	1100 mm dia	Meter	5614.00



SI NO.	Particulars of Items	Unit	Rate (in Rs.)
28.1.16	1200 mm dia	Meter	6915.00
28.1.17	1600 mm dia	Meter	11452.00
28.2	Labour only for Laying and Jointing non pressure (NP2) RCC socket & spigot pipes with rubber gasket joint including testing of joints.		
28.2.1	100 mm dia	Meter	84.00
28.2.2	150 mm dia	Meter	131.00
28.2.3	200 mm dia	Meter	141.00
28.2.4	250 mm dia	Meter	191.00
28.2.5	300 mm dia	Meter	230.00
28.2.6	350 mm dia	Meter	253.00
28.2.7	400 mm dia	Meter	292.00
28.2.8	450 mm dia	Meter	335.00
28.2.9	500 mm dia	Meter	371.00
28.2.10	600 mm dia	Meter	436.00
28.2.11	700 mm dia	Meter	491.00
28.2.12	800 mm dia	Meter	563.00
28.2.13	900 mm dia	Meter	691.00
28.2.14	1000 mm dia	Meter	764.00
28.2.15	1100 mm dia	Meter	836.00
28.2.16	1200 mm dia	Meter	945.00
28.2.17	1600 mm dia	Meter	1363.00
28.3	Providing and Laying non-pressure (NP3) RCC socket & spigot pipes with rubber gasket joint including testing of joints.		
28.3.1	150 mm dia	Meter	642.00
28.3.2	250 mm dia	Meter	907.00
28.3.3	300 mm dia	Meter	1123.00
28.3.4	350 mm dia	Meter	1798.00
28.3.5	400 mm dia	Meter	2175.00
28.3.6	450 mm dia	Meter	2512.00
28.3.7	500 mm dia	Meter	2760.00
28.3.8	600 mm dia	Meter	3297.00
28.3.9	700 mm dia	Meter	4431.00
28.3.10	800 mm dia	Meter	5793.00
28.3.11	900 mm dia	Meter	7118.00
28.3.12	1000 mm dia	Meter	7654.00
28.3.13	1100 mm dia	Meter	9146.00
28.3.14	1200 mm dia	Meter	10794.00
28.3.15	1400 mm dia	Meter	13096.00
28.3.16	1600 mm dia	Meter	15840.00
28.3.17	1800 mm dia	Meter	19229.00

SI NO.	Particulars of Items	Unit	Rate (in Rs.)
28.4	Labour only for laying and Jointing non-pressure (NP3) RCC socket & spigot pipes with rubber gasket joint including testing of joints.		
28.4.1	150 mm dia	Meter	128.00
28.4.2	250 mm dia	Meter	185.00
28.4.3	300 mm dia	Meter	240.00
28.4.4	350 mm dia	Meter	387.00
28.4.5	400 mm dia	Meter	406.00
28.4.6	450 mm dia	Meter	499.00
28.4.7	500 mm dia	Meter	535.00
28.4.8	600 mm dia	Meter	636.00
28.4.9	700 mm dia	Meter	726.00
28.4.10	800 mm dia	Meter	835.00
28.4.11	900 mm dia	Meter	1017.00
28.4.12	1000 mm dia	Meter	1163.00
28.4.13	1100 mm dia	Meter	1217.00
28.4.14	1200 mm dia	Meter	1308.00
28.4.15	1400 mm dia	Meter	1670.00
28.4.16	1600 mm dia	Meter	1997.00
28.4.17	1800 mm dia	Meter	2360.00
28.5	Providing and laying non-pressure (NP4) RCC socket & spigot pipes with rubber gasket joint including testing of joints.		
28.5.1	250 mm dia	Meter	1016.00
28.5.2	300 mm dia	Meter	1466.00
28.5.3	350 mm dia	Meter	2177.00
28.5.4	400 mm dia	Meter	2430.00
28.5.5	450 mm dia	Meter	2869.00
28.5.6	500 mm dia	Meter	3229.00
28.5.7	600 mm dia	Meter	4413.00
28.5.8	700 mm dia	Meter	5283.00
28.5.9	800 mm dia	Meter	6801.00
28.5.10	900 mm dia	Meter	8276.00
28.5.11	1000 mm dia	Meter	8831.00
28.5.12	1100 mm dia	Meter	10524.00
28.5.13	1200 mm dia	Meter	10757.00
28.5.14	1400 mm dia	Meter	13912.00
28.5.15	1600 mm dia	Meter	16578.00
28.5.16	1800 mm dia	Meter	19522.00
28.6	Labour only for laying and jointing nonpressure (NP4) RCC socket & spigot pipes with rubber gasket joint including testing of joints.		

SI NO.	Particulars of Items	Unit	Rate (in Rs.)
28.6.1	250 mm dia	Meter	209.00
28.6.2	300 mm dia	Meter	266.00
28.6.3	350 mm dia	Meter	380.00
28.6.4	400 mm dia	Meter	437.00
28.6.5	450 mm dia	Meter	480.00
28.6.6	500 mm dia	Meter	534.00
28.6.7	600 mm dia	Meter	636.00
28.6.8	700 mm dia	Meter	726.00
28.6.9	800 mm dia	Meter	889.00
28.6.10	900 mm dia	Meter	1071.00
28.6.11	1000 mm dia	Meter	1217.00
28.6.12	1100 mm dia	Meter	1253.00
28.6.13	1200 mm dia	Meter	1398.00
28.6.14	1400 mm dia	Meter	1816.00
28.6.15	1600 mm dia	Meter	1997.00
28.6.16	1800 mm dia	Meter	2360.00
28.7	Providing, Laying & jointing non-pressure (NP2) RCC pipes with collars jointed with stiff mixture of cement mortar in the proportion 1:2 (1 cement : 2 sand ) including testing of joints.		
28.7.1	150 mm dia	Meter	306.00
28.7.2	200 mm dia	Meter	415.00
28.7.3	250 mm dia	Meter	520.00
28.7.4	300 mm dia	Meter	568.00
28.7.5	350 mm dia	Meter	645.00
28.7.6	400 mm dia	Meter	775.00
28.7.7	450 mm dia	Meter	903.00
28.7.8	500 mm dia	Meter	1021.00
28.7.9	600 mm dia	Meter	1092.00
28.7.10	700 mm dia	Meter	1677.00
28.7.11	800 mm dia	Meter	2221.00
28.7.12	900 mm dia	Meter	2846.00
28.7.13	1000 mm dia	Meter	3360.00
28.7.14	1100 mm dia	Meter	4023.00
28.7.15	1200 mm dia	Meter	4746.00
28.8	Labour only for laying & jointing nonpressure (NP2) RCC pipes with collars jointed with stiff mixture of cement mortar in the proportion 1:2 (1 cement : 2 sand ) including testing of joints.		
28.8.1	150 mm dia	Meter	81.00
28.8.2	200 mm dia	Meter	130.00

SI NO.	Particulars of Items	Unit	Rate (in Rs.)
28.8.3	250 mm dia	Meter	134.00
28.8.4	300 mm dia	Meter	126.00
28.8.5	350 mm dia	Meter	161.00
28.8.6	400 mm dia	Meter	170.00
28.8.7	450 mm dia	Meter	176.00
28.8.8	500 mm dia	Meter	187.00
28.8.9	600 mm dia	Meter	209.00
28.8.10	700 mm dia	Meter	233.00
28.8.11	800 mm dia	Meter	253.00
28.8.12	900 mm dia	Meter	297.00
28.8.13	1000 mm dia	Meter	364.00
28.8.14	1100 mm dia	Meter	460.00
28.8.15	1200 mm dia	Meter	574.00
28.9	Providing, Laying & jointing non-pressure (NP3) RCC pipes with collars jointed with stiff mixture of cement mortar in the proportion 1:2 (1 cement : 2 sand ) including testing of joints		
28.9.1	150 mm dia	Meter	437.00
28.9.2	200 mm dia	Meter	651.00
28.9.3	250 mm dia	Meter	694.00
28.9.4	300 mm dia	Meter	756.00
28.9.5	350 mm dia	Meter	1209.00
28.9.6	400 mm dia	Meter	1648.00
28.9.7	450 mm dia	Meter	1759.00
28.9.8	500 mm dia	Meter	2193.00
28.9.9	600 mm dia	Meter	2280.00
28.9.10	700 mm dia	Meter	3639.00
28.9.11	800 mm dia	Meter	3910.00
28.9.12	900 mm dia	Meter	4610.00
28.9.13	1000 mm dia	Meter	5124.00
28.9.14	1100 mm dia	Meter	6408.00
28.9.15	1200 mm dia	Meter	7608.00
28.10	Labour only for laying & jointing nonpressure (NP3) RCC pipes with collars jointed with stiff mixture of cement mortar in the proportion 1:2 (1 cement : 2 sand ) including testing of joints.		
28.10.1	150 mm dia	Meter	81.00
28.10.2	200 mm dia	Meter	130.00
28.10.3	250 mm dia	Meter	134.00
28.10.4	300 mm dia	Meter	126.00
28.10.5	350 mm dia	Meter	161.00
28.10.6	400 mm dia	Meter	170.00

SI NO.	Particulars of Items	Unit	Rate (in Rs.)
28.10.7	450 mm dia	Meter	176.00
28.10.8	500 mm dia	Meter	187.00
28.10.9	600 mm dia	Meter	209.00
28.10.10	700 mm dia	Meter	233.00
28.10.11	800 mm dia	Meter	253.00
28.10.12	900 mm dia	Meter	297.00
28.10.13	1000 mm dia	Meter	364.00
28.10.14	1100 mm dia	Meter	460.00
28.10.15	1200 mm dia	Meter	574.00
28.11	Providing, Laying & jointing non-pressure (NP4) RCC pipes with collars jointed with stiff mixture of cement mortar in the proportion 1:2 (1 cement : 2 sand ) including testing of joints		
28.11.1	150 mm dia	Meter	449.00
28.11.2	200 mm dia	Meter	656.00
28.11.3	250 mm dia	Meter	737.00
28.11.4	300 mm dia	Meter	997.00
28.11.5	350 mm dia	Meter	1663.00
28.11.6	400 mm dia	Meter	1857.00
28.11.7	450 mm dia	Meter	1947.00
28.11.8	500 mm dia	Meter	2314.00
28.11.9	600 mm dia	Meter	2989.00
28.11.10	700 mm dia	Meter	3676.00
28.11.11	800 mm dia	Meter	4589.00
28.11.12	900 mm dia	Meter	5744.00
28.11.13	1000 mm dia	Meter	6401.00
28.11.14	1100 mm dia	Meter	7470.00
28.11.15	1200 mm dia	Meter	7879.00
28.12	Labour only for Laying & jointing nonpressure (NP4) RCC pipes with collars jointed with stiff mixture of cement mortar in the proportion 1:2 (1 cement : 2 sand ) including testing of joints.		
28.12.1	150 mm dia	Meter	81.00
28.12.2	200 mm dia	Meter	130.00
28.12.3	250 mm dia	Meter	134.00
28.12.4	300 mm dia	Meter	126.00
28.12.5	350 mm dia	Meter	161.00
28.12.6	400 mm dia	Meter	170.00
28.12.7	450 mm dia	Meter	176.00
28.12.8	500 mm dia	Meter	187.00
28.12.9	600 mm dia	Meter	209.00
28.12.10	700 mm dia	Meter	233.00

<b>SI NO.</b>	<b>Particulars of Items</b>	<b>Unit</b>	<b>Rate (in Rs.)</b>
28.12.11	800 mm dia	Meter	253.00
28.12.12	900 mm dia	Meter	297.00
28.12.13	1000 mm dia	Meter	364.00
28.12.14	1100 mm dia	Meter	460.00
28.12.15	1200 mm dia	Meter	574.00

**CHAPTER - 29**

**SALT GLAZED STONEWARE PIPES, SEWER  
APPURTENANCES & SEWERAGES  
MAINTENANCE**

## **CHAPTER- 29**

### **SALT GLAZED STONEWARE PIPES, SEWER APPURTENANCES**

#### **NOTES : 1. Salt Glazed Stoneware**

- 29.1. The salt Glazed stoneware pipe shall be conforming to IS:651 :2007
- 29.2. The laying to S.W. pipes shall be done as per IS - 4127 :1983
- 29.3. The bedding of the S. W. pipes shall be as per the specification given in the CPHEEO manual of sewerage & sewage treatment, payment for which shall be made as per chapter - 15 allied civil works.
- 29.4. The testing of the sewer line & refilling shall be done as per CPHEEO manual on sewerage and sewage management
- 29.5. In order to avoid damage to the pipes and especially to the spigot end, pipes shall not be dragged along concrete and similar pavements with hard surfaces.
- 29.6. The pipes and fittings shall be inspected for defects and be rung with a light hammer preferable while suspended to detect cracks.
- 29.7. All lumps, blisters and excess coating materials shall be removed gently from the socket and spigot of each pipe. The outside of the spigot and the inside of the socket shall be wiped clean and dry before the pipe is laid.
- 29.8. In shallow trenches, manual handling is enough but in deep trenches, they shall be lowered into the trench by means of ropes. Under no circumstances the pipe shall be dropped or dumped into the trench.
- 29.9. Every precaution shall be taken to prevent foreign material from entering the pipe when it is being placed in the line.
- 29.10. The pipe between two manholes shall be laid truly in a straight line without vertical and horizontal undulations. The pipe shall be laid true to line and grade as specified in the relevant specifications

#### **29.2. Unloading of pipes:**

- 29.2.1 While unloading, pipes shall not be thrown from the truck on hard ground.

#### **29.3. Trenches:**

- 29.3.1. The width of trench at and below the top of sewer should be the minimum necessary for its proper installation with the due consideration to its bedding. It should be as per clause 7.1.1 page 126 of construction of sewers as per CPHEEO manual on sewerage and sewage treatment (second edition).
- 29.3.2. Unloading of pipes on timber skids without a steadying rope and thus allowing the pipes to bump hard against one another should not be allowed.
- 29.3.3. Where the sewer has to be laid in a soft under ground strata or in a reclaimed land, the trench shall be excavated deeper than what is ordinary required. The trench bottom shall be stabilised by the addition of coarse gravel or rock, in case of very bed soil the trench bottom shall be filled in with cement concrete.



For class of bedding details clause 6.5.3.1 page 116 of CPHEEO manual on sewerage and sewage treatment should be followed.

- 29.3.4. In order to avoid damage to the pipes and especially to the spigot end, pipes should not be dragged along concrete and similar pavements with hard surfaces.
- 29.3.5. The pipe and fittings shall be inspected for defects and be rung with a light hammer preferably while suspended, to detect cracks.
- 29.3.6. All lumps, blisters and excess coating materials shall be removed gently from the socket and spigot end of each pipe and the outside of the spigot and the inside of the socket shall be wiped clean and dry before the pipe is laid.
- 29.3.7. In shallow trenches manual handling is enough but in deep trenches, they should be lowered into the trench by means of ropes. Under no circumstances shall not the pipes be dropped or dumped into the trench.
- 29.3.8. Every precaution shall be taken to prevent foreign materials from entering the pipe when it is being placed in the line.
- 29.3.9. Every precaution shall be taken to prevent foreign materials from entering the pipe when it is being placed in the line.
- 29.3.10. The pipes between two main holes shall be laid truly in a straight line without vertical and horizontal undulations. The pipes shall be laid true to line and grade as specified.
- 29.3.11. Sight rails provided at all changes of direction or gradient and at distances of about 15 meters along straight lengths, with centre line marked each horizontal rail, which is fixed at true level, shall be used for laying all inverts.
- 29.3.12. Normally the socket ends should face the up stream. When the line runs up hill the socket ends should face the upgrade.
- 29.3.13. The stone ware pipes shall be laid with sockets facing up the gradient, on desired, special bedding. Hunching or encasing may be provided where conditions so demand as discussed in clause 6.5 of CPHEEO manual on sewerage and sewage treatment
- 29.3.14. Where pipes are not bedded on concrete, the trench floor shall be left slightly high and carefully buttoned up as pipe laying proceeds, so that the pipes barrels rest on firm and undisturbed ground. If the excavation has been carried too low the desired levels shall be made up with concrete 1:5:10 (1cement: 5 fine cement : 10 graded stone aggregate 40 mm nominal size) for which no extra payment shall be made. The pipe shall be secured in place with approved back fill material or concrete tamped under it except at the socket.
- 29.3.15. Pipe and fittings, which do not allow a sufficient and uniform space for joints, shall be removed and replaced with pipe and fittings of proper dimensions to ensure such uniform space.
- 29.3.16. At times when pipe laying is not in progress, the open ends of pipe shall be closed by a water tight plug or canvas or other means approved by the Engineer incharge.

- 29.3.17. Trenches shall be kept free from water until the material in the joints has hardened.
- 29.3.18. When the pipe is closed and the trench to be flooded by rain; care shall be taken to prevent the pipe from floating.
- 29.3.19. The cutting of pipe for inserting, fittings or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe or inside coating so as to leave a smooth surface and at right angle to the axis of the pipe.
- 29.3.20. The Engineer In-charge should consult the appropriate authorities before preparing plans and specifications for pipeline crossing Railway lines, Irrigation channels or similar works.
- 29.3.21. The connection to an existing sewer shall be done through manholes.
- 29.3.22. Before connecting a pipe to a manhole, a relieving arch or any other similar protection device should be made in the manhole for the safety of the pipe.
- 29.3.23. The pipes when laid, should not be subjected to superimposed load beyond their safe crushing strength

#### **29.4 Jointing:**

- 29.4.1 The stoneware pipes shall be cement jointed.
- 29.4.2 The materials shall consist of the following
- a) Spun yarn or tarred gaskets
  - b) Cement.
  - c) Sand
- 29.4.3** In each joint, spun yarn soaked in neat cement slurry or tarred gasket shall be passed round the joint and inserted in it by means of a caulking tool. More yarn or gasket shall be added if necessary and shall be well caulked. Yarn or gasket so rammed shall not occupy more than one fourth of the depth of socket.
- 29.4.4** Cement mortar (1:1) (one part of cement to one part of sand) shall be slightly moistened and carefully inserted by hand into the remaining space of the joint after caulking of yarn or gasket. The mortar shall then be caulked into the joint with a caulking tool. More cement mortar shall be added until the joint space has been completely filled with tightly caulked mortar. The joint shall then be finished off neatly outside the socket at an angle of 45 degrees (IS4127-1983)
- 29.4.5 The cement mortar joints shall be cured at least for seven days before testing.
- 29.4.6 The joint with cast iron or concrete pipes shall be made with cement joints.

#### **29.5 Testing:**

- 29.5.1. Each section of sewer shall be tested for water tightness preferably between manholes.
- 29.5.2. Each section of sewer shall be tested for water tightness preferably between manholes.

- 29.5.3. Before commencing the hydraulic test the pipelines shall be filled with water for about a week before commencing the application of pressure to allow for the absorption by pipewall.
- 29.5.4. The sewers are tested by plugging the upper end with a provision for an air out let pipe with stopcock. The water is filled through a funnel connected at the lower end provided with a plug. After the air has expelled through the air out let, the stop cock is closed and water level in the funnel is noted after 30 minutes and gravity of water required to restore the original water level is determined. The pipe line under pressure is then inspected while the funnel is still in position. There shall be no leaks in the pipe or joints (small sweating on the pipe surface is permitted).
- 29.5.5. Any sewer or part there of that does not meet the test shall be emptied and repaired or re-laid as required and tested again.
- 29.5.6. The leakage of quantity of water to be supplied to maintain the test pressure during the period of 10 minutes shall not exceed 0.2 litres/mm dia. of pipe per kilometre length per day.
- 29.5.7. It should be done as per clause 7.1.5 page 131 of CPHEEO manual on sewerage and sewage treatment.

#### **29.6 Refilling:**

- 29.6.1. No trench shall be filled in unless the sewer stretches have been tested and approved for water tightness of joints. However partial filling may be done keeping the joints open to avoid disturbance. Soft material screened free from stones or hard substances shall first be used and hand pressured under and around the pipes to half their height. Similarly soft material shall be put up to a height of 30cm above top of pipe and then this will be moistened with water and well rammed. The reminder of the trench can be filled with hard material, in stages, each not exceeding 60 cm. At each stage the filling shall be well rammed, consolidated and completely saturated with water and then only further filling shall be continued. It should be done as per procedure given in clause 7.1.9 page 133 of CPHEEO manual on sewerage and sewage treatment.

#### **29.7 Measurements:**

- 29.7.1. The lengths of pipe shall be measured in the running meters nearest to a cm as laid or fixed, from inside of one manhole to the inside of the other manhole the length shall be taken. Along the centre line of the pipes overall fittings. Such as bends, junction, etc., which shall not be measured separately. Excavation refilling shoring and timbering in trenches and cement concreting where ever required shall be measured separately under relevant item of work.

#### **29.8 Rate:**

The rate shall include the cost of material and labour involved in all the operation described above including the cost of concrete which shall be paid separately

- 29.9 This USOR contains the rates of all the items without GST. GST shall be paid separately as per prevailing government norms as claimed by the contractor in

his bill. All the estimates prepared on this USOR will include GST, as an extra amount as per prevailing rates on the sum of the estimate to arrive at the gross amount.

## **NOTES - 2. Sewer Appurtenance**

Following are the General Sewer Appurtenances-

- 1) Manholes
- II) Inverted Syphon
- III) Storm Water Inlets
- V) Sewer Ventilators

Out of the above, manholes are the most essential items in any sewerage system

### **1. Manhole**

#### **1.1 Function**

Manholes is the essential ancillary structure in any sewerage system. They shall be provided for inspection, testing, cleaning, repairing and removal of obstruction from sewer line.

#### **1.2 Provision:-**

Manholes should be built at every change of alignment, gradient or diameter, at the head of all sewer and branches and at every junction of two or more sewers, on sewer, which is to be cleaned manually or which cannot be entered for cleaning or inspection.

#### **1.3 Spacing:-**

The Maximum spacing of manholes in the sewer shall be kept as follows: -

<b>Pipe dia (mm)</b>	<b>Max. Spacing (mt)</b>
Upto 900	30
900 to 1500	90 - 150
1500 to 2000	150 - 200
Above 2000	300

A spacing allowance of 100m per 1m dia of sewer is a general rule in case of very large sewers

#### **1.4 Types of manholes:**

Following is the general classification of manholes-

##### **1.4.1 Straight-through manholes:-**

The simplest type of manhole is that built on a straight run of sewer with no side junctions. Where there is a change in the size of sewer, the soffit or crown level of the two sewers should be the same, except where special conditions require otherwise.

##### **1.4.2 Junction Manholes:-**

A manhole should be built at every junction of two or more sewers, and the curved portions of the inverts of tributary sewers should be formed within the manhole. To achieve this with the best economy of space, the chamber may be built of a shape other than rectangular. The soffit of the smaller sewer at a junction should be not lower than that of the larger sewer, in order to avoid the surcharging of the former when the latter is running full, and the hydraulic design usually assumes such a condition. The gradient of the smaller sewer may be increased from the previous manhole sufficiently to reduce the difference of invert level at the point of junction to a convenient amount.

#### 1.4.3 Side Entrance Manholes:-

In large sewer or where it is difficult to obtain direct vertical access to the sewer from ground level, owing to existing services, gas, water etc. the access shaft should be constructed in the nearest convenient position off the line of sewer, and connected to the manhole chamber by a lateral passage. In the tunnelled sewer the shaft and the lateral access heading may be used as a working shaft, the tunnel being broken out from the end of the heading, or alternatively the shaft and heading may be used as a working shaft, the tunnel being broken out from the end of the heading, or alternatively the shaft and heading maybe constructed after the main tunnel is completed, provision having been made for breaking in from the access heading to build the chamber. The floor of the side-entrance passage, which should fall at about 1 in 30 towards the sewer, should enter the chamber not lower than the soffit level of the sewer. In large sewer where the floor of the side entrance passage is above the soffit either steps or a ladder (which should be protected either by a removable handrail or by safety chains) should be provided to reach the benching.

#### 1.4.4 Drop Manholes:-

When a sewer connects with another sewer, where the difference in level between water lines (peak flow levels) of main line and the invert level of branch line is more than 600 mm or a drop of more than 600 mm is required to be given in the same sewer line and it is uneconomical or impractical to arrange the connection with in 600 mm a drop connection shall be provided for which is manholes maybe built incorporating a vertical or nearly vertical drop pipe from the higher sewer to the lower one. This pipes maybe either outside the shaft and enclosed in concrete or supported on brackets inside the shaft, which should be suitably enlarged. If the drop pipe is outside the shaft, a continuation of the sewer should be built through the shaft wall to form a rodding and inspection eye, which should be provided with a half blank flange. If the drop pipe is inside the shaft. It should be in cast iron and it would be advantageous to provide adequate means for rodding and water cushion of 150 mm depth should also be provided. The diameter of the backdrop should be at-least as large as that of the incoming pipe. The drop pipe should terminate at its lower end with a plain or duck-foot bend turned so as to discharge its flow at 45 degree or less then to the direction of the flow in the main sewer and the pipe, unless of cast iron, should be surrounded with 150 mm of concrete.

In the case of sewer over 450 mm in diameter the drop in level may be accomplished by one of the following methods: -

- (a) **A cascade:** - This is a steep ramp composed of steps over which the flow is broken up and retarded. A pipe connecting the two levels is often

concreted under the steps to allow small flow to pass without trickling over the steps. The cascade steps maybe made of heavy-duty bricks of class-I quality (IS: 2180- 1985) cement concrete with granolithic finish or dressed granite.

- (b) **A Ramp:** - A ramp maybe formed by increasing the grade of the last length of the upper sewer to about 45 degrees or by constructing a steeply graded channel or culvert leading from the high level to the low level sewer. In order to break up the flow down the ramp and minimize the turbulence in the main sewer the floor of culvert ramp should be obstructed by rased transverse ribs of either bricks or concrete at 1.50m intervals and a stilling pool provided at the bottom of the ramp and.
- (c) By drop in previous successive manholes instead of providing the total drop require at the junction manholes, the same may be achieved by giving smaller deeps in successive manhole preceding the junction manhole. Thus for example, if a total drop of 2.4m is required to be given, 0.6m drop maybe given in each of the previous three manholes and the last 0.6m-drop maybe given at the junction manhole.

#### 1.4.5 **Scraper (Service) Type Manhole:-**

All sewers above 450mm diameter should have manhole at intervals for 110 to 120 m of scraper type. This manhole should have clear opening of 1200 x 900 mm at top to facilitate lowering of buckets.

#### 1.4.6 **Flushing manholes:-**

Where it is not possible to obtain self-cleaning velocities due to flatness of the gradient specially at the top end of branch sewer which receive very little flow, it is essential that same form of flushing device be incorporated in the system. This can be done by making grooves at intervals of 45 to 50m in the main drains in which wooden planks are inserted & water allow to head up and which will rush on with great velocity when the planks are removed. Alternatively, an overhead water tanks is built, from which connection are made through pipe flushing hydrants to rush water to the sewer. The relevant Indian standard is IS:4111(part two). Flushing can be very conveniently accomplished by use of fire hydrant or tanker.

Where flushing manhole is provided, they are located generally at the head of a sewer. Sufficient velocity shall be imparted in the sewer to wash away the deposited solid. The flush is usually effective up to a certain distance after which the imparted velocity gets dissipated.

The automatic systems which are operated by mechanical units gets often corroded by the sewer gases and do not generally function satisfactorily and hence are not recommended. In case of hard chock ages in sewers, care should be exercised to be ensuring that there is no possibility or back flow of sewer into the water supply mains.

Approximate quantities of water needed for flushing are as follows: -

S.No.	Slope	Quantity of Water (litres)	
		200mm dia	250mm dia
1.	0.00502300	2500	3000

2.	0.00751500	1800	2300
3.	0.01001300	1500	2000
4.	0.0200500	800	1000
5.	0.0300400	500	700

## 2. **Constructional Details:-**

Manhole is usually constructed directly over the centre line of the sewer they are usually constructed with brickwork. However in areas where sewers are to be laid in high water condition manhole shall be constructed in R.C.C. They are circular, rectangular or square in shape. Manholes should be of such size as will allow necessary cleaning and inspection of manholes.

(a) **Rectangular Manholes** - The minimum internal sizes of rectangular manholes between brick face should be as follows:

- (i) For depth of manholes less than 0.9m, 900mm x 800mm and
- (ii) For depths of manholes from 0.9m upto 2.5m, 1200mm x 900mm

(b) **Arch type manholes** - For depth of 2.5m and above, arch type manholes can be provided and the internal size of the chambers between brick faces shall be 1400mm x 900mm. The width of manhole chamber on bents and junction of pipes with diameter greater than 450mm should be suitably increased to 900mm or more so that benching width on either side of the channel to be at-least 200mm.

## 3. **Circular manholes-**

Circular manholes are longer than rectangular and arch type manhole and thus there are preferred over rectangular as well as arch type manholes. The circular manholes can be provided for all depths starting from 0.9m circular manholes are straight down in lower portion and slanting in top portion so as to narrow down the top opening equal to internal dia. of manhole over. Depending upon the depth of manhole, the diameter of manhole changes. The internal diameter of circular manholes may be kept as following for verifying depths.

- (i) For depths 0.9m and up to 1.65m, 900mm diameter
- (ii) For depths above 1.65m and up to 2.30m, 1200mm diameter
- (iii) For depths above 2.30m and up to 9.0m, 1500mm diameter.
- (iv) For depths above 9.0m and up to 14.0m, 1800mm diameter.

Typical circular manholes are shown in fig.6

If the sewer is constructed in a tunnel, the manhole should be located at the access or working shaft and the manhole chamber maybe constructed of a size to suit the working shaft or vice-versa.

The width /diameter of the manhole should not be less than internal diameter of the sewer +150mm benching as both sides (150mm+ 150mm) The opening for entry into the manhole (without cover) should be such minimum diameters as to allow a workman with the cleaning equipments into the interior of the manhole without difficulty. A minimum clear opening of 60cm preferably circular is recommended. Suitable steps usually cast iron shall be provided for entry.

Access shaft for large sewers - Access shaft shall be circular in shape and shall have a minimum internal dia of 750mm, where the depth of the shaft exceeds 3m suitable dimensions shall be provided to facilitate cleaning and maintenance.

Access shaft where built of brick work should be corbelled on three sides to reduce it to the size of the opening in the cover frame, and to provide easy access on the fourth side to step iron or ladder. In determining sizes the dimensions of the maintenance equipments likely to be used in sewer, shall be kept in view.

Where the diameter of the sewer is increased, the crown of the entering leaving pipes shall be fixed at the same level and necessary slopes given in the inverted of the manholes chamber. In exceptional cases and where unavoidable the crown of the entering sewer maybe fixed at lower level but in each cases too the peak flow level of the two sewer shall be kept the same.

A slab generally of plain cement concrete at least 150mm thick should be provided at the base to support the walls of the manhole and to prevent the entry of foul water. The thickness of the base also shall be suitably increased up to 300mm, for manholes on large dia sewers, with adequate reinforcement provided to withstand excessive uplift pressures. In the case of larger manholes, the flow in the sewer should be carried in U-Shaped smooth channel constructed integrally with the concrete base of the manhole. The side of the channel should be equal to the dia. of the largest sewer pipe. The adjacent floor should have a slope of 1 in 10 draining to the channel. Where more than one sewer enters the manhole the flow through channel should be curved smoothly and should have sufficient capacity to carry the maximum flow.

It is desirable to place the first pipe joint outside the manhole as close as practicable. The pipe shall be built inside the wall of the manhole flush with the internal periphery protected with an arch of masonry or cement concrete to prevent it from being crushed.

The sidewalls of the manhole are usually constructed of cement brickwork 250mm thick and corbelled suitably to accommodate the frame of the manhole cover.

The inside and outside of the brickwork should be plastered with cement mortar 1:3 (1 cement: 3 coarse sand) and inside finished smooth with a coat of neat cement.

Where subsoil water condition exist, a richer mix may be used and it shall further be water proofed with addition of approved water proofing compound in a quantity as per manufacturer's specifications.

#### 4. **Covers and frames:**

The size of manhole covers should be such that there should be clear opening of not less than 560mm diameter for manholes exceeding 0.9m depths. When cast iron manhole covers and frames are used they shall conform to IS 1726 (parts 1 to 7). The frames of manhole shall be firmly embedded to correct alignment and level in plain concrete on the top of masonry. After completion of the work, manhole covers shall be sealed by means of thick grease. Where sewer are to be laid in high subsoil water conditions, manholes maybe constructed in R.C.C.



of grade M 20 or 1:1.5:3. The manholes in this type of construction shall be preferably circular.

Heavy reinforced concrete covers with suitable lifting arrangements could also be used instead of C.I manhole covers. However pre-cast cement concrete covers reinforced by materials other than mild steel should be used provided that those are properly tested & certified for use by competent authority. Fibre reinforcement plastic covers (FRP) conforming to relevant IS: may be used wherever such covers are available.

## **5. Inverted Syphon**

### **5.1 Function and provision**

In the course of laying sewers, at times it is found necessary to cross obstructions like nallah etc. Such obstruction shall be crossed by means of "Inverted Syphon" i.e. by laying the sewer under the obstruction and regaining as much elevation as possible after the obstruction is passed. As the siphons are depressed below the hydraulic grade line, maintenance of self cleaning velocity at all flows is very important. Two considerations, which govern the profile of a siphon, are provision for hydraulic losses and ease of cleaning.

### **5.2 Construction**

To ensure self-cleaning velocities for the wide variations in flows, generally, two or more pipes not less than 200mm dia are provided in parallel so that up to the average flows, first pipe is used and when the flow exceeds the average, the second and subsequent pipes take the balance flow. Siphons may need cleaning other than gravity sewers and hence should not have any sharp bends either horizontal or vertical. Only smooth curves of adequate radius should be used. The design criteria for inverted siphons are given in IS: 411 part -III. It is necessary to have a self-cleaning velocity of 1.0 mps for the minimum flow to avoid deposition in the line. Provision should be made for isolating the individual pipes as well as the syphon to facilitate cleaning. It is desirable to provide a coarse screen to prevent the entry of rags etc, into the syphon.

### **5.3 Inlet and outlet chambers:-**

In the multiple pipe syphon, the inlet should be such that the pipes coming to action successively as the flow increases. This may be achieved by providing lateral with heights kept in accordance with the depth of flow at which one or more syphon pipes functions. In the two-pipe syphon, the first should take 1.25 to 1.5 times the average flow and second should take the balance of the flow.

A manhole at each end of the syphon should be provided with clearance for rodding. The design of inlet and outlet chambers should allow sufficient room for entry for cleaning and maintenance of siphons. The outlet chambers should be so designed as to prevent the flow of sewage into pipes, which are not being used at the time of minimum flow.

## **6. Hatch box:**

Hatch boxes of adequate size in manholes shall be provided on the pipes so as to give access into the pipes for rodding.

## **7. By pass:**

Proper by pass arrangements should be provided from the inlet chamber and if required special arrangements should be made for pumping the sewage to the

lower reach of sewer line. Alternatively a vacuum pump maybe provided at the outlet to overcome maintenance problems arising out of dogging and silting of siphons. If it is possible a blow off may be installed at the low point to facilitate emergency maintenance operations.

8. **Storm water inlets:-**

There are device meant to admit the surface runoff to the sewers and form a very important part of the systems. Their location and design should therefore be given careful considerations.

Storm water inlets maybe categorised under three major groups viz. curb inlets, gutter inlets and combination inlets, each being either depressed or flush depending upon their elevation with reference to the pavement surface.

The actual structure of an inlet is usually made of brickwork. Normally cast-iron gratings conforming to IS: 5961 shall be used. In case there is no vehicular traffic, fabricated steel gratings maybe used. The clear opening shall not be more than 25mm. The connecting pipe from the street inlet to the main street sewer should not be less than 200mm in dia. and should have sufficient slope.

Maximum spacing of inlets would depend upon various conditions of road surface, size and type of inlet and rainfall. A maximum spacing of 30m is recommended.

9. **Sewer ventilators:-**

In a modern, well designed sewerage system, there is no need to provide ventilation on such elaborate scale considered necessary in the past, especially with the present day policy to omit intercepting traps in house connections. The ventilating columns/shafts are not necessary where intercepting traps are not provided. It is necessary however, to make provision for the escape of air to take care of the exigencies of full flow and also to keep the sewage as fresh as possible especially in out fall sewers. In case of storm sewers providing ventilating manhole covers can do these.

9.1 **Provision:**

Ventilating columns/ shafts shall be provided at an interval of 180m in all mains intercepting and outfall sewers, near the manholes. The connections of house drains to the sewer shall be allowed without the use of any intercepting trap and thus permitting ventilation of laterals and branch sewers via. House drains and their ventilating pipes.

9.2 **Construction: -**

The ventilating shaft shall consist of vertical columns of R.C.C. or cast iron about 6 to 8 metre in height and about 100 to 150mm in diameter (opening) at the top, the diameter increasing uniformly towards the bottom for stability. The shaft shall be provided with a Crowell or fitted with a wire ground at the top.

10. **This USOR contains the rates of all the items without GST. GST shall be paid separately as per prevailing government norms as claimed by the contractor in his bill. All the estimates prepared on this USOR will include GST, as an extra amount as per prevailing rates on the sum of the estimate to arrive at the gross amount.**

### NOTES- 3. Sewerage Maintenance

- 1 Contractor is bound to follow the guide line of CPHEEO manual on sewerage & sewage treatment system (Part-B) issued by Ministry of Urban Development, New Delhi w.e.f. November 2013.
- 2 The tools, plant, machinery and pumps required for cleaning should be arranged by the contractor at his own cost.
- 3 The payment will be made after successful testing of line only. No payment will be made for testing work in pieces.
- 4 No payment will be made for dewatering whatsoever involve in cleaning of manhole & sewer line. The payment of Dat (temporary plugging of chambers) will be made for cleaning of chamber only in accordance with volume of pipes, manholes and drains. The rates of Dat are included in the SOR.
- 5 The manhole cover for replacement will be issued from the store & no extra payment will be made for loading, unloading and transportation of manhole cover with frame upto the work site.
- 6 The contractor shall be fully and solely responsible for making all safety arrangements pertaining to the work such as barricading, lighting, arrangement of gas masks, safety belts and oxygen cylinder etc.
- 7 Shifting of silt and garbage will be done as per the direction of the Engineer-incharge.
- 8 Providing and fixing of CI/SFRC manhole cover with frame may be replaced (if required) but the cover shall be as per ISI mark only. The payment will be made as per rates applicable in the USOR.
- 9 The rates for various works given in the unified schedule of rates include contractor profit over head expenses, water and T&P expenses.
- 10 Some poisonous & inflammable gases are observed in deep sewers manholes, to prevent any disaster due to trance gases, the safety of cleaning staff is the responsibility of the contractor.
- 11 The department is not responsible for any accident during cleaning of sewer line. The contractor is fully responsible for any compensation to labour or for any legal action arising due to the accident.
- 12 **This USOR contains the rates of all the items without GST. GST shall be paid separately as per prevailing government norms as claimed by the contractor in his bill. All the estimates based on this USOR will include GST as an extra amount as per prevailing rates on the sum of the estimate to arrive at the gross amount.**

## SALT GLAZED STONEWARE PIPES, SEWER APPURTENANCES

### 1. Salt Glazed Stoneware Pipes

S.No.	Particulars of Items	Unit	Rate (in Rs.)
29.1	Providing and Laying and Jointing salt glazed stone ware (S.W.) pipes socket and spigot with stiff cement mortar 1:1 including testing of joints complete.		
29.1.1	100 mm	Meter	388.00
29.1.2	150 mm	Meter	558.00
29.1.3	200 mm	Meter	893.00
29.1.4	250 mm	Meter	1342.00
29.1.5	300 mm	Meter	1795.00
29.2	Labour only for Laying and Jointing salt glazed stone ware (S.W.) pipes S&S (socket and spigot) with stiff cement mortar 1:1 including testing of joints complete.		
29.2.1	100mm	Meter	84.00
29.2.2	150 mm	Meter	121.00
29.2.3	200 mm	Meter	143.00
29.2.4	250 mm	Meter	194.00
29.2.5	300 mm	Meter	225.00
29.3	Providing and laying cement concrete 1:5:10 (1 cement:5 fine sand: 10 graded stone aggregate 40 mm nominal size) around S.W. pipe including bed concrete 15 cm thick i/c curing, testing etc. complete for 100 mm dia. to 300 mm dia pipe. (For type "Concrete Around")		
29.3.1	100mm dia SW pipe	Meter	282.00
29.3.2	150mm dia	Meter	456.00
29.3.3	200mm dia	Meter	536.00
29.3.4	250mm dia	Meter	624.00
29.3.5	300mm dia	Meter	720.00
29.4	Providing and laying cement concrete 1:5:10 (1 cement:5 fine sand: 10 graded stone aggregate 40 mm nominal size) up to haunches of SW – pipes including bed concrete i/c curing, testing etc complete for 100mm to 300mm dia SW pipe For Type "Concrete up to Haunches ")		
29.4.1	100mm dia pipe	Meter	592.00
29.4.2	150mm dia	Meter	724.00
29.4.3	200mm dia	Meter	844.00
29.4.4	250mm dia	Meter	976.00
29.4.5	300mm dia	Meter	1121.00
29.5	Dismantling of old S.W. pipes including breaking of		

S.No.	Particulars of Items	Unit	Rate (in Rs.)
	joints and bed concrete stacking of useful materials near the site within 50 m lead and disposal of unserviceable materials in to municipal dumps :		
29.5.1	100mm dia pipe	Meter	36.00
29.5.2	150mm dia	Meter	39.00
29.5.3	200mm dia	Meter	42.00
29.5.4	250mm dia	Meter	44.00
29.5.5	300mm dia	Meter	47.00

## 2. Sewer Appurtenances

S.No.	Particulars of Items	Unit	Rate (in Rs.)
29.6	Providing and fixing SW gully trap complete with CI grating, Brick masonry chamber in cement mortar 1:4 (1 cement : 4 fine sand) water tight CI cover with frame of 30x30cm size including necessary Excavation, cement concrete grade M-5 (Nominal Mix) with stone aggregate 40mm nominal size, fixing CI cover with frame in Cement concrete grade M-15 (Nominal Mix) with stone aggregate 20mm nominal size, 12 mm thick cement plaster 1:2 (1 cement: 2 coarse sand ) finished with a floating coat of neat cement complete.		
29.6.1	100x100mm size "P" Gully Trap Chamber	Each	2085.00
29.6.2	125x100mm size "p", "Q" or "S" type Gully trap chamber	Each	2059.00
29.6.3	180x150mm size "P" or "S" type	Each	2114.00
29.7	Constructing Brick Masonry Manhole in Cement Mortar 1 :4 (1 cement : 4 fine sand) R.C.C. top slab 1:1.5:3 (1 cement : 1.5 coarse sand : 3 graded stone aggregate 20 mm nominal size), foundation concrete 1:4:8 mix (1cement : 4 coarse sand : 8 graded stone aggregate 40mm nominal size) inside plastering 12mm thick with cement mortar 1:3 (1cement : 3 fine sand) finished with a floating coat of neat cement and making channels in CC 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size) including finishing the channel to shape, curing etc. (Excavation foot rest and external cement plaster shall be paid for separately)		
29.7.1	Inside size 90x80 cm and 45 cm deep including CI cover with frame 455x610 mm internal dimensions total weight of cover and frames to be not less than (23+15) 38 kg .	Each	10457.00
29.7.2	Inside size 90x80 cm and 60 cm deep including CI	Each	11501.00

S.No.	Particulars of Items	Unit	Rate (in Rs.)
	cover with frame 455x610mm internal dimensions total weight of cover and frames to be not less than (23+15) 38 kg		
29.7.3	Inside size 120x90 cm and 90 cm deep Manhole including CI cover with frame (medium duty) 500mm internal diameter total weight of cover and frame to be not less than (58+58) 116 kg.	Each	25628.00
29.7.4	Inside size 120x90 cm and 90 cm deep Manhole including CI cover with frame (Heavy duty) 560 mm internal diameter total weight of cover and frame to be not less than (108+100) 208 kg.	Each	33746.00
29.8	Manhole for property (House) connection		
29.8.1	Inside size 60x60 cm and 90 cm deep manhole with fixing of ISI marked pre cast RCC manhole cover & frame i/c transportation etc. 600x600 mm size heavy duty.	Each	8777.00
29.8.2	Inside size 60x45 cm and 60 cm deep manhole with fixing of ISI marked pre cast RCC manhole cover & frame i/c transportation etc. 600x450 mm size heavy duty.	Each	7109.00
29.9	Extra for depth up to 1.00 m for man holes over item 15.2		
29.9.1	90x80cm size manhole over item	Meter	6901.00
29.9.2	120x90cm size manhole over item.	Meter	8253.00
29.9.3	60x60cm size manhole over item.	Meter	4500.00
29.9.4	60x45cm size manhole over item.	Meter	4758.00
29.10	Constructing Brick Masonry Circular Man Hole 1500 mm internal dia at bottom & 560 mm dia at top in cement Mortar 1:4 (1 cement: 4 fine sand), inside Cement plaster 12 mm thick with cement mortar 1:3 (1 cement : 3 fine sand) finished with a floating coat of neat cement, foundation concrete 20 cm thick in 1:3:6 ( 1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size ) and making channels in cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size) finished with a floating coat of neat cement etc. all complete.		
29.10.1	For one manhole upto 2650 mm deep with fixing of 560 mm dia ISI marked reinforcement cement concrete cover & frame heavy duty including transportation etc. in cement concrete 1:2:4 all complete. (Excavation, foot rests & cement plaster at the	Meter	27395.00
29.10.2	For one manhole upto 2650 mm deep with fixing of 560 mm dia CI cover & frame (medium duty) weight not less than (58+58) 116 kg. including transportation	Meter	34549.00

S.No.	Particulars of Items	Unit	Rate (in Rs.)
	etc. in cement concrete 1:2:4 all complete. (Excavation, foot rests & cement plaster at the		
29.11	Extra for depth for circular manholes over item 15.4		
29.11.1	Depth 2.65m to 4.25 m	Meter	12258.00
29.11.2	Depth 4.25m to 9.75m	Meter	16854.00
29.12	Constructing Brick Masonry Circular Man Hole 1200 mm internal dia at bottom & 560 mm dia at top in cement Mortar 1:4 (1 cement: 4 fine sand), inside Cement plaster 12 mm thick with cement mortar 1:3 (1 cement : 3 fine sand) finished with a floating coat of neat cement, foundation concrete 20 cm thick in 1:3:6 ( 1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size ) and making channels in cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size) finished with a floating coat of neat cement etc. all complete.		
29.12.1	For one manhole upto 1650 mm deep with fixing of 560 mm dia ISI marked reinforcement cement concrete cover & frame heavy duty including transportation etc. in cement concrete 1:2:4 all complete. (Excavation, foot rests & cement plaster at the	Meter	17593.00
29.12.2	Add extra for depth 1.65 to 2.30 mtr.	Meter	7037.00
29.13	Constructing Brick Masonry Circular Man Hole 900 mm internal dia at bottom & 560 mm dia at top in cement Mortar 1:4 (1 cement: 4 fine sand), inside Cement plaster 12 mm thick with cement mortar 1:3 (1 cement : 3 fine sand) finished with a floating coat of neat cement, foundation concrete 20 cm thick in 1:3:6 ( 1 cement : 3 fine sand : 6 graded stone aggregate 40 mm nominal size ) and making channels in cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size) finished with a floating coat of neat cement etc. all complete.		
29.13.1	For one Manhole 900mm deep with fixing of 560 mm dia ISI marked reinforcement cement concrete cover & frame heavy duty including transportation etc. in cement concrete 1:2:4 all complete. (Excavation, foot rests & cement plaster at the external surface shall be paid for separately)	Each	12020.00
29.13.2	Add extra for depth 0.90 to 1.65 mtr.	Each	4808.00
29.14	Providing MS foot rests i/c fixing in manhole with 20x20x10cm CC blocks of 1:3:6 (1 cement:3 coarse sand : 6 graded stone aggregate 20mm nominal size)		
29.14.1	With 20mm square bar foot rest	Each	317.00
29.14.2	With 20mm round bar foot rest	Each	249.00

S.No.	Particulars of Items	Unit	Rate (in Rs.)
29.15	Making connection of drain or sewer line with existing service lines Manhole including breaking into and making good the walls, floors etc. with cement concrete 1 :2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size), cement plastered with CM 1:3(1 cement : 3 coarse sand) finished with a floating coat of neat cement and making necessary channels etc. complete.		
29.15.1	For 100 to 200 mm dia pipes	Each	384.00
29.10.2	For 250 to 300 mm dia pipes	Each	423.00
29.10.3	For 350 to 450 mm dia pipes	Each	717.00
29.16	Providing SCI (Sand Cast Iron) drop connection with SCI (Sand Cast Iron) drop pipe and bend encased alround with CC 1:5:10 (1 cement: 5 coarse sand: 10 graded stone aggregate 40 mm nominal size) including cutting holes and making good with brick work in cement mortar 1:5 (1 cement:5 fine sand) plastered with cement mortar 1:3 (1 cement: 3 fine sand ) on inside walls including lead caulked joints and jointing SW pipes & SCI pipes with stiff cement mortar 1:1(1 cement: 1fine sand) including making required channel etc. complete.		
29.16.1	(a) 100mm dia Sand cast iron drop connection	Each	5668.00
29.16.2	(b) 150mm dia Sand cast iron drop connection	Each	6943.00
29.16.3	Extra rate shall be payable for depths of drop more than 60 cm		
29.16.3.1	(a) 100mm dia Sand cast iron drop connection	Meter	1674.00
29.16.3.2	(b) 150mm dia Sand cast iron drop connection	Meter	2313.00
29.17	Road Gully Chambers - Construction of Brick masonry road gully chambers with brick work in cement mortar 1:5 (1 cement: 5 fine sand) and 12mm thick plaster in cement mortar :3 including foundation concrete 1:5:10 (1 cement :5 coarse sand :10 graded stone aggregate 40mm nominal size) including excavation etc. complete.		
29.17.1	Chamber 45x45x77.5cm with vertical grating 450x100 mm size	Each	4897.00
29.17.2	Chamber 50x45x60cm with horizontal grating 500x450mm	Each	4244.00
29.17.3	Chamber 110 x 50 x 77.5cm with 500x450 mm horizontal and 450x100 mm vertical gratings both.	Each	7886.00
	<b>REPAIRING</b>		
29.18	Dismantling of manhole including R.C.C./C.C. top slab, CI / pre cast RCC cover with frame including stacking of useful materials near the site and disposal of		



S.No.	Particulars of Items	Unit	Rate (in Rs.)
	unserviceable materials into municipal dumps within 50 m lead.		
29.18.1	Manhole size 90x80 and 45 cm deep	Each	831.00
29.18.2	Manhole size 90x80 and 60 cm deep	Each	940.00
29.18.3	Manhole size 120x90 and 90 cm deep	Each	1536.00
29.18.4	Manholes size 60x45 and 60 cm deep.	Each	475.00
29.18.5	Manholes size 60x60 and 90 cm deep.	Each	680.00
29.19	Extra for depth of manholes dismantling		
29.19.1	Manhole size 90x80 cm, depth above 60 cm	Meter	622.00
29.19.2	Manhole size 120x90cm, depth above 90 cm	Meter	740.00
29.19.3	Manholes size 60x45 cm, depth above 60 cm	Meter	474.00
29.19.4	Manholes size 60x60 cm, depth above 90 cm	Meter	474.00
29.19.5	Manhole 1.50 m dia circular and upto 2.65 m deep	Each	3506.00
29.19.6	Manhole 1.20 m dia circular, and upto 1.65 m deep	Each	2193.00
29.19.7	Manhole 0.90 m dia circular and upto 0.90 m deep	Each	1672.00
29.20	Extra for depth of manholes dismantling		
29.20.1	Manhole 1.50 m dia circular, depth 2.65 to 4.25m	Meter	1402.00
29.20.2	Manhole 1.50 m dia circular, depth 4.25 to 9.75m	Meter	1928.00
29.20.3	Manhole 1.20 m dia circular, depth 1.65 to 2.30 m	Meter	877.00
29.20.4	Manhole 0.90 m dia circular, depth 0.90 to 1.65m	Meter	669.00
29.21	Replacement of M.S. Foot rests in manhole including dismantling concrete block and fixing with 20x20x10 cm C.C. blocks of 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20mm nominal size)		
29.21.1	With 20mm square bar foot rest	Each	309.00
29.21.2	With 20mm round bar foot rest.	Each	281.00
29.22	Pumping out to remove the sewers blockages by using suitable pump sets operated by generators, whole assembly mounted on two/four wheels trailer /pickup van. Including diesel & labour charges etc.	Per Hours	264.00
29.23	Providing and fixing in position Cast Iron Manhole Covers and frame conforming to IS 1726. All exposed edges rounded end finished in cement mortar etc. complete.	Kg.	92.00
29.24	Labour only for fixing in position Cast Iron Manhole Covers & frame conforming to IS-1726.	Kg.	5.00
29.25	Providing & fixing of ISI marked pre cast reinforced cement concrete manhole cover including frame and transporting at site, cost of all material etc.		
29.25.1	500 mm dia. Extra heavy duty	Each	1683.00
29.25.2	560 mm dia. Extra heavy duty	Each	2090.00
29.25.3	600mm dia. Extra heavy duty	Each	2554.00
29.25.4	500 mm dia. heavy duty	Each	2496.00

S.No.	Particulars of Items	Unit	Rate (in Rs.)
29.25.5	560 mm dia. heavy duty	Each	2903.00
29.25.6	600 mm dia. heavy duty	Each	3193.00
29.25.7	600 x 900 mm size extra heavy duty	Each	5458.00
29.25.8	600 x 900 mm size heavy duty	Each	4819.00
29.25.9	450 x 900 mm size heavy duty	Each	4297.00
29.25.10	450 x 900 mm size extra heavy duty	Each	3948.00
29.25.11	600 x 600 mm size extra heavy duty	Each	3077.00
29.25.12	600 x 600 mm medium duty	Each	2554.00
29.25.13	600 x 450 mm size heavy duty	Each	2845.00
29.25.14	600 x 450 mm medium duty	Each	2845.00
29.25.15	450 x 450 mm size heavy duty	Each	2206.00
29.25.16	450 x 450 mm medium duty	Each	1857.00
29.26	Providing & fixing of ISI marked pre cast reinforced cement concrete manhole cover without frame and transporting at site, cost of all material etc.		
29.26.1	500 mm dia. Extra heavy duty	Each	2090.00
29.26.2	560 mm dia. Extra heavy duty	Each	2438.00
29.26.3	600mm dia. Extra heavy duty	Each	2787.00
29.26.4	500 mm dia. heavy duty	Each	1683.00
29.26.5	560 mm dia. heavy duty	Each	2090.00
29.26.6	600mm dia. heavy duty	Each	2554.00
29.26.7	600 x 900 mm size extra heavy duty	Each	4761.00
29.26.8	600 x 900 mm size heavy duty	Each	4413.00
29.26.9	450 x 900 mm size heavy duty	Each	3367.00
29.26.10	600 x 600 mm size extra heavy duty	Each	2496.00
29.26.11	600 x 600 size heavy duty	Each	2322.00
29.26.12	600 x 600 mm medium duty	Each	1683.00
29.26.13	600 x 450 mm size heavy duty	Each	2032.00
29.26.14	600 x 450 mm medium duty	Each	1683.00
29.26.15	450 x 450 mm heavy duty	Each	1451.00
29.26.16	450 x 450 mm medium duty	Each	1219.00

### 3. Sewerage Maintenance

S.No.	Particulars of Items	Unit	Rate (In Rs.)
29.27	Lifting & placing of manhole cover during cleaning of choked sewer line & manhole.		
29.27.1	SFRC 500 mm dia size	Each	33.00
29.27.2	SFRC 560 mm dia size	Each	41.00
29.27.3	SFRC 600 mm dia size	Each	49.00
29.27.4	SFRC 450x900 mm size	Each	57.00

S.No.	Particulars of Items	Unit	Rate (In Rs.)
29.27.5	SFRC 600x450 mm size	Each	33.00
29.27.6	SFRC 600x600 mm size	Each	41.00
29.27.7	SFRC 600x900 mm size	Each	49.00
29.27.8	SFRC 1.2 x 0.9 mtr. Size	Each	106.00
29.27.9	C.I. 560 mm dia size	Each	49.00
29.27.10	C.I. 1.2 x 0.9 mtr. Size	Each	122.00
29.28	Lifting & placing of manholes cover & frame including dismantling of existing C.C. coping during Raising of manholes (civil work to be paid separately)		
29.28.1	SFRC 500 mm dia size	Each	91.00
29.28.2	SFRC 560 mm dia size	Each	107.00
29.28.3	SFRC 600 mm dia size	Each	123.00
29.28.4	SFRC 450x900 mm size	Each	148.00
29.28.5	SFRC 600x450 mm size	Each	91.00
29.28.6	SFRC 600x600 mm size	Each	107.00
29.28.7	SFRC 600x900 mm size	Each	123.00
29.28.8	SFRC 1.2 x 0.9 mtr. Size	Each	214.00
29.28.9	C.I. 560 mm dia size	Each	123.00
29.28.10	C.I. 1.2 x 0.9 mtr. Size	Each	255.00
29.29	Replacement of SFRC manhole cover with frame or without frame of approved quality of any shape & size with cost of material & labour (civil work to be paid separately)	Kg	52.00
29.30	Labour only for replacement of SFRC manhole cover with frame or without frame of any shape & size (civil work to be paid separately)	Kg	2.00
29.31	Making arrangement for dat (plugging of sewer) including all required material such as steel plate, manila rope, gunny bags, earth etc. or by and other plugging device with all required T & P and safety equipment including dewatering.		
29.31.1	<b>Depth upto 1.5 m</b>		
29.31.1.1	100 mm dia	Each	682.00
29.31.1.2	150 mm dia	Each	991.00
29.31.1.3	200 mm dia	Each	994.00
29.31.1.4	250 mm dia	Each	999.00
29.31.1.5	300 mm dia	Each	1004.00
29.31.2	<b>Extra rate of depth 1.5m to 3m or part</b>		
29.31.2.1	100 mm dia to 300 mm	Each	48.00
29.31.3	<b>Extra rate of depth 3m to 4.5 or part</b>		
29.31.3.1	100 mm dia. to 300 mm	Each	95.00
29.31.4	<b>Extra rate of depth 4.5 m to 6m or part</b>		
29.31.4.1	100 mm dia to 300 mm	Each	143.00

S.No.	Particulars of Items	Unit	Rate (In Rs.)
29.31.5	<b>Depth upto 1.5 m for RCC Sewer.</b>		
29.31.5.1	350 mm dia	Each	1372.00
29.31.5.2	400 mm dia	Each	1380.00
29.31.5.3	450 mm dia	Each	1389.00
29.31.5.4	500 mm dia	Each	1395.00
29.31.6	<b>Extra rate of depth 1.5m to 3m or part</b>		
29.31.6.1	350 mm dia to 500 mm	Each	64.00
29.31.7	<b>Extra rate of depth 3m to 4.5 or part</b>		
29.31.7.1	350 mm dia. to 500 mm	Each	128.00
29.31.8	<b>Extra rate of depth 4.5 m to 6m or part</b>		
29.31.8.1	350 mm dia to 500 mm	Each	192.00
29.31.9	<b>Extra rate of depth 6 m to 7.5 m or part</b>		
29.31.9.1	350 mm dia to 500 mm	Each	256.00
29.31.10	<b>Extra rate of depth 7.5 m to 9 m or part</b>		
29.31.10.1	350 mm dia to 500 mm	Each	384.00
29.31.11	<b>Depth upto 1.5 m for RCC Sewer.</b>		
29.31.11.1	600 mm dia	Each	1938.00
29.31.11.2	700 mm dia	Each	1961.00
29.31.11.3	850 mm dia	Each	1989.00
29.31.11.4	900 mm dia	Each	2022.00
29.31.11.5	1000 mm dia	Each	2055.00
29.31.12	<b>Extra rate of depth 1.5m to 3m or part</b>		
29.31.12.1	600 mm dia to 1000 mm	Each	88.00
29.31.13	<b>Extra rate of depth 3m to 4.5 or part</b>		
29.31.13.1	600 mm dia to 1000 mm	Each	177.00
29.31.14	<b>Extra rate of depth 4.5 m to 6m or part</b>		
29.31.14.1	600 mm dia to 1000 mm	Each	265.00
29.31.15	<b>Extra rate of depth 6 m to 7.5 m or part</b>		
29.31.15.1	600 mm dia to 1000 mm	Each	354.00
29.31.16	<b>Extra rate of depth 7.5 m to 9 m or part</b>		
29.31.16.1	600 mm dia to 1000 mm	Each	643.00
29.31.17	<b>Depth upto 1.5 m for RCC Sewer.</b>		
29.31.17.1	1200 mm dia	Each	2720.00
29.31.17.2	1400 mm dia	Each	2842.00
29.31.17.3	1600 mm dia	Each	2955.00
29.31.17.4	1800 mm dia	Each	3083.00
29.31.18	<b>Extra rate of depth 1.5m to 3m or part</b>		
29.31.18.1	1200 mm dia to 1800 mm	Each	115.00
29.31.19	<b>Extra rate of depth 3m to 4.5 or part</b>		
29.31.19.1	1200 mm dia to 1800 mm	Each	230.00
29.31.20	<b>Extra rate of depth 4.5 m to 6m or part</b>		

S.No.	Particulars of Items	Unit	Rate (In Rs.)
29.31.20.1	1200 mm dia to 1800 mm	Each	345.00
29.31.21	<b>Extra rate of depth 6 m to 7.5 m or part</b>		
29.31.21.1	1200 mm dia to 1800 mm	Each	460.00
29.31.22	<b>Extra rate of depth 7.5 m to 9 m or part</b>		
29.31.22.1	1200 mm dia to 1800 mm	Each	690.00
29.31.23	<b>Extra rate of depth 9 m to 10.5 m or part</b>		
29.31.23.1	1200 mm dia to 1800 mm	Each	920.00
29.31.24	<b>Extra rate of depth 10.5 m to 12 m or part</b>		
29.31.24.1	1200 mm dia to 1800 mm	Each	1150.00
29.32	Cleaning of Silt, sludge brick bats, polythene bags, garbage etc. from choked sewer manholes / sewer drains & Nallahs/ wet well of SPH/ Anaerobic & Facultative Pond of STP with all required T&P such as bucket, manila rope, and all required safety equipment such as safety belt, gas mask, oxygen cylinder etc. including disposal of silt/ sludge upto 50 mtr lead & 1.5 mtr. lift as directed by Engineer-in-Charge including dewatering but excluding dat (plugging of sewer pipe line)		
29.32.1	<b>Depth up to 1.5 mtr</b>	Cu.m	550.00
29.32.2	Extra rate for depth 1.5 m to 3m or part	Cu.m	30.00
29.32.3	Extra rate for depth 3m to 4.5 m or part	Cu.m	59.00
29.32.4	Extra rate for depth 4.5 m to 6m or part	Cu.m	67.00
29.32.5	Extra rate for depth 6m to 7.5 m or part	Cu.m	73.00
29.32.6	Extra rate for depth 7.5m to 9m or part	Cu.m	82.00
29.32.7	Extra rate for depth 9m to 10.5 m or part	Cu.m	86.00
29.32.8	Extra rate for depth 10.5 m to 12m or part	Cu.m	98.00
29.33	Cleaning of Silt, sludge brick bats, polythene bags, garbage etc. from choked sewer line with all required T&P and Safety equipment such as bucket, manila rope, safety belt, gas mask, oxygen cylinder etc. including disposal of silt, sludge upto 50m lead & lift up to 1.5mtr. as directed by Engineer-in- Charge including dewatering but excluding dat(plugging of sewer pipe line)		
29.33.1	<b>150 mm dia</b>	Meter	51.00
29.33.1.1	Extra rate for depth 1.5 m to 3m or part	Meter	3.00
29.33.1.2	Extra rate for depth 3m to 4.5 m or part	Meter	5.00
29.33.1.3	Extra rate for depth 4.5 m to 6m or part	Meter	8.00
29.33.2	<b>200 mm dia</b>	Meter	62.00
29.33.2.1	Extra rate for depth 1.5 m to 3m or part	Meter	3.00
29.33.2.2	Extra rate for depth 3m to 4.5 m or part	Meter	6.00
29.33.2.3	Extra rate for depth 4.5 m to 6m or part	Meter	9.00

S.No.	Particulars of Items	Unit	Rate (In Rs.)
29.33.2.4	Extra rate for depth 6m to 7.5 m or part	Meter	12.00
29.33.3	<b>250 mm dia</b>	Meter	73.00
29.33.3.1	Extra rate for depth 1.5 m to 3m or part	Meter	4.00
29.33.3.2	Extra rate for depth 3m to 4.5 m or part	Meter	7.00
29.33.3.3	Extra rate for depth 4.5 m to 6m or part	Meter	11.00
29.33.3.4	Extra rate for depth 6m to 7.5 m or part	Meter	15.00
29.33.4	<b>300 mm dia</b>	Meter	87.00
29.33.4.1	Extra rate for depth 1.5 m to 3m or part	Meter	4.00
29.33.4.2	Extra rate for depth 3m to 4.5 m or part	Meter	9.00
29.33.4.3	Extra rate for depth 4.5 m to 6m or part	Meter	13.00
29.33.4.4	Extra rate for depth 6m to 7.5 m or part	Meter	17.00
29.33.5	<b>350 mm dia RCC</b>	Meter	310.00
29.33.5.1	Extra rate for depth 1.5 m to 3m or part	Meter	15.00
29.33.5.2	Extra rate for depth 3m to 4.5 m or part	Meter	31.00
29.33.5.3	Extra rate for depth 4.5 m to 6m or part	Meter	46.00
29.33.5.4	Extra rate for depth 6m to 7.5 m or part	Meter	62.00
29.33.5.5	Extra rate for depth 7.5m to 9m or part	Meter	93.00
29.33.6	<b>400 mm dia RCC</b>	Meter	372.00
29.33.6.1	Extra rate for depth 1.5 m to 3m or part	Meter	19.00
29.33.6.2	Extra rate for depth 3m to 4.5 m or part	Meter	37.00
29.33.6.3	Extra rate for depth 4.5 m to 6m or part	Meter	56.00
29.33.6.4	Extra rate for depth 6m to 7.5 m or part	Meter	74.00
29.33.6.5	Extra rate for depth 7.5m to 9m or part	Meter	111.00
29.33.7	<b>450 mm dia RCC</b>	Meter	427.00
29.33.7.1	Extra rate for depth 1.5 m to 3m or part	Meter	21.00
29.33.7.2	Extra rate for depth 3m to 4.5 m or part	Meter	43.00
29.33.7.3	Extra rate for depth 4.5 m to 6m or part	Meter	64.00
29.33.7.4	Extra rate for depth 6m to 7.5 m or part	Meter	86.00
29.33.7.5	Extra rate for depth 7.5m to 9m or part	Meter	128.00
29.33.8	<b>500 mm dia RCC</b>	Meter	465.00
29.33.8.1	Extra rate for depth 1.5 m to 3m or part	Meter	24.00
29.33.8.2	Extra rate for depth 3m to 4.5 m or part	Meter	46.00
29.33.8.3	Extra rate for depth 4.5 m to 6m or part	Meter	70.00
29.33.8.4	Extra rate for depth 6m to 7.5 m or part	Meter	93.00
29.33.8.5	Extra rate for depth 7.5m to 9m or part	Meter	139.00
29.33.8.6	Extra rate for depth 9m to 10.5m or part	Meter	186.00
29.33.9	<b>600 mm dia RCC</b>	Meter	557.00
29.33.9.1	Extra rate for depth 1.5 m to 3m or part	Meter	28.00
29.33.9.2	Extra rate for depth 3m to 4.5 m or part	Meter	56.00
29.33.9.3	Extra rate for depth 4.5 m to 6m or part	Meter	84.00
29.33.9.4	Extra rate for depth 6m to 7.5 m or part	Meter	111.00

S.No.	Particulars of Items	Unit	Rate (In Rs.)
29.33.9.5	Extra rate for depth 7.5m to 9m or part	Meter	168.00
29.33.9.6	Extra rate for depth 9m to 10.5m or part	Meter	223.00
29.33.10	<b>700 mm dia RCC</b>	Meter	669.00
29.33.10.1	Extra rate for depth 1.5 m to 3m or part	Meter	33.00
29.33.10.2	Extra rate for depth 3m to 4.5 m or part	Meter	67.00
29.33.10.3	Extra rate for depth 4.5 m to 6m or part	Meter	100.00
29.33.10.4	Extra rate for depth 6m to 7.5 m or part	Meter	134.00
29.33.10.5	Extra rate for depth 7.5m to 9m or part	Meter	201.00
29.33.10.6	Extra rate for depth 9m to 10.5m or part	Meter	268.00
29.33.11	<b>750 mm dia RCC</b>	Meter	737.00
29.33.11.1	Extra rate for depth 1.5 m to 3m or part	Meter	36.00
29.33.11.2	Extra rate for depth 3m to 4.5 m or part	Meter	74.00
29.33.11.3	Extra rate for depth 4.5 m to 6m or part	Meter	110.00
29.33.11.4	Extra rate for depth 6m to 7.5 m or part	Meter	148.00
29.33.11.5	Extra rate for depth 7.5m to 9m or part	Meter	221.00
29.33.11.6	Extra rate for depth 9m to 10.5m or part	Meter	374.00
29.33.12	<b>800 mm dia RCC</b>	Meter	744.00
29.33.12.1	Extra rate for depth 1.5 m to 3m or part	Meter	41.00
29.33.12.2	Extra rate for depth 3m to 4.5 m or part	Meter	81.00
29.33.12.3	Extra rate for depth 4.5 m to 6m or part	Meter	122.00
29.33.12.4	Extra rate for depth 6m to 7.5 m or part	Meter	162.00
29.33.12.5	Extra rate for depth 7.5m to 9m or part	Meter	250.00
29.33.12.6	Extra rate for depth 9m to 10.5m or part	Meter	334.00
29.33.13	<b>900 mm dia RCC</b>	Meter	929.00
29.33.13.1	Extra rate for depth 1.5 m to 3m or part	Meter	46.00
29.33.13.2	Extra rate for depth 3m to 4.5 m or part	Meter	93.00
29.33.13.3	Extra rate for depth 4.5 m to 6m or part	Meter	139.00
29.33.13.4	Extra rate for depth 6m to 7.5 m or part	Meter	186.00
29.33.13.5	Extra rate for depth 7.5m to 9m or part	Meter	276.00
29.33.13.6	Extra rate for depth 9m to 10.5m or part	Meter	372.00
29.33.14	<b>1000 mm dia RCC</b>	Meter	1064.00
29.33.14.1	Extra rate for depth 1.5 m to 3m or part	Meter	53.00
29.33.14.2	Extra rate for depth 3m to 4.5 m or part	Meter	106.00
29.33.14.3	Extra rate for depth 4.5 m to 6m or part	Meter	158.00
29.33.14.4	Extra rate for depth 6m to 7.5 m or part	Meter	213.00
29.33.14.5	Extra rate for depth 7.5m to 9m or part	Meter	319.00
29.33.14.6	Extra rate for depth 9m to 10.5m or part	Meter	426.00
29.33.14.7	Extra rate for depth 10.5m to 12m or part	Meter	532.00
29.33.15	<b>1200 mm dia RCC</b>	Meter	1273.00
29.33.15.1	Extra rate for depth 1.5 m to 3m or part	Meter	64.00
29.33.15.2	Extra rate for depth 3m to 4.5 m or part	Meter	127.00

S.No.	Particulars of Items	Unit	Rate (In Rs.)
29.33.15.3	Extra rate for depth 4.5 m to 6m or part	Meter	191.00
29.33.15.4	Extra rate for depth 6m to 7.5 m or part	Meter	255.00
29.33.15.5	Extra rate for depth 7.5m to 9m or part	Meter	382.00
29.33.15.6	Extra rate for depth 9m to 10.5m or part	Meter	509.00
29.33.15.7	Extra rate for depth 10.5m to 12m or part	Meter	1470.00
29.33.16	<b>1400 mm dia RCC</b>	Meter	1490.00
29.33.16.1	Extra rate for depth 1.5 m to 3m or part	Meter	73.00
29.33.16.2	Extra rate for depth 3m to 4.5 m or part	Meter	147.00
29.33.16.3	Extra rate for depth 4.5 m to 6m or part	Meter	220.00
29.33.16.4	Extra rate for depth 6m to 7.5 m or part	Meter	373.00
29.33.16.5	Extra rate for depth 7.5m to 9m or part	Meter	441.00
29.33.16.6	Extra rate for depth 9m to 10.5m or part	Meter	588.00
29.33.16.7	Extra rate for depth 10.5m to 12m or part	Meter	735.00
29.33.17	<b>1600 mm dia RCC</b>	Meter	1690.00
29.33.17.1	Extra rate for depth 1.5 m to 3m or part	Meter	85.00
29.33.17.2	Extra rate for depth 3m to 4.5 m or part	Meter	169.00
29.33.17.3	Extra rate for depth 4.5 m to 6m or part	Meter	253.00
29.33.17.4	Extra rate for depth 6m to 7.5 m or part	Meter	338.00
29.33.17.5	Extra rate for depth 7.5m to 9m or part	Meter	506.00
29.33.17.6	Extra rate for depth 9m to 10.5m or part	Meter	676.00
29.33.17.7	Extra rate for depth 10.5m to 12m or part	Meter	845.00
29.33.18	<b>1800 mm dia RCC</b>	Meter	1944.00
29.33.18.1	Extra rate for depth 1.5 m to 3m or part	Meter	97.00
29.33.18.2	Extra rate for depth 3m to 4.5 m or part	Meter	194.00
29.33.18.3	Extra rate for depth 4.5 m to 6m or part	Meter	370.00
29.33.18.4	Extra rate for depth 6m to 7.5 m or part	Meter	389.00
29.33.18.5	Extra rate for depth 7.5m to 9m or part	Meter	583.00
29.33.18.6	Extra rate for depth 9m to 10.5m or part	Meter	777.00
29.33.18.7	Extra rate for depth 10.5m to 12m or part	Meter	972.00
29.34	Removing of all weeds and other growth with roots i/c refused material such as polythene, cloths, algae etc. from facultative pond of STP and disposal up to 50 mtr lead and 1.5 mtr lift as directed by Engineer in Charge including all required T&P, boat with boatman, bamboo, plunger, cutter, bucket, rope etc. and all safety equipments such as safety belt, gas mask, oxygen cylinder etc.	Sq.M	30.00
29.35	Carriage of desilted sludge & other material from sewage components by mechanical transport including loading unloading & stacking etc.		
29.35.1	1. Distance 1 km	Cum	108.00
29.35.2	2. Distance 2 km	Cum	125.00

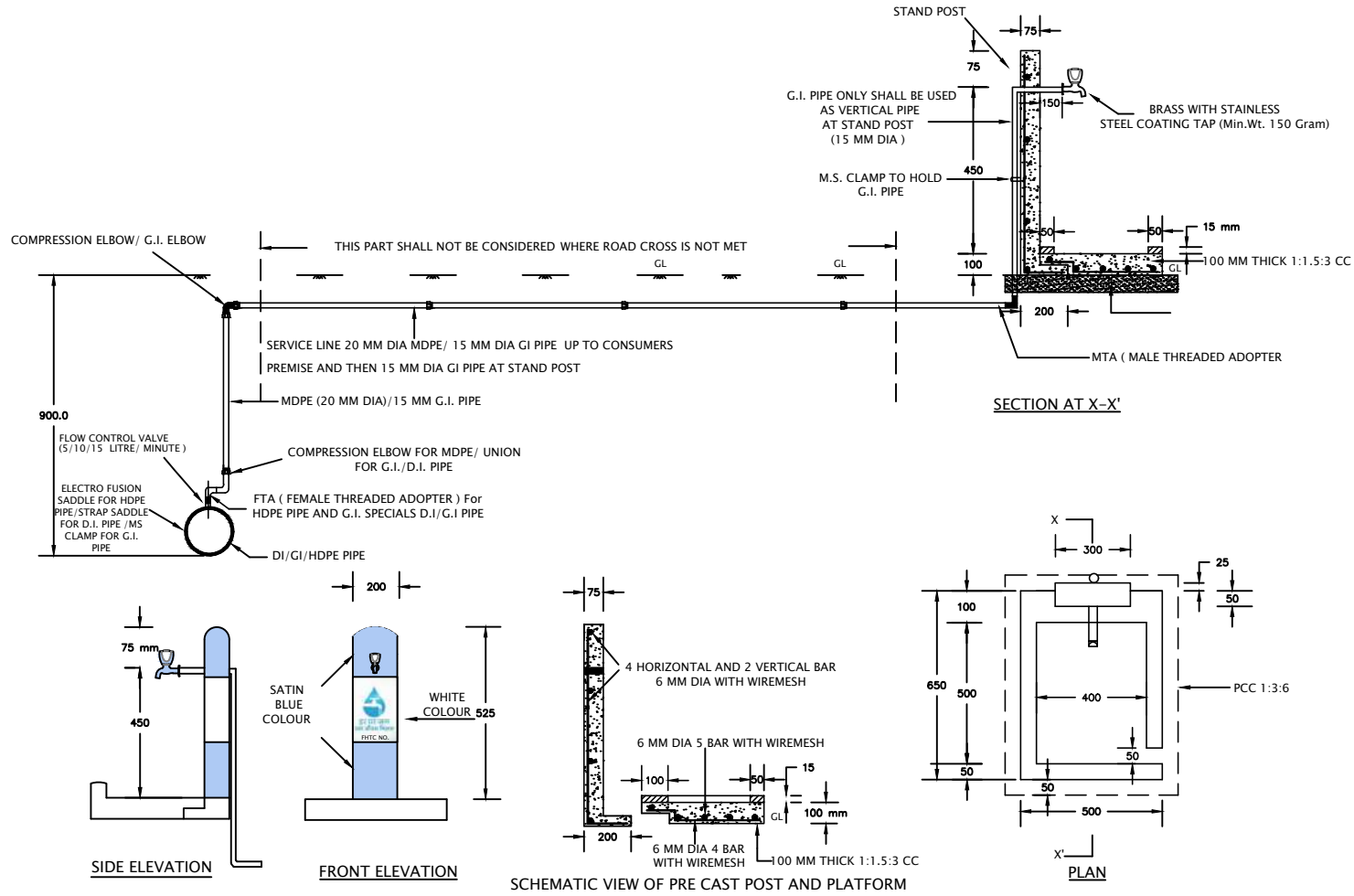


<b>S.No.</b>	<b>Particulars of Items</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
29.35.3	3. Distance 3 km	Cum	142.00
29.35.4	4. Distance 4 km	Cum	159.00
29.35.5	5. Distance 5 km	Cum	175.00
29.35.6	6. Beyond 5km upto 10km. add per km	Cum	15.00
29.35.7	7. Beyond 10km. upto 20km. add per km.	Cum	13.00
29.35.8	8. Beyond 20km. add per additional	Cum	10.00

# **CHAPTER - 31**

## **Drawings**

# GENERAL ARRANGEMENT DRAWING FOR HOUSE HOLD CONNECTION FROM HDPE/GI/DI PIPE WITH GI/MDPE PIPE CONNECTION & PRE-FABRICATED CEMENT PLATFORM & STAND POST

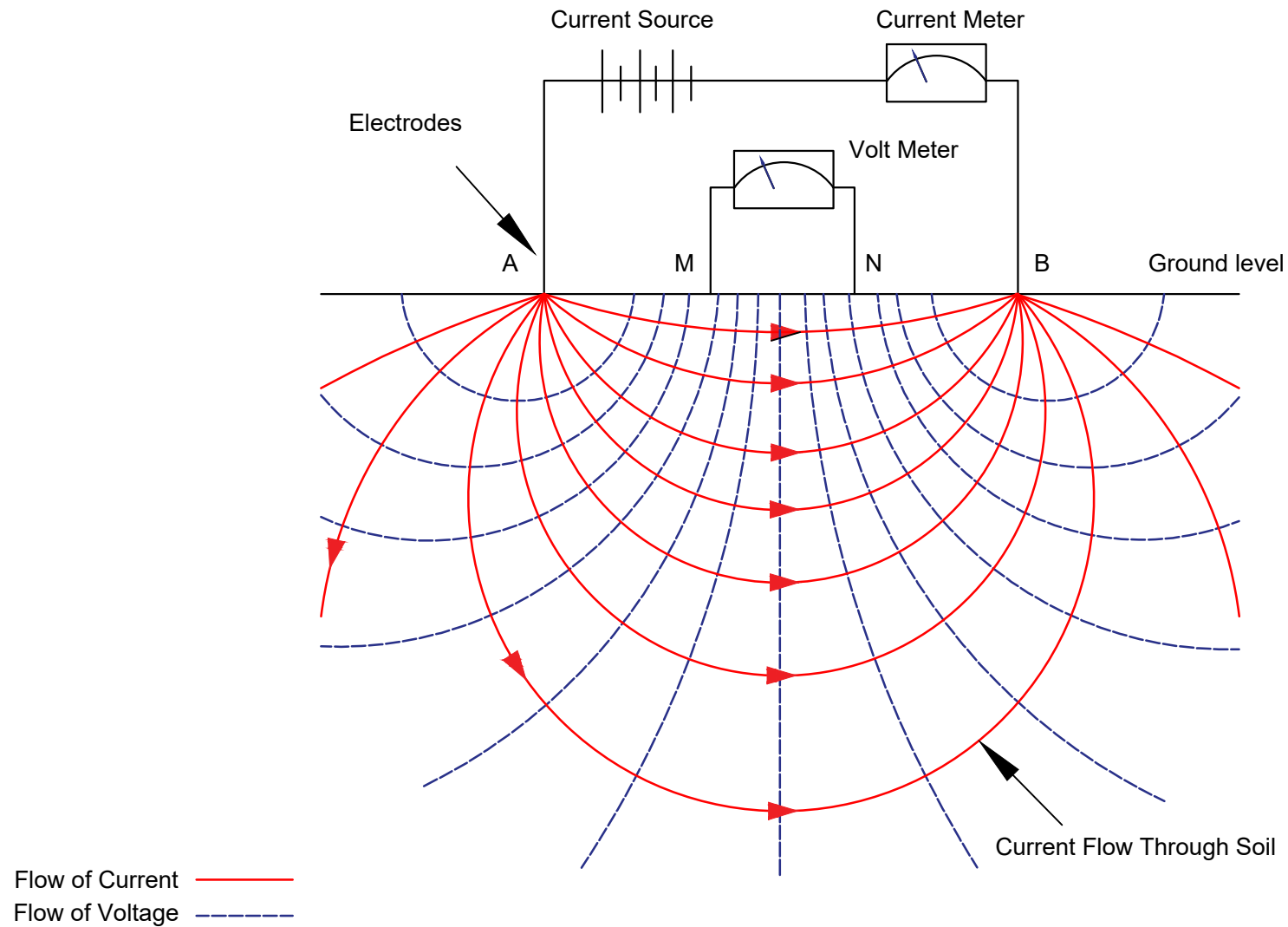


## NOTES-

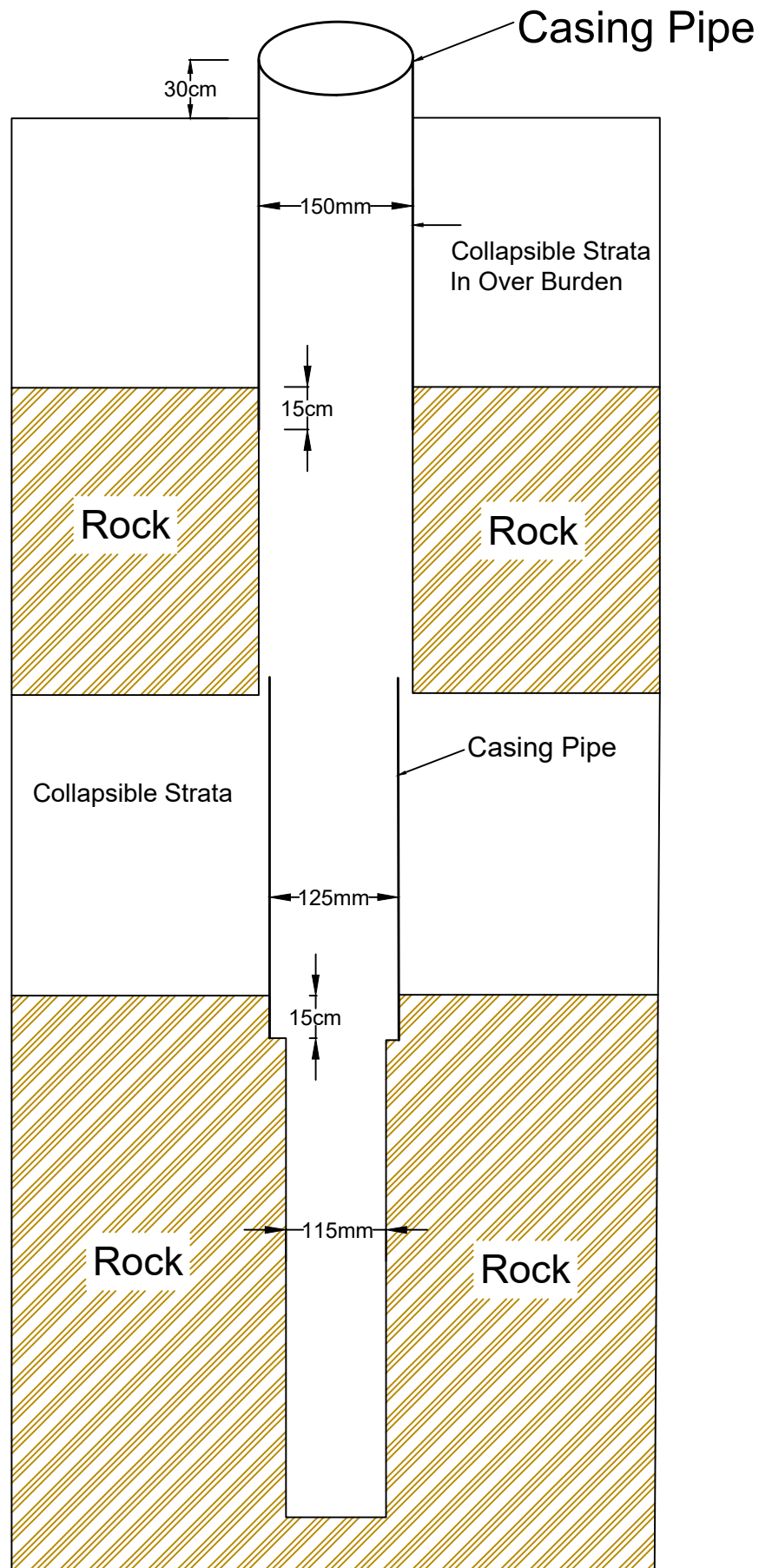
- FLOW CONTROL VALVE SIZE (5/10/15 LITRE / MIN) SHALL BE DECIDED ON THE BASIS OF THE DURATION OF DAILY SUPPLY OF WATER
- FONTS JJM LOGO AND TOP/ BOTTOM STRIP AS SHOWN IN FIGURE SHALL SATIN BLUE SYNTHETIC ENAMEL PAINT (FOR REFERENCE PURPOSE SEE COLOUR CODE 0124 OF ASIAN PAINTS)
- ALL DIMENSION IN MM

GENERAL ARRANGEMENT DRAWING FOR USOR CHAPTER NO. 09  
ITEM NO. 9.37 TO 9.40

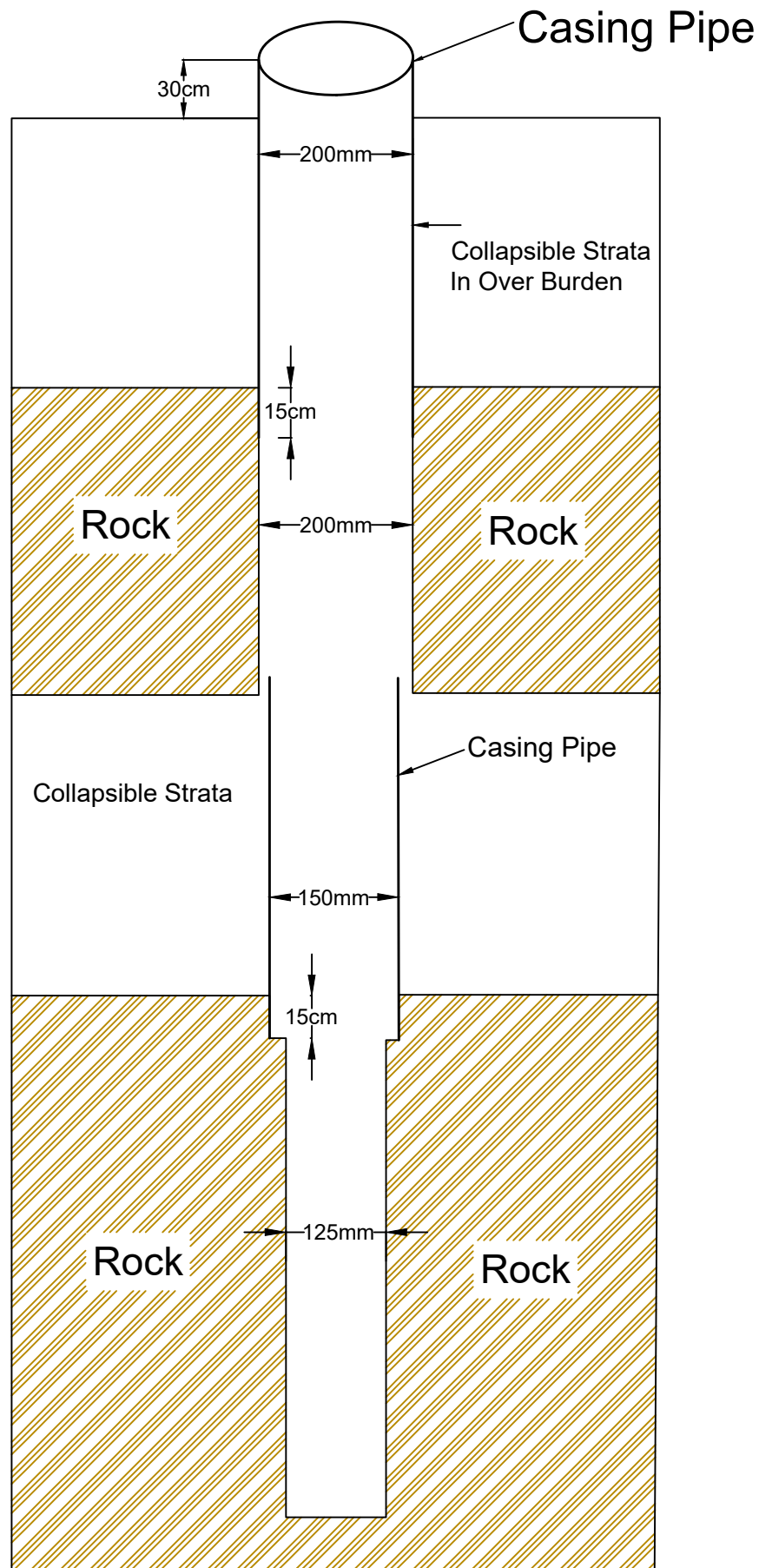
# RESISTIVITY SURVEY SCHEMATIC DIAGRAM



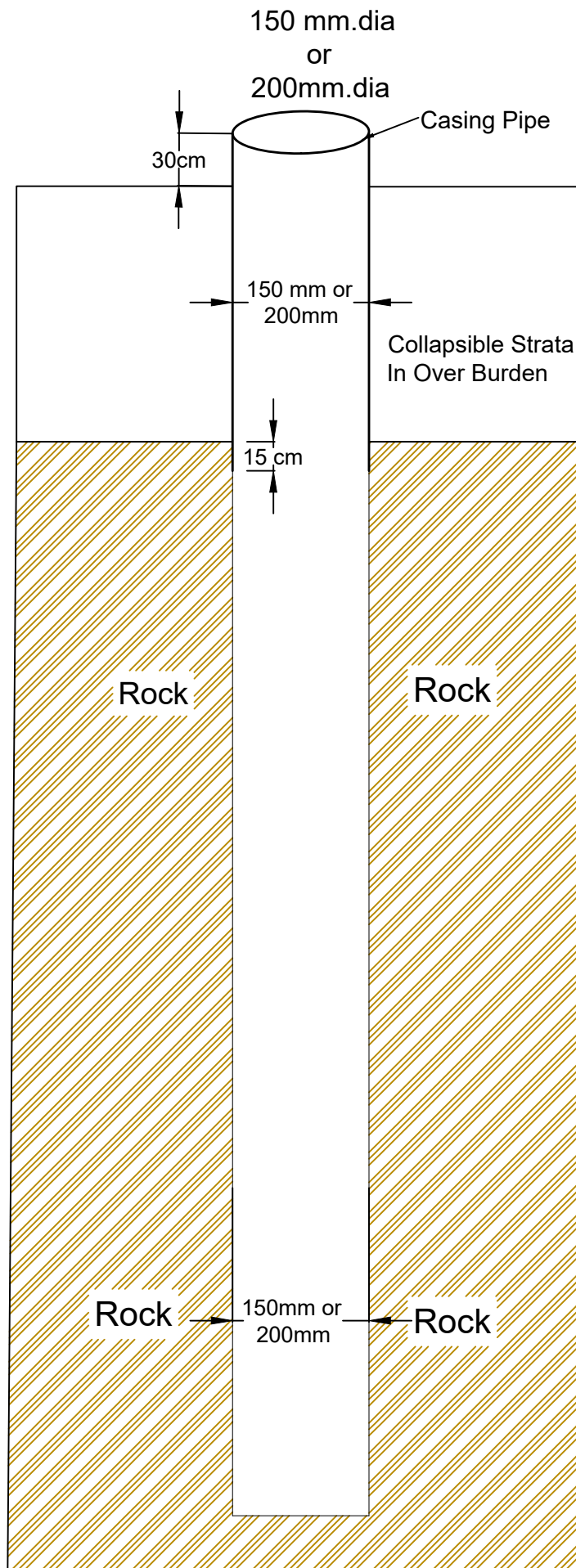
150/125/115 mm dia.  
Tubewell



200/150/125 mm dia.  
Tubewell

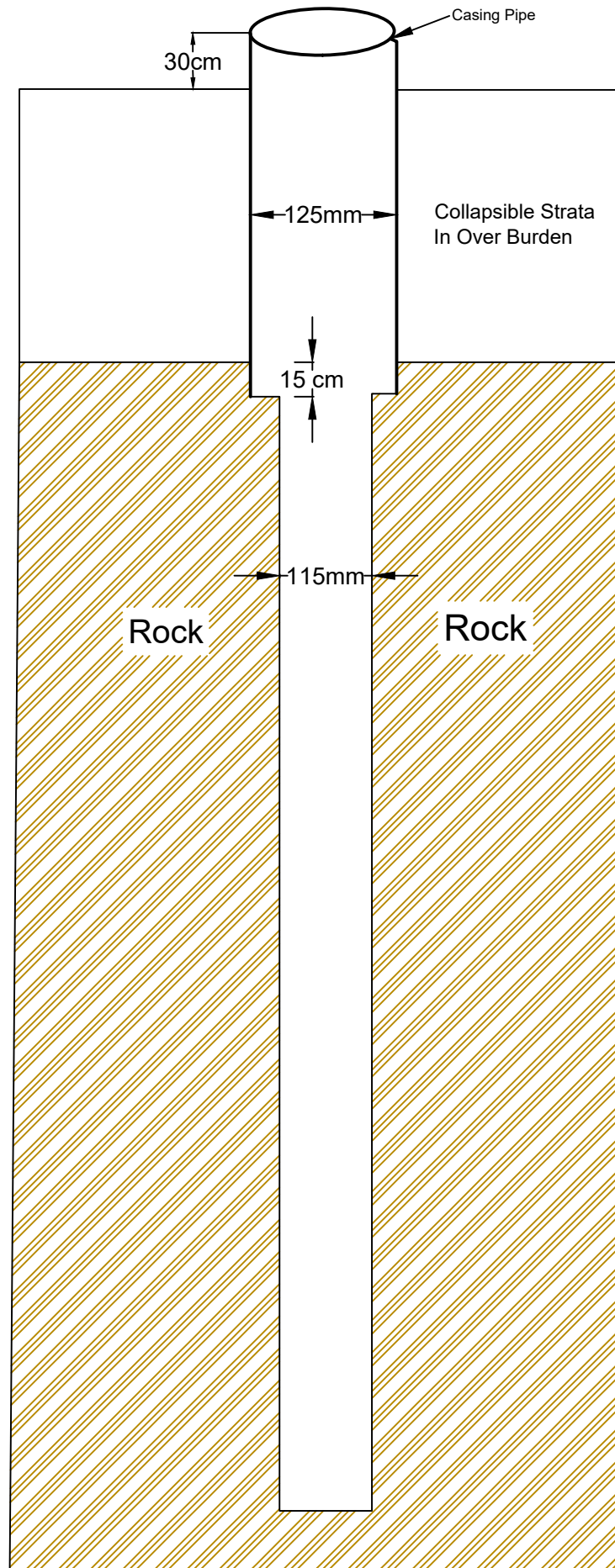


# Ordinary Tubewell



# Ordinary Tubewell

125/115 mm.dia





# Gravel Pack Tubewell

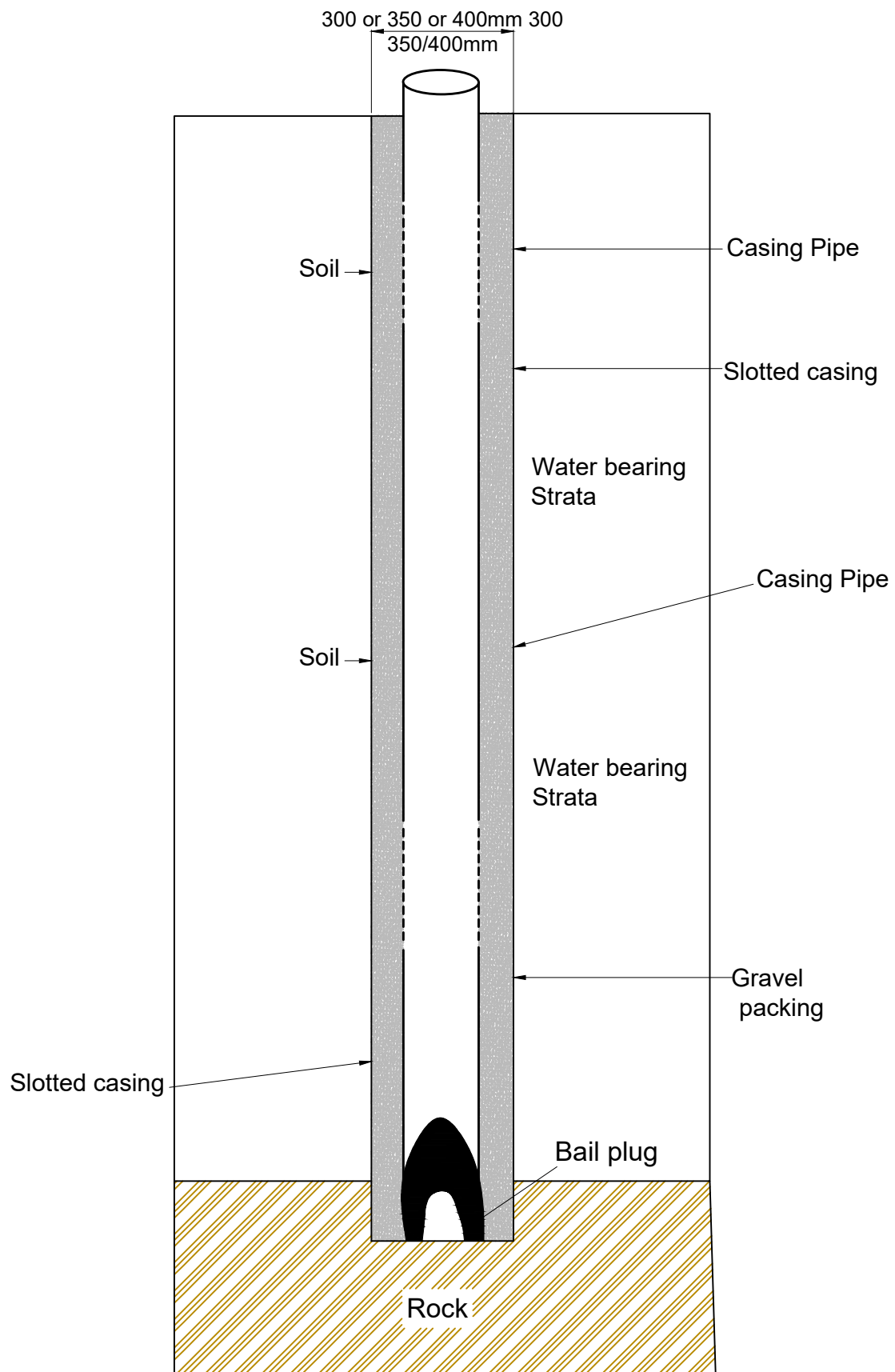
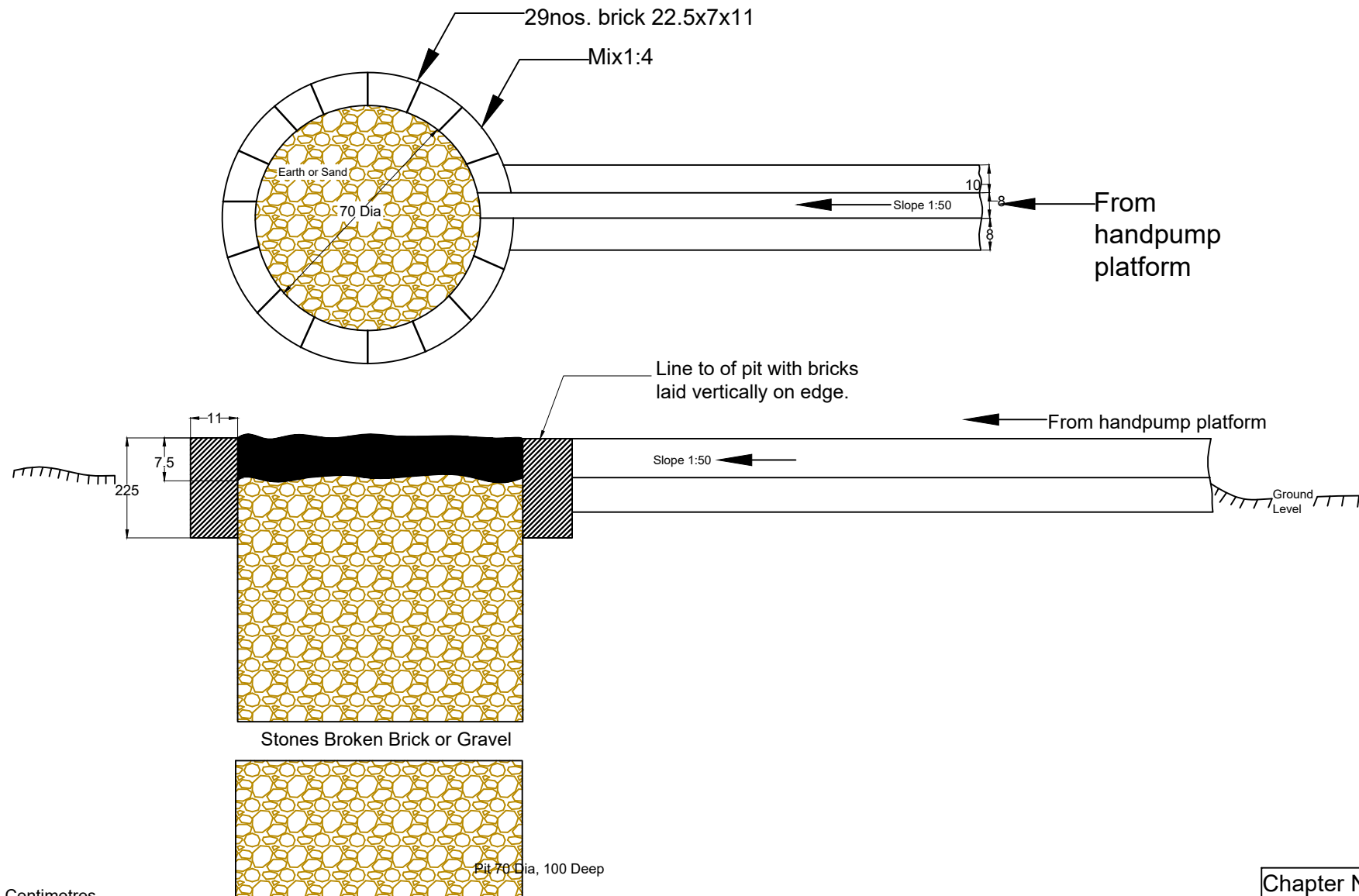


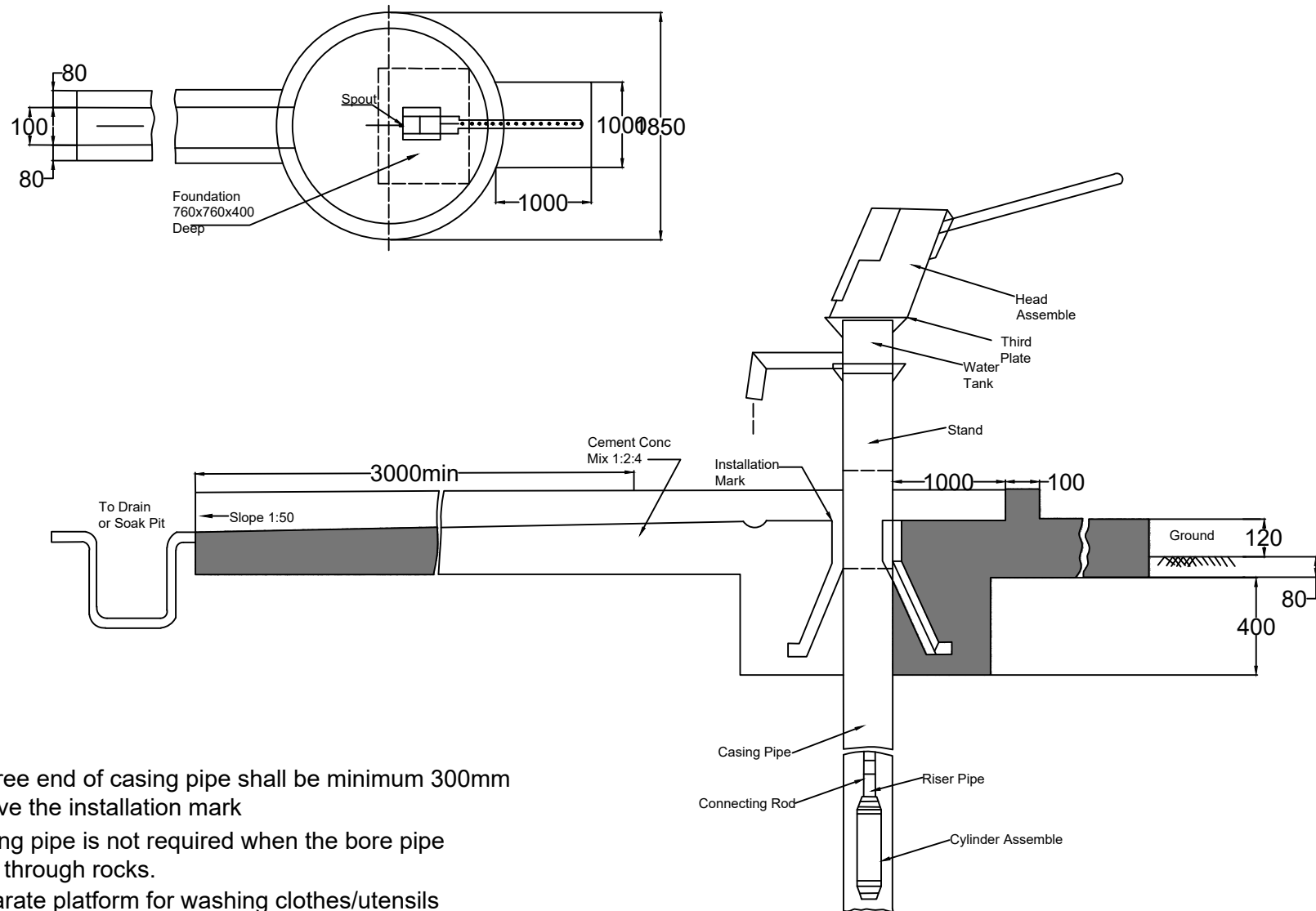
Figure-18

## SOAKAGE PIT FOR HANDPUMPS



All units in Centimetres

Chapter No.23



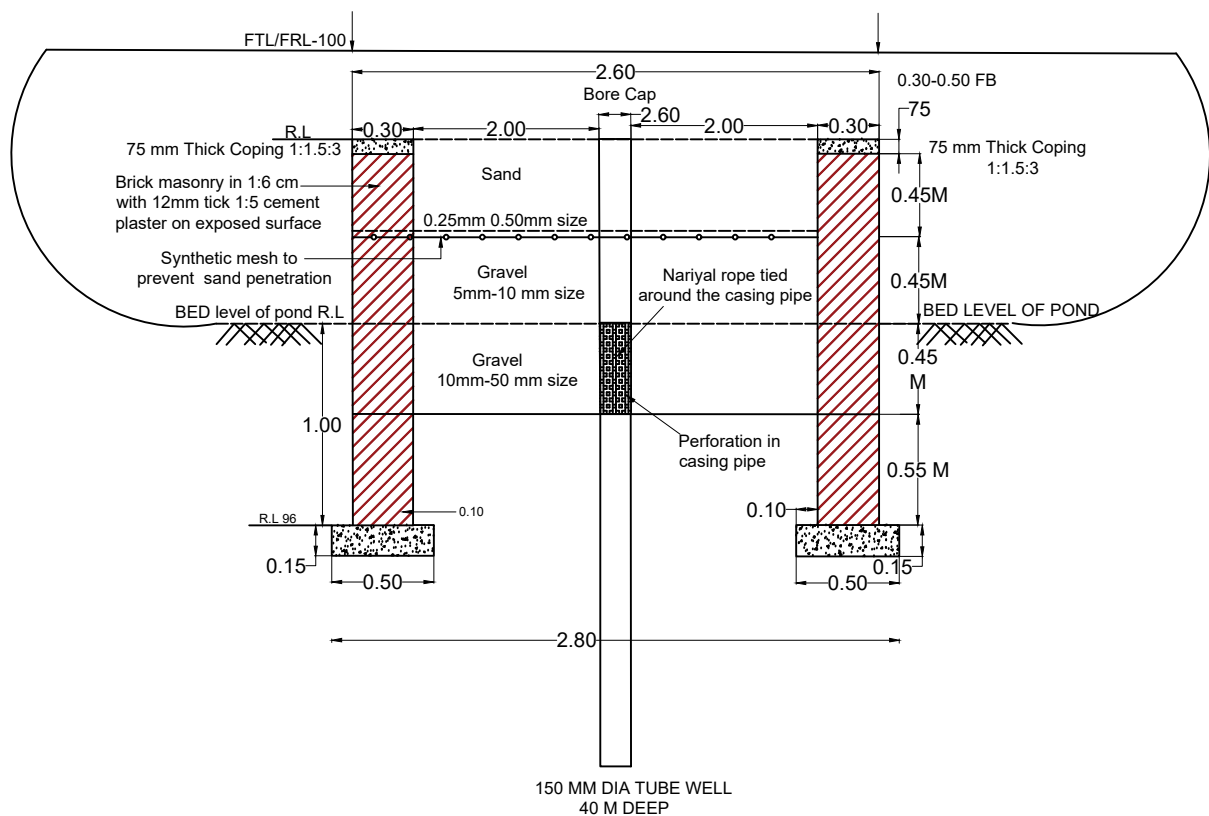
**Notes:-**

1. The free end of casing pipe shall be minimum 300mm above the installation mark
2. Casing pipe is not required when the bore pipe passes through rocks.
3. Separate platform for washing clothes/utensils and cattle ruffe may be provided if required.

All dimensions in millimeters.  
Typical Set-Up Deepwell Handpump

Chapter No.23

## DRAWING FOR CONSTRUCTION OF RECHARGING PIT ONLY FOR CONSTRUCTION OF RECHARGING SHAFT IN SUBMERGENCE



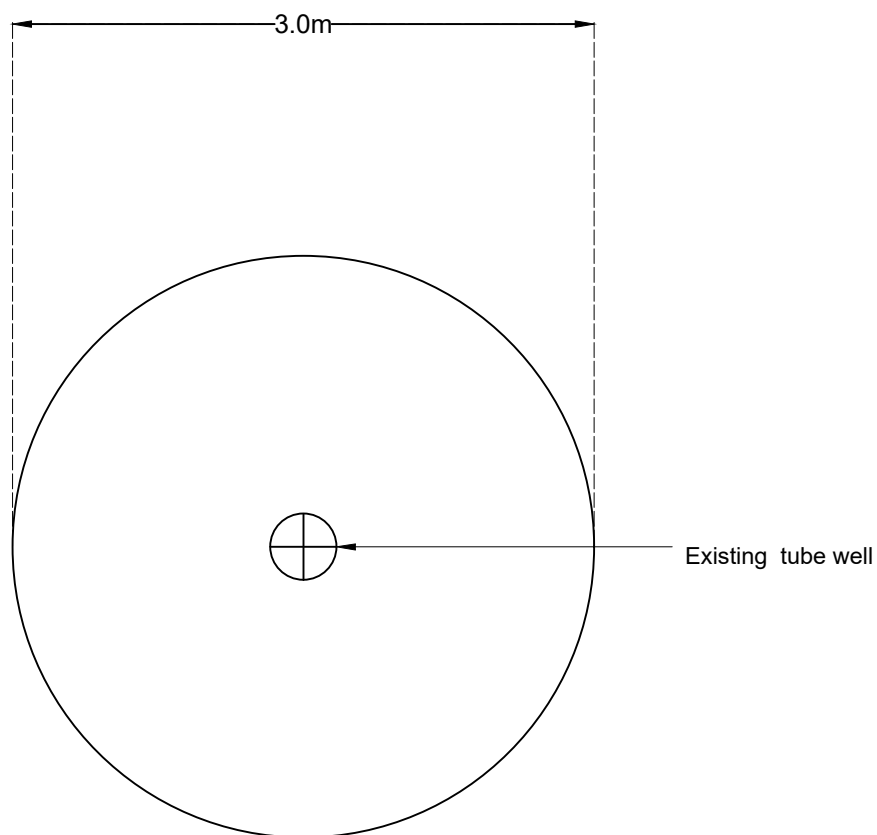
### Notes:-

1. All Dimension in meters
2. Minimum casing in recharge shaft shall be 9:00 or Upto hard strata it is to prevent entry of polluted water in aquifer
3. Rectangular pits internal size =2.00x2.00x1.35m not to scale

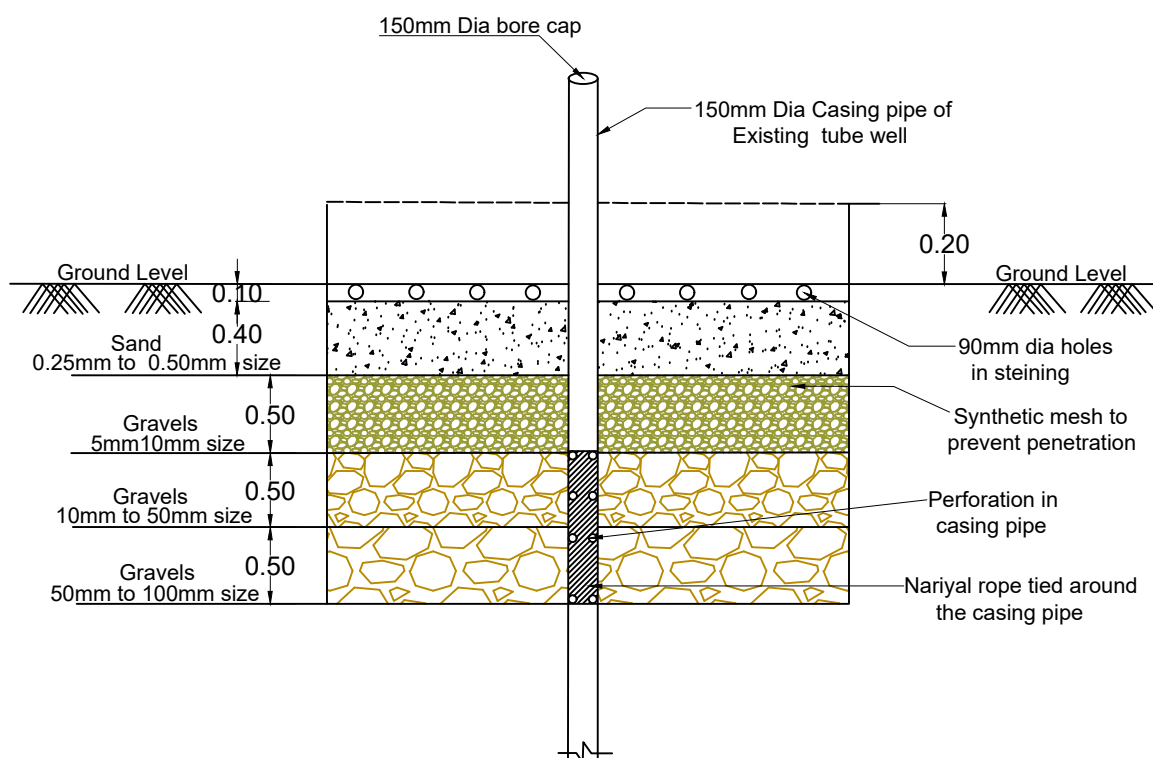
Recharge shaft with vertical filter to be constructed  
in the submergence of reservoir

Chapter No.26

# DRAWING FOR CONSTRUCTION OF RECHARGING PIT AROUND TUBE WELL, IN SOFT/HARD ROCK AREA



Plan

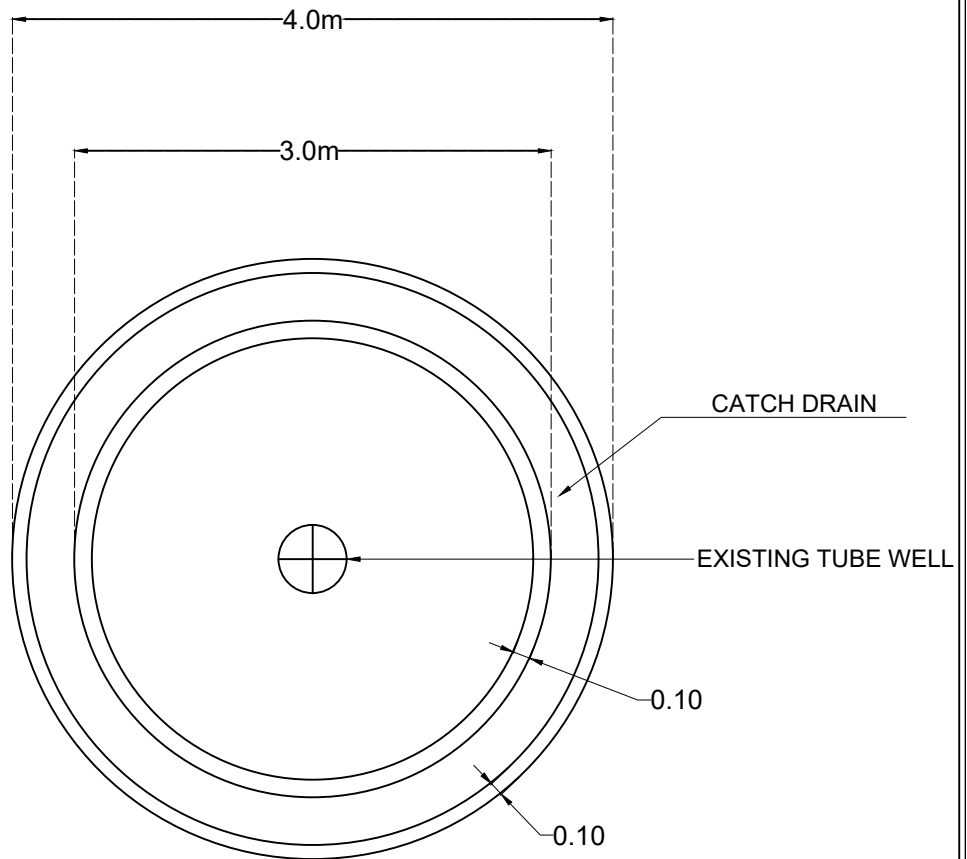


SECTIONAL ELEVATION

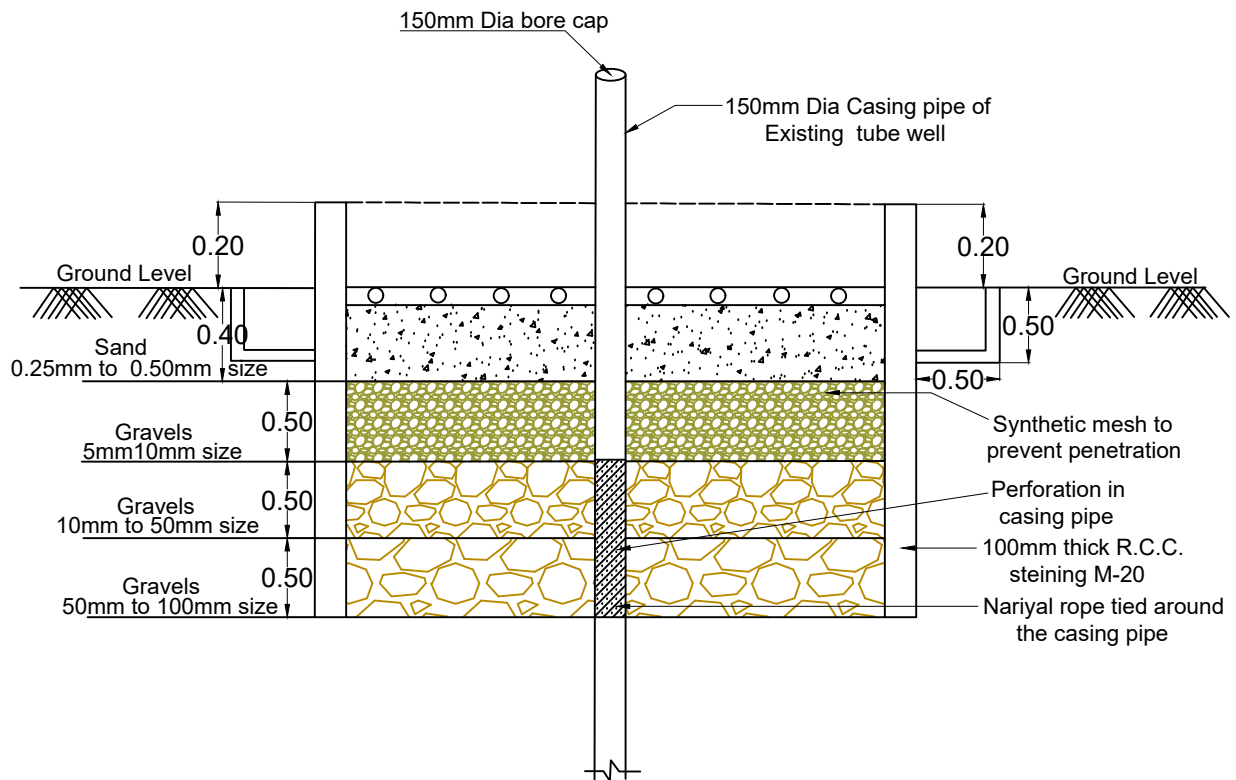
Chapter No.26

All Dimension in meter

# DRAWING FOR CONSTRUCTION OF RECHARGING PIT WITH STEINING AND CATCH DRAIN AROUND TUBE WELL



Plan



SECTIONAL ELEVATION

Chapter No.26

All Dimension in Meter

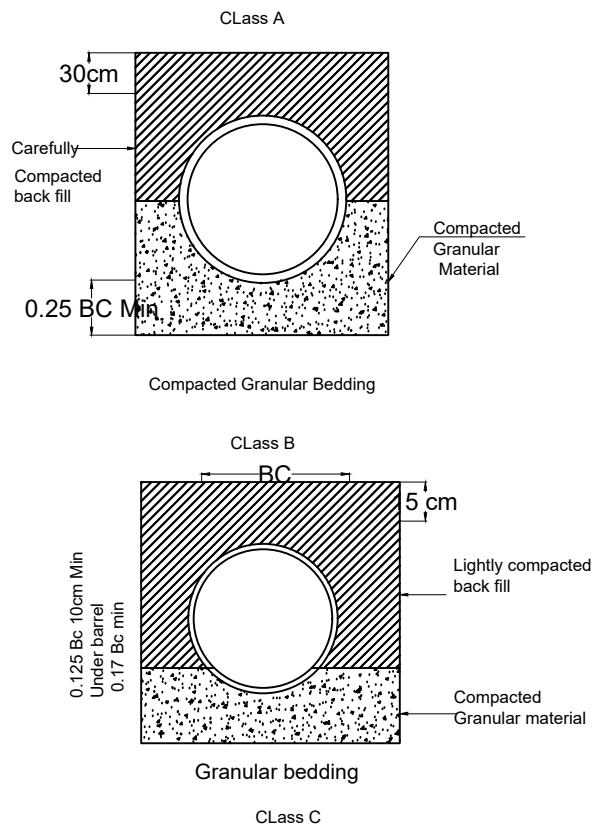
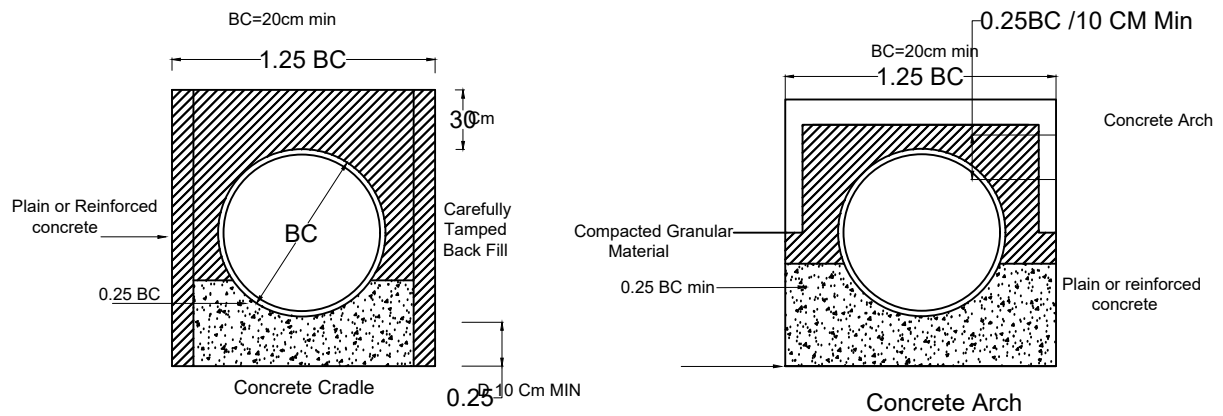


Fig 1. CLASSES OF BEDDING FOR CONDUIT IN TRENCH

Notes:- In Rock, Trench is Excavated Atleast 15 cm  
Below the bell of the except where concrete cradle is used.

Chapter No.28

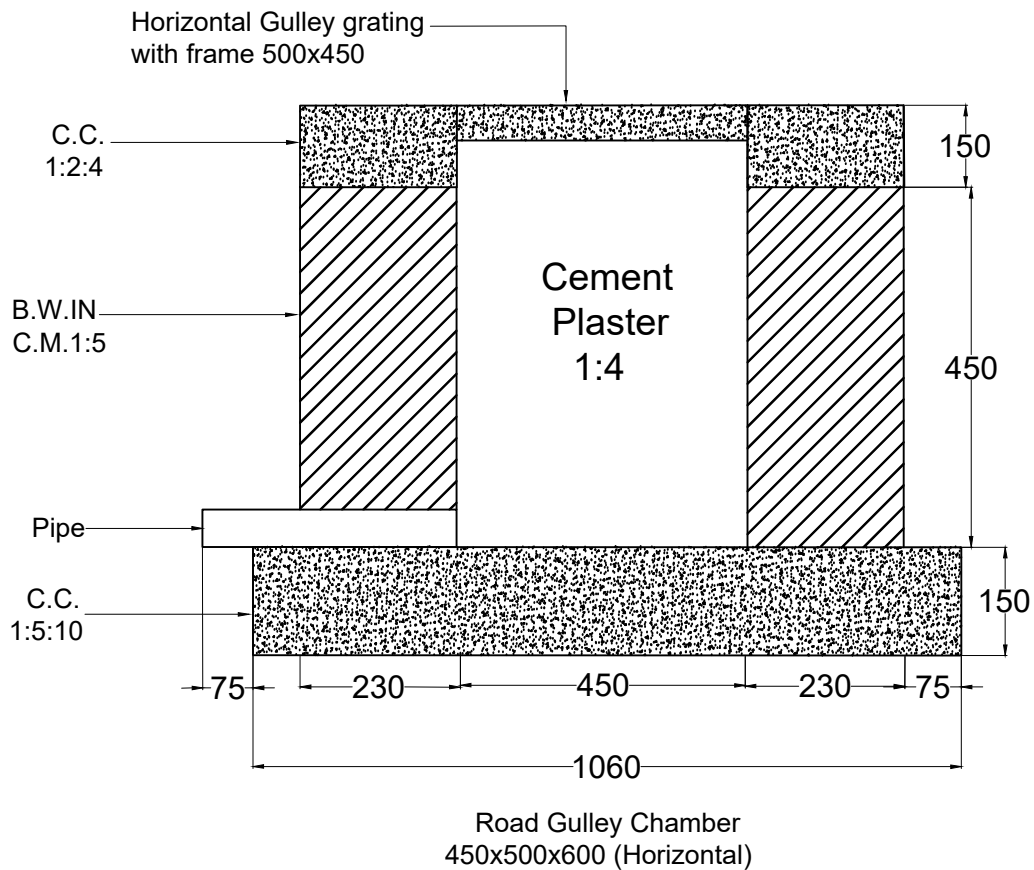


Figure-2

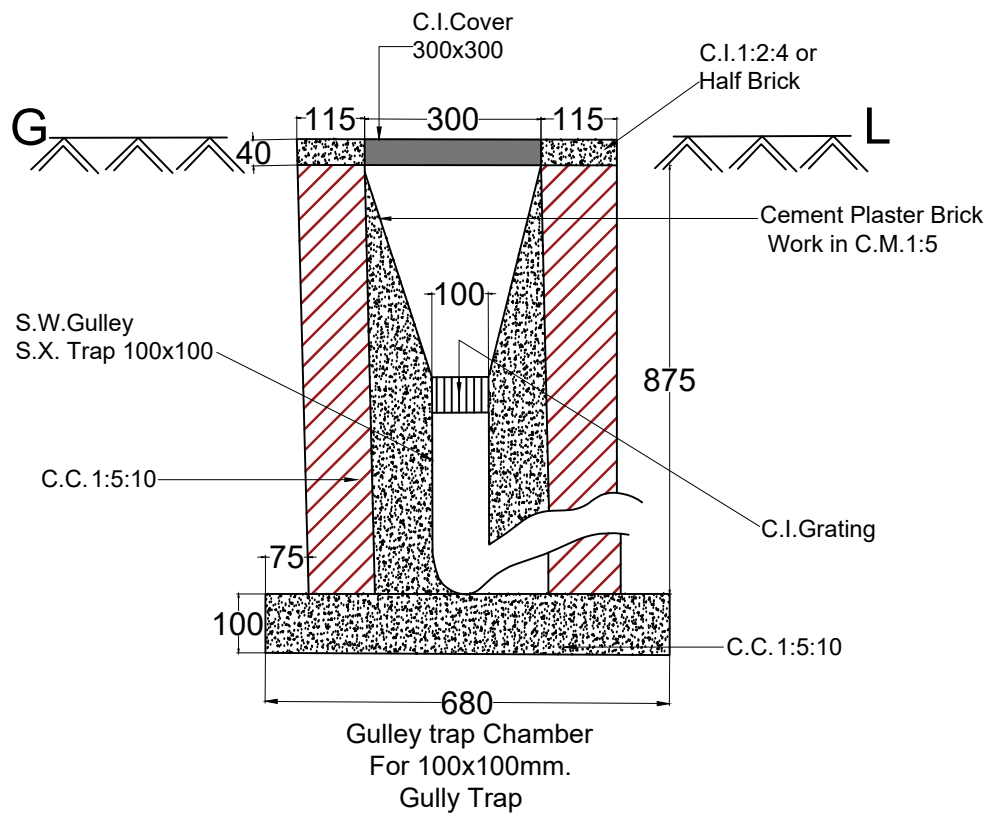
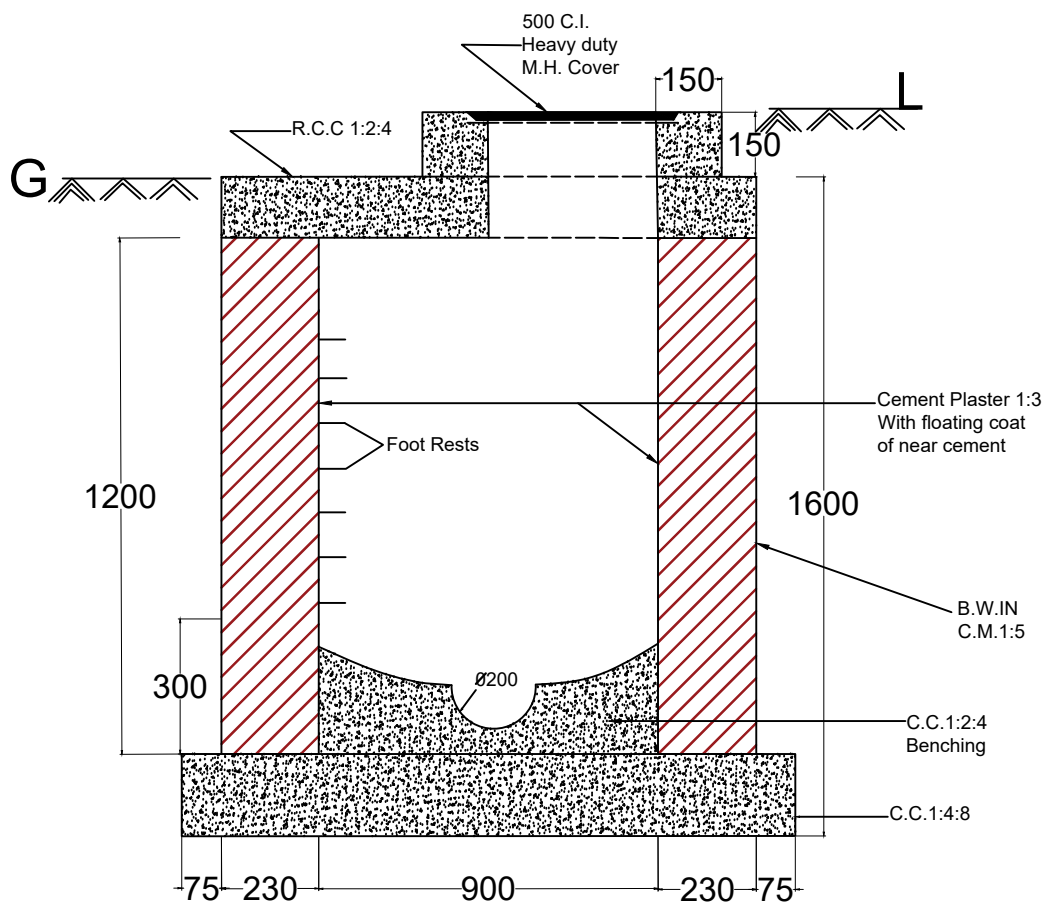
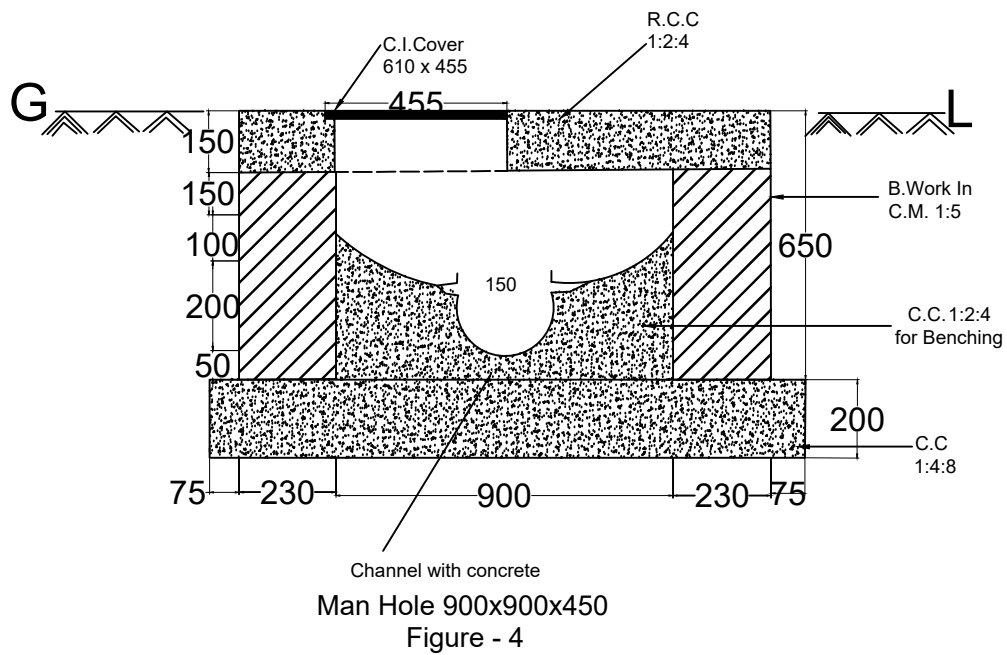
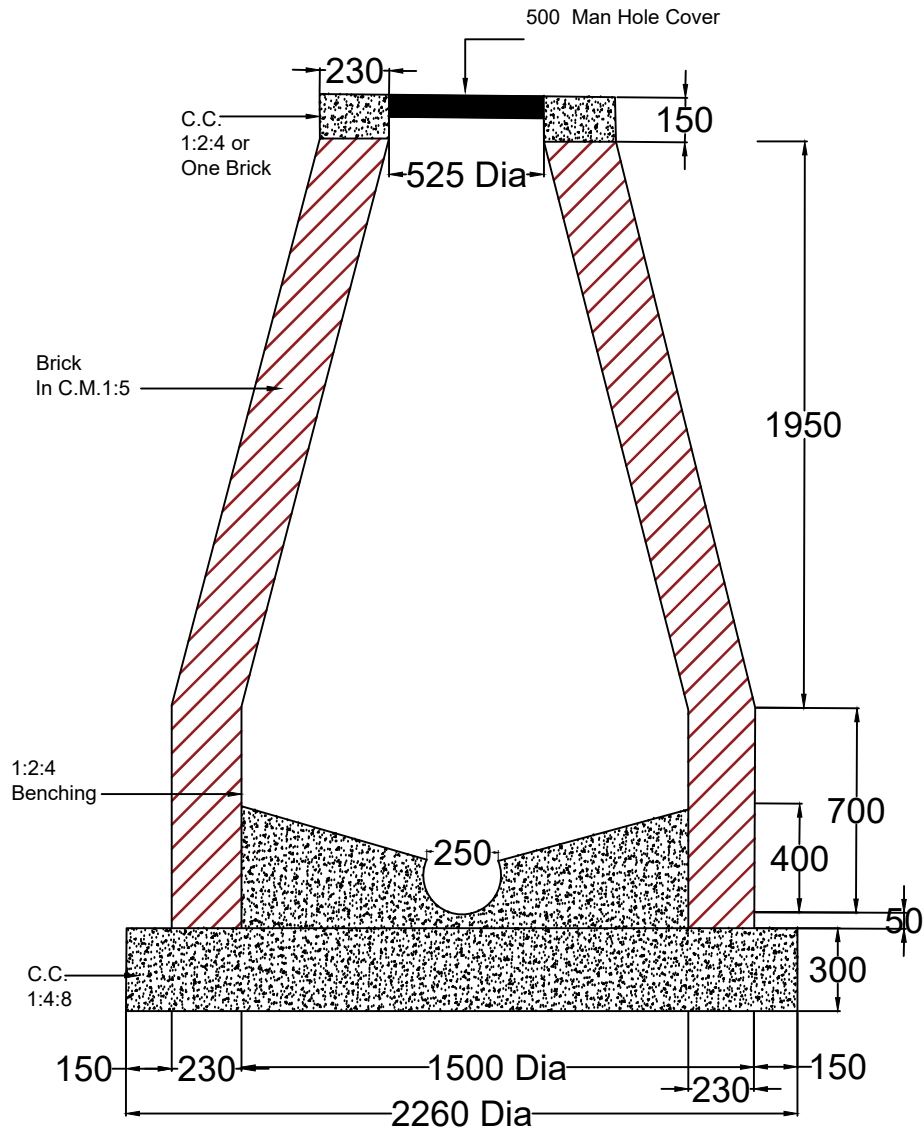


Figure-3

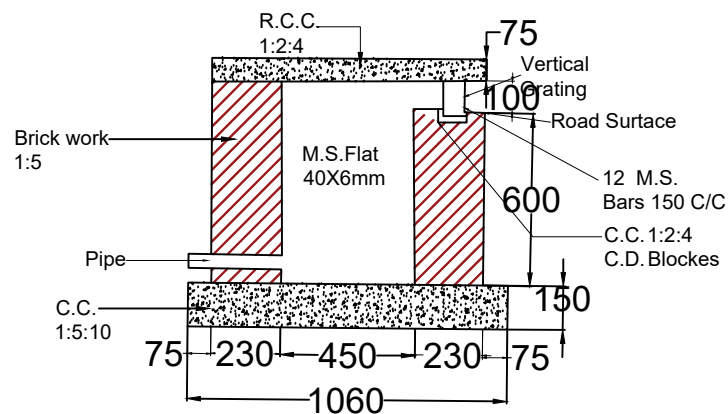
Chapter No.29



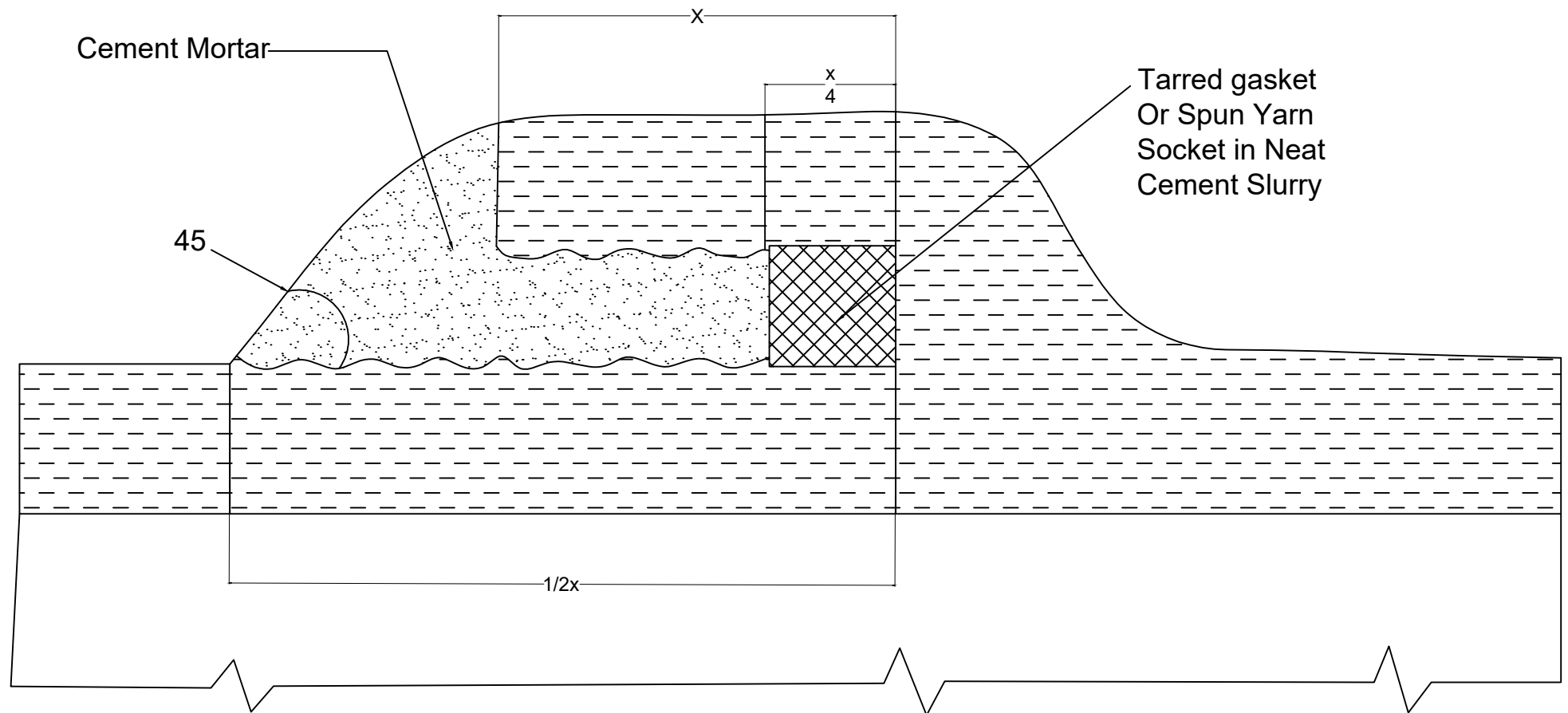




Circular Type Man Hole  
Figure - 6



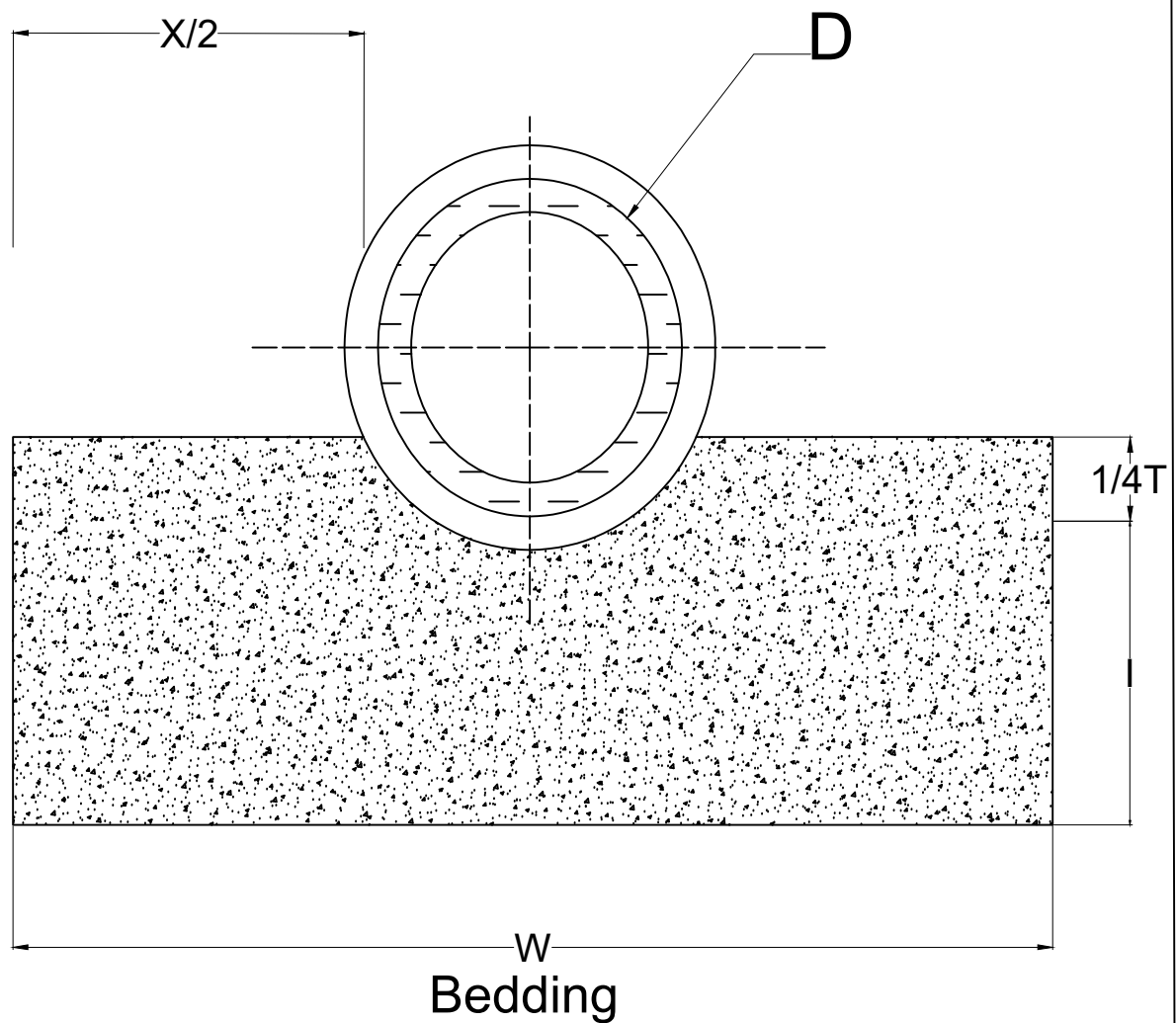
Road Gully Chamber  
400x450x775 (Vertical Grating)  
Figure - 7



X-Socket Length

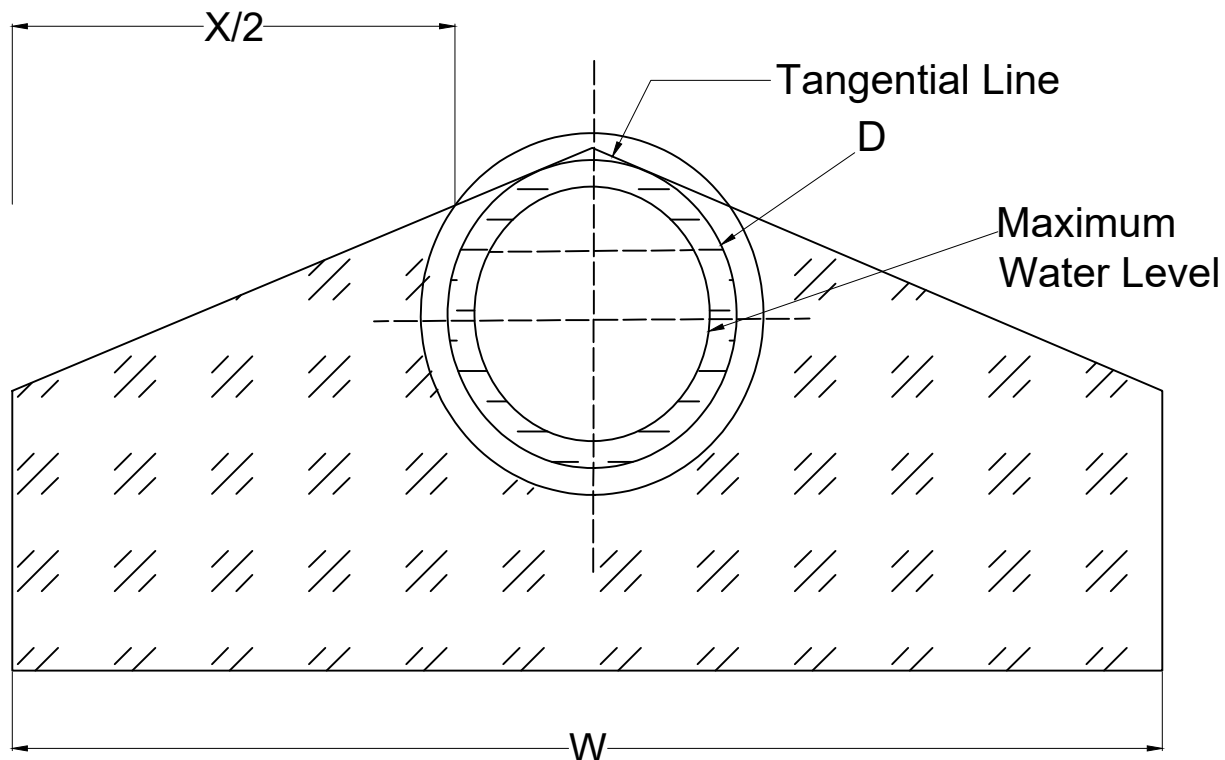
TYPICAL DETAIL OF CEMENT JOINTS FOR GLAZED STONEWARE PIPES

Chapter No.29



- $W = D + X$ , where  $D$  is the external diameter of the pipe  
 $X =$  300mm upto trench depth of 1200mm  
 400mm for trench depth more than 1200mm  
 $T =$  100mm for pipes under 150mm  
 1/4th internal dia. subject to a min. of 150mm and max. 300mm. for pipes more than 150mm dia

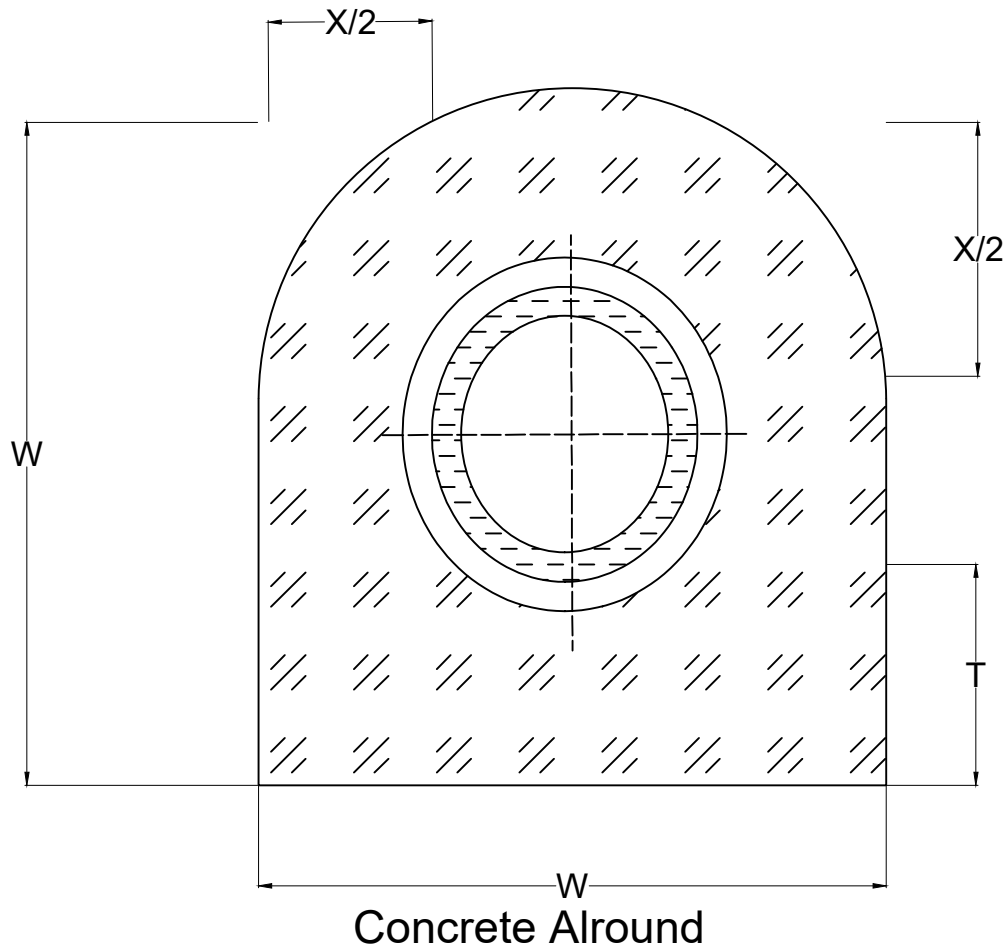
Chapter No.29



**Concrete Upto haunches**

- W=  $D+X$ . where D is the external diameter of the pipe
- X= 300mm upto trench depth of 1200mm  
400mm for trench depth more than 1200mm
- T= 100mm for pipes under 150mm  
1/4th internal dia. subject to a min. of 150mm and max. 300mm. for pipes more than 150mm dia

**Chapter No.29**



- W= 100mm for pipes under 150mm  
1/4th internal dia. subject to a min. of 150mm and max.  
300mm. for pipes more than 150mm dia.
- X= D+X. where D is the external  
diameter of the pipe
- T= 300mm upto trench depth of 1200mm  
400mm for trench depth more than  
1200mm

Chapter No.29