

OFFICE OF THE COMMISSIONER MUNICIPAL CORPORATION
JAGDALPUR, CHHATTISGARH

E-procurement Tender Notice

Main Portal: <https://cgeprocurement.gov.in>

NIT. No. 01

Jagdalpur/Dated 07.06.2021

Online bids are invited for followings works up to 29-06-2021

1	System Tender no.	77878
2	Name of work	Balance work/s of Engineering, Procurement, Construction, testing, commissioning of Intake well, Overhead Tanks, Water Treatment Plant, Raw and Clear Water Pumps, Rising and Feeder Mains Including Distribution Network, House Service Connections, PLC- SCADA automation, monitoring and control system, and all others allied civil, Electro Mechanical works associated for Augmentation & Reorganization of Water Supply scheme at Jagdalpur under Amrut Mission including testing, commissioning, Trial run, 12 months Defect Liability period and 5 years O&M of whole scheme
3	Probable amount of contract	Rs 6933.39 Lakh
4	Earnest money	Rs 34.67 Lakh
5	Class of Contractor	In appropriate Class

The details can be viewed and downloaded online directly from Government of Chhattisgarh e-Procurement System Portal (<https://cgeprocurement.gov.in>) from 08-06-2021 at 10.30 Hours (IST) on wards.

For more details on the tender and bidding process you may please visit the above mentioned portal.

KEY DATES

S.no	Nagar Nigam Stage	Contractor Stage	Date	Time
1	Bid Start date		08-06-2021	10.30
2		Site visit	22-06-2021	10:00 to 14:00
3		Pre bid Meeting		15:00 to 17:00
4		Last date of online submission of bids	29-06-2021	17:30
5		Physical/Hard copy submission	30-06-2021	17.30
6	Opening of Envelope A & B		01-07-2021	10:30


Commissioner
Municipal Corporation Jagdalpur.
Jagdalpur(C.G)

कार्यालय नगरपालिक निगम, जगदलपुर, जिला-बस्तर(छ0ग0)

शांतिनगर, वार्ड क्र. 25, बस स्टैण्ड रोड, जगदलपुर

E-Mail - jagdalpurnagarnigam@yahoo.com, Website - nagarnigamjagdalpur.in, Phone No. - 07782-221055



क्रमांक / 923 / न0पा0नि0 / लो0नि0शा0 / 2021 जगदलपुर, दिनांक 08 / 06 / 2021

प्रति,

शिवम पब्लिसिटी

रायपुर


ई-मेल : sivamrpr@gmail.com

विषय :- निविदा सूचना समाचार पत्र में प्रकाशित करने के संबंध में।

—00—

विषयान्तर्गत लेख है कि इस कार्यालय के आर.एफ.पी. क्रमांक 01 दिनांक 07.06.2021 (सिस्टम निविदा क्रमांक 77878) को संलग्न कर प्रेषित की जा रही है। कृपया आर.एफ.पी. सूचना का प्रकाशन हिन्दूस्तान टाइम्स में 03 कॉलम 08 सेमी साईज में एक बार प्रकाशित करवायी जाकर प्रकाशित समाचार की तीन-तीन प्रतियों सहित देयक भुगतान हेतु आयुक्त, नगरपालिक निगम, जगदलपुर नाम से बिल तैयार कर कार्यालय, नगरपालिक निगम, जगदलपुर जिला-बस्तर, छ0ग0 को प्रस्तुत करें।

सहपत्र :- एक।


आयुक्त
नगरपालिक निगम,
जगदलपुर

कार्यालय नगरपालिक निगम, जगदलपुर, जिला-बस्तर(छ0ग0)

शांतिनगर, वार्ड क्र. 25, बस स्टैण्ड रोड, जगदलपुर

E-Mail - jagdalpurnagarnigam@yahoo.com, Website - nagarnigamjagdalpur.in, Phone No. - 07782-221055



क्र. 924

प्रति,

दिनांक 08/06/21

हरिभूमि
जगदलपुर।

विषय :- आर.एफ.पी. सूचना समाचार पत्र में प्रकाशित करने के संबंध में।

—00—

विषयान्तर्गत लेख है कि इस कार्यालय के आर.एफ.पी. क्रमांक 01 दिनांक 07.06.2021 (सिस्टम निविदा क्रमांक 77878) को संलग्न कर प्रेषित की जा रही है। कृपया आर.एफ.पी. सूचना का प्रकाशन आपके दैनिक समाचार पत्र के अंक में एक बार 03 कॉलम 08 सेमी साईज में एक बार प्रकाशित करवायी जाकर प्रकाशित समाचार की तीन-तीन प्रतियों सहित देयक भुगतान हेतु आयुक्त, नगरपालिक निगम, जगदलपुर नाम से बिल तैयार कर कार्यालय, नगरपालिक निगम, जगदलपुर जिला-बस्तर, छ0ग0 को प्रस्तुत करें।

सहपत्र :- एक।

प्रकाशित दिनांक 09/06/2021

ह
आयुक्त

नगरपालिक निगम,
जगदलपुर



Jagdalpur Municipal Corporation
Augmentation & Reorganisation of Jagdalpur Water
Supply Scheme
UNDER AMRUT MISSION
TENDER DOCUMENTS
For Turn Key Package
Form "F"
(Lump-sum Contract)

Name of Work:

**Balance/Leftover works for Augmentation & Reorganisation to Water supply Scheme-
Jagdalpur under Mission AMRUT on TURN KEY Basis (Form-F).**

(PAC Rs 6933.39 Lakh)

COST OF TENDER DOCUMENT & BID PROCESSING FEE —Rs.15,000.00

Office of the Commissioner
Municipal Corporation, Jagdalpur
Chhattisgarh

Web site: www.nagarnigamjagdalpur.co.in

E-mail: nagarnigamjagdalpur@gmail.com

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TENDER DOCUMENT FOR BALANCE/LEFTOVER WORKS OF AUGMENTATION &
REORGANISATION TO JAGDALPUR WATER SUPPLY SCHEME UNDER AMRUT MISSION
GOVERNMENT OF CHHATTISGARH

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TENDER DOCUMENT FOR BALANCE/LEFTOVER WORKS OF AUGMENTATION &
REORGANISATION TO JAGDALPUR WATER SUPPLY SCHEME UNDER AMRUT MISSION
GOVERNMENT OF CHHATTISGARH

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Municipal Corporation Jagdalpur, Chhattisgarh

NOTICE INVITING TENDER

NIT. No. 01

Jagdalpur/Dated : 07.06.2021

Online tender are invited by the Commissioner, Municipal Corporation, Jagdalpur for the following work in Form “F” for lump Sum contract from the contractors registered with Unified Registration System (Single Window) on GoCG PWD & e-Procurement System Portal (<https://cgeprocurement.gov.in>) through sub portal <https://uadd.cgeprocurement.gov.in> as per the 'key Dates' mentioned below . All other conditions for submission of tenders and criteria for prequalification etc. have been mentioned in the tender documents and prequalification documents.

1	Name of Work	Balance /leftover work/s of Engineering, Procurement, Construction, testing, commissioning of Intake well, Overhead Tanks, Water Treatment Plant, Raw and Clear Water Pumps, Rising and Feeder Mains Including Distribution Network, House Service Connections, PLC- SCADA automation, monitoring and control system, and all others allied civil, Electro Mechanical works associated for Augmentation & Reorganization of Water Supply scheme at Jagdalpur under Amrut Mission including testing, commissioning, Trial run, 12 months Defect Liability period and 5 years O&M of whole scheme
2	Probable amount of contract	Rs 6933.39 Lakh
3	Earnest money(EMD)	Rs 34.67 Lakh (Rupee Thirty four Lakh Sixty Seven thousand only) TDR/FDR in favour of Commissioner Municipal Corporation Jagdalpur
4	Time allowed for completion (including rainy season)	18(Eighteen) months (including 03 (three) months trial run), and 5(five) years Operation and maintenance (including 12 (twelve) months Defect Liability period).
5	Cost of Tender document fee	Rs.15000.00 (Rupee Fifteen Thousand only) in the form of DD in favour of favour of Commissioner Municipal Corporation Jagdalpur
6	Validity of Offer	120 days from the day of opening of Financial offer
7	Class of Contractor	In appropriate Class
8	Site Visit and Pre bid meeting	<ol style="list-style-type: none">1. A Site visit conducted by the Employer will be organized by the Executive Engineer/Nodal Officer AMRUT Mission, 22.06.2021 Jagdalpur, Chhattisgarh at 10.00 hours to 14.00 hours on.2. A Prebid meeting in context of this project shall be held in the office of the Commissioner Jagdalpur Municipal Commissioner, Jagdalpur, C.G.on 22.06.2021 at 1500 HRS onwards.

TENDER DOCUMENT FOR BALANCE/LEFTOVER WORKS OF AUGMENTATION &
REORGANISATION TO JAGDALPUR WATER SUPPLY SCHEME UNDER AMRUT MISSION
GOVERNMENT OF CHHATTISGARH

For further clarifications, The Bidders may contact **M/s Mjunction Service Ltd.**, on helpdesk Toll free number **1800 419 9140** or through Email ID pro-chips@gov.in they may contact to **Mr. Shailesh Kumar Soni, Sr. Manager, Infotech and Biotech Promotion Society (CHIPS) on Tel. No. 0771-4014158**

The tender documents containing detailed terms & conditions are available for free download on GoC e-Procurement portal <http://cgeprocurement.gov.in> through sub portal of Urban Administration & Development Department <http://eproc.cgstate.gov.in> Bidders have to quote online their prices along with Technical and Commercial bids in prescribed formats on the above mentioned portal only.

The Bidders intending to participate in this Tender are required to get enrolled on the above mentioned website and get empanelled on the Sub-Portal of Urban Administration & Development Department. Enrolment on the above mentioned Portal is mandatory. As the online Bids are required to be digitally signed, Bidders are required to obtain Class – II Digital Signature Certificates (DSCs).

The Bidders are also invited to get themselves trained on the operations of the e-Procurement System. Bidders may get in touch with the Service Provider of the e-Procurement System for confirming the time and date for their training session.

KEY DATES

S.no	Nagar Nigam Stage	Contractor Stage	Date	Time
1	Bid Start date		08-06-2021	10.30
2		Site visit	22-06-2021	10:00 to 14:00
3		Pre bid Meeting		15:00 to 17:00
4		Last date of online submission of	29-06-2021	17:30
5		Physical/Hard copy submission	30-06-2021	17.30
6	Opening of Envelope A &		01-07-2021	10:30

**Commissioner,
Municipal Corporation Jagdalpur.**

Jagdalpur/Dated:

Copy forwarded to :-

1.
2.
3. Notice Board.

Municipal Corporation

Jagdalpur, Chhattisgarh

DETAILED NOTICE INVITING TENDER

NIT. No. 01

Jagdalpur/Dated : 07.06.2021

Online tender are invited by the Commissioner, Municipal Corporation, Jagdalpur for the following work in Form “F” for lump Sum contract from the contractors registered with Unified Registration System (Single Window) on GoCG PWD & e-Procurement System Portal (<https://cgprocurement.gov.in>) through sub portal <https://uadd.cgprocurement.gov.in> as per the 'key Dates' mentioned below . All other conditions for submission of tenders and criteria for prequalification etc. have been mentioned in the tender documents and prequalification documents.

Group No.	Name of work	Probable amount of contract (Rs. in Lacs)	Earnest money	Time allowed for completion (including rainy season)	Cost of Tender Document	Validity of the Offer	Class of the Contractor
1	2	3	4	5	6	7	
1.	<p>Balance/ leftover work/s of “Engineering, procurement, construction, testing, commissioning and 3 months trial run and 12 months Defects Liability period of Augmentation to Water Supply Scheme of Jagdalpur town on TURN KEY JOB basis”</p> <p>(i) Construction of IntakeWell (10.0 m Dia , 32.0 m Depth) & Connecting main (DI Class K-9 , 900 mm Dia , 50m length from Indravati river to Intake well)</p> <p>(ii) (a)Raw Water Pumping machinery on Intakewell VT Pumps, 4 Nos, Status (2 W+ 2S), Discharge = 530 m³/hour Head = 51m, Pumping hours - 22 Hrs, Including electrical panel specials , valves EOT and other accessories</p> <p>(b) One 33/0.415 kV, 500 kVA Sub-station</p> <p>Note: While quoting the rates the bidders shall take into account</p>	Rs 6933.39 Lakh	Rs 34.67 Lakh (Rupee Thirty four Lakh Sixty Seven thousand only) TDR/ FDR in favour of Commissioner Municipal Corporation Jagdalpur	18 (Eighteen) months (including 03 (three) months trial run), and 5(five) years Operation and maintenance period (including 12 (twelve) months Defect Liability period).	Rs.15000.00 (Rupee Fifteen Thousand only) in the form of DD in favour of Commissioner Municipal Corporation Jagdalpur	120 days	In appropriate Class

TENDER DOCUMENT FOR BALANCE/LEFTOVER WORKS OF AUGMENTATION &
REORGANISATION TO JAGDALPUR WATER SUPPLY SCHEME UNDER AMRUT MISSION
GOVERNMENT OF CHHATTISGARH

<p>any cost to be incurred for successful installation & commissioning of already procured pumps & motors alongwith its accessories and other Electro-mechanical equipments. It is desired that the bidder alongwith his expert to verify/check/inspect and assess the suitability of already procured pumps, motors, allied accessories and other electro-mechanical equipments at his own cost.</p> <p>The quoted lump sum offer shall be deemed to be included of all the cost required for successful installation and commissioning of all the electro-mechanical equipments along with any other required accessories.</p> <p>The department will not entertain any extra financial claim on account of extra items, it is solely the responsibility to bidder to ascertain that extra items required for successful commissioning of whole scheme and should include the rates in its quoted offer.</p> <p>(iii) RAW WATER RISING MAIN 600mm Dia DI (class K-9) pipe of length 347 m (From Proposed Headwork To Proposed WTP) including Di Specials, fittings, valves thrust blocks, surge control devices, excavation ,laying jointing using EPDM rubber gaskets including hydrostatic testing , commissioning with trial run complete</p> <p>(iv) Provision of WATER TREATMENT PLANT 35 MLD CAPACITY, including provision of additional 2 No. Rapid Sand Filter Beds in Existing 9 MLD WTP & Demolition of existing 4.5 MLD WTP Including provision of all treatment units, electro-mechanical equipment and 20 % overloading for all</p>							
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<p>treatment units , electrically actuated valves, Actuators, PLC- SCADA automation, monitoring and control system & recirculation arrangement for wastewater and sludge to make it a ZERO Liquid Discharge WTP.</p> <p>(v) (a) Provision of CLEAR WATER PUMPING MACHINERY AT WTP-- Centrifugal Pumps, 4 Nos, (2 W+ 2S), Discharge =510 m³/hour, Head = 50m, Pumping hours- 22 Hrs including valves, piping, electrical panel, EOT crane including installation , testing commissioning and trial run for 12 months.</p> <p>(b) One 33/0.415 kV, 500 kVA Sub-station installation , testing and commissioning complete.</p> <p>(vi) Provision of CLEAR WATER RISING MAIN (150 to 600 mm dia DI , class K-9 pipe Length -5013 m) including DI Specials, fittings, valves thrust blocks, surge control devices, excavation , laying jointing using EPDM rubber gaskets including hydrostatic testing , commissioning with 12 months trial run complete.</p> <p>(vii) Construction of RCC OHSRs</p> <ol style="list-style-type: none"> I. (Capacity – 300 kL of - 20 m staging) II. (Capacity – 850 kL, Staging - 15 m) III. (Capacity – 750 KL, Staging - 20 m) IV. (Capacity – 650 KL, Staging - 20 m) V. (Capacity– 1250 KL, Staging - 20 m), VI. (Capacity – 650 KL, Height - 20 m) including inlet, outlet, overflow , 							
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TENDER DOCUMENT FOR BALANCE/LEFTOVER WORKS OF AUGMENTATION &
REORGANISATION TO JAGDALPUR WATER SUPPLY SCHEME UNDER AMRUT MISSION
GOVERNMENT OF CHHATTISGARH

<p>wash out pipes including water tightness test complete with 12 months trial run.</p> <p>(viii) Provision of DISTRIBUTION network (L ength 199926.15 M) (100 mm dia DI , class K-7 pipe L ength 131466.82 m) (150 mm dia DI class K-7 pipe L = 35220.18 m) (200 mm dia DI class K-7 pipe L = 16488.79 m) (250 mm dia DI class K-7 pipe L = 10418.1 m) (300 mm dia DI class K-7 pipe L = 4372.53 m) (350 mm dia DI class K-7 pipe L = 892.25 m) (400 mm dia DI class K-7 pipe L = 1014.44 m) (450 mm dia DI class K-7 pipe L = 53.07 m) including DI Specials, fittings, valves thrust blocks, surge control devices, excavation ,laying jointing using EPDM rubber gaskets including hydrostatic testing , commissioning with 12 months trial run complete.</p> <p>(ix) For National Highway Crossing for NH 16 (2 Locations) & NH 43 (1 Location) using Jack Push ing Method (MS pipes from dia 200 to 600 mm)</p> <p>(x) Provision of House Service Connections: 23832 Nos. (Clamp saddle, (PE-AL-PE) Composite Pressure Pipes,</p>					
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TENDER DOCUMENT FOR BALANCE/LEFTOVER WORKS OF AUGMENTATION &
REORGANISATION TO JAGDALPUR WATER SUPPLY SCHEME UNDER AMRUT MISSION
GOVERNMENT OF CHHATTISGARH

<p>GM or brass ferrules, Brass stop-cock, G.I pipe 15mm dia, MS/PP Meter Box, Compression fittings, water meters, consumer survey, Customer Facility Center, Billing software)</p> <p>(xi) Provision of Bulk Flow Meters--- Electromagnetic Bulk Flow Meters at various entry points of the System, Electric Valve actuators, Pressure Gauges & Flow control Valves complete</p> <p>(xii) PLC- SCADA automation, monitoring and control system, for existing and proposed components including RWPS, WTP, ESRs, CWPS, Bulk Flow meters , FCVs, Pressure gauges with facility of centralized monitoring and control</p> <p>(xiii) Allied Civil Works --Provision of Compound wall , Chain link mesh fencing, Main Gates, Misc items , Plantation at OHT & WTP site, tree guard, plants ,Roads WTP, Copper lightening conductor , Desilting & Screen Guard in Existing Jackwell complete.</p> <p>(xiv) Operation&Maintenance for 5 Years of existing 09 MLD WTP and proposed 35 MLD WTP including PLC SCADA monitoring & control system (covering all WTPs all RWPs,CWPS,valve actuators,OHSRS,FCVs,& electromagnetic bulk flow meters) and all new RWPS & CWPS including replacement and warranty for 5 years.</p>						
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Note:

1. Registration and subsequent empanelment for e-tendering website (<https://eproc.cgstate.gov.in>)

through Sub Portal <https://eproc.cgstate.gov.in> and department's sub-portal is mandatory.

2. The Bidders intending to participate in this Tender are required to get enrolled on the above mentioned website. Enrolment on the above-mentioned Portal is mandatory. As the online Bids are required to be signed digitally, bidders are required to obtain class II Digital Signature Certificates (DSCs).

The Bidders may contact **M/s Mjunction Service Ltd.**, on helpdesk Toll free number **1800 419 9140** or through Email ID pro-chips@gov.in they may contact to **Mr. Shailesh Kumar Soni, Sr. Manager, Infotech and Biotech Promotion Society (CHIPS) on Tel. No. 0771-4014158.**

3. The Bidders have to digitally sign their bids before submitting the bids hashes online. Thus the Bidders are advised to obtain Digital Certificates. The registered contractors may obtain information required for issuance of a Class II Digital Signature Certificate from the Controller of Certifying Authorities (www.cca.gov.in) or the Service Provider of eProcurement System for Government of .
4. Validity of offer - 120 days from date of opening of financial offer.
5. The Technical offer shall be opened in presence of the Bidders or their authorized representatives, who may choose to be present. The date of opening of financial offer will be intimated to the Bidders subsequently after opening of technical offer.
6. No Joint ventures shall be allowed for the bidding process.
7. The department reserves the right to change the key dates of the tender process.
8. Sufficient hindrance free space is available for construction. Location maps of each site showing size of open space available for construction are attached
9. Bidders are advised to visit the site sufficiently in advance of the date fixed for the submission of the tender at his own cost. The Tenderer shall be deemed to have full knowledge of all relevant documents and site conditions, assessment of balance/leftover work etc. whether he inspects it or not.
10. A Prebid meeting in context of this project shall be held in the office of the Commissioner Jagdalpur Municipal Commissioner, Jagdalpur. The contractors shall give their suggestions and conditions in writing based on which Corrigendum/Amendments/clarifications shall be framed and uploaded which will supercede the original NIT Conditions unless otherwise specified.
11. Cess @ 1 % (one percent) or latest shall be deducted at source from every bill of contractor under "Building and other Construction for workers welfare, cess Act-1996.
12. Bidders/tenderers should have to submit/attached "Envelope A' and "B" physically (in sealed Envelope) and online and "Envelope C' online only as per dates indicated in key Dates.
 - a. **Envelope "A'** All the following documents submission are mandatory for opening of Technical Bid.
 - (i) The Earnest money as mentioned in NIT in original with physical Envelope and scan copy (online). The Earnest money will be returned to the unsuccessful Bidders after the award of contract. The Earnest Money of the Successful Bidder will be retained as part of the Security Deposit.
 - (ii) The tender fee as mentioned in NIT in original with physical Envelope and scan copy (online). It is non refundable.
 - (iii) Attested copy of Valid Registration Certificates. CG PWD Registration in appropriate Class In Unified Registration System (Single Window) on GoCG e-Procurement System Portal of (<https://cgprocurement.gov.in>) through sub portal <https://uadd.cgprocurement.gov.in> and (Partnership Deed, registration amendment certificate as the case may be)

- (iv) Declaration for Not Being Blacklisted (Appendix-13)-Affidavit's in Original. (Non Judicial stamp in 100 Rs.)
- (v) Undertaking on Firm's letterhead (Appendix-14) in Original
- (vi) Attested copy of PAN card issued by I.T. Department.
- (vii) Attested copy of Valid GST/ CGST Registration must be valid up to Bid due date as per key dates otherwise tender will be disqualified while opening.
- (viii) Valid Bank Solvency certificate in Bank Letter Head. (Not Older than 12 Months) Mention the Bank Dispatch No. or Ref. No. or Verifiable unique number or Date.

b. **Envelop- 'B'(Technical Bid –Submit physically & online)** -Also the Envelop B containing the following documents shall be submitted physically and online also. In all cases the submission which is online shall prevail

- (i) Power of Attorney/Letter of authorization to sign the bid
- (ii) Partnership deed /MOA of company
- (iii) Technical & Financial prequalification documents
- (iv) BID CAPACITY-Tenderer who meets the minimum qualification criteria will be qualified only if their **available bid capacity** for construction work is equal to or more than the probable amount of contract. The available bid capacity will be calculated as under:

Bid Capacity=(2.5xAxN)-B

Where A= Maximum value of works executed during last 5 years (with 10% compounded rate per year).

Where N = Period of completion in years (shown in NIT)

Where B = Value of works in hand

The bid capacity of contractor/firm/company should be equal or more than the PAC shown in NIT.

- (v) ITR of last five years (up to 31-03-20)
- (vi) As per Pre-Qualification Criteria mentioned in PQ document. (Appendix-1 to 14)

c. **Envelop- "C"** - Total Lump sum offer shall be submitted online only. However the breakup of the Lump Sum offer as per the "Form F" is required to be submitted in physical sealed envelope super scribed with "ENVELOPE "C" (To be opened along with Financial offer only)".

Note:

- i. The experience of work executed in Public undertakings/Municipal Corporations issued by an officer not below the rank of rank of Executive Engineer shall be acceptable. The Experience certificate of successful completion of work in contractor's/firm's/comapny's own name indicating name of work, Agrrement no. work order no. and date, amount of contact, stipulated period of completion, actual period of completion during last five years i.e 2015-16 to 2019-20. The experience of the bidder as a contractor who has executed a work sublet to him and not as a main contractor will be out-rightly rejected.
- ii. The details of works in hand indicating name of work, Agrrement no. work. work order no. and date, amount of contract, period of completion, value of work done and balanced work in hand with details of work on the date of submission of Teneder.

- iii. Financial turn over during last five years i.e 2015-16 to 2019-20.
- iv. The tenderer who was blacklisted anywhere in India in last 05 years or was abandoned the work will not be allowed to bid for this tender. The tenderer shall submit an Affidavit in this regard.
- v. In the event of withdrawing his/her offer before the expiry of the period of validity of offer or failing to execute the agreement as required by conditions of the notice inviting tender (N.I.T.) he/she will not be entitled to tender for this work in case of recall of tenders. In addition to forfeiture of his/her earnest money as per provisions of tender condition as may be applicable for the work, the Commissioner, Jagdalpur Municipal Corporation will restrict the contractor/firm for a period of one year in participation of all tenders. If the tenderer has committed a similar default after restriction period on earlier occasion(s) as well, then Commissioner, Jagdalpur Municipal Corporation recommended for demotion in registration to the committee of 'Unified Registration System' (e-Registration) with Chhattisgarh P.W.D. State Governments will be permanently. This special condition will supersede anything contrary to it in the tender document.
- vi. Additional performance shall be deposited by the successful bidder at the time of signing of agreement when the bid amount is seriously unbalanced. i.e. less than the estimated cost by more than 10% in such an event the successful bidder will deposit the additional performance security to the extent of differential cost of bid amount and 90% of the estimated cost in shape of Bank Guaranty issued by scheduled Bank for agreement period in favour of Commissioner Municipal Corporation in Additional To Performance security failing which the tender in this favour shall be liable for Rejection." The same shall be released along with the normal Security Deposit.
- vii. Bidders are advised to go through the Notice Inviting tenders & the complete tender document /P.Q./Bid Capacity document thoroughly and all Certificates, annexures, enclosures as mentioned in the document will have to be submitted by the bidders strictly in the prescribed format, at the time of submission of Technical bid, failing which the contractor shall disqualify for the work & his financial offer shall not be opened and no representation, appeal or objection, what so ever in this regard shall be entertained by the department

13. PRE QUALIFICATION DOCUMENT (TECHNICAL AND FINANCIAL)

Technical Pre-qualification Criteria	
The minimum eligibility criteria in respect of particular experience to be fulfilled by the applicant are as under:---	
(a)	The bidder should have executed/completed Procurement Construction / Design-Build / Design-Build-Operate contract including design, installation, supply, construction, testing and commissioning successfully of following work's within the last five years in a single contract :-
(i)	Raw Water Intake Well of diameter not less than 7m with overhead pump house in River/Dam under a single contract.
(ii)	Providing laying, jointing, testing & commissioning of water supply pipelines of 50% of largest diameter i.e.(600/2 = 300mm) of a minimum half of the total length of largest diameter i.e. (347/2=173.5 m).Overall quantity laid of diameter 100mm and above should not be less than half of the desired combined estimated length i.e. (205.29/2 = 102.65 km) under a single or multiple contracts.
(iii)	At least one completed drinking Water Treatment Plant of at least 50% of required capacity of 35 MLD i.e. 17.5MLD in a single contract.
(iv)	Over Head Service Reservoir of at least 50% of the desired combined capacity i.e 2225 KL in a single or multiple contract with atleast one OHSR of minimum 625 KL @20 m staging in a single contract.
(v)	a) Experience of Installation of Pump– motor works of at least 50% of the desired capacity including all civil, mechanical and electrical works in a single or multiple contract i.e, i) Raw water VT Pumps of total discharging capacity 264.89 cum/hr ii) Clear Water Horizontal Centrifugal Pumps of total discharging capacity 255.00 cum/hr b) Electric Sub Station of at least 50% i.e. 250 KVA

TECHNICAL PREQUALIFICATION CRITERIA FOR SUPPLYING & FIXING OF CONSUMER METERS

1. Manufacturer's (who fulfill the minimum specification as mentioned in annexure E) written authorization will have to be submitted alongwith the tender.
2. Authorization must be submitted on Rs.100 stamp paper, duly stamped and signed by manufacturer's authorized signatory
3. In case supplier fails to supply the mentioned quantity, JMC reserve the right to permit the use of other make having quality as per specifications.
4. Manufacturer must have capacity to manufacture 10000 meters per month.
5. The manufacturer or bidder must have in-house computerized calibration test bench to offer after sales service in India.
6. The Tenderer must offer three years warranty against manufacturing defect, backed by supplier / manufacturer after installation and commissioning of water meters.
7. The contractor who was blacklisted anywhere in India in last 5 years or stopped/abandoned /was asked to stop metering job, will not be eligible to bid for this tender. The contractor shall submit an affidavit in this regard.
8. Tenderer should submit necessary company incorporation certificate.

**Technical Prequalification Criteria for Provision of PLC –SCADA
Monitoring and Control System**

1. Bidder should be a Manufacturer or a Authorized Dealer or a System integrator of Sensors (Flow, Pressure, level)/ PLC-SCADA Systems/ Water quality monitoring systems
2. If bidder is Not Manufacturer or a Authorized Dealer or system Integrator of Sensors (Flow, Pressure, level) /PLC-SCADA Systems, Water quality monitoring systems, then the Bidder should form MOU on One Hundred Rupee Stamp Paper with the Manufacturer/Authorized Dealer of Sensors (Flow, Pressure, level)/PLC-SCADA Systems/ Water quality monitoring systems.
3. The Manufacturer /Authorized Dealer should have Experience of successful installation and commissioning of automation in single or multiple contracts of water supply with automation at head works and pumping Machinery operations / WTP and water quality monitoring / ESR operations
4. Manufacturer /Authorized Dealer to submit experience certificate from the officer not below the rank of Executive Engineer or equivalent in PHED/Municipal Corporation/Council.
5. For Automation, certificates issued by Private listed Organizations can also be considered if supported by valid documents
6. Experience for the maintenance of Instrumentation including Sensors (Flow, Pressure, level)/Automation systems for 3 years is must.

**Commissioner
Municipal Corporation
Jagdalpur, Chhattisgarh**

FINANCIAL PRE-QUALIFICATION AS PER LATEST NORMS

To qualify in the Tender each Tenderer must have in last Five years

Cost of Package I	Details	Rs. In Lakh	Rs 6933.39 Lakh
1	Achieved in "any one financial year" a financial turnover (in all classes of Construction Works related to Water Supply Schemes) value of construction work of at least 60% (Sixty percent) the amount equal to the probable amount of contract for which bid has been invited. AND	Rs. In Lakh	
2	Satisfactorily completed at least one Water Supply work equal in value 40% (forty percent) of the Probable amount of contract as on date of submission of financial offer. OR	Rs. In Lakh	
3	Satisfactorily completed at least two Water Supply works total costing equal to value 40% (forty percent) of the probable amount of contract for which the tender is invited as on date of submission of financial offer. OR	Rs. In Lakh	
4	Satisfactorily executing at least one Water Supply work having received payment of value not less than 40% (forty percent) OR Two Water Supply works having received aggregate payment of value not less than 40% (forty percent) of the value of probable amount of contract as on date of submission of financial offer. OR	Rs. In Lakh	
5	One Water Supply work completed & satisfactorily executing one Water Supply work Total aggregate value in both the Water Supply works shall be minimum 40%(forty percent) of the value of probable amount of contract for which tender is invited as on date of submission of financial offer. Note: - 1) The turn over shall be indexed at the compounded rate of 10% (Ten percent) for each earlier year. Note (2) (1)The value of completed work shall be updated to the value of current financial year @ compounded rate of 10% (Ten percent) per year from completion year of work	Rs. In Lakh	

Note:

Even though the tenderer meet the above qualifying criteria, they are subject to be disqualified if they have:

- (i) Made misleading, incorrect or false representations in the forms, statements, affidavits and attachments submitted in proof of the qualification requirements.

And/or

- (ii) Record of poor performance such as abandoning the works, not properly completing the contract, unsatisfactory quality of work, inordinate delays in completion, claim and litigation history, or financial failures etc in any department of Govt. of Chhattisgarh or any other state or Govt. organization /services/corporations/local body etc. (by whatever names these are called) within State territory of Chhattisgarh or anywhere in India.

Other condition including qualification and details of work can be seen in the office of the undersigned during office hours and downloaded online directly from the portal <http://eproc.cgstate.gov.in> and shall be submitted online on or before _____. This NIT shall also form the part of agreement. The details can be viewed on the website <http://eproc.cgstate.gov.in> from _____, _____ onwards

14. "INSTRUCTIONS FOR USING THE ELECTRONIC TENDERING SYSTEM"

For details on tendering procedure through the electronic tendering system, please refer to "instructions for using the electronic tendering system" document available along with the tender documents.

The Bidders are also invited to get themselves trained on the operations of the e-Procurement System. Bidders may get in touch with the Service Provider of the e-Procurement System for confirming the time and date for their training session.

Payment for Service Provider Fees: In addition to the Tender Document Fees payable to Municipal Commissioner Jagdalpur, the Contractors will have to pay Service Providers Fees of Rs. _____ through online payments gateway service available on Electronic Tendering System. For the list of options for making online payments, the Contractors are advised to visit the link E-Payment Options under the section E-Tendering Toolkit for Bidders on the Home Page of the Electronic Tendering System

Steps to be followed by Contractors to participate in the e-Tenders

- I-. Registration in Class 'A' in Unified Registration (Single Window) System on (<https://eproc.cgsstate.gov.in>) and subsequent empanelment for e-tendering website

(<https://eproc.cgsstate.gov.in>) and department's sub-portal is mandatory.

II--. Online viewing of Detailed Notice Inviting Tenders:

The Contractors can view the Detailed Tender Notice along with the Time Schedule (Key Dates) for all the Live Tenders on the Portal (<https://eproc.cgsstate.gov.in>) and <https://municipal corporation Jagdalpur.com>

III--. Download of Tender Documents:

The Pre-qualification / Main Bidding Documents are available for free downloading. However to participate in the online tender, the bidder must deposit Bid Processing and tender document fee online by filling up details of Demand Draft.

IV--. Online Bid Preparation and Submission of Bid Hash (Seal) of Bids:

Submission of Bids will be preceded by online bid preparation and submission of the digitally signed Bid Hashes (Seals) within the Tender Time Schedule (Key Dates) published in the Detailed Notice Inviting Tender. The Bid Data is to be prepared in the templates provided. The templates may be either form based, extensible tables and / or uploadable documents. In the form based type of templates and extensible table type of templates, the Contractors are required to enter the data and encrypt the data using the Digital Certificate.

In the uploadable document type of templates, the Contractors are required to select the relevant document / compressed file (containing multiple documents) already uploaded in the briefcase.

Notes:

A The Contractors upload a single document or a compressed file containing multiple documents against each unuploadable option.

B. The Hashes are the thumbprint of electronic data and are based on one – way algorithm. The Hashes establish the unique identity of Bid Data.

C. The bid hash values are digitally signed using valid Digital Certificate issued any Certifying Authority. The Contractors are required to obtain Digital Certificate in advance.

The Bidders may contact M/s Mjunction Service Ltd., on helpdesk Toll free number 18002582502 or through Email ID – helpdesk.eproc@cgsstate.gov.in or they may contact to Mr. Shailesh Kumar Soni, Sr. Manager, Chhattisgarh Infotech and Biotech Promotion Society (CHIPS) on Tel. No. 0771-4014158 or email- pro-chips@nic.in

D. After the hash value of bid data is generated, the Contractors cannot make any change / addition in its bid data. The bidder may modify bids before the deadline for Bid Preparation and Hash Submission as per Time Schedule mentioned in the Tender documents.

V- Close for Bidding (Generation of Super Hash Values):

After the expiry of the cut – off time of Bid Preparation and Hash Submission stage to be completed

by the Contractors has lapsed, the Tender will be closed by the Tender Authority.

The Tender Authority shall generate and digitally sign the Super Hash

VI--Decryption and Re-encryption of Bids (submitting the Bids online):

After the time for generation of Super Hash values by the Tender Authority has lapsed, the Contractors have to make the online payment of Rs. towards the fees of the Service Provider.

After making online payment towards Fees of Service Provider, the Contractors are required to decrypt their bid data using their Digital Certificate and immediately re-encrypt their bid data using the Public Key of the Tendering Authority. The Public Key of the Tendering Authority is attached to the Tender during the Close for Bidding stage.

Note: The details of the Processing Fees shall be verified and matched during the Technical Opening stage.

At this time, the Contractors are also required to upload the files for which they generated the Hash values during the Bid Preparation and Hash Submission stage.

The Bid Data and Documents of only those Contractors who have submitted their Bid Hashes (Seals) within the stipulated time (as per the Tender Time Schedule), will be available for decryption and re-encryption and to upload the relevant documents from Briefcase. A Contractor who has not submitted his Bid Preparation and Hash Submission stage within the stipulated time will not be allowed to decrypt / re-encrypt the Bid data / submit documents during the stage of Decryption and Re-encryption of Bids (submitting the Bids online).

15. Bid Opening and Evaluation

Bid Opening

- i. The Municipal Corporation JAGDALPUR will open the bids received (except those received late). In the event of the specified date for the submission of bids being declared a holiday for Municipal Corporation JAGDALPUR, the Bids will be opened at the appointed time and location on the next working day.
- ii. The files containing the technical bid shall be opened. The document marked "cost of bidding document" will be opened first and if the cost of the bidding documents is not there, or incomplete, the remaining bid documents will not be opened, and bid will be rejected.
- iii. In all other cases, the amount of Earnest Money, forms and validity shall be announced. Thereafter, the bidders' names and such other details as the Municipal Corporation JAGDALPUR may consider appropriate, will be announced by the Municipal Corporation JAGDALPUR at the opening.
- iv. Evaluation of the technical bids with respect to bid security, qualification information and other information furnished in the bid in pursuant to relevant Clause of ITB, shall be taken up and completed and a list will be drawn up of the responsive bids whose financial bids are eligible for consideration.

- v. The Municipal Corporation JAGDALPUR shall inform, by email, telegram or fascimal, the bidders, whose technical bids are found responsive, date, time and place of opening as stated in the Notice Inviting Bid.
- vi. In the event of the specified date being declared a holiday for the Municipal Corporation JAGDALPUR, the bids will be opened at the appointed time and location on the next working day Bidders or their representative, may attend the meeting of opening of financial bids.
- vii. At the time of the opening of the 'Financial Bid', (**Envelope 'C'**) the names of the bidders whose bids were found responsive in accordance with relevant clause of ITB will be announced. The financial bids of only these bidders will be opened. The responsive bidders' names, the Bid prices, the total amount of each bid, and such other details as the Municipal Corporation JAGDALPUR may consider appropriate will be announced by the Municipal Corporation JAGDALPUR at the time of bid opening.
- viii. **Process to be Confidential** Information relating to the examination, clarification, evaluation, and comparison of bids and recommendations for the award of a contract shall not be disclosed to bidders or any other persons not officially concerned with such process until the award to the successful Bidder has been announced. Any attempt by a Bidder to influence the Municipal Corporation JAGDALPUR's processing of bids or award decisions may result in the rejection of his Bid
- ix. Clarification of Bids and Contacting the Municipal Corporation JAGDALPUR: -
No Bidder shall contact the Municipal Corporation JAGDALPUR on any matter relating to its bid from the time of the bid opening to the time the contract is awarded.
- x. Any attempt by the bidder to influence the Municipal Corporation JAGDALPUR's bid evaluation, by any means, bid evaluation, bid comparison or contract award decision may result in the rejection of his bid.

16. Examination of Bids and Determination of Responsiveness

- 1) During the detailed evaluation of "Technical Bids"(**Envelope 'B'**), the Municipal Corporation JAGDALPUR will determine whether each Bid
 - (a) meets the eligibility criteria defined relevant Clauses.
 - (b) has been properly signed;
 - (c) is accompanied by the required securities; and
 - (d) is substantially responsive to the requirements of the bidding documents.

During the detailed evaluation of the "Financial Bids"(Envelope 'C'), the responsiveness of the bids will be further determined. To assist in the examination, evaluation and comparison of Bids, the Employer may at his discretion, ask any Bidder for clarification of his Bid including breakdown of unit rates. The request for

clarification and the response shall be in writing or vide email.

- 2) A substantially responsive "Financial Bid" is one, which conforms to all the terms, conditions, and specifications of the bidding documents, without material deviation or reservation. A material deviation or reservation is one
- (a) which affects in any substantial way the scope, quality, or performance of the Works;
 - (b) which limits in any substantial way, inconsistent with the bidding documents, the Municipal Corporation Jagdalpur's rights or the Bidder's obligations under the Contract; or
 - (c) whose rectification would affect unfairly the competitive position of other bidders presenting substantially responsive bids.
- 3) If a "Financial Bid" (Envelope 'C') is not substantially responsive, it will be rejected by the Municipal Corporation JAGDALPUR, and may not subsequently be made responsive by correction or withdrawal of the nonconforming deviation or reservation.

1.1 Corrections of Errors

(1) Bids determined to be substantially responsive, will be checked by the Municipal Corporation JAGDALPUR for any arithmetic errors. Errors will be corrected by the Municipal Corporation JAGDALPUR as follows:

- a) where there is a discrepancy between the rates in figures and in words, the rate in words will govern; and
- b) where there is a discrepancy between the unit rate and the line item total resulting from multiplying the unit rate by the quantity, the unit rate as quoted will govern.

(2) The amount stated in the Bid will be adjusted by the Municipal Corporation JAGDALPUR in accordance with the above procedure for the correction of errors and shall be considered as binding upon the Bidder. If the Bidder does not accept the corrected amount, the Bid will be rejected, and the Earnest money shall be forfeited in accordance with relevant Clause of ITB.

1.2 Evaluation and Comparison of Bids

(1) The Municipal Corporation JAGDALPUR will evaluate and compare only the bids determined to be substantially responsive in accordance with relevant Clause of ITB.

(2) In evaluating the bids, the MUNICIPAL CORPORATION, JAGDALPUR will determine for each Bid the evaluated Bid price by adjusting the Bid price by making correction, if any, for errors pursuant to relevant Clause of ITB.

(3) If the Bid of the successful Bidder is seriously unbalanced **in relation to the PAC of work** to be performed under the contract, the Municipal Corporation Jagdalpur may require the Bidder to produce detailed price analysis for any or all items of the Bill of Quantities, to demonstrate the internal consistency of those prices with the construction methods and schedule proposed.

After evaluation of the price analyses, the Municipal Corporation JAGDALPUR may require that the amount of the performance security set forth in relevant Clause of ITB be increased as described in relevant clause.

17. Earnest Money

I. FORM OF EARNEST MONEY:

To be deposited as stated in NIT

II. EARNEST MONEY IN SEPARATE COVERS: -

The Earnest Money should be deposited as mentioned in NIT/DNIT. If the Earnest Money is not found in accordance with the prescribed mode, the tender of the tenderer shall not be opened.

III. ADJUSTMENT OF EARNEST MONEY: -DELETED

IV. SECURITY DEPOSIT: -

The Security Deposit to be taken for the due performance of the contract under the terms and conditions printed on the tender form will be the earnest money plus an amount to make it equal to 5% (fivepercent) of the cost of work put to tender, as per clause 1 of condition of contract of form "F". The security deposit can be submitted in the shape of FDR from Nationalised/ Scheduled Bank. The Bank gurantee shall not be accepted in this case. One moiety of the Security Deposit shall be refunded on completion of work as certified by the Engineer-in-Charge. The balance 50% amount shall be refunded on expiry of defect liability period OR settlement of final bill which ever is later. Security deposit is in addition to Performance Bank Guarantee to be submitted by Contractor.

The security deposit can also be submitted in the shape of FDR form Nationalised/Scheduled bank along with the submission of each RA bill

18. IMPLICATION OF SUBMISSION OF TENDERS: -

- I. Bidders are advised to visit the site sufficiently in advance of the date fixed for the submission of the tender. The tenderer shall be deemed to have full knowledge of all relevant documents and site conditions etc. Whether he inspects it or not.
- II. The submission of a tender by a contractor implies that he has read the notice, conditions of the tender and all the contract documents and has made himself fully aware of all the standards and specifications in this respect laid down in the relevant is specifications, IRC specifications, manual on water supply and treatment, and Annexure-E having the scope and the specification of the work to be done. The contractor will be deemed to have seen the site of works.
- III. The contractor shall make his own arrangement for supply of water for construction, purposes. No lead and lift for any material including water will be paid. The tender offer should be inclusive of all leads and lifts for the materials. The contractor should himself verify the leads & r oyalti charges of different materials before submitting his tender.

19. LIST OF WORKS IN PROGRESS: -

Tenders must be accompanied by a list of Contracts already held by the tenderer at the time of submitting the tender, in the Department and elsewhere showing therein.

- (i) The amount of each contract.
- (ii) Balance of work remaining to be done.
- (iii) The amount of solvency-certificate produced by him at the time of enrolment in the department.

20. RELATIONSHIP:

The contractor shall not be permitted to tender for works in the corporation, (responsible for award and execution of contract) in which his near relative is posted. He shall intimate the names of his near relative working in State and Municipal Corporation, Jagdalpur. He shall also intimate the name of person working with him in any capacity or subsequently employed by him and who are near relatives to any Gazetted Officer in the . Any breach of this condition by the contractor would render him self liable to be removed from the approved list of contractors of the UADD department.

NOTE: - By the term "near relative" is meant wife, husband, parents and son, Grand son, brothers, sisters, brothers in laws, father in law and mother in law.

21. OPENING AND ACCEPTANCE OF TENDERS:

PLACE AND TIME OF OPENING: -

The tenders shall be opened at Jagdalpur Municipal Corporation
Bid Opening & Evaluation of NIT. In the first instances, the envelope containing the earnest money shall be opened. If the earnest money is found proper and scan copy of documents required as minimum qualification to bid shall be opened. If the tenderer found qualified as per minimum qualification, the online Envelope B containing the terms and conditions will be opened in the presence of such contractors, who choose to be present. After short listing of prequalified contractors, their online financial offers shall be opened. The contractor having quoted lump sum offer in prescribed online proforma with minimum cost shall be declared as the **lowest bidder.**

(I) POWER OF THE EXECUTIVE ENGINEER:

The Executive Engineer does not bind himself to accept or recommend for acceptance to the higher authority, the lowest or any tender or to give any reasons for his decision.

(II) CONDITIONAL TENDER:

Conditional tenders are liable to be rejected.

(III) CANVASSING: -

Canvassing for support in any form for the acceptance of any tender is strictly prohibited. Any tenderer doing so will render himself liable to penalties which may include removal of his name from the Register of approved contractors of penal action under section 8 of CHHATTISGARH Vinirdishta Bhrashtacharacharan Nivaran Vidheyak, 1982.

(IV) ONLINE SUBMISSION OF TENDER: -

No Sealed envelopes unless otherwise stated in the Bid document will be accepted only the bids submitted online will be opened.

(V) AUTHORITY OF EXECUTIVE ENGINEER: -

The authority competent to accept a tender, reserves the right for accepting the tender for the whole work or for a distinct part of it, or distributing the work between two or more Bidders.

All works to be executed under this contract shall be executed under the direction and subject to the approval in all respects of concerning Engineer-in Charge/Nodal officer of Municipal Corporation Jagdalpur under which the work is executed, for time being who shall be entitled to direct at what point or points and what manner they are to be commenced and from time to time carried out.

22. VALIDITY OF OFFER: -

Tender shall remain valid up to 120 days from the date of opening of Envelope - C and in the event of the Bidders withdrawing the offer before the aforesaid date for any reason whatsoever, Earnest Money Deposited with the tender shall be forfeited by JMC.

23. TIME OF COMPLETION:

The time allowed for carrying out the work i.e. **18 months** including rainy season shall be strictly observed and shall be reckoned from the **date of issue of work order** to commence the work. Delay beyond the specified time limit will be subject to liquidated damages according to relevant clause of Form "F" of Lump sum contract.

24. TIME SCHEDULE: -

The work shall be done by the contractor according to the schedule fixed in consultation with the competent authority. BAR/PERT/CPM chart showing detailed programme shall have to be submitted and adhered to by the contractor.

25. TRIAL RUN AND DEFECT LIABILITY PERIOD

3(Three) months Trial run and 12 months Defects Liability period: Trial run will start after completion of all the works under this contract except installation of Consumer Meters, however all consumer meters installed up to valid completion of other works, shall also be under trial period. The trial run of 03 months of whole scheme is included in the 18 months duration of the contract.

Defect Liability period of 12 months and five years O&M of all components of whole scheme shall start concurrently after successful completion of 03 months trial run as certified by Engineer-in-Charge.

26. 3 MONTHS TRIAL RUN OF COMPLETE WORK AFTER COMPLETION OF WORK:

- a) The tender must be inclusive of operation of the plant for the 3(three) months trial run period free of charge by contractor's trained and qualified Engineers who should be completely familiar with the equipment supplied and erected and they shall train the Departmental Staff in operation & maintenance of the plant within that period. Detailed operation manual as well as the drawings of equipment supplied should also be supplied by the contractor free of cost. The cost of electrical energy, Chlorine Gas, and pay to departmental staff for operation of the plant, will be paid by the Department during this period. Cost of chemical etc including complete O & M shall be borne by the contractor including replacement and warranty of any item component/spares. Performance Guarantee must be demonstrated within the test run for this period of twelve months."
- b) Period of construction shall be reckoned from date of issue of work order to time of completion. Defect liabilities, tests, guarantee and trial run will be as per N.I.T.

After satisfactory completion of the complete work including testing, installation, commissioning and trial run of 3 months, the Engineer-in-charge will issue the Completion Certificate. Trial run at full load will be carried out. Any non-compliance in terms of running, delivery and performance of each component of the complete WORK will be maintained and recorded by the Engineer-in-Charge. Record of the incoming raw water quality (physical, chemical and biological parameters) and that of the treated water rendered from the existing and proposed WTP shall be maintained.

Each day/part of the day when raw water Intake structure or the Water treatment Plant does not deliver as per the norms of Contract Agreement and CPHEEO Manual means that the trial

run will be extended by that many days without any extra cost to Jagdalpur Municipal Corporation.

27. PAYMENTS BY CHEQUES/ ONLINE ACCOUNTING SYSTEM: -

The running payments shall be made in accordance with the Break up schedule of payment as per “Annexure F”.

28. PRICE ADJUSTMENT/ESCALATION: -

The scope of work includes all costs and no claim for price adjustment/Esxalation or on account of any reason whatsoever shall be entertained.

29. SPECIFICATIONS: -

The detailed specifications for the work have been given in the enclosed Annexure-E. However, the following order of priority regarding specifications shall be followed by the contractor.

- (i) Specifications given in the Annexure-E are enclosed.
- (ii) Specifications for pipes, valves, specials, rubber, gaskets RCC and other civil works and materials shall be governed by the relevant **latest IS codes, IRC specifications and National Building code of India (latest revision), Indian Electricity Rules.**
- (iii) Manual on water supply and treatment (latest edition) published by CPHEEO, New Delhi.
- (iv) Any other specifications, not covered under the above said standards, as shall be decided by the Engineer-in-Charge i.e. Executive Engineer.

CHANGE IN SPECIFICATIONS: -

Nothing in earlier clause shall, however, curtail the right of the Executive Engineer to alter the specifications for any part or whole of the work if he considers it necessary in the interest of work. On all matters where there is difference of opinion, between the contractor and the Executive Engineer, the matter will be decided by the Commissioner, Municipal Corporation Jagdalpur, which shall be binding to the bidders.

30. SUB-LETTING WORK: -

The contractor shall not without the prior approval of the competent authority, in writing, sublet or assign to any other party or parties the whole, or any portion of the work under the contract. Where such approval is granted, the contractor shall not be relieved of any obligation or duty or responsibility which he under takes under the contract.

31. INSURANCE

The Contractor shall take such insurance in connection with the work in accordance with the tender condition as acceptable to the Municipal Commissioner JAGDALPUR. The cost of the insurance premium paid by the Contractor.

32. LEGAL JURISDICTION

All the disputes regarding this contract will be subjected to the Chhattisgarh High Court Jurisdiction.

33. BLASTING: -

In case limited/suppressed blasting resorted to by the contractor in excavation of trenches, it will be the responsibility of the contractor to observe all rules and regulations permission

licence, procurement, preservation and storage of Explosive material etc. Permission for blasting shall be obtained in writing form the competent Authority.

34. TAXES: -

The rates quoted by the contractor shall be deemed to be inclusive of all taxes. All charges regarding taxes including the IGST, CGST & SGST and any other taxes, royalties and other levies which are legibly levied on the contract work by Govt., local bodies or private individuals will be payable by the contractor executing the work, JMC will not entertain any claim on this account. It will be the contractor's duty to ascertain the above taxes and include in his Lump sum offer. No separate claim shall be entertained on this account by the department.

35. ROYALTY: -

Minerals extracted for works carried out on behalf of the government, from the quarries in possession of and controlled by the State Government or otherwise is subject to payment of Royalty by the contractor to whom it shall not be refundable.

36. Model rules related to labour, water supply and sanitation in labour camps.

The contractor will be bound to follow the Model Rules, relating to layout Water Supply and sanitation in labour camps, as per Annexure - A and the provisions of the National Building Code of India, in regard to construction and safety.

37. FAIR WAGES: -

The contractor(s) shall pay not less than the fair wages to labour engaged by him on the work (copy of the Rules enclosed as Annexure - "A")

38. WORKS IN THE VICINITY: -

The Executive Engineer, reserves the right to take up Departmental work or to award works on the contract in the vicinity without prejudice to the terms of contract.

39. BEST QUALITY OF QUARRIED MATERIALS: -

If the quarry material of more than one quality is found, the material approved by the Executive Engineer will only used by the contractor. If the materials of required Specification is not available in the near by area/quarry, the contractor shall have to arrange the same from the place where it is available.

40. REMOVAL OF UNDESIRABLE PERSONS: -

The contractor shall on receipt of the requisition from the Executive Engineer, at once remove any person employed by him on the work who in the opinion of the Executive Engineer is unsuitable or undesirable.

41. AMOUNT DUE FROM CONTRACTOR: -

Any amount due to Government from the Contractor on any account of concerning work may be recovered from him as arrears of Land Revenue.

42. TOOLS & PLANTS: -

The contractor shall arrange at his own cost all Tools and Plants required for proper execution of work. Certain plants, may however, be issued to the contractors by the Department, as special case as per provision of W.D. Manual Vol. 1 if available and can be spared

43. RIGHT TO INCREASE OF DECREASE OF QUANTUM OF WORK:

The competent authority reserves the right to increase or decrease any item of work during the currency of the contract and the contractor will be bound to comply with the order of the competent authority without any claim for compensation or higher rates for additions and alterations.

44. LABOUR REPORT: -

Contractor will submit a report on labour engaged to local employment office and copy of same may be attached with the running account bill, failing which Rs.50/- will be deducted from each running bill. Total recovery on this account may be effected on the final bill.

45. LABOUR LICENCE: -

Every contractor who employs on any day of the preceding 12 months, twenty or more workers on contract is required to obtain license from the Licensing Officer or the Contract as per provision contained under Sub-section 4 (b) of section 2 of the Contract Labour (Regulation and Abolition) Act 1970 as per provision contained in Section 12 of Act. No, contractor shall execute any work without obtaining licence, contravention of above is punishable and contractor is liable to be prosecuted. The successful tenderer is liable to produce licence as and when demanded by the Executive Engineer, obtained from labour Department as laid down in chapter 4 of Contract labour (Regulation and abolition) Act 1970.

LABOUR HUTMENT: -

The contractor shall make arrangement, at his own cost, for housing his staff and stores for the work and Model Rules relating to labour Water supply and sanitation shall be followed.

46. NOTICE TO BE GIVEN BEFORE WORK IS COVERED UP:-

The contractor shall give not less than five days notice in writing to the Engineer- in- Charge or his subordinate in charge of the work before covering up or otherwise placing beyond the reach of measurement any work in order that the same may be measured and correct dimensions thereof be taken before the same is so covered up or placed beyond the reach of measurement and shall not cover up or place beyond the reach of measurement any work without the consent in writing of the Engineer-in-Charge or subordinate-in-charge of the work, and if any work shall be covered or placed beyond the reach of measurement without such notice having been given or consent obtained the same shall be uncovered at the contractor's expense or in default thereof no payment or allowance shall be made for such work or materials with which the same was executed.

47. SITE ORDER BOOK:-

An order book, to be called, as site order book shall be kept at the Site office of Municipal Corporation Jagdalpur. As far as possible, all orders regarding the work are to be entered in this book. All entries shall be signed and dated by Municipal Corporation Jagdalpur officers in direct charge of the work and noted by the contractor or his accredited representative. The site order book shall not be removed from work site, except with the written permission of the Engineer-in-Charge.

48. CONTRACTORS PROJECT MANAGER AND CONTRACTORS STAFF:-

The contractor shall, in his own absence keep constantly on the works a competent and well qualified and experienced Project Manager, and any direction or explanations given by the Superintending Engineer or his staff to Contractor's Project Manager shall be held to have been given to the contractor. The contractor shall further provide all staff that is necessary for the supervision, execution and measurement of the work to ensure full compliance with the terms of contract.

49. PRODUCTION, SUBMISSION AND APPROVAL OF ENGINEERING DOCUMENTS:-

The production, submission and approval procedure for design & drawings and documents shall comply with the following requirements.

Meaning:

The following meanings shall apply:

"Preliminary drawings" means drawings which the Contractor submits to the Engineer-in-Charge through PDMC for approval and any drawings returned by the Engineer-in-Charge marked "Preliminary" or not marked "Approved".

"Approved Drawings" means drawings which the Engineer-in-Charge has marked "Approved" and returned to the Contractor. Approval in this context means that the work described thereon may proceed.

"Preliminary" and "Approved" as applied to designs and documents shall have the same meanings as applied above to drawings. A drawing which forms part of an approved design or document shall not be considered as approved drawing unless it has been marked "Approved".

Numbering and Titling :

The Contractor shall institute a reference numbering system for designs, drawings and documents so that each number used is unique. The numbering and title information on designs, drawings and documents shall be designed so that management, transmittal and communication therewith can be carried out expeditiously.

Submission Procedure :

Every drawing submitted by the Contractor to the Engineer-in-Charge through Project Development and Management Consultants for checking and approval shall be based on previously approved designs or documents. Interrelated drawings shall be submitted at the same time in a complete and self-sufficient set.

In the case of first submissions by the Contractor to the Engineer in charge for approval, each design, drawing and document shall reach the Engineer's review office in time to allow 30 working days (excluding weekends and national holidays) for checking by the Engineer-in-Charge before return to the Contractor.

Manufacturer's and Contractor's Certificate:

Where certificates are required by the Specification or relevant Reference Standard, the original and one copy of each such certificate shall be provided by the Contractor.

Certificates shall be clearly identified by serial or reference number where ever possible to the material being certified and shall include information required by the relevant Reference Standard or Specification Clause.

The instruction manuals shall describe the installation as a whole and shall give a step-by-step procedure for any operation likely to be carried out during the life of such item of Plant, including the erection, commissioning, testing, operation, maintenance, dismantling and repair.

Maintenance instructions shall include charts showing lubrication, checking, testing and replacement procedures to be carried out daily, weekly, monthly and at longer intervals to ensure trouble-free operation. Where applicable, fault location charts shall be included to facilitate tracing the cause of malfunction or breakdown.

A section dealing with procedures for ordering spares shall also be included in the instruction. Three draft copies of the manual shall be submitted to the Engineer's Representative prior to commissioning the works. Five final copies of the amended and corrected manuals and drawings shall be provided at the commencement of the period of Maintenance.

All the electrical and mechanical equipments shall be subjected to approved third party inspection at place of manufacture, at contractor's cost.

Transit insurance of all equipments shall be the contractor's responsibility.

Contractor shall have to take the certificate from the Electrical Inspector for regarding all electrical equipments before commissioning of plant.

Important instructions charts shall be framed and fixed at appropriate and prominent places

Maintenance Instructions:

A maintenance manual shall be provided as supporting documents to the equipment manufacturer's instructions.

(i) Maintenance Manual

Checking, testing and replacement procedures to be carried out on all mechanical and electrical plant items on a daily, weekly and monthly basis or at longer intervals to ensure trouble free operations.

Fault location and remedy charts to facilitate tracing the cause of malfunctions or breakdown and correcting faults.

A complete list of recommended lubricants, oils and their charts.

A spares schedule, which shall consist of a complete list of item wise spares for all electrical and mechanical plant items with ordering references and part numbers.

A complete list of manufacturer's instructions for operation and maintenance of all bought-out equipment. The list shall be tabulated in alphabetical order giving the name of the Supplier/Manufacturer, identification of the plant item giving the model number and the literature provided including instruction leaflets and drawing numbers.

Preventive maintenance details.

Record Drawings:

The Contractor shall provide record drawings including those drawings submitted by the Contractor to show the whole of the plant as installed and all civil works as built. These shall include all such drawings, diagrams and schedules as are necessary for a complete understanding of the works. Information given on record drawings shall include tolerance, clearances, loadings, finishes, materials and ratings of Plant and associated civil works. The Contractor shall ensure that the approved and completion drawings are marked up, to show the condition of plant as installed and associated Civil Works, as built and two copies of such marked up prints shall be submitted to the Engineer-in-Charge for approval prior to the preparation of Record Drawings. Submission to and approval by the Engineer-in-Charge or Record Drawings shall be pre-requisite for the last taking over certificate. All the Record Drawings shall be of A2 size, in five copies, out of which 3 sets shall be plastic laminated for long-life. In addition, one set of Microfilm of all the Record Drawings also shall be furnished. The text of all the reports shall be prepared on a widely used IBM compatible MS Word / MS Excel, and all the Drawings shall be prepared using AutoCAD Software and in .pdf form. When reports, drawings are furnished to Municipal Corporation Jagdalpur,

two copies of the processor files together with 2 copies of a descriptive memorandum linking these files to the text, drawings etc., shall also be provided to the Municipal Corporation Jagdalpur on CDs, Pen drive, data base preferable on MS office and AutoCAD latest versions and in .pdf form.

50. PROGRAMME OF WORK:-

The works to be carried out under this Contract form an important part of the execution of this Water Supply Project, Satisfactory progress of the entire project as a whole depends upon the timely completion of these works. For this reason, great importance needs to be attached for proper programming for the works with adequate provision for guarding against all the delays normally encountered in execution of various activities.

The contractor shall include with his tender a critical path network diagram which commences from the date of issue of Order of Commencement and includes inter alia the various activities as per the programme of works, furnished as specified in Schedule.

- Activity duration in months and event times should be in months from the first event on the network and event numbers:
- A tabulation of months from the starting date of the network to enable earliest and latest event dates to be read off; duration in months to be the last day of the month and the monsoon months of 15th June to 15th October to be specially indicated in the Table:
- The timing of events shown in the programme of work to be adhered to and shown in the network;
- The erection programme shall be shown in detail (with not more than 15 activities) with durations in weeks shown in brackets behind the duration in months on the network diagram wherever considered necessary;
- The programme for setting-up, treating, delivery, storage (if necessary) and placing of filter media (where appropriate) the
- Placing being a part of the erection programme referred to in (iv) above; and
- Programme for submission of Instruction Manuals and Record Drawings;

As soon as practicable, and in any case not later than four weeks, after acceptance of his tender the Contractor shall submit to the Engineer-in-Charge for his approval a programme showing the order of procedure in which he proposes to carry out the works.

Particulars to be shown on the programme shall include:

- Submission of drawings;
 - Placing of work orders;
 - Stages of manufacture;
 - Tests at place(s) of manufacture;
 - Deliveries to Site;
 - Construction of Civil works ready for erection of Plant;
 - Mechanical completion of erection at site;
 - Tests at site;
- Finishing and completion of civil and electrical works.

Any approval of or consent to the Contractor's programme by the Engineer-in-Charge shall not relieve the Contractor of his duties and responsibilities under the Contract.

51. PROGRESS :

The Contractor shall submit to the Engineer-in-Charge during the first week of each month a "Monthly Progress Report" with weighted activities all in an approved format so that actual progress at the end of the preceding month may be compared with the Contractor's programme.

The progress report shall also include status report on the following approved individual formats:

- Drawings;
- Supplies of Plant Items;
- Construction programme;
- Construction Progress;
- Overall Progress Curve;

From time to time the Municipal Commissioner Jagdalpur or Engineer-in-Charge will call meetings in their office or at the Engineer's Site Office, as they deem necessary for the purpose of control of the Contract, a responsible representative of the Contractor shall attend such meetings.

The Contractor shall regularly review his programme in the light of the progress actually achieved and shall submit for approval updated PERT/CPM network and bar charts at intervals to be agreed with the Engineer-in-Charge. If progress falls behind that needed to ensure timely completion of the various parts of the works, the Contractor shall submit

proposals for improving his methods and pace of working to the satisfaction of the Engineer-in-Charge shall carry out such measures as are needed to ensure that the works are completed on time.

52. AGREEMENT:

The Notes and specifications given in the detailed notice inviting tenders and its annexure are to be read in conjunction with conditions given in the short notice inviting tenders and the conditions of Contract. These have been intended to supplement the provisions, in the NIT and the conditions of the Contract. All these will be binding on the contractor and shall form part of the agreement. However, in case of any contradiction between the common set of conditions and the NIT, the common set of conditions will supersede.

53. EXECUTION OF AGREEMENT:

The Tenderer whose tender has been accepted shall have to execute the agreement with in a fortnight of the communication of the acceptance of his tender by the competent authority. Failure to do so will result in the Earnest Money being forfeited to Govt. and tender being cancelled.

54. ANNEXURE:

Other than Form 'F', condition of contract, Special conditions of contract, if any following documents are appended as annexures with this N.I.T. and these shall be part of contract agreement.

Annexure-"A"	Model Rules relating to labour, water supply and sanitation etc
Annexure-"B"	Contractor's Labour Regulations
Annexure-"E"	Scope of Work and Technical Specification
Annexure-"F"	Price Schedule including payment breakup in concerned annexures
Annexure-"G1' & G2"	Guarantee Bond
Annexure-"H"	Special Conditions of NIT
Annexure-"I"	Information & Instructions to the Bidders for Online Electronic Government Procurement System (e-GPS).
Annexure-"J"	Pre-contract Integrity Pact'

- Appendix '1'** Qualification Information
- Appendix '2'** Information regarding minimum one similar work
- Appendix '3'** Work performed on all classes of construction Works over last 05 years
- Appendix '4'** Existing commitments and ongoing all classes of Civil Engineering construction works
- Appendix '5'** Availability of major items of Contractor's Equipment proposed to carry out the works
- Appendix '6'** Qualifications of each Technical Personnel of Contractor proposed for the Contract
- Appendix '7'** Financial reports for the immediate previous 05 years
- Appendix '8'** Information on current claims, Arbitration, Litigation in which Bidder is involved
- Appendix '9'** List of key plants and Equipment to be deployed on Contract Work
- Appendix '10'** List of key Plants and equipment to be deployed on Contract Work(Roads)
- Appendix '11'** List of Technical persons to be deployed on the Contract Work
- Appendix '12'** Contact persons
- Appendix '13'** Affidavit (Declaration for Not Being Blacklisted)
- Appendix '14'** Undertaking
- Appendix '15'** Materials details

**Commissioner
Municipal Corporation Jagdalpur
C.G**

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FORM-F

**NAGAR NIGAM JAGDALPUR
AUGMENTATION TO JAGDALPUR WATER SUPPLY SCHEME
(Under AMRUT MISSION)
Tender for a Lump - Sum Contract**

“We do hereby tender to execute the whole of the work described in the Drawing Nos.-
----- and according to the annexed specifications signed by -----
----- and dated ----- for the sum of Rs. -----
----- (Rupees -----) as given below:

Sr. No.	Particulars	Lump – Sum Cost
A	Lump Sum offer for For the balance leftover work/s of Engineering, Procurement ,Constrcution of Intake well, Overhead Tanks, Water Treatment Plant, Raw and Clear Water Pumps, Rising and Feeder Mains Including Distribution Network, House Service Connections, PLC- SCADA automation, monitoring and control system, and all others allied civil, Electrical, Mechanical works associated for Augmentation & Reorganization of Water Supply scheme at Jagdalpur under Amrut Mission including testing, commissioning, 3months trial run and 12 months Defect Liability period	Rs.
B	Lump Sum offer for 5 Years Opearation and Maintenance cost of the entire scheme including chemical and establishment cost on 24x 7, existing 09 MLD WTP and proposed 35 MLD WTP including PLC SCADA monitoring & control system (covering all WTPs all RWPs,CWPS, valve actuators,OHSRS,FCVs,& electromagnetic bulk flow meters) and all new RWPS & CWPS including replacement and warranty for 5 years.	Rs.

Grand total ‘C’ = A + B = Rs.....

(Rupees.....)

For Evaluation purpose sum total of A+B shall be considered

and should this tender be accepted I/We do hereby agree and bind myself/ourselves to abide by and fulfil all the conditions annexed to the said specification or in default thereof to forfeit and pay to the Jagdalpur Municipal Corporation, the penalties of sums

TENDER DOCUMENT FOR BALANCE/LEFTOVER WORKS OF AUGMENTATION &
REORGANISATION TO JAGDALPUR WATER SUPPLY SCHEME UNDER AMRUT MISSION
GOVERNMENT OF CHHATTISGARH

of money mentioned in the said conditions, viz.

Dated:

Tenderer's Signature

Witness:

Address:

Address:

The above tender is hereby accepted by me on behalf of the Jagdalpur Municipal corporation.

The _____/2021

Signature of the authority by whom the tender has been accepted.”

(Note: Figures given by the bidder in sub para –C shall be considered for evaluation purpose.)

SECURITIES

Name	Address	Occupation of Profession	Remarks

CONDITIONS OF CONTRACT

Definitions

- A.** The contract means the documents, forming the notice inviting tenders and tender documents submitted by the tenderer and the acceptance thereof including the formal agreement executed between the Jagdalpur Municipal Corporation and the contractor.
- B.** In the contract the following expressions shall unless otherwise required by the context have the meanings hereby respectively assigned to them:-
- (a)** The expression “works” or “work” shall unless thereby mean something either in the subject or context repugnant to such construction be construed and taken to mean the works or by virtue of the contract contracted to be executed whether temporary or permanent and whether original, altered, substituted or additional.
- (b)** The “site” shall mean the land and/or other places on, into or through which work is to be executed under the contract or any adjacent land path or street through which work is to be executed under the contract or any adjacent land, path, or street which maybe allotted or used for the purpose of carrying out the contract.
- (c)** The “Commissioner” means Commissioner of Jagdalpur Municipal Corporation
- (d)** The “Engineer-in-Charge” means the Executive Engineer who shall supervise and be in charge of the work and who shall sign the contract on behalf of the Commissioner.
- (e)** “Municipal Corporation Jagdalpur” shall mean the JAGDALPUR MUNICIPAL CORPORATION. Competent Authority means Commissioner of JAGDALPUR MUNICIPAL CORPORATION.
- (f)** The term “Chief Engineer” means the Competent Authority from JAGDALPUR MUNICIPAL CORPORATION.
- (g)** The term "Superintending Engineer" means the Superintending Engineer of the concerned JAGDALPUR MUNICIPAL CORPORATION / UADD
- (h)** The term "Executive Engineer"/"Engineer-in-Charge"/"Divisional Officer" means the Executive Engineer of JAGDALPUR MUNICIPAL CORPORATION.
- (i)** The term "Assistant Engineer" means the Assistant Engineer JAGDALPUR MUNICIPAL CORPORATION.
- (j)** The word "Sub Engineer" shall mean "Section Officer" of the JAGDALPUR MUNICIPAL CORPORATION.

NOTE: “Words” importing the singular number include plural number and vice-versa,

CONDITIONS OF CONTRACT

1. The person(s) whose tender may be accepted (hereinafter called the contractor(s), their EMD shall be retained by JAGDALPUR MUNICIPAL CORPORATION as an initial security deposit and the remaining sum to make the security deposit to 5% (Five percents) shall be deducted from their RA Bills. The security deposit shall be released to the contractor after one year of successful completion of the performance and defect liability period. The JAGDALPUR MUNICIPAL CORPORATION at any time can forfeit the security deposit if it seems to their opinion that the contractor is making any prejudice with the essence of the contract. The decision of the Commissioner in this regard shall be final and binding on the contractor.
2. The Contractor(s) is/are to provide every-thing of every sort and kind (with the exception noted in the schedule attached) which may be necessary and requisite for the due and proper execution of the several works included in the contract according to the true intent and meaning of the drawings and specifications taken together, which are to be signed by Executive Engineer/ Commissioner, Municipal corporation, Jagdalpur. and the contractor(s) whether the same may or may not be particularly described in the specification or shown on the drawings, provided that the same are reasonably and obviously to be inferred there-from and in case of any discrepancy between the drawings and the specification the Executive Engineer/ Commissioner is to decide which shall be followed.
- 2 (a) The Contractor(s) is/are to set out the whole of the works in conjunction with an officer to be deputed by the Executive Engineer/ Commissioner and during the progress of the works to amend on the requisition of the Executive Engineer/ Commissioner any errors of which may arise therein and therein and provide all the necessary labour and materials for so doing. The contractor(s) is/are to provide all plant, labour and materials (with the exceptions noted in the schedule attached) which may be necessary and requisite for the works. All materials and workmanship are to be the best of their respective kinds. The contractor(s) is/are to leave to works in all respects clean and perfect at the completion thereof.

All inspection charges will be payable by the contractor

3. Complete copies of the drawings and specification signed by the Executive Engineer are to be furnished by him to the contractor(s) for his/their own use, and the same or copies thereof are to be kept on buildings incharge of the Contractor(s) agent who is to be constantly kept on the ground by the contractor(s) and to whom the instructions can be given by the Executive Engineer/ Commissioner. The Contractor(s) is/are not to sublet the works or any part there of without the consent in writing of the Executive Engineer/Commissioner.
4. The Executive Engineer/ COMMISSIONER is to have at all times access to the works which are to be entirely under his control. He may require the contractor(s) to dismiss any person in the Contractor(s) employ upon the works that may be incompetent or misconduct himself and contractor(s) is/are forthwith to comply with such requirements.
5. The Contractor(s) is/are not to vary or deviate from the drawings or specifications or execute any extra work of any kind whatsoever unless upon the authority of Executive Engineer to be sufficiently shown by any order in writing by any plan or drawings expressly given and signed by him as an extra or variation or by any subsequent written

approval signed by him. In cases of daily labour all vouchers for the same are to be delivered to the Executive Engineer / Commissioner or the Officer-In-charge at least during the week following that in which the work may have been done and only such day work is to be allowed for as such as may have been authorized by the Executive Engineer/Commissioner. to be so done unless the work cannot from its character be properly measured and valued. The drawings in respect of which this contract is drawn up provide for a minimum depth of foundations for good soil. Any extra depth will not be measured as an extra when the foundation trenches have been opened up and will not be paid for in addition to the sum contracted for the completed work. The contractor has to ascertain the foundation strata in advance and shall prepare the designs as per actual site conditions.

6. Any authority given by the Commissioner for any alterations or additions in or to works is not to vitiate the contract, but all additions, omission or variations made in carrying out the works are to be measured and valued and certified by the Executive Engineer /Commissioner and added to or deducted from the amount of the contract, as the case may be, at rates in force in the CGPWD/UADD/CGPHED Department. In such cases in which rates do not exist, the Municipal Corporation, will fix the rates to be paid.
7. All work and materials brought and left upon the ground by the Contractor(s) or his/their orders for the purpose of forming part of the works are to considered to be the property of Jagdalpur Municipal corporation and the same are not to be removed or taken away by the Contractor(s) or any other without the special license and consent in writing of the Commissioner/ Executive Engineer of Jagdalpur Municipal Corporation is not to be in any way answerable for any loss or damage which may happen to or in respect of any such work or materials either by the same being lost or stolen or injured by weather or otherwise.
8. The Commissioner has full power to require the removal form the premises of all materials which in his opinion are not in accordance with the specification and in case of default the Commissioner is to be at liberty to employ other persons to remove the same without being answerable or accountable for any loss or damage that may happen or arise to such materials. The Commissioner is also to have full power to require other proper materials to be substituted and in case of default the Commissioner may cause the same to be supplied and all costs which may attend such removal and substitution are to be borne by the contractor(s).
9. If in the opinion of the Executive/Commissioner any of the works are executed with improper materials or defective workmanship, the contractor(s) is/are when required by the Commissioner forthwith to re-execute the same and to substitute proper materials and workmanship and in case of default of the contractor (s) is so doing within a week the COMMISSIONER is to have full power to employ other persons to re-execute the work and the cost thereof shall be borne by the contractor(s).
10. Any defects, shrinkage or other faults which may appear within 12 months performance period, from the completion of the work arising out of defective or improper materials or workmanship are upon the direction of the COMMISSIONER/Executive Engineer to be amended and made good by the contractor(s) at his/their own cost unless the COMMISSIONER/Executive Engineer shall decide that he/they ought to be paid for the same and in case of default the Commissioner Jagdalpur Municipal corporation may recover from the contractor(s) the cost of making good the works.
11. From the commencement of the works to the completion of the same they are to be under the contractor's(s) charge. The contractor(s) is/are to be held responsible for and

to make good all injuries, damages and repairs, occasioned or rendered necessary to the same by fire/ Natural Calamity or other causes and they are to hold the Jagdalpur Municipal corporation harmless from any claims for injuries to persons or for structural damage to property happening from any neglect, default, want of proper care or misconduct on the part of the contractor(s) or any one in his/their employ during the execution of the works

12. The COMMISSIONER is to have full power to send workmen upon the premises to execute fittings and other works not included in the contract for whose operation the contractor(s) is/are to afford every reasonable facility during ordinary working hours, provided that such operations shall be carried in such a manner as not to impede the progress of the work included in the contract but the contractor(s) is/are not to be responsible for any damage which may happen to or be occasioned by any such fittings or other works.
13. The works comprised in this tender are to be commenced immediately upon receipt of the order of commencement given in writing by the COMMISSIONER when possession of the site can be had. The whole work including all such additions and variations as aforesaid (but excluding such if any as may have been postponed by an order from the COMMISSIONER) shall be completed in every respect within **18(eighteen) months from the date of** issue of the aforesaid order and if from any cause whatever other than will full obstruction or default, on the part of COMMISSIONER or his staff and except as hereinafter provided the whole of such work shall not be finished to the satisfaction of the COMMISSIONER within the said period, the contractor(s) shall forfeit to the Jagdalpur Municipal corporation from his/their security deposit by way of ascertained and liquated damages for each defaults and not by way of penalty the sum of **Rs. 62,000/- (Rs. Sixty two thousand only)** per day for every completed day of such default provided that the entire amount of damages to be forfeited under the provisions of this clause shall not exceed ten percent on the estimated value of the whole work as shown in the tender.

Provided nevertheless that if the contractor to that effect from the COMMISSIONER himself which orders COMMISSIONER is the hereby e(s) shall be of the opinion that he is/they are entitled to any extension of time on account of the works being altered, varied or added to or on account of any delay by reason of any inclement whether or causes not under the control of the contractor(s) in consequence of orders empowered to give them in any or either of the such cases it shall by competent for the COMMISSIONER by an order in writing to extend the aforesaid period for final completion by such period or periods as he shall deem reasonable and the contractor(s) is/are to complete the works within such extended period or periods as aforesaid. Provided that the contractor(s) shall not be entitled to any extension of time unless he/they shall within 3 days after the happening of the event in respect of which he/they shall consider himself/themselves entitled to any extension give to the COMMISSIONER written notice of such claim to any extension of time and of the ground or grounds and of the amount thereof unless in any case the COMMISSIONER shall in his direction dispense with such notice and certify for an extension of time. Nevertheless and in case of any extension of time, the aforesaid provisions with amount for damages in defaults of due completion shall apply in case of non completion of the works within the extended time. Provided that the contractor(s) shall not be entitled to any extension of time in respect of the extra work involved in the extra depth of foundation mentioned in clause 5.

14. If the contractor(s) shall become bankrupt or compound with or make any assignment for the benefit of his/their creditors or shall suspend or delay the performance of

his/their part of the contract (Except on account of causes mentioned in clause 13 or in consequence of not having proper instructions for which the contractor(s) shall have duly applied.) The COMMISSIONER may give to the contractor (s) or his/their assignee or trustee, as the case may be, notice requiring the work to be proceeded with and in case of default on the part of the contractor(s) or his/their assignee or trustee for a period of 7 days, it shall be lawful for the COMMISSIONER to enter upon and take possession of the works and employ any other person or persons to carry on and complete the same and to authorise his/them to use the plant, materials and property of the contractor(s) upon the works and the costs and the charges incurred in any way in carrying on and completing the said works are to be paid to the COMMISSIONER by the Contractor(s). The COMMISSIONER shall be the final authority to determine the amount spent to complete the unfinished work. The certificate of COMMISSIONER as to the value of the balance work done shall be final and conclusive against the contractor.

15. DELETED.
16. A certificate of the COMMISSIONER or an award of the referee hereinafter referred to, as the case may be showing the final balance due or payable to the contractor(s) is to be conclusive evidence of the works having been duly completed and the contractor(s) is/are entitled to receive payment of the final balance, but without prejudice to the liability of the contractor(s) provision of clause 10.
17. Provided always that in case any question, dispute of difference shall arise between the COMMISSIONER and the contractor(s) as to what additions if any, ought in fairness to be made to the amount of the contract by reason of the works being delayed through no fault of the contractor(s) or by reason or on account of any directions or requisitions of the COMMISSIONER involving increased cost to the contractor(s) beyond the cost properly attending the carrying out of the contract according to the true intent and meaning of the signed drawings and specification, or as to the works having been duly completed or as to the construction of these presents or as to any other matter or thing arising under or out of this contract, except as to matter left during the progress of the works to the sole decision or requisition of the COMMISSIONER under clauses No.1,4,8 and 9 or in the case the contractor(s) shall be dissatisfied with any certificate of the COMMISSIONER under clause 6 or under the provision in clause 13 or in case he shall withhold or not give any certificate to which he/they may be entitled, or as to the right of the contractor(s) to receive any compensation or as to the amount of such compensation payable to him/them under clause 18, then such question, dispute or difference or such certificate of the value or matter which should be certified as the case may be, is to be from time to time submitted to the arbitration of a tribunal composed of one arbitrator nominated by the contractor(s) and one arbitrator nominated by the JAGDALPUR MUNICIPAL CORPORATION. In the event of a disagreement between the arbitrators on any matter or matters, such matter or matters shall be referred to an umpire to be nominated by the Director, UADD and the award of such arbitrators or the umpire is to be final and where necessary to be equivalent to a certificate of the Director, UADD and the contractor(s) is/are to be paid accordingly.
18. If at any time before or after the commencement of the work, Commissioner Jagdalpur Municipal Corporation shall for any reason whatsoever:-
 - 18.1 Cause Alterations, omissions or Variation in the drawings and specification involving any curtailment of the works as originally completed; OR
 - 18.2 Not required the whole of work as specified in the tender to be carried out,

The contractor(s) shall have no claim to any payment or compensation whatsoever on account of any profit or advantage which he/they might have derived from the execution of the work in full as specified in the tender but which he/they did not derive in consequence of the curtailment of the works by reason of alterations, omissions or variations or in consequence of the full amount of the work not having been carried out. But the contractor(s) shall be entitled to compensation for any loss sustained by him/them by reason of his/their having purchased or procured any materials or entered into any engagements or made any advances to labour or taken any other preliminary or incidental measures on account of or with a view to the Execution of the works or the performance of the contract.

19. Death or permanent invalidity of the contractor-If the contractor is an individual or a proprietary concern, partnership concern, dies during the currency of the contract or becomes permanently incapacitated, where the surviving partners are only minors the contract shall be closed without levying any damages/ compensation as provided for in clause 3 of the contract agreement. However, if the competent authority is satisfied about the competence of the surviving, then the competent authority shall enter into a fresh agreement for the remaining work strictly on the same terms and conditions, under which the contract was awarded.
20. Penalty for Breach of Contract- On the breach of any term or condition of this contract by the contractor, the JAGDALPUR MUNICIPAL CORPORATION shall be entitled to forfeit the security deposit or the balance thereof that may at the time be remaining, and to realize and retain the same as damages and compensation for the said breach but without prejudice to the right of the JAGDALPUR MUNICIPAL CORPORATION to recover further sums due or which may become due to the contractor by JAGDALPUR MUNICIPAL CORPORATION or otherwise howsoever.
21. From the commencement of the work to the completion of the same they are to be under the contractor's charge. The contractor(s) is/are to be held responsible for and to make good all injuries, damages and repairs, occasioned by or rendered necessary to the same by the fire/ natural calamity or any other causes and they are to hold the corporation harmless from any claims for injuries to persons or for structural damage to property happening from any neglect, default, want of proper care or misconduct on the part of the contractor(s) or anyone in his/their employ during the execution of the works.

Dated:

Signature of the Contractor

Dated:

**Commissioner
Municipal Corporation
Jagdalpur**

Special Conditions of Contract

S.no	Amendement&Suppliment to Clauses in the General Conditions of Contract
1	The addresses are: “Employer”: The Municipal Corporation Jagdalpur’
2	Tax will be deducted at source as per prevailing Income Tax Rules
3	<p>The risk and insurance coverage shall be as follows:</p> <ol style="list-style-type: none"> a. Third party vehicle liability insurance as required under India’s Motor Vehicles Act, 1988 by the contractor for its Personnel or for Sub Contractor and their personnel for the period of contract. b. Third Party Liability insurance, with a minimum coverage of equal to amount of contract. c. Professional Liability insurance with a minimum coverage equal to amount of contract. d. Employer’s liability & Workers compensation insurance in respect of the Personnel of the contractor in accordance with the relevant provisions of the Applicable Laws of India, as well as with respect to such personnel and such life, health, accident, travel or other insurance as may be appropriate. e. Any other laws/rule applicable in India.
4	The arbitration proceedings shall take place in Jagdalpur, C.G.
5	<p>Performance Security: The Contractor shall have to submit performance security of amount equal to 5.00 % of the accepted cost at the time of signing of the contract in the form of Bank Guarantee issued by any nationalized/Scheduled banks. The contractor shall have to ensure that such performance security remains valid for the period up to 03 (three) months beyond the Expiry of defect Liability Period/Extended Defect Liability.</p> <p>The performance guarantee will be in addition to the normal security to be deducted as per clause 1 of Conditions of contract for the execution of contract.</p>
6	<p>MOBILISATION ADVANCE: Mobilization advance up to 5% (Five percent) of the contract value shall be given if requested by the contractor with in one month of the date of order to commence the work. In such a case the contractor shall furnish Bank Guarantee from schedule bank for the equal amount in favour of the Commissioner before sanction and release of the advance. The advance shall be Interest free. The 5% (Five percent) advance shall be given in two stages</p> <p>Stage-1:2% (Two percent) of the contract value payable after signing of the agreement</p> <p>Stage-2:3% (Three percent) of the contract value payable on receipt of the certificate from the contractor that he has established complete central and field testing laboratories and has engaged workers/technicians and have brought requisite plants and machineries at work site, and also that the work is physically started and only after construction programme is submitted by the contractor and is duly approved by the Executive Engineer.</p> <p>RECOVERY OF MOBILISATION ADVANCE: The recovery of above advances (mobilizations, plants and machineries) shall be recovered in equal monthly installments on pro- rata basis (after 15% (Fifteen percent) of contract work is executed) from each of the further running</p>

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	<p>bills. However all these advances shall be fully recovered when 80% (Eighty percent) contract sum is complete or when 75% (Seventy Five percent) of stipulated or validity extended period is over – which ever event is earlier.</p>
7	<p>Secured advances:-</p> <p>Advances to contractor are as a rule prohibited, and every endeavor should be made to maintain a system, under which no payments are made for unmeasured work except for work actually done. Exceptions are, however permitted in the following cases. Cases in which a contractor whose contract is for finished work, requires an advance on the security of materials brought to site, Commissioner may in such cases sanction advances up to an amount not exceeding 75% of the value of material in the case of DI Pipes and Electromechanical Equipments only (as assessed by the Executive Engineer) provided that the rate(s) of allowed in no case is/are more than the rate payable for the finished item as stipulated in the contract of such materials, provided that they are of imperishable nature and that a formal agreement is drawn up with the contractor under which Nagar Nigam Jagdalpur secures a lien on the materials and is safeguarded against losses due to the contractor postponing the execution of the work or to the shortage or misuse of the materials, and against the expense entitled for their proper watch and safe custody. Payment of such advances should be made only on the certificate of an officer not below the rank of Executive Engineer, that the quantities of materials upon which the advances are made have actually been brought to site, that the contractor has not previously received any advance on that security and that all the materials are required by the contractor for use on items of work for which rates for finished work have been agreed upon. Recoveries of advances so made should not be postponed until the whole of the work entrusted to the contractor is completed. They should be made from his bills for work done as the materials are used the necessary deductions being made whenever the item of work in which they are used; are billed for. Before granting the above-secured advance the contractor shall sign the prescribed Indenture Bond in the prescribed form.</p>
8	<p>Project Development & Management Consultants (PDMC) & IRMA (Independent Review & Monitoring Agency) engaged by SUDA C.G., will carry out complete supervision, quality control of activities carried out by contractor including checking measurement, designs, drawings, contractors bill, all deliverables till completion of the contract & rectification of deliverables.</p>
9	<p>THIRD PART INSPECTION of all items for procurement shall be carried out by SGS/Rites based on Datasheets, Quality Assurance Plan and complete specifications as submitted by the contractor to Engineer-in-Charge through PDMC. Third Party Inspection charges will be borne by the Contractor.</p> <p>Further for witnessing the tests at works of the manufacturer by 2 No. officials of the JAGDALPUR Municipal Corporation, the contractor shall arrange the same and bear the entire cost.</p>
10	<p>The Successful bidder has to submit the following documents to within 21 days from the date of issue of Work order</p> <p>(a) Local Address of office or Site office at Jagdalpur for regular communications and correspondences along with details of Contact Person.</p> <p>(b) Details & CVs of Technical persons and key Staffs to be deployed in the Project for approval of DMC</p> <p>(c) Detailed work programme (Using CPM/PERT Techniques) showing key /</p>

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	<p>sub activities and mobilization schedule for personnel, equipment and procurement of materials for construction for approval of Engineer-in-charge.</p> <p>(d) Detailed list of Equipment as specified in bid document or as any other which is necessary required for construction along with all the necessary information as stipulated in there</p> <p>(e) Methodology of work and</p> <p>(f) Format of Site order Book for Approval</p>
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Annexure- "A": Model Rules relating to Labour, Water Supply and Sanitation in Labour Camps

NOTE:

These model rules are intended primarily for labour camps which are not of a permanent nature. They lay down the minimum desirable standard which should be adhered to. Standards in permanent or semi permanent labour camps should not obviously be lower than for temporary camps.

LOCATION:

The camp should be located in elevated and well drained ground in the locality. Labour huts to be constructed for one family of 5 persons each. The layout to be shown in the prescribed sketch.

HUTTING:

The huts to be built of local materials. Each hut should provide at least 20 sqm of living space.

SANITARY FACILITIES:

Latrines and urinals shall be provided at least 15 mtrs away from the nearest quarters separately for men and women and specially so marked in the following scale.

LATRINES:

Pit provided at the rate of 10 users of families per seat. Separate are required as the privacy can also be used for this purpose.

DRINKING WATER:

Adequate arrangements shall be made for the supply of drinking water. If practicable filtered and chlorinated supplies shall be arranged when supply is from intermittent sources over head storage tank shall be provided with a capacity of five liters per person per day. Where the supply is to be made from a well it shall conform to the sanitary standard laid down in the report of the rural sanitation committee. The well should be at least 30 meters away from any latrine or other source of pollution. If possible the pump should be installed for drawing the water from well. The well should be effectively disinfected once every month and the quality of the water should be got tested at the Public Health Institution between each work of disinfecting.

BATHING AND WASHING:

Separate bathing and washing plan shall be provided for men and women for every 25 persons in the camp. There shall be one gap and space of 2 sq. for washing and bathing. Proper drainage for waste water should be provided.

WASTE DISPOSAL:

Dustbin shall be provided at suitable places in camp and the residence shall be directed to throw all rubbish into those dustbins. The dustbin shall be provided with cover. The contents shall be removed every day and disposed off by trenching.

MEDICAL FACILITIES:

- a) Every camp where 1000 or more persons reside shall be provided with whole time doctor and dispensary. If there are women in the camp a whole time Nurse shall be employed.
- b) Every camp where less than 1000 but more than 250 persons resides shall be provided with a dispensary and a part time, Nurse/Midwife. If there are less than 250 persons in any camp a first aid kit shall be maintained in charge of whole time persons trained in first side. All the medical facilities mentioned above shall be for the all residents in the camp, including a dependent of workers, if any, free of costs. For each labour camp there should be qualified sanitary inspector and sweepers should be provided in the following scales :-

For camps with strength over 200 but not exceeding 500 persons - One sweeper for every 75 persons above the first 200 for which 3 sweepers will be provided.

For camps with strength over 500 persons - One sweeper for every 100 persons above first 500 for which 6 sweepers should be provided.

Annexure- "B": Contractors Labour Regulations

The contractor shall pay not less than fair wage to labours engaged by him in the work:

EXPLANATION:

- A. "FAIR WAGES" means whether for time of piece work as notified on the date of inviting tenders and where such wages have not been so notified the wages prescribed by the competent authority for division in which the work is done.

The contractor shall, notwithstanding the provision of any contract to the contrary, cause to be paid a fair to labours indirectly engaged on the work including any labour engaged by his sub-contractor in connection with the said work as if labourers had been immediately employed by him.

In respect of all labour directly or indirectly employed on the works or the performance of his contract, the contractor shall comply with or cause to be complied with the labour Act. Enforce.

The Executive Engineer/Assistant Engineer shall have the right to deduct from the money due to the contractor any sum required or estimated to be required for making good, the loss suffered by a worker or workers by reason of non-fulfillment of the conditions of the contract for the benefit of the workers non payment of the wages or of deductions made from his or their wages which are not justified by their terms of contract or non-observance of regulations.

The contractor shall be primarily liable for all payments to be made under and for the observance of the regulations aforesaid without prejudice to his right to claim indemnity from his sub-contractor.

The Regulations aforesaid shall be deemed to be a part of this contract and any breach thereof shall be deemed to be a breach of this contract.

The contractor shall obtain a valid license under the contract (Regulation & Abolition) Act, in force and rule made there under by the competent authority from time to time before commencement of work and continue to have a valid license until the completion of the work.

Any failure to fulfill this requirement shall attract the penal provisions of this contract arising out of the resulted non execution of the work assigned to the contractor.

Special Additional Condition:-

- Cess@1% (one percent only) shall be deducted at source, from every bill of contractor by Executive Engineer under "Building and other Construction for workers welfare, cess Act-1996"

It is mandatory for the contractor(s) to get him self/them selves registered with "Chhattisgarh Building and other Construction Welfare Board" for work amounting to Rs. 10.00 Lacs (Ten Lacs) and above and enclose a true copy of such registration certificate within one month of award of contract.

Annexure-"C": Form of Income Tax Clearance Certificate

DELETED

ANNEXURE – “D”

Statement showing the Lead of Materials

S.No.	Description	Lead
1.
2.
3.
4.
5.

Note - This statement is only for guidance of the contractor. The tenderer should satisfy himself regarding the availability of the required quality and quantity of materials.

ANNEXURE - “E”

SCOPE OF WORK & TECHNICAL SPECIFICATIONS

Scope of Work

The entire scope of work involves but not limited to following:-

1. For the balance leftover work/s of Engineering, Procurement, Construction of Intake well, Overhead Tanks, Water Treatment Plants, Raw and Clear Water Pumps, Rising and Feeder Mains Including Distribution Network, House Service Connections, PLC- SCADA automation, monitoring and control system, and all others allied civil, Electro Mechanical works associated for Augmentation & Reorganization of Water Supply scheme at Jagdalpur under Amrut Mission including testing, commissioning, trial run, 12 months Defect Liability period and 5 years O&M of all components of whole scheme including existing water works, pumps, motors, OHSRs, Distribution Network etc complete.
2. Defect Liability period of 12 months and Five years O&M of all components of whole scheme shall start concurrently after successful completion of 03 months trial run as certified by Engineer-in-Charge.
3. The bidder/s is/are particularly advised to inspect the site(s) of work by making prior appointment with Nodal officer Amrut Mission Jagdalpur Municipal Corporation, so as to acquaint himself with regard to the nature and conditions of sites/works, conditions of access and all other cognate matters concerning the execution, successful completion and commissioning of the scheme. When a contractor submits his bid for this work, it will be considered that he has acquainted himself with full and complete knowledge of the site, prevailing conditions, availability of equipments, materials etc, and no claim or extra charges consequent on misunderstanding or otherwise will be allowed and no additional compensation shall be entertained whether he actually inspects the site or not. Any items/components which may not be mentioned in the tender document/scope of work, but are necessarily required for successful commissioning of the Plant/system with desired outputs and complete functions in all respects will be deemed to inclusive in quoted cost by the bidder and nothing extra shall be paid by JMC. In this connection, bidders have to provide undertaking along with bids in the prescribed format as appended; otherwise their bids will be disqualified.
4. An indicative inventory of balance works with materials (already procured) shall be provided by JMC. In this context, the successful bidder has to carry out survey cum audit and submit the report by indicating the details of all items procured by the department/JMC and list of balance works after Survey/audit.
5. The bidder is expected to inspect the Site to investigate, but not limited to following items, before quoting their rates in the tender:

- a. Complete Scope of balance left over work of all the components for successful commissioning of entire scheme
 - b. Materials available and to be procured
 - c. Nature and type of protection required for neighboring property to ensure full safety during construction activities in progress; and
 - d. Place for disposal of serviceable / unserviceable material obtained during construction activities.
6. The rates quoted by the bidder shall be the all-inclusive value for the work described and be deemed to include for all the Contractor's liabilities and obligations and all risks set forth or implied in the document and all matters and things necessary for the proper and successful commissioning of the entire scheme including surveying, setting out, plant, labour, supervising, materials, carriage of materials from source to site, erection, maintenance, insurance, profit, taxes and duties together with all general risks liabilities and obligations set out or implied in the Contract. The Charge for any obligation of the Contractor for proper/satisfactory completion of work for which apparently no corresponding item is given in the scope of work/ Bills of Quantities/Price or Payment Schedule shall be deemed to be included. No extra payment shall be made.
7. The approved drawings are available with JMC and the contractor shall construct as per the approved drawings. The responsibility for structural stability and water tightness of all R.C.C. structures already constructed or to be constructed under this scheme shall be solely with contractor.
8. Contractor shall arrange at his cost for the space required for storage of the materials, equipments and pipes, specials and valves etc supplied for transmission and distribution networks along with its watch and ward.
9. The following materials which were procured and in possession of JMC shall be utilized under this package. The said materials will be handed over to Contractor within 7 days of issuance of work order.

List of materials available at JMC procured by the previous contractor

S.no	Description of materials	Quantity available at JMC stores	Remarks
ATTACHED AS APPENDIX-15			

10. Extra safety precautions must be ensured during construction so as to avoid any damage/theft to the materials procured, completed /under completion structures/pipelines etc. In case of any damage to any of them contractor shall solely be held responsible for it and the rectification of the defects will be carried out on the risk and cost of contractor only. Decision of Commissioner Municipal Corporation about rebuilding / rectification depending upon the quantum of damage occurred will be deemed as final and the contractor has to abide by the instructions with no extra financial implication to the department.

11. The Contractor shall provide, construct and maintain at his own expense the site office, material testing laboratory, stores and shall make his own arrangements for water, sanitation, access roads, electrification and cleanliness required for proper and efficient execution of work. The site office should be suitable for accommodating JMC's and PDMC or any representatives of JMC officials for monitoring the progress of the project work. Contractor shall provide computers with printer with internet connection also. Contractor at his own cost shall also provide 2 nos. four wheeler vehicles (SUV type) with driver & fuel (for 3000 km per month running) during the currency for the use of both JMC and PDMC officials/staffs in connection with the supervision of works. The provision shall be fulfilled within the 15 working days after receiving of Work order.
12. The 10m dia Intake circular well at Jagdalpur should be constructed as per the conditions enumerated in NIT and Bidder/s should assess that all installations can be done on one floor as per specifications, if not; then construction of a switch room near the Intake well cum Pump House shall be included in the Lump sum offer. Also, while quoting the rates the bidders shall take into account any cost to be incurred for successful installation & commissioning of already procured pumps & motors along with its accessories and other Electro-mechanical equipments. It is desired that the bidder along with his expert to verify/check/inspect and assess the suitability of already procured pumps, motors, allied accessories and other electro-mechanical equipments at his own cost. The quoted lump sum offer shall be deemed to be included of all the cost required for successful installation and commissioning of all the electro-mechanical equipments along with any other required accessories. The department will not entertain any extra financial claim on account of extra items, it is solely the responsibility to bidder to ascertain that extra items required for successful commissioning of whole scheme and should include the rates in its quoted offer.
13. The Contractors will have to make their own arrangements for drawing electric power from the nearest power line after obtaining permission from the Chhattisgarh State Electricity Board at his own cost. In case of failure of electricity, the Contractor has to make alternative arrangements for supply of electricity by Diesel Generator sets of suitable capacity at place of work. If the supply is arranged by the Department / Authority, necessary Tariff rates shall have to be paid based on the prevailing rates. The contractor will pay the bills of Electricity Board for the cost of power consumed by him. The contractor shall satisfy all the conditions and rules required as per Indian Electricity Act 1910 and under rule -45(I) of the Indian Electricity Rules, 1956 as amended from time to time and other pertinent rules
14. The contractor shall provide at his own cost all materials, machinery, tools & plants as require for completion of work. In addition to this, appliances, implements, other plants, ladders, cordage, tackle, scaffolding and temporary works required for the proper execution of the work, whether original, altered or substituted and whether included in the specifications or other documents forming part of the contract or referred to in these conditions or not, or which may be necessary for the purpose of satisfying or complying with the requirements of the Engineer-in-Charge as to any matter as to which under these conditions he is entitled to be satisfied, or which he is entitled to require together with carriage therefore to and from the work. The contractor shall also supply without charge the requisite number of persons with the means and materials, necessary for the purpose of setting out works, and counting, weighing and assisting the measurement or examination at any time and from time to time of the work or materials. Failing his so doing, the same may be provided by the Engineer-in-

Charge at the expense of the contractor and the expenses may be deducted, from any money due to the contractor, under this contract or otherwise and/or from his security deposit or the proceeds of sale thereof, or of a sufficient portions thereof.

15. To ensure that the services under the scope of this contract are in accordance with the specifications, the Contractor shall adopt Quality Assurance Programme to control such activities at the necessary points. The contractor shall prepare and finalize such Quality Assurance Programme within 15 days from date of issue of work order. JMC shall also carry out quality audit and quality surveillance of systems and procedures of Contractor's quality control activities. A Quality Assurance Programme of Contractor shall generally cover the following:

- a. His organization structure for the management and implementation of the proposed Quality Assurance Program.
- b. Documentation control system.
- c. The procedure for purpose of materials and source inspection.
- d. System for site controls including process controls.
- e. Control of non-conforming items and systems for corrective actions.
- f. Inspection and test procedure for site activities.
- g. System for indication and appraisal of inspection status.
- h. System for maintenance of records.
- i. System for handling, storage and delivery.
- j. A quality plan detailing out quality practices and procedures, relevant standards and acceptance levels for all types of work under the scope of this contract. All the quality reports (i.e. checklists & registers) shall be maintained /submitted by the Contractor as per direction of Engineer in Charge. Checklists & Registers enclosed in the QA-QC manual shall be followed while carrying out Construction activities (items). If any item is not covered by the Checklist/Register, the Format for the same may be developed and submitted to Engineer-in-Charge for approval and the same shall be adopted. These filled in reports shall be duly signed by representatives of contractor and JMC. All the costs associated with Printing of Formats and testing of materials required as per technical specifications or by Engineer-in-charge shall be included in the Contractor's quoted Lumpsum rates

16. TECHNICAL SUPERVISION: -

The Contractor is required to ensure the compliances on account deployment which shall be taken place immediately after the commencement of work. Prior to deployment the CVs of all key/technical personnel shall be submitted for the approval to Engineer in Charge with a copy to PDMC. Only after obtaining the approval the key staff shall be mobilised.

The technical staff should be available at site whenever required by the Executive Engineer to

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give instructions. In case the contractor fails to employ a Graduate Engineer as aforesaid Deptt. shall have the right to take suitable remedial measures. The contractor should give the names and other details of the Graduate Engineer/Diploma holder Sub-Engineers when he intends to employ or who is under employment, before he commences the work. The contractor should give a certificate to the effect that the Graduate Engineer is exclusively in his employment.

It is not necessary for the contractor (or partner in case of firm/company) who is himself an engineer to employ engineer for the supervision of the work so long as the Contractor/partner works similar to what would have been done by and Employed Engineer.

The retired Engineer who is holding Diploma in Civil Engineer or a Diploma holder having 5 years or more experience will be treated as Graduate Engineer, for the operation of above

Postion	Numbers	Professional Qualification	Total Expearence years	In similar works (years)	Expearence of similar works in the present postion (Years)
	Minimum	Minimum	Minimum	Minimum	Minimum
Project Manager	1	BE in Civil/Public Health/Environment	15 years	10 years	05 years
Quantity Surveyor cum billing Engineer	1	BE in Civil Engineer	10 years	07 years	05 years
Mechanical Engineer	1	BE in Mechanical Engineer	05 years	05 years	03 years
Electrical Engineer	1	BE in Electrical Engineer	05 years	05 years	03 years
Quality Control Engineer	1	BE in Civil Engineer.(The applicant must possess complete knowledge of QA/QC,BIS and relvent IS codes)	05 years	05 years	03 years
Supervisory Staff					
Safety Engineer	1	Degree in relvent field	05 years	05 years	03 years

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Site Engineer	4	BE/Diploma in civil	05 years	05 years	03 years
Supervisors	4	Diploma/ITI	03 years	02 years	-

In case of the contractor fails to employ the technical staff as aforesaid he shall be liable to pay to the JMC a sum of Rs. 50,000/- (Rupees Fifty Thousand) for each staff which is not employed for each month of default.

17. LEAD AND LIFT FOR WATER-

The contractor shall make his own arrangement for supply of water for construction and other purposes. No lead and lift for water will be paid. However water for testing will be provided by the department free of cost at the convenience of the department.

18. LEAD AND LIFT OF MATERIALS-

No lead and lift for any material will be paid. The tendered amount should be inclusive of all lead and lift for the materials. The contractor should himself verify the lead of different materials before submitting his tender.

The contractor will have to arrange for the temporary electric connection at site of work at his own cost for dewatering, curing, vibrator, testing and internal and outside electric fittings, etc

19. DEWATERING-

The lump-sum offer shall include dewatering, bailing foundation water, river water and rain water if any, which shall be required to be done by the contractor at his own cost and for which no payment will be admissible under any circumstances. The tenderer shall assess the work of dewatering that may be required for execution of work and include in his lump-sum offer. No dewatering shall be payable separately under any circumstances whether natural, artificial or man-made.

20. CEMENT:-

The Contractor shall procure minimum 43 grade, unless otherwise stated separately confirming to BIS specifications, ordinary Portland cement, as required in the work only, from reputed manufacturers such as Ultra Tech, Grasim, Birla Uttam, ACC, Gujarat Ambuja, Cement Corporation of India. etc. of cement having a production capacity of one million tones per annum or more, and as approved by Employer, Ministry of Industry, Government of India and holding license to use BIS certification mark for their product, whose name shall be got approved from Engineer-in-Charge. Supply of cement shall be taken either in silos or in 50 kg. bags bearing manufacturer's name and BIS marking. Samples of cement arranged by the Contractor shall be taken by the Engineer-in-Charge and got tested in accordance with provisions of relevant BIS codes. Cost of such tests shall be borne by the contractor. In case test results indicate that the cement arranged by contractor does not conform to be relevant BIS codes the same stand rejected and shall be removed from the site by the Contractor at his own cost within one week time of written order from the Engineer-in-charge.

The cement shall be brought at site in bulk supply of approximately 50 tonnes from the manufacturer direct, or as decided and approved by the Engineer-in-charge, as the case may be.

The cement godown of the sufficient capacity should be constructed by the contractor and at all time it should have a stock of minimum of 2000 bags. The contractor shall facilitate the inspection of the cement godown by the Engineer-in-Charge at any time. Storage of cement shall be as per CPWD specification.

Cement brought at site and cement remaining unused after completion of work shall not be

removed from site without written permission of Engineer-in-Charge.

21. Approval of Designs & Drawings:

All balance / leftover design calculation & detailed drawing of all components (Electrical, Mechanical and Structural) of the project shall be got approved by **Govt. Engg College in Chattisgarh/National Institute of Technology [NIT]/ Bhilai Institute of Technology, Bhilai** at the cost of contractor and then submitted to Jagdalpur Municipal Corporation through PDMC for final approval.

Concret Design Mix to be used shall be got designed by Govt Engineering College, C.G./National Institute of Technology [NIT], keeping in mind the **Target Mean Strength** as per **clause 9.2 of IS-456[2000]**.

Clause 9.2.2 of IS-456[2000]: The mix shall be designed to produce grade of concrete having the required workability & a characteristic strength not less than appropriate values given in Table -2. The Target Mean Strength of Concrete Mix should be equal to characteristic strength plus 1.65 times the Standard Deviation.

Ready Mixed Concrete- The contractor shall use Ready Mixed Concrete prepared at established Concrete Batching & Mixing Plant. Batching and Mixing Plant with a minimum 20 cum/hour capacity shall be used to comply with the compressive strength criterion given in clause 16 of IS-456[2000].

Clause 16 ACCEPTANCE CRITERIA of IS-456[2000]:-

16.1 Compressive Strength: --

The concrete shall be deemed to comply with the strength requirements when both the following condition are met:

- a. The mean strength determined from any group of four consecutive test results complies with the appropriate limits in col 2 of Table 11 of IS-456—2000.
- b. Any individual test result complies with the appropriate limits in col 3 of Table I of IS-456-2000).

The contractor can use RMC OR mixing of concrete can be done in a mechanical mixer (proportioning of aggregates to be used shall be done using a weigh batcher at site) as per the site conditions on prior approval of Engineer- In –incharge.

22. Accident -Hoardings - Lighting Observations:

When there is any Likelihood of accidents, the contractor shall comply with any requirements of law on the subject, and shall provide suitable hoarding, lighting and watchman as necessary or directed by Engineer-in charge.

It shall be contractor's sole responsibility to protect - the public and his employees against accident from any cause and he shall indemnify Municipal Corporation JAGDALPUR, against any claims for damages for injury to person or property, resulting, from any such accidents; and shall where the provision of the workmen's compensation Act apply, take steps to properly insure against any claims there under.

On the occurrence of an accident which results in the death of any of the workman employed by the contractor or which is so serious as to be likely to result in the death of any such workman, the contractor shall, within 24 hours of the happening of such accident, intimate in writing to Municipal Corporation JAGDALPUR /Police the facts of such accident. The contractor shall indemnify Municipal Corporation JAGDALPUR against all loses or damage sustained by Municipal Corporation resulting directly or indirectly from his failure to give intimation in the manner aforesaid including the penalties or fines if any payable by

Municipal Corporation JAGDALPUR as consequence of failure to give notice under the Workmen's Compensation Act.

In the event of an accident in respect of which compensation may become payable under the workman's compensation act VIII of 1923 whether by the contractor or by the Government as principal it shall be lawful for the Engineer-in-Charge to entertain out of monies due and payable to the contractor such sum or sums of money as may in the opinion of the said Engineer-in-Charge be sufficient to meet such liability. The opinion of Municipal Commissioner JAGDALPUR shall be final in regard to all matters under this clause.

23. HYDRAULIC TESTING

3% amount shall be withheld/deducted from each bill for hydraulic testing of pipeline work and shall be released after successful hydro static testing of that particular section of Pipeline..

24. USE OF DI FITTINGS:

Provision of laying & jointing of DI fittings P.N. 1.6 conforming to IS: 9523:2000 duly inspected and approved by RITES/SGS as per tender. DI specials shall be manufactured as per IS: 9523 and shall be ISI marked. In case of flanged joints, the flanges shall be at right angles to the axis of the pipe machined on the face. The bolt-hole circle shall be concentric with the bore and bolt holes shall be located off the centre lines as per IS: 9523. Fittings shall be tested as per IS: 9523.

25. HINDRANCE FREE ALIGNMENT OF PIPELINE ETC:

JAGDALPUR MUNICIPAL CORPORATION will provide hindrance free alignment. The bidders should inspect the whole alignment and should make himself conversant with site conditions, strata, nallah crossings, road crossings, railway crossings, canal crossings etc completely. All permissions from Government/ Semi Government Authorities shall be taken by Jagdalpur Municipal Corporation for above works.

26. DEPTH OF EXCAVATION FOR LAYING OF PIPELINE:

The crown of the pipeline will be kept minimum 1.0 m below the firm GL.

27. Order of Priority:-

- i. Specifications as per NIT
- ii. Specifications as per SOR
- iii. Specifications mentioned in CPHEEO manual 1999 (current revision) for various water supply and treatment Components.
- iv. Relevant IS codes.

28. STATUS OF ENVIRONMENTAL CLEARANCE:

Since this being a Water Supply Project involves neither displacement /rehabilitation of people nor any pollution of water body, hence no Environmental Clearance is required.

29. VALVES WITH ACTUATORS:

All the sluice valves shall be provided with electrically operated actuators up to inlet of OHSR. The cost of electrically operated actuators shall be inclusive in the Lumpsum offer.

30. LAYOUT PLAN OF WATER TRANSMISSION AND DISTRIBUTION NETWORK:

Location of valves marked on the L-section will be prepared by the contractor for the approval of Engineer-in-Charge as mentioned in ANNEXURE-E.

31. PERMISSION FOR INSTALLATION OF CONSUMER WATER METERS:

Municipal Corporation Jagdalpur will provide the permission for fixing of consumer water meters.

As regards the provision of HSC including the installation and commissioning of consumer water meters the onus lies on Municipal Corporation to provide the site to the contractor. In case six months after the completion of the entire Lump Sum Contract work except the provision of HSCs the Municipal Corporation fails to hand over the balance complete site of HSCs to the contractor, the contractor is at liberty to apply for extension of PDC (probable date of Completion) or he can request for determination of the contract.

32. PREPARATION OF GIS BASED MAP:

Contractor has to prepare a entire layout plan of indicating the complete integrated water supply scheme including canal intake works, raw water sump-cum pump house, 35 MLD WTP, GLSR and all OHSRs (existing and proposed) , 9 MLD existing WTP, Thana clear water pumping station, all rising mains, gravity feeders , distribution network (existing and proposed) including all Bulk Flow meters, FVC, pressure gauges & valves etc on GIS platform .This will be put on the web site of the Municipal Corporation and monthly updated indicating the progress of the progress achieved.

33. LIST OF SPARES TO BE MAINTAINED DURING O &M period of 35 MLD WTP:-

The contractor shall operate and maintain the water treatment plant including all the civil structures, electro-mechanical equipment, pipes, pipe specials, instrumentation provided by him in 35 MLD Water Treatment Plant. He will maintain spares with stores for the proper upkeep of the WTP. List of spares is given below.

LIST OF SPARES: for 35 MLD WTP

- I. Flash Mixer
 - (a) Motor----1 no of each capacity of motor
 - (b) Bearing----1 set for each type of pump and motor
 - (c) Shaft----1 set for each type of pump of specified MOC
- II. Clariflocculators
 - (a) Motor Shaft--1 set for each type of motor
 - (b) Bearing---1 set for each type of pump and motor of specified MOC
- III. 2 No. Tonners of approved MAKE Chlorine Cylinder

For repairs and proper upkeep of the WTP in case any repair to any equipment is required, no extra payment will be paid to the contractor.

For non compliance of the water quality parameter a penalty of Rs. 5000/- for one event in a day shall be levied. Residual chlorine at outlet of clear water pump house ≤ 2 ppm

34. TESTING OF RAW AND TREATED WATER DURING 05 YEARS O & M BY THE CONTRACTOR:

“Daily the contractor has to get the raw water and treated water tested atleast three times at 8 hour interval for the parameters viz., turbidity, colour, taste, pH, TDS, Total hardness, residual chlorine conductivity, Alkalinity, Chlorides and coliform for both 35 MLD and 9 MLD Water Treatment Plants.

For non-compliance of the water quality parameter a penalty of Rs. 5000/- for one event in a day shall be levied incase the residual chlorine at outlet of WTP is found less than 2 ppm or any of the above physico-chemical and biological parameters is found in the beyond acceptable range as specified in IS: 10500

- (i) Residual chlorine at outlet of clear water pump house < 2 ppm

Every day at least 3 times daily raw water and treated water test reports of all the parameters as indicated shall be made available to Engineer in Charge.”

35. GENERAL REQUIREMENTS FOR BUILDING WORKS:-

Unless otherwise specified, all the building works shall generally comply with the following Employer's Requirements:

- (a) All buildings shall have reinforced concrete framework.
- (b) 75 mm thick PCC Damp Proofing Course in M15 shall be provided to all building walls.

36. TOPOGRAPHIC SURVEY:-

The contractor will carry out the Topographic survey work by using Total station of the entire site where the intake, raw water sump cum pump house, proposed and existing WTP's, existing & proposed OHSRs and proposed raw water and clear water rising main and proposed water distribution network are required to be constructed/laid. This is mandatory to confirm the levels and the lengths. Only after this exercise is carried out, contractor should prepare the detailed drawings, plans of Distributions networks, L-sections of pumping mains/Gravity mains.

37. HANDING OVER OF EXISTING 9 MLD WTP:-

After signing the Contract, existing WTP will be handed over to Contractor and from this date, Contractor will require to operate and maintain the existing WTP.

After successful completion and commissioning of proposed 35 MLD WTP the existing 9 MLD will be handed over to contractor in a phased manner as per the instructions of Engineer-in-Charge to install recirculation arrangement & automation. After the completion of recirculation arrangement and automation of existing WTPs contractor shall operate and maintain the existing WTPs in such a manner that the existing water supply to consumers is not disrupted at all. The Contractor has to bear the expenses of chemicals and the operating staff deployed by him for this purpose. Chlorine gas and electricity charge will be provided by Municipal Corporation at no cost.

The rehabilitation of existing 09 MLD WTP including replacement of Electro-mechanical equipment in the schedule including Supply, installation, testing and commissioning of recirculation arrangement for wastewater & sludge & PLC SCADA automation, monitoring and control system shall be carried out by the contractor in a manner without adversely affecting the clear water output from 09 MLD WTP during the currency of the contract.

38. PROCUREMENT OF PIPES & VALVES:

Contractor shall take written procurement clearance for the specified quantities of pipes, valves, specials etc from Engineer-in-Charge before taking procurement action. The payment shall be made for the actual work executed. In case secured advance is granted the materials which are not used in the work, the recovery of secured advance will be recovered from the Contractor.

39. CONSUMER WATER CONNECTION:

- a) Length of pipe to be provided for each consumer water connection is 6m upto the property line. Variations if any arises shall be payable/deducted as per Clause 6 of conditions of contract.
- b) Road breaking and its reinstatement will be carried by the contractor as per tender.
- c) Reinstatement of floor/surface for provision of consumer meter connection will be done with PCC.
- d) Number of Specials/ compression fittings as required shall be provided by the contractor**

40. INTERCONNECTIONS OF RISING MAINS:-The Contractor is expected to visit the site of work and make his own assessment of quantum of work required to be carried out. Further before actual implementation of work the drawing of interconnections will have to be got approved from the Engineer-in-Charge. The interconnections of rising mains of all OHSRS (existing and proposed) with the distribution mains is included in the scope of work of this Contract. Bidder's Lump sum offer shall be all inclusive and no extra payment shall be made.

41. INTERIOR LIGHTING AND RECEPTACLES IN PUMP HOUSE & WTP:

Each panel shall be provided with a LED lighting fixture rated for 20 watt, 230V, 1 phase, 50 Hz 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.

42. RECYCLING OF WASTE WATER SYSTEM IN THE PROPOSED proposed & existing WTP :

- a) Total maximum sludge volume = 5%
- b) Maximum sludge volume from Clari-floculator = 2%
- c) Filter waste (washed water) to be directly pumped to inlet channel of plant
- d) Filter waste sump volume = complete waste of 2 beds wash
- e) Clari-floculator sludge to be re circulated through centrifuge only, Bypassing thickener during high sludge content
- f) Decanted water from thickener may be collected in filter waste sump
- g) Water part from centrifuge should be diverted to raw water inlet channel of the plant
- h) The Clari-floculator sludge should be churned either by mechanical churner or by blower to protect from siltation

Recycling of waste water and sludge of flocculator shall be designed to achieve zero discharge.

For by pass arrangement of the used wash water, it is proposed to be disposed of in nearby nalla through gravity. The wash water gutter invert level should therefore be fixed considering H.F.L. of nalla /natural drain so that drainage by gravity during flood can be possible.

43. Approved make list:-

Item/Component	Recommended Marks
VT and Centrifugal Pumps	Kirloskar/Jyoti/Mather+Platt/WPIL/Becon Weir, Worthington/
Pump Motors	Kirloskar/Jyoti/Crompton Greaves/ARB/Alstom/BHEL/Siemens/Bharat Bijlee/Marathon

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DI pipes	ISI marked conforming to IS: 8329 Centrifugally Cast (Spun) DI Pressure Pipe of Water, Gas and Sewage duly inspected by [SGS/RITES] as per approved QAP
MS Pipes/Plates	as per IS 3589.
Sluice Valves/Scour Valves	Kirloskar/IVC/VAG/IVI/Fourcss/DURGA/DAULI
Butterfly Valve	Kirloskar/IVC/VAG/IVI/Fourcss/DURGA/DAULI
Non-Return Valves	Kirloskar/IVC/VAG/IVI/Fourcss/DURGA/DAULI
Kinetic Air Valve	Kirloskar/IVC/VAG/IVI/Fourcss/DURGA/DAULI
Valve Actuators	Auma/Rotork/Limitork
Hydraulically operated Flow-cum-Pressure control valves	VACI/Daling-Muesco/Singer/Dorot/Bermad
Single faced Sluice Gates	JASH/VACI/Kirloskar/IVC
Water Hammer Control Devices	Sureseal/Saisanket/Durga
Electro-Magnetic Flow Meters	Emerson/KrohneMarshall/Yokogawa/E&H/Nivvo Control/Siemens/Adeopt/SBEM
Woltman type Bulk Flow Water Meters	Zenner/Itron/Elster/Mmol
WTP Equipment: Flash-mixers, Clarifloccutors, Rotating-Bridge, Blowers etc.	Triveni, Shispad/Dorr-Oliver/ Voltas/ Reliable/ KAY/ AIRVAC
Chlorination Equipments, Chlorinator, Chlorine leak detesctor, Residual Chlorine analyzer, Scrubber etc.	Pennwalt/ W&T/ Alldos/ CHLOROTECH/ Siemence/ Emerson Process
DI/C Fitting & Specioals	As per IS 9523:2000
Dismantling/ Expansion Joints	Reputed Makes
Compression fitting, Tapping Saddles, Electro-fusion Couplets	Kimplas/ Georgeficher/ Glynwed/ Frialeii/ Trustlene/ GPS/ Durafuse/ Aiva
Programmable Logic Controllers (PLC)	Rockwell (ALLen Bradly)/ Siemens/ Honeywell/ Krohne-marshell/ Schnider
Moulded Case Circuit Breaker (MCCB)	Siemens/ Schneider M.G./ Jyoti/ L&T/ C&S
ACB	Siemens/ Jyoti/ ABB/ L&T/ Snider/ C&S/ BCH
Relay and Contractors	Siemens/ Alstom/ Jyoti/ ABB/ L&T/ Snider/ C&S/ BCH
Cables	Tropodue/ Finolex/ Asian/ Gloster/ Incab/ Universal/ Polycab/ Unidoor/ Havells/ Nicco/ RR Kabel
Panel Enclosures and Consoles	Rittal/ President/ Cutler Hammer
Switch Fuse Disconnecter	L&T, FN Type, Siemens 3KL Type, GEPS/ Havells/ C&S/ Sanider
Multi-Function Energy Meters	Enercon, L&T, SOCOMEC/AE/Mecco
Capacitor Bank	Cromton Greaves, Khatau Junker, Malde, L&T/Asian/ Mohmaya/ Universal/ C&S

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Cable Termination Kit	Raychem Denson, M-Seal
Battery	HBI, NIFE, Exide, Amco
Battery Charger	Chaabi Electrical, Masstech
Ultrasonic Type Level Measurement Device	Endress+Hauser/ Krohne Marsnall/ Hycontrol
Pressure Switch	Indfoss, Switzer, Tag Process Instruments
Pressure Guage	WAREE, WIKA, AN Instrumentals, Guru, Hitek
Flow Switch	Switzer, General Instrument, Forbes Marshall
Pressure Transmitter	Wemerson, Foxbro, Druck, Endress- Hauser, ABB, Honeywell Automation
Engineering cum Opreator work Station	IBM, Compaq, Dell
Local Supervisory Station	IBM, Compaq, Dell
Ferrules	AKAR, SAKSHAM, AIVA, GRRF
HMI Software	Wincc, Rs View, Monitorpro, Intellution, Indusoft
Alarm Annunciator	Miniles, Peacon, ICA, APLAB
Uninterruptible Power Supply	HI-Real, Pulse, Tata Libert, APC, APLAB
Lightening Protection Unit	MH Inst, Crompton Greaves, MLT, Pepper & Fuchs, Rittmeyer, Cirprotec/ Alstom/ Elpro
Instruments & Control Cables	Delton, Asian, Several, TCL, Thermopad
Receiver Indicator/ Digital Panel Meter	Masibus, Yokogawawa, Lectrotek, NISHKO, Saitech, MTL INSTS
Conductivity Level Switch	Pune techtrol, SBEm, Krohne Marshall, E+H, NIVO
Computer[Servers & Workstation]	HP-Compaq/ IBM/ Dell
Laptop	HP/ Dell/ Sony/ Toshiba
Printer	Samsung, HP, CANNON
Soft Stater	Siemens/ ABB/ BCH/ GE/ L&T/ C&S/Schineder
EOT Cranes	Venus Engineers/ Unicon/ Hercules
Transformer	Kiloskar/ Crompton/ MP Transformer/ Voltamp/ Patson/ Datson/ Danke/ Danish

Salient Features of Augmentation to Jagdalpur Water Supply Scheme

Sr. No.	Components	Details
1)	Source	Indravati River
2)	Population Projection	Year Population
		2016 - 139720
		2020 - 151700
		2035 - 203060
		2050 - 270030
Details of Head works		
3)	Existing Intake Well	Diameter - 9 m
		Depth - 28.8 m
		Shape - Circular
		Construction Type - RCC
4)	Proposed Intake Well	Diameter - 10 m
		Depth - 32 m
		Shape - Circular
		Construction Type - RCC
Details of Pump House		
5)	Existing Pump House	Diameter - 9 m
		Height - 7.0 m
		Shape - Circular
		Construction Type - RCC
6)	Proposed Pump House	Diameter - 10 m
		Height - 6.0 m
		Shape - Circular
		Construction Type - RCC
Details of Connecting Main		
7)	Proposed Connecting Main (River to Proposed Intake Well)	Diameter – 900 mm, DI [class K-9], Port--3 Nos, Length – 50 m
Details of Raw Water Pumping Machinery		
9)	Proposed Raw Water Pumping Machinery (Proposed Intake well to Proposed WTP 35 MLD)	VT Pumps as per design, 4 Nos, Status (2 W+ 2SB), Discharge = 529773 LPH, Head = 51m,Pumping hours- 22 Hrs.
Details of Transmission Main		
10)	Proposed Raw Water Transmission Main	Diameter - 600 mm DI K-9, Length - 2076 m

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Sr. No.	Components	Details
	Proposed Intake well To Proposed WTP 35 MLD	
	Details of Water Treatment Plant	
11)	Water Treatment Plant (Existing)	Type - Conventional Capacity – 9.0 MLD, Additional 2 filter beds 3.5 m X 6.0 m with actual filtration rate of 2500 Lit/Sqm/Hr are proposed for the augmentation to 14.0 MLD capacity besides the existing filter bed & Demolition of 4.5 MLD old WTP
12)	Water Treatment Plant (Proposed)	Type – Conventional, with Lamella clarifier and recirculation facility Capacity – 35.0 MLD
	Details of Clear Water Pumping Machinery	
13)	Proposed Clear Water Pumping Machinery (Proposed WTP 35 MLD)	Pumps as per design, 4 Nos, Status (2 W+ 2SB), Discharge =510000 LPH, Head = 50m, Pumping hours- 22 Hrs.
	Details of Clear Water Pumping Mains	
14)	Proposed Clear Water Pumping Main (Transmission Main) Proposed WTP 35 MLD TO OHSRs	Diameter - 150 mm DI K-9, Length - 834 m Diameter - 200 mm DI K-9, Length - 5635 m Diameter - 250 mm DI K-9, Length - 5960 m Diameter - 300 mm DI K-9, Length - 3558 m Diameter - 350 mm DI K-9, Length - 135 m Diameter - 400 mm DI K-9, Length - 1871 m Diameter - 450 mm DI K-9, Length - 24 m Diameter - 500 mm DI K-9, Length - 114 m Diameter - 600 mm DI K-9, Length - 161 m Total length = 18170 m
	Details of Over Head Service Reservoirs (OHSR)	
15)	Dharampura Proposed OHSR	Capacity – 300 KL Staging Height - 20 m GL – 554.50 m LSL – 574.50 m FSL- 578.50 m
16)	Army Training Centre Proposed OHSR	Capacity – 5 KL Staging Height - 15 m GL – 578.50 m LSL – 593.50 m FSL – 597.50 m
17)	Jaiswal Colony Proposed OHSR	Capacity – 750 KL

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Sr. No.	Components	Details
		Staging Height - 20 m
		GL – 550.00 m
		LSL – 570.00 m
		FSL – 574.00 m
18)	Wardhaman Colony Proposed OHSR	Capacity – 650 KL
		Staging Height - 20 m
		GL – 566.20 m
		LSL – 586.20 m
		FSL– 590.20 m
19)	Lal Bagh Proposed OHSR	Capacity – 1250 KL
		Staging Height - 20 m
		GL – 548.00 m
		LSL – 568.00 m
		FSL– 572.00 m
20)	Hathkachora Proposed OHSR	Capacity – 650 KL
		Staging Height - 20 m
		GL – 551.10 m
		LSL – 571.10 m
		FSL–575.10 m
	Details of Distribution Network	
21)	Proposed Distribution Network	Diameter - 100 mm DI K-7, Length - 166694 m
		Diameter - 150 mm DI K-7, Length - 43378 m
		Diameter - 200 mm DI K-7, Length - 18891 m
		Diameter - 250 mm DI K-7, Length - 11968 m
		Diameter - 300 mm DI K-7, Length - 6073 m
		Diameter - 350 mm DI K-7, Length - 1108 m
		Diameter - 400 mm DI K-7, Length - 1134 m
		Diameter - 450 mm DI K-7, Length - 685 m
		Total length = 249931 m
	Details of House Service Connections	
22)	House Connections	Consumer Connection 24332 Nos.
23)	PLC & SCADA for RWPH, WTP, OHSR, CWPH	

ANNEXURE - "E-1"

Scope of work for RCC Intake well:-

SCOPE OF WORK AND SPECIFICATION FOR RCC INTAKE WELL

1.0 Scope of work:-

The 10m dia Intake circular well at Jagdalpur should be constructed as per the conditions enumerated in NIT and Bidder/s should assess that all installations can be done on one floor as per specifications, if not; then construction of a switch room near the Intake well cum Pump House shall be included in the Lump sum offer. Also, while quoting the rates the bidders shall take into account any cost to be incurred for successful installation & commissioning of already procured pumps & motors along with its accessories and other Electro-mechanical equipments. It is desired that the bidder along with his expert to verify/check/inspect and assess the suitability of already procured pumps, motors, allied accessories and other electro-mechanical equipments at his own cost. The quoted lump sum offer shall be deemed to be included of all the cost required for successful installation and commissioning of all the electro-mechanical equipments along with any other required accessories. The department will not entertain any extra financial claim on account of extra items, it is solely the responsibility to bidder to ascertain that extra items required for successful commissioning of whole scheme and should include the rates in its quoted offer.

1. Intake Well

S.No	Scope of work	Remarks
1	Mechanical & electrical works installation and commissioning including approval by Third party Inspection[SGS/RITES]	Balance work to be done including submission and approval of Design and drawings and as per specifications given in tender document
2	Inside & outside oil bound distemper	.
3	On testing of structure & all other equipments etc. Including 12 months trial period	-

ii. Intake Well (For Electrical Work)

S NO.	Item Description	Nos	Remarks
1	33/0.415 kV 500 KVA Transformer having as per detail specification.	2 Nos.	Balance work to be done including submission and approval of Design and drawings
2	33 kV Lightning Arrestor.	6 Sets	-
3	33 kV DO Fuse Unit.	4 Sets.	-
4	33 kV A.B. Switch Complete with Rod/Handle.	2 Sets	-
5	ACRS Conductor.	200 Mtr	-
6	33 kV Pin Insulator.	18 Nos.	-
7	33 kV DISC Insulator.	54 Set.	-
8	Hardware kit, complete for laying of ACSR Conductor & inter connection from A/B Set, L/A Set, D/O Set, Pin & Disc Insulator upto transformer.	2 Set.	-
9	3½ core x 400 sq.mm Aluminum Armored cable from Transformer to MCCB panel including accessories like lugs, glands.	150 Mtr.	-
10	Main panel having 400 Amp MCCB for fixing near transformer.	2 Set	-
11	Earthing work using G.I. Plate of 600 x 600 x 6mm, G.I. Strip 25 x 5 mm, Complete hardware of earthing like coal, salt, galvanized nut-bolts, funnels, G.I. Pipes etc., and main hole cover for earthing pit. Complete	14 Nos.	-
12	I Section 200 x 100 - Length as required . Channel 100 x 50 , etc. – as required.	4700 Kg.	-

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13	Fencing work using 50 x 50 x 5mm size vertical post of 3 Mtr. length and 50 x 50 x 5mm size struts for even corner of 3 Mtr., Wire mesh of 3mm thick with netting size of 100 x 100mm of height 2 Mtr., M.S. Flats of size 25 x 3mm size for vertical & horizontal support. Hardware material, like Nut, Bolt, G.I. Wire, etc. for fencing., Gate of 3.5 Mtr. Wide & height of 1.5 Mtr. of Iron Steel.	51 Rmtr	-
14	Metalling	1 Lot.	-
15	Street lighting poles of height – 8.5 Mtr. Sodium Vapor Lamp of 250 Watts & fitting for Sodium Vapor lamp with hardware complete.	4 Nos.	-
16	Cables of 2.5sq.mm x 2 core copper armored cable for street lighting load.	300 Mtr.	-
17	Drawing preparation for sub – station and approval from safety electrical inspector.	1 Job	-
18	Charging permission for sub – station and approval from safety electrical inspector.	1 Job	-
19	All civil work relating to erection of poles, fencing work, construction of platform for transformer, earth pit chambers.	1 Job	-
20	Installation and commissioning of all above items including painting, trial and testing	1 job	-
21	ACCESSORIES		-
	Rubber Hand Gloves.	1 Set.	-
	Ball Pin Hammer with Wooden Handle.	1 Set.	-
	Screw Driver 8” & 12”	1 Set.	-
	Shock Treatment Chart.	4 Nos.	-
	Danger Notice Board.	1 Nos.	-
	Fire Stand with Fire Bucket in sub-station.	1 Nos.	-

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Insulated Player.	1 Set.	-
Fire extinguisher 4.5 Kg.	1 Set.	-
D.O. Operating rod 33 kV fiber H.D.	1 Set.	-
Discharge rod with accessories fiber.	1 Nos.	-
Helmet H.D.	1 Set.	-

iii. Intake Well (For Mechanical Work)

S.No	Description	Nos.	Remark
1.	V.T pump for 148LPS at 51 Mtr. total head as per detail specification along with column pipe of size 300 (pipe) x 43 (shaft) mm column assembly of 15 MTR length I/c bowl assembly, Foundation bolts for above pump set along with suitable HP VHS Electric Motor 3 phase, 415 volts, as per detail specification. Pump efficiency minimum 80% at duty point.	4 Nos.	Pumps already Supplied
2.	Vertical Hollow Shaft motor, SPDP, 1450 RPM suitable to operate on 415V + 10%, 3P, 50Hz, AC supply having 'F' class insulation temp. rise limited to 'B' class with continuous duty, conforming to IS-325	4 Nos.	Pumps already Supplied

TENDER DOCUMENT FOR BALANCE/LEFTOVER WORKS OF AUGMENTATION &
REORGANISATION TO JAGDALPUR WATER SUPPLY SCHEME UNDER AMRUT MISSION
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3.	Butterfly valve electrically operated of PN 1.0 size 300mm for delivery side of pump as per detail specification.	4 Nos.	
4.	Sluice valve of PN 1.0 size 300mm for delivery pipe as per detail specification.	4 Nos.	
5.	Non-Return valve of PN 1.0 size 300mm for delivery side of pump as per detail specification.	4 Nos.	
6.	Sluice valve of PN 1.0 size 500mm for manifold pipe line as per detail specification.	1 Nos.	
7.	Non-Return valve of PN 1.0 size 500mm for common manifold as per detail specification.	1 No.	-
8.	D/f Flow meter of electromagnetic type for installation on manifold pipe as per detail specification.	1 No.	-
9.	Pressure gauge of dial size 150mm dia for 0-7kg/cm ² delivery side of pump as per detail specification	4 Nos.	-
10.	M.S./ CI Dismantling Joint of 300 mm for delivery side of pump as per detail specifications.	4 Nos.	-
11.	M.S./ CI Dismantling Joint of 500 mm for common manifold pipe.	1 No.	-
12.	M.S. D/F Pipe for delivery of 300mm size of 8 mm thickness along with flanges hardware like Nut, Bolts, Washers & Rubber Sheet, complete for joining pipes, valves, etc.	400Kg	-
13.	M.S. C.I. D/F 300 x 500mm as per distance prices delivery side	4 Nos.	
14.	M.S. S/F 300 mm Bend of 90/45 deg for jointing to common main fold and pump outlet.	4 Nos.	
15.	M.S. D/F Pipe for common manifold of 500mm size of 8 mm thickness and of lengths as required along with flanges & hardware like Nut, Bolts, Washers & Rubber Sheet complete for joining pipes, valves, etc.	2500 Kg	

TENDER DOCUMENT FOR BALANCE/LEFTOVER WORKS OF AUGMENTATION &
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16.	3½ core x 400sq.mm Aluminum Armored cable from MCCB to pump hose MCCB including accessories like lugs, gland. For connection of Transformer MCCB Panel to Motor Panel.	300 Mtr.
17.	3½ core x 185sq.mm Aluminum Armored cable from Panel to motor including accessories like lugs, gland. For connection of Panel to Motor.	250 Mtr.
18.	HOT Crane 3 Ton capacity with 6 mtr. Span & 6 mtr. lift of chain & 40 x 40 mm sq. bar etc. complete as per specification..	1 Set
19.	MOTOR CONTROL PANEL: Motor control panel shall be as per detail specification alongwith soft starters 4 Nos. As per specification.	1 Set
20.	Earthing work using G.I. Plate of 600 x 600 x 6mm, G.I. Strip 25 x 3 mm, Complete hardware of earthing like coal, salt, galvanized nut-bolts, funnels, G.I. Pipes etc., and main hole cover for earthing pit. Complete	4 Nos.
21.	Tools accessories as per specification.	1 Set
22.	Installation and commissioning of all above items including painting, trial run of 12 months and testing	1 Job

Note: The above scope of work and others details are minimum and not limited and Bidders are advised to visit the JMC office and site in advance to verify the balance scope of work with concerned Nodal official Amrut Mission Jagdalpur before quoting the rates. Any items/components which may not be mentioned in the scope of work, but are necessarily required for successful commissioning of the Plant/system with desired outputs and complete functions in all respects will be deemed to inclusive in quoted cost by the bidder and nothing extra shall be paid by JMC

General

1.1 Design, Drawing, construction, testing, commissioning & five year operation & maintenance of R.C.C. Intake well cum pump house near river Indravati, having 10.00 m Internal dia including construction, providing and fixing of connecting mains (2 nos. DI K-9, Dia 900mm & 50m length), Gantry Crane, Control valves and Double drum Hoist with Grab etc. complete. The Intake well shall be suitable for housing 3 sets of vertical turbine pumps each of capacity 11.22 MLD & provision with one opening for desilting operations including all allied works. Under Jagdalpur augmentation water supply scheme under AMRUT Mission.

1.2 The job implies all works from preliminary investigation to the final commissioning of the structure including all ancillary works such as construction of coffer dam, island, dewatering, bailing out of water, etc. all.

1.3 The tenderer is required to arrange complete construction of civil work, until the whole structure is handed over to the JMC. Testing will also have to be carried out at contractor's cost and it will be the responsibility of tenderer to ensure that respective guarantees are achieved.

1.4 The Intake well is required to house vertical turbine pumps. Therefore, contractor should have adequate technical know-how to decide the arrangement of pumps installation concealed cabling and control panel etc. The contractor will have to carry out modification, addition and alteration in the design of structure to meet such requirements, if needed without causing any extra cost of Lump sum offer.

He will therefore design the intake well cum pump house in such a manner that it should meet the hydraulic requirements of pumps to be installed in it.

1.5 There is existing canal on the left side of the intake location & there is existing Barage in to the near proximity in U/S of the proposed site of work also there are many houses constructed near by the area. It is of utmost importance & as such shall be responsibility of the contractor that neither threat of damage is posed to the existing structures, because of activities of constructions of this tendered work. In view of the above blasting is avoided for any excavations. If cutting of rock is not possible by chisel only then explosive will be used & care should be given so that no damage or threat to existing structures & anicut will take place. The responsibility to take the necessary permissions for blasting shall be with the contractor.

1.6 In the Intake well cum pump house total 3 sets vertical turbine pumps (each capable of pumping approximately 11.22 MLD will be installed). Two pump sets may work at a time. The civil structure will have to ensure that no vortex is formed and there is no interference or pump starvation by operating these pumps in any group or independent operation. In addition to this there should be two more slots for future provision of pumps

1.7 PRELIMINARY INVESTIGATION

It will be necessary for the tenderer to depute technical personnel to visit the site and contact the office of the Engineer-in-charge to collect all relevant data for designing the entire construction work of said structure. However, the preliminary geological, hydrological and topographical details, taken by Department are as below:-

A. All permission shall be obtained from the respective department for required of construction.

B. HYDROLOGICAL DATA

The cross section of river at proposed construction site is enclosed. The H.F.L. at work site is 545.90 M.

C. GEOLOGICAL DATA

The Contractor has to take trial bore at the proposed site and the details of trial bore shall be submitted to JMC. On the basis of the trial bore data all the structural designs shall be prepared.

1.8 PREPARATION OF TECHNICAL DETAILS

The tenderer shall prepare the technical report for design and construction of the said work incorporating complete information, specification and data.

1.9 TENDER DRAWING

At the time of submitting tender the contractor shall have to submit an outline plan and section of the proposed work showing different components, arrangement of motors, panel boards, capacitors, remote control desk & cabling etc.

2.0 DETAILED SCOPE OF WORK

2.1 LOCATION OF INTAKE WELL

The intake well should satisfy pre and post flood/submergence conditions. Its successful

functioning should be ensured at H.F.L. condition of source as well as at minimum draw down level.

2.2 DETAIL DESIGN

2.2.1 After written order to commence the work, contractor; will have to submit the structural details, design and drawings of the entire structure including allied works within **30** days from the written order regarding acceptance of his offer. Contractor will also submit the arrangement for installation of 3 Nos. vertical turbine pumping sets. Each of 11.22 MLD Capacity, location of their starters, control panels, main switch boards, cable, PLC SCADA arrangements etc. However, the supply and erection of pumping machineries and their electrical parts are not included in the scope of work but the entire civil works related to installation of mentioned items.

2.2.2 Detail design will include calculations for the following components:-

1. Design of connecting mains to be provided in Intake well suitable for a flow of 35 MLD at 0.6 m/s Velocity.
2. Design of scour depth and stability of well.
3. Design of foundation and bottom floor slab.
4. Design of staining.
5. Designing of discharge floor, plan of delivery pipes and control valves.
6. Design of motor floor, for live load & load of pumping machinery & vibration due to pumps.
7. Plan of motors location & panel boards, remote control desks etc.
8. Design of Pump house wall.
9. Design of Gantry column and ring beam
10. Design of roof slab
11. Design of bearings
12. Design of load test
13. Design of stairs.
14. Design of Form work required for construction

Note:- Requisite total station survey will be carried out by contractor to verify above details & collect all water resources related data from EE WRD Division.

2.2.3 DRAWINGS

Detail working drawings each in 5 sets will be submitted for record of Department. The detail designs will also be submitted in three copies duly well bound. In addition to above drawings in 5 sets will be given to the Engineer-in-charge for the execution of the work.

2.2.4 The responsibility for designs, constructions, structural stability and water tightness in all R.C.C. structure shall rest solely with contractor. The contractors shall have to submit four sets of completion drawings (As built) immediately after completion of work.

2.3 FOUNDATION OF WELL

The foundation of Intake well will be designed and constructed keeping in view the strata met in foundation, maximum scour depth, weight of superstructure, velocity forces, wind forces, live load of pumps, motors, pipes, dynamic forces due to vibrations of pumps, water thrust, seismic force, other live loads over structures, including uplift pressure etc. complete. The bottom plug will be capable of with standing up lift pressure when the water level is at invert level of top most inlet pipe and inside is empty. Any other forces required to be taken for safe design which are not mentioned here will also be taken into consideration for the design. The stability of Intake well will also be checked for seismic forces.

The foundation of the Intake well shall be kept below scour level. The depth of foundation should also be sufficient from consideration of bearing capacity, settlement, and suitability of strata at foundation level and stability of structure as a whole against overturning and sliding.

The scour depth shall be calculated from maximum discharge of river. The depth of scour for Intake well shall be taken as 2.0 times the mean depth of scour for the maximum discharge. The

mean depth of scour shall be calculated from formula as given in IRC 78-1983.

In case, if it is required to rest foundation on erodible strata, the depth of foundation below the scour line shall not be less than 1.2 m. In case of foundation resting on rock, the minimum embedment of foundation into rock below shall be 1.5 m in soft & 1.0 m in hard rock. The depth of embedment shall exclude that portion of rock which is weathered or fissured.

The foundation shall be designed for worst combination of loads and forces.

For laying foundation concrete under water, it shall be done by skip boxes or termite pipe. Pumping out of water shall not be permitted from the time of placing of concrete up to 72 hrs thereafter.

The foundation of Intake well will be laid over lean concrete of minimum M20 concrete, 200 mm thick. The minimum grade of concrete used in structure will be Cement concrete M-30 and stresses in concrete will be taken from IS:3370.

Use of explosive will be avoided for foundation excavation which will be done by dropping heavy chisels. If at all breaking of rock is not possible by chisel only then explosive will be used with responsibility of contractors to no damage to surroundings existing structures.

On completion of Intake well above rock level, the annular space will be filled with cement concrete M-10 except top 300 mm depth (below rock top) will be filled with cement concrete M-20.

2.4 WELL STEINNING

The thickness of staining of Intake well will be designed keeping in view the various stresses developed due to self load of staining, super structure live load, due to pumps motors and pipe column assembly of six pumping sets water forces due to river floods, velocity forces, wind force, dynamic forces, due to vibration of motors, water thrust in discharge pipe, due to water hammer and other live loads over slabs, roofing, balconies (as specified in forth coming pars), other loads due to buoyancy effect and any other forces required to be taken for safe design will also be taken into consideration which are not mentioned here. The staining will be designed for the various combination of forces. Its stability will be checked for the worst condition including the conditions when the river water at HFL & intake well is empty.

The entire construction will be in R.C.C. M30. The minimum thickness of well from the bottom floor to discharge floor level will not be less than 750 mm even if it comes on lower side at the designing it. From discharge floor level to motor floor the thickness will not be less than 200 mm even if it comes on lower side after designing. Above motor floor level the minimum thickness shall not be less than 200 mm.

The contractor will have to design size and no of Inlet port however minimum 3 no of Inlet ports with minimum diameter 900mm will have to be provided with strainer and operating sluice valves gate. Operated from discharge floor.

2.5 PROVIDING AND FIXING OF CONNECTING MAINS

Twin or single connecting mains shall be provide at various levels and directions to draw water from various levels of river during maximum draw down level and at the time of highest flood. Each single or twin connecting main will be designed to allow the flow of raw water at the rate of 35 MLD when 0.6 m head is available above crown of the mains.

When intake well will function for its two times pumping capacity (i.e. 35 MLD) the intake of water from connecting mains will be more than the maximum pumping rate and hence inside the intake well; the water level will be the same as in the river.

The location and R.L. of these connecting mains will be decided during the time of construction.

2.6 SLUICE VALVE GATES

Sluice gate valves will be provided on all connecting mains conforming to IS 14846-2000 with connecting rods for operation at discharge floor level. Also connecting rod shall be supported by MS Clamping. Also connecting rod shall be supported by MS Clamping.

2.7 ELECTRIFICATION

Electrification of pump house inside and outside will be done in such a manner that standard level of illumination is obtained at all places. Proper earthing arrangements as per relevant IS specifications are to be provided. The wiring shall be concealed or As per IS only. The total number of light points shall not be less than 30 nos. inside pump house, Eight Power points, 15 Amp, four each at motor and discharge floor will be provided. The inside of the intake well below discharge floor will be illuminated with the help of 4 or more sodium vapors/ LED lamps. On the outside of pump house also, sodium vapors/ LED lamps, 4 or more nos., will be provided. On Approach Bridge 5 nos. decorative lighting will be provided on each side, but the illumination level, in any case, shall not be less than the standard specifications.

2.8 PUMP HOUSE

2.8.1 PUMPHOUSE (DISCHARGE AND MOTOR) FLOOR LEVEL

Pumphouse floor at R.L. 557.33 M will be provided to house all discharge pipes and vertical column assembly pipes for 3 nos. vertical turbine pumping sets. The floor slab will be designed for a uniformly distributed live load of 1500 kg/sqm and in addition to it, the point loads of 8 T at each opening of pumps will be taken into account. Self load of pumps, water load and water thrust due to water hammer effect will also be taken into account and suitable opening will be provided for passing column pipes through the slab. Flooring with cement concrete will be provided.

2.8.2 SUPER STRUCTURE.

The entire construction of pump house will be R.C.C M 25. The Pump House shall be circular or rectangular in shape. The R.C.C. wall of pump house shall not be less than 200 mm thick. The details of floor and cantilever balcony has already been mentioned earlier. Cantilever chajjas on the outer side of pump house will be provided over doors/window/ventilators. Good architectural appearance will be provided to pump house. A main entrance of size 2.1 m x 2.3 m is provided with rolling shutter facing towards the stair case. The railing as per the specification given earlier will be provided all around the balcony. Sufficient doors with Aluminum frames and fully paneled, ventilators and windows with aluminum frames & paneled fully glazed shall be provided in the pump house which will be at least 30% of motor Floor area for light and ventilation. The height of pump house shall be at least 6.0 M from motor floor level to roof level.

GLAZED WINDOWS

Providing & fixing glazed windows & fabricated from 0.6mm cold rolled low carbon steel of deep drawing quality, primer coated upto 5 microns with thermosetting epoxy resin, painted with polyester powder coating 50 microns thick. The size of profiles for external frame shall be 46x52mm, for internal shutter frame 46x46mm and for mid and bottom cross bar of doors 23x100mm, joints mitred at corners, brackets made of 1.2mm thick CRCA steel strips, styles frame to be fitted to concrete/masonry walls by means of self-expanding screws.

M.S.LADDER

Providing and fixing in position M.S. ladder 0.50 M wide consisting of 75x10mm M.S. flats as stringers and 16 mm dia M.S. bars in double rows as steps placed at 25 cm/c

ROLLING SHUTTER

Providing and fixing rolling shutter with M.S. Sheet 18 gauge, frame and diagonal braces of 40x40x6mm angle iron, 3.0mm

STONE PITCHING

thick M.S. gusset plates at junctions and corners, and as directed by Engineer in Charge.
Providing 30 cm thick hard packed stone pitching with 59% of the individual stones of 30 cm depth including laying, finishing etc. but excluding slope cutting of embankment AND AS DIRECTED BY Engineer In Charge

2.8.3 ROOF SLAB

The roof slab of pump house shall be R.C.C. M-25 and it will be designed for live load of 1500 kg/sqm.

2.8.4 ARRANGEMENT OF GANTRY GIRDER

Cantilever projection not less than 0.5 M will be provided all around on the inner side of the pump house wall; at 5.0M height from motor floor level, to support gantry girder crane through columns. Rails of suitable size will be provided all around this projection over which the gantry girder crane will move along the circumference.

The Circular traveling Gantry Crane of 3 T. capacity will be provided with cross travel trolley and chain pulley block. It will be operated from motor floor level.

2.9 STAIRS & RAILINGS.

R.C.C. stair case of 1.5 m width designed for a live load of 500 kg/sqm from motor floor to discharge floor level along the outer circumference of the well and M.S. ladder from discharge floor level to bottom of the intake well will be provided, on the inner circumference of the staining. The stairs shall be provided in such a way that there is no obstruction due to connecting mains or operating rods etc. The intermediate landings will be provided at 3.0 M vertical intervals in stairs

2.10 Detail specifications of traveling gantry girder crane & grab are as under:

Straight monorail traveling power controlled, wire rope, Double Drum Hoist unit generally satisfying requirement of IS:3938, class-2 medium duty, floor controlled, designed for indoor functions and having the following functional parameter.

- | | | | |
|----|----------------------|---|--|
| a. | Type | : | Electric powered wire rope hoist unit motorized transverse type. |
| b. | Capacity | : | 3 M.T. |
| c. | Falls of Rope | : | Two |
| d. | Hoisting speed | : | 1 meter per minute |
| e. | Hoisting motor power | : | Minimum 5.0 H.P./1440x2 nos. |
| f. | Cross Travel motor | : | Min. 0.75 H.P./1440 x 2 nos. |
| g. | Cross travel speed | : | 2 Meters per Minute |

- | | | | |
|----|--------------------|---|--|
| h. | Dimensions Crane | : | Overall width 1050 mm (max.)
Overall length 1500 mm
Overall depth 500 mm |
| i. | Height of Lift | : | 12.00M |
| j. | Size of Monorail | : | IS MB 300 |
| k. | Length of Monorail | : | Suitable length |
| l. | Wire Rope | : | Flexible, regular, steel wire rope in multiple configurations with high tensile strength, sufficient in length, so that lifting from 12.0 M depth is possible. |
| m. | Test | : | The hoist will be tested at 25% over load prior to dispatch. |
| n. | Paints | : | The hoist to be supplied will be painted with enamel paint over red oxide primer for corrosion proofing and for aesthetic appearance. |
| o. | Grab | : | A double rope type Grab of 0.50 cum. capacity will be provided. The grab will be fabricated by M.S. plate capable to take up safe working load of 2 MT and perforated by 6 mm dia holes to facilitate removal of water from Grab, during the silt removal operation. |

2.11 LIGHTENING ARRESTOR

Aluminum lightening arrestor with all accessories shall be provide as per IS specification for safety of structure. One no. of lightning conductor at the highest elevation shall be provided suitably for the entire area.

It shall consist of

- (i) solid copper rod with upper terminal 25mmdia , 1.5 m long with a knob at the end and the conical spikes on top.
- (ii) Suitable clamps to fix the conductor to the walls.
- (iii) Aluminum tape conductor 25 mm x 3mm.
- (iv) The earthing shall be done as per IS 3043.

2.12 Water level indicator

Water lever indicator shall be provided at suitable location it shall comprise of copper float, guide, pulley, with a pointer on the enamel painted indicator plate which shall be calibrated to indicate the water level in intake well.

2.13 PAINTING

Two coats of finishing with acrylic premium emulsion (plastic) inside of pump house and acrylic smooth exterior paints on outside of pump house and Intake well. Two coats enamel oil paint over primer shall be done on doors, windows, ventilations and all steel fabrication work i.e. railing, gantry girder etc.

2.14 CONCRETE

Entire concrete used in the structure will be “Design Mix” controlled concrete only.

In case of controlled concrete theoretical consumption will be the actual consumption. However minimum cement content and maximum water cement ratio shall be as per IS:456-2000. Contractor will have to setup concrete Batching and Mixing plant duly approved by Engineer in charge.

2.15 STEEL FOR REINFORCEMENT -

The steel for reinforcement shall be ISI mark thermo mechanically treated bars conforming to ISS.

HYSD steel bars conforming to relevant IS will be used for all RCC work. Contractor to produce test certificates as obtained from manufacturer at the time of procurement for each lot of delivery at site. Sample steel rods will be got tested for tensile strength at Government approved laboratory in C.G. Similarly all M.S. steel works including angle T iron & all sections shall conform to IS 2026 all welding and fabrication works will be carried out by qualified welders.

2.16 STEEL SPECIFICATION

Minimum 10 mm to 12 mm diameter bar shall be considered as a main bar for design of each component of Intake well.

**DESIGN DATA AND SPECIFICATIONS FOR DESIGN AND CONSTRUCTION
OF INTAKE WELL
(For purpose of guidance)**

1. Capacity of Intake well : Internal Dia 10.0 m below discharge floor level with 9.0 m bowl
2. **Location of site** : Near Existing Head-work
- 2.1 Name of river : Indravati
- 2.2 Distance from the nearest Rly. station : About 5.00 Km
- 2.3 Distance from main town : Within main Town

3. **Hydraulic data**

3.1 H.F.L.	:	545.90 m
3.2 Proposed anicut top level	:	534.05 m
3.3 River Bed level	:	523.60 m
3.4 Lowest suction level	:	517.00 m
3.5 Average Groundlevel	:	548.00 m
3.6 Bottom level of Intake well	:	516.00 m
4. <u>Important Levels :</u>		
4.1 Motor floor level	:	557.33 M
4.2 Mazinine floor level	:	557.33 m
4.3 Top slab level of Pump House	:	563.33 m
5. <u>Invert Levels of Inlet port :</u>		
5.1 Ist Inlet port	:	As per Design
5.2 IInd. Inlet port	:	As per Design
5.3 IIIrd. Inlet port	:	As per Design
6. <u>Minimum Dimensions</u>		
6.1 Diameter of well	:	10.00 m (internal) below discharge floor level
6.2 Diameter of Pump House	:	10.00 m
6.5 Balcony at Motor floor	:	1.0 m width

7. **Minimum Head room at Various Floors**

- 7.1 Between Motor floor & Mazinine floor : 4.00 m
- 7.2 Mazinine floor to top of roof slab : 4.25 m

8. **Minimum staining thickness**

8.1 Upto discharge flow level	:	More than 750 mm
8.2 From DF Level to Motor floor level	:	300 mm
8.3 Above motor floor level	:	250 mm
8.4 RCC Column	:	230 mm x 230 mm 8 Nos. from the ring beam of the staining

9 **Design Loadings**

9.1 **On discharge floor**

Live load	:	1500 kg/sqm
Concentrated load	:	8.0 T
No. of delivery mains	:	3 nos.
Common manifold	:	600 mm dia MS Pipes

9.2 **On Motor floor**

Live load	:	1500 kg/sqm.
Concentrated load of each motor	:	8 MT
No. of Motors	:	5 Nos.
Double drum Hoist with grab	:	2.00 MT
9.3 For stairs inside the well	:	500 kg/sqm
9.4 For stair case from bridge to Motor floor	:	500 kg/sqm
9.5 Gantry support	:	3 Tones + Load of crane
9.6 Top slab of pump house	:	1500 kg/sqm

10 **Seismic Zone** : Zone-II Importance factor 1.5

11. **MECHANICAL ITEMS**

(a) Connecting mains

1. Type	:	D.I. K-9. as per IS::5382/85 including testing of joint (laying Conforming to IS 12288 : 1987
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(b) Gantry Crane

1. Type	:	Single Girder, electrically operated Circular Traveling gantry
2. Capacity	:	3 MT
3. Operation level	:	Motor Floor

- (c) 1. Electrically operated of hoist with : Capacity 2.0 Ton.
0.5 cum Grab bucket
2. Operation level : Discharge floor
- (d) Control valves on Connecting mains
1. Type : Sluice valves as per IS:14846:2000
2. Operational level : motor floor level
3. class : PN 1.6

12 **SPECIAL FEATURES :**

The structure will be designed for Seismic zone II.

GENERAL CONDITIONS :-

1. No extra payment for dewatering required for natural, artificial or manmade reason or rock excavation will be payable for any depth or for repetitive work.
2. The bearing capacity of the foundation should be ascertained by the firm/contractor for which a test certificate will have to be submitted by the firm/contractor to the JMC, Before submitting the design.
3. The prices should be firm inclusive of all taxes, handling, storage, transportation, wages, watch and ward etc. at the site of work.
4. Payment shall be made as per breakup schedule given in ANNEXURE 'G' as per clause - 15. The bank charges and interest on delay in payment if any will not be paid by the department.
5. All Switches, cables, starters, electrical fixtures/equipment shall be of best available standard made such as L & T, Siemens, GEC, Philips etc.
6. Weather proof Exterior painting on exterior & Acrylic Emulsion in two coats on inside walls including good architectural appearance of plant should be provided.
7.
 - a. Surplus excavation earth should be filled and leveled in the area as per the direction of Engineer-in-charge and in no case disposed off near the site .
 - b. The pump house should have adequate space for free movement after installation of all pump, machinery, pipes and accessories.
 - c. Anti termite treatment to entire structure below ground level shall be provided.

The firms/contractors are directed to submit the detail designs, plan and elevation of complete structure showing the dimensions of all components and other details as per the specifications attached here. 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 & BOQ for intake wall, approach bridge, coffer dam etc. complete as directed by the Engineer-in-charge in Indravati river. 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:-

Preparation of Contour plan general arrangement drawing, layout of site, cross-section of site on proper scale as directed by the department.

Architectural/ Structural drawing having following items :-

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.

Preparation of BOQ on prevailing schedule of rates, architectural drawing / structural drawing for technical vetting. The designs and drawings shall be got approved from Govt. Engineering College in CG/ NIT and then submitted to JMC. Complete set of drawing and estimate will be submitted in 6 sets.

ANNEXURE – E-2

DETAILED TECHNICAL SPECIFICATIONS MECHANICAL WORKS

**Schedule For Items For Raw Water Vertical Turbine Pump Sets (At Intake Well) & Clear Water
Pump Sets At Wtp**

SCOPE OF WORK & SPECIFICATION OF WORK :

SCOPE OF WORK

Design, Supply, Erection, Commissioning, Testing and trial run for 3 months complete for following works under Augmentation Water Supply Scheme for Jagdalpur :-

Four nos. Raw Water VT pumping sets of having discharge 148 LPS and 51 m head at proposed Raw water site along with suitable 0.415 KV LT motors with allied electrical and mechanical equipments, control panel, cable, manifold pipe system, valves etc. complete with 33/0.415 KV electric substation consisting of 2 nos. 33/.415 KV, 500 KVA capacity outdoor transformer, isolator, lightening arrester, control panel, etc..

AND

Four Nos. clear water horizontal split casing centrifugal pumping sets each of discharge capacity 142 LPS with 50 m head at proposed WTP site along with suitable 0.415 KV LT motors with allied electrical and mechanical equipments, control panel, cable, manifold pipe system, valves etc. complete with 33/0.415 KV electric substation consisting of 2 nos. 33/.415 KV, 500 KVA capacity outdoor transformer, isolator, lightening arrester, control panel, etc..

The main items of works are given in annexure E-2.

PART “A”

DETAILED SPECIFICATION OF RAW WATER PUMPSET (PROPOSED)

1 VERTICAL TURBINE PUMPS:-

The pumping capacity and length of column assembly of each pump is as **specified in annexure “E-2”**.

SPECIFICATION FOR RAW WATER VERTICAL TURBINE PUMPS

1.1 General Design Consideration :

The pumps shall be vertical turbine wet pit type non pull out design with multi stage bowl assembly, directly coupled through vertical hollow shaft motor without speed reduction gear. These pumps are to be installed in the jack well cum pump house in Raw Water Pumping Station to pump the turbid water.

Pumps shall be designed so as to have a maximum flow capacity of not less than 120% of the rated flow capacity. The pumps shall be designed so as to have a stable non over loading characteristic. The shut off head should not exceed 120% of duty point head on higher side and 80 % on lower side.

The impeller adjustment shall be designed in such a way that impellers run free in any installed condition in spite of the extension of line shaft caused by hydraulic down-thrust and

the weight of shafts and impellers.

The pump should be of efficiency of 80% or above at duty point.

1.2 **General specifications** :-

The pumps shall be complete with bowl assembly, column pipe, sub floor discharge head, line shaft, foundation plate/sole plate, basket strainer, motor foot stool and all other necessary accessories. The pumps should generally comply with the requirements of following standards.

- i) I.S. 1710 - Vertical turbine pumps for raw water.
- ii) I.S. 5120 - Technical requirement of rotor dynamic
Special purpose pumps.

1.3. **Impeller shaft** : -

The impeller shaft shall be of stainless steel with renewable stainless steel sleeves at bearing portion. The impeller shaft shall be guided by bearings provided in each bowl. The butting faces of the shaft shall be machined square to the axis and the shaft shall be chamfered on the edges. The shaft shall have a surface finish of 0.75 micron as per I.S. 3073-1967.

1.4. **Impellers** :

The impeller may be of closed type made of CF8M material statistically and dynamically balanced. The impeller shall be free of any casting defect and shall be properly machined. All the water passages shall be smooth finished and coated. The impellers shall be fastened with shaft thrust collar and keys.

1.5. **Bowls** :

The bowls shall be made of cast iron smoothly finished and free from any casting defects. The bowls shall be capable of withstanding hydrostatic pressure equal to twice the pressure at rated capacity or 1.5 times of the shut off head whichever is greater. The bowls shall be equipped with replaceable seal rings on the suction side of impellers in case of closed impellers. The water passage in the bowls shall be smooth.

1.6. **Line shafts** :

The line shaft shall be made of SS410 and shall be finished with inter changeable section, have a length of .75 m , 1.5 m or 3 m. The butting faces of shafts shall be machined square to shafts axis and the shafts ends shall be chamfered on the edges. To ensure the correct alignment of shafts, they shall be straight within 0.125 mm for 3 m length total dial indicator reading. The shaft shall not have the surface roughness more than 0.75 micron as per IS 3073-1967. The shaft coupling shall be designed with a minimum factor of safety two for shafts and shall have left hand or right hand threads depending on the direction of rotation of pump to tighten during the pump operation. The outside diameter of the coupling shall be concentric with the bore and with a small transverse hole in the middle. The shaft shall have the adequate strength to withstand all the forces at $\pm 20\%$ of the critical speed of shaft.

1.7 **Column pipe** :

The columns pipe shall be manufactured from the Heavy series of mild steel tube conforming to relevant Indian Standard Specifications. The column pipes shall be flanged and bolted and shall be complete with nuts and bolts the length of column section shall depend upon the design of sump well cum pump house and the installation. However, for handling, the length of each column pipe shall not exceed 1.50 m.

1.8 **Line shaft Bearings** :

The bearing shall be designed to be for proper lubrication. The line shaft bearing shall be of cut less rubber.

1.09 **Discharge head** :

The discharge head should be sufficiently strong to support the weight of the pump having outlet size as given in **annexure "E-2"**.

1.10 **Motor Foot Stool** :

The motor foot stool shall be of fabricated mild steel and shall be designed to take care of all the static and dynamic loads on it.

1.13 **Sole Plate** :

Each pump shall be provided with a heavy structural steel sole plate. Sole plate shall be

provided and grouted with foundation. The sole plate shall be designed to permit removal of entire pump without disturbing sole plate.

1.14 **BOLTS NUTS & WASHERS:-**

All bolts, nuts and washers shall be of superior quality and should be made of high tensile mild steel conforming to relevant Indian Standard Specifications.

TESTING:-

The department can depute the Engineer-In-Charge of work to witness inspection for routine test at manufacturer's place with respect to their characteristic and performance.

FIELD TEST:-

The field test shall be carried out as per IS: 1520-1972 & 5120-1965.

GUARANTEED PERFORMANCE & TECHNICAL PARTICULARS:-

The contractor shall submit the details of guaranteed performance & technical particulars as desired in the Performa enclosed vide schedule's with the tender along with the preliminary out line drawing indicating principal dimensions & weight of pumping equipments and cross-section drawing indicating the assembly of pumps & major parts thereof with materials of constructions and special features. Complete descriptive and illustrated literature on the equipment and accessories offered.

2. **PRESSURE INDICATION DEVICES:-**

Each pump shall be provided with pressure gauges along with siphon tube and cork of best quality. The pressure gauges should be of Aluminum casting body with glycerin field. The dial size shall be of 100mm.

3. **SPECIFICATIONS FOR 415-V INDUCTION VERTICAL HOLLOW SHAFT MOTORS:**

3.1 **TYPE:**

The VHS motor shall be Induction type suitable to operate on 415 V, 3 phases, 50 cycles A.C. supply directly coupled to turbine pump having nominal speed of 1500 RPM generally conforming to IS: 325 of H.Pas specified in **annexure "E-2"** or as per clause 3.3 which ever is higher.

3.2 **VARIATION IN SUPPLY VOLTAGE**

The motors shall be capable of delivering rated out put and rated power factor with following variations:-

Voltage	=	± 10%
Frequency	=	± 5%
Combined	=	As per IS 325

3.3 **RATED CAPACITY:**

The minimum conditions rated capacity of motors shall be such that it meets the power requirements of pumps in the complete range of its operation. It shall also provide on additional power requirement on the motor. By 10% at the duty point of operation or 5% of maximum power drawn by pump or as specified in **annexure E-2**, which ever is higher among the three option.

3.4 **ACCELERATION CHARACTERISTICS:**

The acceleration characteristics of motor shall be matched with the driven equipment so that acceleration is obtained without over heating of motor.

3.5 **METHOD OF STARTING:**

The motors shall be designed for star/delta starting at full voltage with starting current not

exceeding four times the rated full load current. The motor shall also be designed for a minimum pull out torque of 200%.

3.6 NUMBER OF START:

Motor when started with the drive imposing its full starting torque under the specified supply voltage variation shall be capable of withstanding at least one successive starts from hot condition two start from cold condition without damage to the winding.

3.7 CLASS OF INSULATION:

The motor winding shall be provided with insulation conforming to thermal class "F". The maximum temperature rise of the winding shall not exceed the limits specified for class "F" insulation of the winding shall not exceed the limits specified as per class "F" insulation. The insulation shall be given tropical and fungicidal treatment for successful operation of motor in hot humid tropical climate. It shall be of thermos setting type and shall remain unaffected by heat. The coils shall be highly uniform with uniform insulation strength and uniform dielectric losses.

3.8 MOTOR CONSTRUCTION:

The motor construction shall be suitable for easy dismantling and reassemble at site with the help of simple overhead crane. The motor shall be of core pack construction attached to the stator frame to facilitate easy removal and replacement of the winding for maintenance purpose. The overhead for winding at both ends of the core shall be accessible for usual inspection without resorting to major dismantling.

3.9 MOTOR FRAME:

Motor frames shall be of rigid fabricated steel they shall be suitably annealed to eliminate any residual stresses introduced during process of fabrication and machining

3.10 STATOR LAMINATIONS:-

Stator laminations shall be made from suitable grade sheet steel varnished on higher side and shall be adequately designed to over heating during starting and running conditions stipulated above.

3.11 ROTOR SHORT CIRCUITING RINGS:

Rotor short circuiting and rings shall be such that it is free to move with expansion of bars without distortion. The connections of the bars to the end rings shall be made by brazing.

3.12 LOCKING ROTOR WITH STAND TIME:-

Locked rotor with stand time under hot conditions at 110% voltage shall be more than starting time at minimum permissible voltage by at least two seconds.

3.13 TYPE OF ENCLOSURE & DEGREE OF PROTECTION.

The degree of protection provided by the enclosures of motor shall conform to IS:4691. The enclosure for the motors shall be SPDP (IP23).

3.14 SHAFT INSULATION:

Suitable insulation shall be provided on shaft/bearing housing to prevent shaft current. The insulation provided shall be such that it shall retain its dielectric properties even after itshandled for number of times during dismantling and reassemble.

3.15 BEARING ASSEMBLY:

Bearing assembly shall be such that it prevents dust getting to the bearing. Further, bearing lubricant shall not find access to the motor winding. The bearing assembly shall be provided

with proper lubricating nipples.

3.16 EARTHING:-

The motor body shall have two separate earthing terminals for earthing in compliance with I.E. Rules.

3.17 DIMENSIONS OF MOTORS:-

Motors shall be properly dimensioned to have greater stability and low vibration limit.

3.18 TESTING:-

All the motors shall be routine tested at manufacturer's workshop and test certificate shall be provided with motors.

4. SLUICE VALVES:

1. DESIGN REQUIREMENT:

A. Sluice valves shall be I S I mark and conforming to IS 14846-2000, Additionally, they should also meet specific requirement as stated.

B. Spindle, thrust collar and operating arrangement including hand wheel should be designed insuch a way that one adult male is able to operate the valve against full differential pressure by exerting no more than 16 kgf effort (Pull and push) on the hand wheel.

2. FEATURES OF CONSTRUCTION:

a. Valves shall have inside screw, non rising spindle.

b. Valves shall be with appropriate bushing arrangement for replacement of packing without leakage (300 NB and above)

d. Valves 300 mm dia & above shall be provided with an antifriction device/ ball trust bearing arrangement to minimize friction between spindle collar and casting. These should be housed away from wet chamber and should have facility for periodic greasing.

e. Valves of size 350 mm dia and above shall be provided with enclosed, grease packed spur/ worm gear box.

f. Valves 450 mm dia and above shall be provided with a drain and air plug.

g. Valves shall be fitted with gunmetal channel and shoe arrangement in case these are electrically operated, the clearance being controlled between 2 to 3 mm throughout the door travel. The channels should be fixed from inside Puncturing the body for fixing of channels is not allowed.

h. All valve doors when fully closed, would ensure door faces are riding on body seat ring by at least 50% of the width of seat ring and there is sufficient room for wear travel.

i. All face and seat rings will be force/press fitted and additionally riveted (300 NB & above) to the recess in the CI casting.

j. Nominal size of the valve shall be cast on the body of the valve:

DATA

– Rating (Kg/sq.mm) : PN 1.6

- Drilling : IS 1538 Table 4 & 6
3. SHOP TESTING:
- HYDRO TEST
- Seat leakage : 16 Kg/cm² (5 min) – for PN 1.6
- Back seat leakage : 8 Kg/cm² (2 min) – for PN 1.6
- Body : 24 Kg/cm² (5 min) – for PN 1.6
- Each pump shall be provided with Sluice valve to be provided on delivery side of size as specified in **annexure “E-2”**.
- On manifold pipe line one numbers of sluice valve is to be provided of size as specified in **annexure “E-2”**.

5. NON RETURN VALVES:

1. The valves shall be I S I mark and conforming to IS 5312 Part 1 (Single Door Type) for sizes 80 to 600 mm dia and IS 5312 Part II (Multi Door Type) for sizes above 600 mm dia.
2. The valve shall be suitable for mounting on a horizontal pipeline and flow direction shall be clearly embossed on the valve body.
3. Valves shall have in built quick closing non-slam characteristics achieved by suitable disposition of weight on door and the hydraulic passage. No spring loaded/ spring return action or external dampening arrangement is acceptable.
4. Valves of multi door type shall be additionally provided with a supporting foot.
5. All faces and seat rings will be force/press fitted and additionally riveted (300 NB & above) to the recess in the CI casting.

DATA:

1. Size :
2. Rating (Kg/sq.cm) : PN 1.6
3. Drilling : IS 1538 Table 4 & 6
4. Accessories :
- By-Pass Arrangement : Required

SHOP TESTING :

B) HYDRO-TEST

- Seal Leakage : 16 Kg/cm² (5 min) – For PN 1.6
- Body : 24 Kg/cm² (5 min) – For PN 1.6
- Each pump shall be provided with Non Return valve to be provided on delivery side of size as specified in **annexure “E-2”**.
- On manifold pipe line one numbers of Non Return valve is to be provided of size as specified in **annexure “E-2”**.

6. BUTTERFLY VALVES:

1. DESIGN REQUIREMENT:

- A. Butterfly valves shall be I S I mark and conforming to BS 5155 and must also meet the following requirement.
- B. Cone-sphere eccentric design.
- C. Generously designed disc, shaft and cotter pins, ensure that actual working stress at designed pressure never exceeds 40% of the yield strength of material.
- D. Gear box must be generously designed and must be rated for at least 25% more than the torque required to crack open the valve at designed pressure. Also, one adult male is able to

- operate the valve against full differential pressure by existing not more than 10 kgf pull and push on the hand wheel.
- E. Valves should be drop tight and designed for flow in either direction.
2. FEATURES OF CONSTRUCTION:
- A. Valve shall be U – section wafer long/ double flanged short body type.
- B. Valves to have two stub shaft, extending at least 2 times their dia, within a robust housing on either side fitted with PTFE bearing.
- C. The valve seat on the body should be integral with it to preclude any leakage from beneath the ring/ “O” ring when the disc is closed.
- D. The synthetic rubber seal ring should be of ample proportion, “T” shaped and must be fastened to the disc by a one piece retaining ring in such a way that the seal ring does not become loose in service.
- E. In addition to providing end of travel stops in the gear box, an integral stopper in the body be provided to prevent over travel of disc during closure.
- F. Gear box must be self locking type, with a continuous indicator. Traveling nut and screw type of gear boxes are not acceptable.
- G. Nominal size of the valve must be cast on the valve body.

DATA

– Rating (Kg/sq.mm)	:	PN 1.6
– Drilling	:	IS 1538 Table 4 & 6

3. SHOP TESTING:

- | | | |
|----------------|---|--|
| – Seat leakage | : | 16 Kg/cm ² (5 min) – for PN 1.6 |
| – Body | : | 24 Kg/cm ² (5 min) – for PN 1.6 |
- Each pump shall be provided with BUTTERFLY valve to be provided on delivery side of size as specified in **annexure “E-2”**.

➤ **VALVE ACTUATOR**

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 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 440Volt +/- 10%, 3 phase, 50Hz 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.

7. **DELIVERY PIPES:**

Providing, laying & jointing of D/F, M.S. Delivery pipes of lengths as per site requirement and size of pipe shall be as specified in **annexure “E-2”**.

8. DISMANTLING JOINT:

Each pump delivery pipe line and one number on manifold pipe line shall be fitted with D/F dismantling joint of size as specified in **annexure “E-2”** . The dismantling joint shall be designed in such manner so that gap is created in pipe line for easy removing of pump, valves, pipes etc., for maintenance.

9. COMMON MANIFOLD PIPES:

All the pumps delivery pipeline shall be connected to common manifold pipe which is to be provided as per size as specified in **annexure “E-2”**.

10. CABLES:

Providing, and laying of be I S I mark LT Cable for 415 Volts, of Aluminum conductor of 3½ core, having PVC Insulated, color code, wrapped with appropriate filler and care binder and single layer galvanized steel wire armoring for multi-core and overall PVC Jacket. Cable shall be laying, fitted with Lugs, Gland, etc., as required from Transformer to Panel.

1 x 3½ core x of size as specified in **annexure “E-2”**–

Providing, and laying be I S I mark LT Cable for 415 Volts, of Aluminum conductor of 3½ core, having PVC Insulated, color code, wrapped with appropriate filler and care binder and single layer galvanized steel wire armoring for multi-core and overall PVC Jacket. Cable shall be laying, fitted with Lugs, Gland, etc., as required from Panel to Motor.

1 x 3½ core x of size as specified in **annexure “E-2”**–

11. FLOWMETER :-

On manifold pipe line one numbers of flow meter will have to be installed having of size as specified in **annexure E2**, flow meter shall be electro magnetic type having additional display in pump house also through cable.

TECHNICAL SPECIFICATION FOR ELECTROMAGNETIC FLOW METER SHALL BE AS UNDER:-

The diam. of electromagnetic flow meter should be equal to the Header size of pipe line to be erected between pipe line with two sides flanged. The meter should provided with 25 mtr. Cable and signal convertor should be mounted separately on the nearest wall in the pump house.

Electromagnetic Flow Sensor

Type	: Pulsed DC
Flow tube	: SS 304
Coil housing	: Fully welded Sheet Steel, PU coated
Liner	: Hard Rubber
Electrodes	: SS 316
Grounding type	: Rings
Grounding ring material	: SS 316
Process connection	: Flanged PN10.
Flanges	: CS, SORF
Area classification	: Non-Hazardous
Protection class	: IP 68

Electromagnetic Signal Converter

Mounting	: Separate
Type	: Microprocessor Based
Output	: 4-20mA, HART + Pulse/Frequency + Status
Accuracy	: $\pm 0.5\%$ of measured value
Max load	: approx..500 Ohms,
Power consumption	: 10 VA
Display	: Large back lit LCD Display
Parameters	: Actual flow rate, totalized flow (8 digit), flow direction, flow Velocity.
Diagnostics	: Empty pipe detection
Local indication	: Programmable
Power supply	: 230 VAC
Housing	: Die cast Aluminum with PU finish
Cable entry	: M20 x 1.5
Area classification	: Non-Hazardous
Protection class	: IP 67
Interchangeability	: Fully Interchangeable with all sizes of flow sensors

12. CONTROL PANEL BOARDS:

The LT A.C. Switch Board shall be of 440 Volts, 3 Phase and neutral, 50 Hz. Distribution board, indoor type, sheet clad by 1.5mm thick CRC sheet over M.S. Channel structure frame, floor mounted free standing type, cubical pattern, dust & vermin proof, and shall comprise of following.

2 Nos. of Incoming feeders each comprising of:-

- 1 No. 630 Amps MCCB.
- 1 No. of 96sq.mm flush type ampere meter with selector switch.
- 1 No. of 96sq.mm flush type volt meter with selector switch.
- 1 Set. of Indication Lamps for all three phase, ON/OFF, Auto Trip.
- 1 Set. of CT's for protection and metering.
- 1 No. of over current and earth fault protection.
- 1 No. Multifunction meter.
- The bus bar shall be suitable for full load of Ampere of MCCB of incomer.

1 No. Bus couplar between 2 incoming feeders comprising of
1 No. 630 Amp.MCCB with interlocking arrangement both electrical as well as mechanical.

Outgoing feeder with front operated rotary handles facilities shall be provided as under:

- 4 Nos. of 315 Amps MCCB for out going with over load and short circuit protection
- 1 No. of 32 Amps 4P MCCB for auxiliary loads.
- 1 No. of 63 Amps 4P MCCB for auxiliary loads.
- 4 Set. of Ampere Meter for motor with selector switch.
- 4 Sets. of Capacitor of 50 KVAR with 125 Amp. MCCB.

- 4 Nos. 4P MCB for valve actuators.

The bus bar shall be suitable for 3 phase, 4 wire and shall be of 250 amps. The bus bars shall be with colored insulated sleeves. The supports shall be suitably spaced to give mechanical rigidity for with standing stress due to system fault. The panel compartments shall have adequate space for termination of incoming and outgoing feeder cables equipped with gland, lugs etc. The contractor shall also provide rubber hand gloves, rubber mattings in front of panel boards.

13. SOFT STARTERS

The soft starter panel shall be suitable on operating voltage $415V \pm 10\%$ 3ph., 4 wire and 240 V AC $\pm 10\%$ control supply voltage at $50Hz \pm 5\%$ to be provided on line side of motor for pump application as per IS 5553 (part 3) of 2mm thick CRCA sheet, with IP 41 protection, natural air cooled, duly epoxy power coated, with bottom side removable cable gland plates of non magnetic material.

The Estaster should limit the starting current of motor between 3 to 3.5 of fault load current, with Start/Stop/Reset – Push buttons, Bus bar shall be of Electolytic Copper Conductor, of suitable capacity with 'H' class insulation with temperature rise limit upto class 'B' & 50° Amp. tempreture.

The starter should have powe contactors as a by pass device having follosing protection relay (O/L, SP, EF, LR, UC) 1)U/O voltage relay. Indications by LED type indicating lamps.

14. CIVIL WORK FOR ERECTION AND COMMISSIONING OF ENTIRE JOB.

Foundation as per site condition of pump set, valves support, etc with help of 1:2:4 Cement Concrete. 1 Job.

Installation of all above supplied items as per rules along with earthing of all electrical equipments as per IE rules. 1 Job.

L.T. Panel board incorporating ammeter , voltmeter, switches, starter, earth leakage, circuit brakers, single phasing preventer, water level guard, capacitor etc. EOT Crane, Tools, Spares and lifting arrangement will also be provided by the contractor.

PART “B”
DETAILED SPECIFICATION OF CLEAR WATER PUMPSET (PROPOSED)

1. **PUMP:-**

The pumping capacity of each pump will be as given in **annexure “E-2”**.

1.1 **GENERAL DESIGN CONDITIONS:-**

The pumps shall Horizontal split casing type of Single/Two Stage Centrifugal type. The pumps shall be designed to operate satisfactory while handling positive or negative suction as specified in **annexure “E-2”** lift from all caused, the rotating elements of pumps will be dynamically balanced and over stressing should not occur due to sudden failure of power. Reverse rotation should not damage the pumps,

Pumps shall be designed so as to have a maximum flow capacity of not less than 120% of the rated flow capacity. The pumps shall be designed so as to have a stable non over loading characteristic. The shut off head should not exceed 120% of duty point head on higher side and 80 % on lower side.

The pump should be designed for minimum efficiency 75% and HP of motor as given in **annexure “E-2”** at duty point.

1.2 **MATERIAL OF CONSTRUCTION OF PUMP.**

1.2A **PUMP CASING:-**

The casing shall be Cast Iron ensuring smoothness of hydraulic passages resulting in high efficiency. The delivery flange is vertical.

1.2B **IMPELLERS:-**

The impeller shall be enclosed type. It is hydraulically balanced by its inherent design. The impeller is statically and dynamically balanced of Bronze.

1.2C **PUMP SHAFT:-**

The pump shaft shall be manufactured from high tensile carbon steel and provided with sleeves.

1.2D Facilities for gland drainage shall be provided and gland lubrication shall be suitably arranged by means of providing connections from the discharge volute of the pump casing.

1.2E **BOLTS NUTS & WASHERS:-**

All bolts, nuts and washers shall be of superior quality and should be made of high tensile mild steel conforming to relevant Indian Standard Specifications.

TESTING:-

The department can depute the Engineer-In-Charge of work to witness inspection for routine test at manufacturer's place with respect to their characteristic and performance.

FIELD TEST:-

The field test shall be carried out as per IS:1520-1972 & 5120-1965.

GUARANTEED PERFORMANCE & TECHNICAL PARTICULARS:-

The contractor shall submit the details of guaranteed performance & technical particulars as

desired in the Performa enclosed vide schedule's with the tender along with the preliminary out line drawing indicating principal dimensions & weight of pumping equipments and cross-section drawing indicating the assembly of pumps & major parts thereof with materials of constructions and special features. Complete descriptive and illustrated literature on the equipment and accessories offered.

2. **PUMP COUPLING:-**

This shall be of flexible pin type equipped with a suitable coupling guard.

3. **BASE PLATE.**

Each pump shall be provided with a heavy structural base plate & foundation bolts. Base plate shall be provided and grouted with foundation and shall be designed to permit removal of entire pump without disturbing base plate.

4. **SPECIFICATIONS FOR 415-V INDUCTION MOTORS:**

4.1 **TYPE:**

The motor shall be Induction type suitable to operate on 415 V, 3 phase, 50 cycle A.C. supply directly coupled to pump having nominal speed of 1500 RPM Generally conforming to IS:325 of H.Pas specified in **annexure "E-2"** or as per clause 4.3 which ever is higher.

4.2 **VARIATION IN SUPPLY VOLTAGE**

The motors shall be capable of delivering rated out put and rated power factor with following variations:-

Voltage	=	± 10%
Frequency	=	± 5%
Combined	=	As per IS 325

4.3 **RATED CAPACITY:**

The minimum conditions rated capacity of motors shall be such that it meets the power requirements of pumps in the complete range of its operation. It shall also provide on additional power requirement on the motor. By 10% at the duty point of operation or 5% of maximum power drawn by pump or as specified in **annexure E-2**, which ever is higher among the three option.

4.4 **ACCELERATION CHARACTERISTICS:**

The acceleration characteristics of motor shall be matched with the driven equipment so that acceleration is obtained without over heating of motor.

4.5 **METHOD OF STARTING:**

The motors shall be designed for star/delta starting at full voltage with starting current not exceeding four times the rated full load current. The motor shall also be designed for a minimum pull out torque of 200%.

4.6 **NUMBER OF START:**

Motor when started with the drive imposing its full starting torque under the specified supply voltage variation shall be capable of withstanding at least one successive starts from hot condition two start from cold condition without damage to the winding.

4.7 **CLASS OF INSULATION:**

The motor winding shall be provided with insulation conforming to thermal class "F". The maximum temperature rise of the winding shall not exceed the limits specified for class "F"

insulation of the winding shall not exceed the limits specified as per class "F" insulation. It shall be of thermos setting type and shall remain unaffected by heat. The coils shall be highly uniform with uniform insulation strength and uniform dielectric losses.

4.8 MOTOR CONSTRUCTION:

The motor construction shall be suitable for easy dismantling and reassemble at site with the help of simple over head crane. The motor shall be of core pack construction attached to the stator frame to facilitate easy removal and replacement of the winding for maintenance purpose. The over head for winding at both ends of the core shall be accessible for usual inspection without resorting to major dismantling.

4.9 MOTOR FRAME:

Motor frames shall be of rigid fabricated steel they shall be suitably annealed to eliminate any residual stresses introduced during process of fabrication and machining

4.10 STATOR LAMINATIONS:-

Stator laminations shall be made from suitable grade sheet steel varnished on higher side and shall be adequately designed to over heating during starting and running conditions stipulated above.

4.11 ROTOR SHORT CIRCUITING RINGS:

Rotor short circuiting and rings shall be such that it is free to move with expansion of bars without distortion. The connections of the bars to the end rings shall be made by brazing.

4.12 LOCKING ROTOR WITH STAND TIME:-

Locked rotor with stand time under hot conditions at 110% voltage shall be more than starting time at minimum permissible voltage by at least two seconds.

4.13 TYPE OF ENCLOSURE & DEGREE OF PROTECTION.

The degree of protection provided by the enclosures of motor shall conform to IS:4691. The enclosure for the motors shall be TEFC.

4.14 SHAFT INSULATION:

Suitable insulation shall be provided on shaft/bearing housing to prevent shaft current. The insulation provided shall be such that it shall retain its dielectrical properties even after it's handled for number of times during dismantling and reassemble.

4.15 BEARING ASSEMBLY:

Bearing assembly shall be such that it prevents dust getting to the bearing. Further, bearing lubricant shall not find access to the motor winding. The bearing assembly shall be provided with proper lubricating nipples.

4.16 EARTHING:-

The motor body shall have two separate earthing terminals for earthing in compliance with I.E. Rules.

4.17 DIMENSIONS OF MOTORS:-

Motors shall be properly dimensioned to have greater stability and low vibration limit.

4.18 TESTING:-

All the motors shall be routine tested at manufacturer's workshop and test certificate shall be provided with motors.

5. **BUTTERFLY VALVES:**

1. DESIGN REQUIREMENT:

- A. Butterfly valves shall be I S I mark and conforming to BS 5155 and must also meet the following requirement.
- B. Cone-sphere eccentric design.
- C. Generously designed disc, shaft and cotter pins, ensure that actual working stress at designed pressure never exceeds 40% of the yield strength of material.
- D. Gear box must be generously designed and must be rated for at least 25% more than the torque required to crack open the valve at designed pressure. Also, one adult male is able to operate the valve against full differential pressure by exerting no more than 10 kgf pull and push on the hand wheel.
- E. Valves should be drop tight and designed for flow in either direction.

2. FEATURES OF CONSTRUCTION:

- A. Valve shall be U – section wafer long/ double flanged short body type.
- B. Valves to have two stub shaft, extending at least 2 times their dia, within a robust housing on either side fitted with PTFE bearing.
- C. The valve seat on the body should be integral with it to preclude any leakage from beneath the ring/ “O” ring when the disc is closed.
- D. The synthetic rubber seal ring should be of ample proportion, “T” shaped and must be fastened to the disc by a one piece retaining ring in such a way that the seal ring does not become loose in service.
- E. In addition to providing end of travel stops in the gear box, an integral stopper in the body be provided to prevent over travel of disc during closure.
- F. Gear box must be self locking type, with a continuous indicator. Traveling nut and screw type of gear boxes are not acceptable.
- G. Nominal size of the valve must be cast on the valve body.
- H. The valve shall generally conform to relevant C.I. BS:5155 Wafer (Short), Valve shall be **warm gear operated** for smooth operation.

DATA

– Rating (Kg/sq.mm)	:	PN 1.6
– Drilling	:	IS 1538 Table 4 & 6

3. SHOP TESTING:

– Seat leakage	:	16 Kg/cm ² (5 min) – for PN 1.6
– Body	:	24 Kg/cm ² (5 min) – for PN 1.6

- Each pump shall be provided with BUTTERFLY valve to be provided on delivery side of size as specified in **annexure “E-2”**.

➤ **VALVE ACTUATOR**

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 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 440Volt +/- 10%, 3 phase, 50Hz 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.

6. NON RETURN VALVES:

1. The valves shall be I S I mark and conforming to IS 5312 Part 1 (Single Door Type) for sizes 80 to 600 mm dia and IS 5312 Part II (Multi Door Type) for sizes above 600 mm dia.
2. The valve shall be suitable for mounting on a horizontal pipeline and flow direction shall be clearly embossed on the valve body.
3. Valves shall have in built quick closing non-slam characteristics achieved by suitable disposition of weight on door and the hydraulic passage. No spring loaded/ spring return action or external dampening arrangement is acceptable.
4. Valves of multi door type shall be additionally provided with a supporting foot.
5. All faces and seat rings will be force/press fitted and additionally riveted (300 NB & above) to the recess in the CI casting.

DATA:

1.	Size	:	
2.	Rating (Kg/sq.cm)	:	PN 1.6
3.	Drilling	:	IS 1538 Table 4 & 6
4.	Accessories	:	
	By-Pass Arrangement	:	Required

SHOP TESTING :

B) HYDRO-TEST

Seal Leakage : 16 Kg/cm² (5 min) – For PN 1.6
Body : 24 Kg/cm² (5 min) – For PN 1.6

- Each pump shall be provided with Non Return valve to be provided on delivery side of size as specified in **annexure “E-2”**.
- On manifold pipe line one numbers of Non Return valve is to be provided of size as specified in **annexure “E-2”**.

6. **SLUICE VALVES:**

1. DESIGN REQUIREMENT:

- A. Sluice valves shall be I S I mark and conforming to IS 14846, additionally, they should also meet specific requirement as stated.
- B. Spindle, thrust collar and operating arrangement including hand wheel should be designed in such a way that one adult male is able to operate the valve against full differential pressure by exerting no more than 16 kgf effort (Pull and push) on the hand wheel.

2. FEATURES OF CONSTRUCTION:

- a. Valves shall have inside screw, non rising spindle.
- b. Valves shall be with appropriate bushing arrangement for replacement of packing without leakage (300 NB and above)
- c. Valves 300 mm dia & above shall be provided with an antifriction device/ ball trust bearing arrangement to minimize friction between spindle collar and casting. These should be housed away from wet chamber and should have facility for periodic grasing.
- d. Valves of size 350 mm dia and above shall be provided with enclosed, grease packed spur/ worm gear box.
- e. Valves 450 mm dia and above shall be provided with a drain and air plug.
- f. Valves shall be fitted with gunmetal channel and shoe arrangement in case these are electrically operated, the clearance being controlled between 2 to 3 mm throughout the door travel. The channels should be fixed from inside Puncturing the body for fixing of channels is not allowed.
- g. All valve doors when fully closed, would ensure door faces are riding on body seat ring by atleast 50% of the width of seat ring and there is sufficient room for wear travel.
- h. All face and seat rings will be force/press fitted and additionally riveted (300 NB & above) to the recess in the CI casting.
- i. Nominal size of the valve shall be cast on the body of the valve:

DATA

– Rating (Kg/sq.mm) : PN 1.6
– Drilling : IS 1538 Table 4 & 6

3. SHOP TESTING:

HYDRO TEST

– Seat leakage : 16 Kg/cm² (5 min) – for PN 1.6
– Back seat leakage : 8 Kg/cm² (2 min) – for PN 1.6

– Body : 24 Kg/cm² (5 min) – for PN 1.6

- Each pump shall be provided with Sluice valve to be provided on suction side of size as specified in **annexure “E-2”**.
- Each pump shall be provided with Sluice valve to be provided on delivery side of size as specified in **annexure “E-2”**.
- On manifold pipe line one numbers of sluice valve is to be provided of size as specified in **annexure “E-2”**.

7. **PRESSURE INDICATION DEVICES:-**

Each pump shall be provided with pressure gauges along with siphon tube and cork of best quality. The pressure gauges should be of Aluminum casting body with glycerin field. The dial size shall be of 100mm.

8. **FLOWMETER :-**

On manifold pipe line one numbers of flow meter will have to be installed having of size as specified in **annexure EI**, flow meter shall be electro magnetic type having additional display in pump house also through cable.

TECHNICAL SPECIFICATION FOR ELECTROMAGNETIC FLOW METER SHALL BE AS UNDER:-

The diam. of electromagnetic flow meter should be equal to the Header size of pipe line to be erected between pipe line with two sides flanged. The meter should provided with 25 mtr. Cable and signal convertor should be mounted separately on the nearest wall in the pump house.

Electromagnetic Flow Sensor

Type	: Pulsed DC
Flow tube	: SS 304
Coil housing	: Fully welded Sheet Steel, PU coated
Liner	: Hard Rubber
Electrodes	: SS 316
Grounding type	: Rings
Grounding ring material	: SS 316
Process connection	: Flanged PN10.
Flanges	: CS, SORF
Area classification	: Non-Hazardous
Protection class	: IP 68

Electromagnetic Signal Converter

Mounting	: Separate
Type	: Microprocessor Based
Output	: 4-20mA, HART + Pulse/Frequency + Status
Accuracy	: ± 0.5% of measured value
Max load	: approx..500 Ohms,
Power consumption	: 10 VA

Display	: Large back lit LCD Display
Parameters	: Actual flow rate, totalized flow (8 digit), flow direction, flow Velocity.
Diagnostics	: Empty pipe detection
Local indication	: Programmable
Power supply	: 230 VAC
Housing	: Die cast Aluminum with PU finish
Cable entry	: M20 x 1.5
Area classification	: Non-Hazardous
Protection class	: IP 67
Interchangeability	: Fully Interchangeable with all sizes of flow sensors

9. **SUCTION & DELIVERY PIPES:**

Providing, laying & jointing of D/F, M.S. Suction & Delivery pipes of lengths as per site requirement and size of pipe shall be as specified in **annexure E-2**.

10. **ENLARGER:**

Each pump shall be provided with M.S. D/F Eccentric Enlarger of size as specified in **annexure E-1** x suction size of pump.

Each pump shall be provided with M.S. D/F Concentric Enlarger of size as specified in **annexure E-1** x outlet size of pump.

11. **DISMANTLING JOINT:**

Each pump suction and delivery pipe line and one numbers on manifold pipe line shall be fitted with D/F dismantling joint of size as specified in **annexure E-2**. The dismantling joint shall be designed in such manner so that gap is created in pipe line for easy removing of pump, valves, pipes etc., for maintenance.

12. **BENDS:**

Each pump Suction pipe and delivery pipe may have to be provided with D/f bend as per site condition of size as specified in **annexure E-2**.

13. **COMMON MANIFOLD PIPES:**

All the pumps delivery pipeline shall be connected to common manifold pipe which is to be provided as per size as specified in **annexure E-2**.

14. **CABLES:**

Providing, and laying of be I S I mark LT Cable for 415 Volts, of Aluminum conductor of 3½ core, having PVC Insulated, color code, wrapped with appropriate filler and care binder and single layer galvanized steel wire armoring for multi-core and overall PVC Jacket. Cable shall be laying, fitted with Lugs, Gland, etc., as required from Transformer to Panel.
2 x 3½ core x of size as specified in **annexure E-2**–

Providing, and laying of be I S I mark LT Cable for 415 Volts, of Aluminum conductor of 3½ core, having PVC Insulated, color code, wrapped with appropriate filler and care binder and single layer galvanized steel wire armoring for multi-core and overall PVC Jacket. Cable shall be laying, fitted with Lugs, Gland, etc., as required from Panel to Motor.

1 x 3½ core x of size as specified in **annexure E-2-**

15. CONTROL PANEL BOARDS:

The LT A.C. Switch Board shall be of 440 Volts, 3 Phase and neutral, 50 Hz. Distribution board, indoor type, sheet clad by 1.5mm thick CRC sheet over M.S. Channel structure frame, floor mounted free standing type, cubical pattern, dust & vermin proof, and shall comprise of following.

2 Nos. of Incoming feeders each comprising of:-

- 1 No. 630 Amps MCCB.
- 1 No. of 96sq.mm flush type ampere meter with selector switch.
- 1 No. of 96sq.mm flush type volt meter with selector switch.
- 1 Set. of Indication Lamps for all three phase, ON/OFF, Auto Trip.
- 1 Set. of CT's for protection and metering.
- 1 No. of over current and earth fault protection.
- 1 No. Multifunction meter.
- The bus bar shall be suitable for full load of Ampere of MCCB of incomer.

1 No. Bus couplar between 2 incoming feeders comprising of

1 No. 630 Amp.MCCB with interlocking arrangement both electrical as well as mechanical.

Outgoing feeder with front operated rotary handles facilities shall be provided as under:

- 4 Nos. of 315 Amps MCCB for out going with over load and short circuit protection
- 2 Nos. of 32 Amps 4P MCCB for auxiliary loads.
- 2 Nos. of 63 Amps 4P MCCB for auxiliary loads.
- 4 Set. of Ampere Meter for motor with selector switch.
- 4 Sets. of Capacitor of 60 KVAR with 125 Amp. MCCB.
- 4 Nos. 4P MCB for valve actuators.

The bus bar shall be suitable for 3 phase, 4 wire and shall be of 250 amps. The bus bars shall be with colored insulated sleeves. The supports shall be suitably spaced to give mechanical rigidity for with standing stress due to system fault. The panel compartments shall have adequate space for termination of incoming and outgoing feeder cables equipped with gland, lugs etc. The contractor shall also provide rubber hand gloves, rubber mattings in front of panel boards.

16. SOFT STARTERS

The soft starter panel shall be suitable on operating voltage $415V \pm 10\%$ 3ph., 4 wire and 240 V AC $\pm 10\%$ control supply voltage at $50Hz \pm 5\%$ to be provided on line side of motor for pump application as per IS 5553 (part 3) of 2mm thick CRCA sheet, with IP 41 protection, natural air cooled, duly epoxy power coated, with bottom side removable cable gland plates of non magnetic material.

The Estaster should limit the starting current of motor between 3 to 3.5 of fault load current, with Start/Stop/Reset – Push buttons, Bus bar shall be of Electolytic Copper Conductor, of suitable capacity with 'H' class insulation with temperature rise limit upto class 'B' & 50° Amp. tempreture.

The starter should have powe contactors as a by pass device having follosing protection relay (O/L, SP, EF, LR, UC) 1)U/O voltage relay. Indications by LED type indicating lamps.

17. CIVIL WORK FOR ERECTION AND COMMISSIONING OF ENTIRE JOB.

- | | |
|---|--------|
| Foundation as per site condition of pump set, valves support, etc with help of 1:2:4 Cement Concrete. | 1 Job. |
| Installation of all above supplied items as per rules along with earthing of all electrical equipments as per IE rules. | 1 Job. |

PART “C”

DETAILED SPECIFICATION FOR VARIOUS ITEMS FOR SUB- STATION.

1. TRANSFORMER:

GENERAL REQUIREMENT:

Sub-station shall be provided with 2 Nos. each 500 KVA for Raw Water & Clear Water capacity transformer given in **annexure E-2** 33/0.415 kV double copper wound outdoor type transformer. The transformer of sub-station shall be installed on the specially constructed open to sky. Stage of about 1.0-1.5 M. height above ground level connected hence the entire cable connection arrangements of these transformer shall be closed type.

Voltage ration : 33/0.415 Kv
Vector group : Dyn-II and all the transformers shall be filled with mineral oil and ONAN cooling type suitable for outdoor installation and for parallel operation.

- ❖ Each transformer shall be capable of operation continuously at its rated output without exceeding the limits of temperature rise as given below over the ambient temperature of 50°C.

a. In Oil by thermometers. : 45°C
b. In winding by resistance : 55°C

- ❖ The loading of the transformer shall conform to IS:6600/1972.
- ❖ The transformers shall be so designed as to capable of withstanding without injury to the thermal mechanical effect of short circuits at the terminals of any winding for a period as specified in IS:2026.
- ❖ The transformer shall be capable of continuous operation at the rated output under the following conditions.

a. Voltage variation : $\pm 7.5\%$ of rated voltage.
b. Frequency variation : $\pm 3\%$ of rated frequency.
c. Combined voltage and frequency : 10%
variation.

- ❖ The transformer shall be free from any abnormal noise and vibration and have noise level below the limits prescribed in the relevant standards.
- ❖ The transformer shall be capable of running in parallel.

CONSTRUCTIONAL FEATURES:

TANK:

1. The tank shall be of welded construction and fabricated from sheet steel or adequate thickness. All seams shall be properly welded to withstand requisite impact during short circuit without distortion. The tank wall shall be reinforced by stiffener of structural steel for general rigidity. The tank shall have sufficient strength to withstand without deformation (i) mechanical stock during transportation and (ii) all filling by vacuum.

2. The tank cover shall be bolted on to the tank with weather proof, hut oil resistant, resilient gasket in between for compete oil tightness. If gasket is compressible, metallic stops shall be provided to prevent over compression. Bushing, cover of access holders and other devices shall be designed to prevent any leakage of water into and oil from the tank. The cover shall also be provided with 2 Nos. grounding pads for earthing.
3. Oil sampling taps shall be provided with valve at top and bottom to collect sample of oil from the tank for testing.
4. To facilitate the oil filtration by streamline filter suitable inlet and outlet taps with valve sat the bottom and at the top of the tank diagonally opposite corners shall be provided. The valve at the bottom may be used as drain valve.
5. Thermometer pocket for top oil temperature measurement by mercury thermometer shall be provided.
6. The transformer tank shall be fitted with a double diaphragm type of explosion relief vent at the top having equalizer pipe connection from conservator.

CORE AND COILS:

The transformer will be of core type, the core design shall be built up with inter lived high grade non-grain. Low loss, high permeability grain oriented cold rolled silicon steel laminations properly treated for core material. The coils shall be manufactured from electrolytic copper of suitable grade, and should be properly insulated varnished and stacked.

All insulation material shall be of proven design. Coils shall be also insulated that impulse and power frequency voltage stresses are minimum. Insulating level of graded insulation shall conform to the relevant standard of IS:2026 Part-III, 1977.

Coil assembly shall be suitable supported between adjacent sections by insulation spacers and barriers. Bracing and other insulation used in assembly of the winding shall be arranged to ensure a free circulation of the oil and reduce the hot spot of the winding.

All leads from the winding to the terminal board and bushing shall be rigidly supported to prevent injury from vibration or short circuit stresses. Guide tube shall be soused where practicable.

The core and coil assembly shall be securely fixed in position, so that no shifting or deformation accurse during movement of transformer or under short circuit stresses.

TAPINGS:

Off load tap changer is to be provided on the high voltage winding. The steps shall be of 1.25% variation required is $\pm 7.5\%$ Winding including tapping arrangement shall be designed to maintain the electromagnetic balance between HV and LV winding at all voltage rations.

CONSERVATOR TANK:

Conservator tank shall be provided with dial type level indicator visible form ground level and fitted with low oil level alarm contact. Plain oil level gauge shall also be provided.

Transformer oil shall comply with IS:335-1972.

TEMPERATURE INDICATOR:

1 No. Dial type temperature indicator shall be provided in the transformer.

TERMINAL ARRANGEMENT.

Since the cables shall be provided for connection with LV systems of transformer, hence the cable terminal boxes shall be provided for the connections to have a closed connections.

TRANSFORMER BUSHING:

All bushing shall conform to the requirements of the latest revision of relevant IS:2099-1973 & 3347. Bushings shall be so located to provide at least minimum permissible electrical clearance and between phase and ground as per the relevant standard.

TRANSFORMER ACCESSORIES:

Transformer shall be equipped with fitting and accessories as listed below complying with IS:3639/1966.

Oil conservator with filter cap and drain plug for each transformer.

Silicagel breather with connecting pipe and oil seal.

Explosion relief vent with double diaphragm and equalizer pipe connection to conservator air space.

Air release plugs.

Direct reading plain oil level gauge – 1 No. for each transformer.

Drain valve with threaded adopter.

Oil sampling valves (top and bottom)

Filter valves with threaded adopter (top & bottom)

Cover lifting eyes.

Jacking pads, handling and lifting lugs.

Skids.

Radiator – These shall be tank (wall) mounted type.

Rating plate and terminal marking plate.

Termination arrangement for cable connection at sides LV.

Neutral bushing.

Off circuit tap charger.

Clamping device with nuts and bolts for clamping the transformer on foundation rails.

Temperature meter.

2. CABLES:

Providing, and laying of be I S I mark LT Cable of 1100 Volts, of Aluminium conductor of 3 - 1/2 core, having PVC Insulated, colour code, wrapped with appropriate filler and core binder and single layer galvanized steel wire armoring for multi-core and overall PVC Jacket. Cable is required from Transformer to Incomer panel.

3½ core x of size as specified in **annexure E-2**–

3 LT PANEL BOARD:

The LT AC Switch board shall be 440 volts 3 phase and neutral, 50 Hz., distribution board, outdoor type, wall/floor mounted comprising of following:

1. 1 Nos. Incoming feeder **each** incoming feeder comprising of:
 - (a) 1 Nos. Three pole MCCB of amperes rating as specified in **annexure E-2** with in-built magnetic thermal release, under voltage release and shunt trip release.
 - (b) 1 Nos. suitable CTs for protection & metering.

The bus bar shall be suitable for 3 phase 4 wire and shall be of amps of MCCB as per rated per phase and 100 amps for neutral. Nominal current density in bus bars shall not exceed 1.5 amps per mm². The bus bars shall be with colored insulated sleeves. The supports shall be suitably spaced to give mechanical rigidity for withstanding stress due to system fault level of 40 KA for 1 second. The bus bar chambers shall be of adequate size to house the stated air insulated bus bars. Panel compartments shall have adequate space for termination of incoming and outgoing feeder cables equipped with compression glands etc.

All MCCB units shall be front operated handle type.

4. **LIGHTING ARRESTOR:**

Each Sub-Station shall be provided with 30 kV. of L/A.

The lightning arresters (Surge Diverters) shall be single pole, station type, suitable for use in solidly earthed system i.e. 33 kV side short circuit level is considered upto 1500 MAV. The lightning arrester will comply with IEC 99.5 and IS 3070. All ferrous parts shall be hot dip galvanized. It should act as a by pass for the lightning surge and also to limit and squash the flow of follow current from the system after the surge has passed. Its rating should be 33 kV, 50 Hz., heavy duty, long duration discharge class with 8/20 wave shape, 10,000 Amp and also be of pressure relief class.

5. **33 KV DROP OUT FUSE –.**

Each Transformer shall be provided with DO Fuse set as per enclosed tentative drawing attached.

6. **33 KV GANG OPERATED A B SWITCH:**

Each Transformer & Incoming of electricity board line shall be provided with 33 KV up right mounted Horizontal or Vertical rotating single break A b switch which should be compact in design, operated with manual handle, conforming to IS:9921 (Part I to V) 1981.

7. **ACRS CONDUCTOR –.**

This shall be used for transmitting line from electricity board connection to Transformer for 33 KV line of 48sq.mm.

8. **33 KV PIN INSULATOR.**

These shall be used in Sub-Station as per requirement.

9. **33 KV DISC INSULATOR:**

These shall be used in Sub-Station as per requirement.

10. **HARDWARE FOR ACSR CONDUCTOR.**

Miscellaneous hardware material required to draw ACSR conductor from electricity board line to L/A to DO to AB Switch to Transformer.

11. **Earthing:- Material :-G.I. PLATE:**

Supply & fixing of G.I. Plate of size 600 x 600 x 6mm for additional earthing of Transformer, panel etc.

G.I. STRIP:

Supply & fixing of G.I. Strip of size 25 x 5mm from earthing pit to various points of earthing connection of all electrical equipments.

G.I. PIPES:

Supply & fixing of G.I. 50mm from earthing pit to various points of earthing connection of all

electrical equipments.

HARDWARE FOR EARTHING:

Miscellaneous hardware material such as Galvanized Nut-Bolts, Funnels, Coal/ Charcoal, Salt etc. required to complete the earthing arrangement.

MAIN HOLE COVER:

Main Hole Cover of size 300 x 300mm for earthing pits chamber protection.

12 D.P. STRUCTURE for each sub station i/e for Raw water and Clear water:

- 2 Pole Structure for incomer line fabricated out of RS joint of the size 200 x 100 mm of 9 to 11 M. length.
- 100 x 50 x 5mm MS channels of required length for installation of various equipment like LA/ Pin Insulator/ Disk Insulator/ DO Sets/ AB Switch, CT's, PT's, etc.
- MS Flats, MS Angles of 50 x 50 x 6mm, etc. for miscellaneous cross support, horizontal and vertical support etc.
- 6 pole structure for transformer will also be provided by the contractor
- Control room 20 Sqm will also be provided by the contractor.
-

13 FENCING:

The boundaries of sub-station shall be fenced with help of M.S. Angles, flats, gate, as per requirement.

VERTICALS:

The vertical posts of 2.5 M height above G.L. shall be legged by 50 x 50 x 5mm size angle fixed at a distance of 2 M and every corner shall be provided with diagonal struts of 50 x 50 x 5mm angle.

WIRE MESH:

The boundary shall be covered by G.I. Wire Mesh of 3mm thick netting size 100 x 100mm of height 2.5 M

FASTENING FLAT:

The wire mesh will be fastened with the supports by M.S. Flats of 25 x 3mm size for vertical & horizontal support as required.

HARDWARE:

The standard make nut-bolts, G.I. Wire, Washers, etc., shall be provided for fixing of wire mesh.

One Iron Gate of 3.5 M. wide & height of 1.5 M. shall be provided.

14 METALLING:

50mm thick metal shall be covered uniformly over the entire surface of sub-station, the metal shall be hard, tough, resistance to abrasion and weathering action, nonporous drainable, and rough surfaces for proper interlocking.

15 CIVIL WORK FOR ERECTION AND COMMISSIONING OF ENTIRE JOB.

Transformer platform made of CC M-20 Mix, Foundation work and other mechanical mixed CC M-20 work.

Construction of wall for partition between two transformers.

Construction of earth pit chamber as per I.E. Rules.

Trenches for cable from transformer to panel room with filling by sand.

16 ACCESSORIES:

Rubber Hand Gloves.

Ball Pin Hammer with Wooden Handle.

Screw Driver 8” & 12”

Shock Treatment Chart.

Danger Notice Board.

Fire Stand with Fire Bucket in sub-station.

Insulated Player.

Fire extinguisher 4.5 Kg.

D.O. Operating rod 33 kV fibre H.D.

Discharge rod with accessories fibre.

Helmet H.D.

17 Work of erection (as per IE rules) of entire sub station equipments and allied works.

18 Work of drawing preparation, commissioning along with obtain of charging permission from electrical inspector as per IE rules.

PART- A

SCHEDULE FOR ITEMS FOR RAW WATER VT PUMP SET (PROPOSED).

S.No	Particulars.	Qty.
	DESIGN, SUPPLY, FIXING, COMMISSIONING, TRIAL RUN OF FOLLOWING AS PER DETAILED SPECIFICATIONS GIVEN ON ANNEXURE "E"	
1.	V.T pump for 148 LPS at 51 Mtr. total head as per detail specification along with column pipe of size 300 (pipe)x 43 (shaft) mm column assembly of 15 MTR length I/c bowl assembly, Foundation bolts for above pump set along with suitable HP VHS Electric Motor 3 phase, 415 volts, as per detail specification. Pump efficiency minimum 80% at duty point.	4 Nos.
2.	Vertical Hollow Shaft motor, SPDP, 1450 RPM suitable to operate on 415V + 10%, 3P, 50Hz, AC supply having 'F' class insulation temp. rise limited to 'B' class with continuous duty, conforming to IS-325	4 Nos.
3.	Butterfly valve electrically operated of PN 1.0 size 300mm for delivery side of pump as per detail specification.	4 Nos.
4.	Sluice valve of PN 1.0 size 300mm for delivery pipe as per detail specification.	4 Nos.
5.	Non-Return valve of PN 1.0 size 300mm for delivery side of pump as per detail specification.	4 Nos.
6.	Sluice valve of PN 1.0 size 500mm for manifold pipe line as per detail specification.	1 Nos.
7.	Non-Return valve of PN 1.0 size 500mm for common manifold as per detail specification.	1 No.
8.	D/f Flow meter of electromagnetic type for installation on manifold pipe as per detail specification.	1 No.
9.	Pressure gauge of dial size 150mm dia for 0-7kg/cm2 delivery side of pump as per detail specification	4 Nos.
10.	M.S./ CI Dismantling Joint of 300 mm for delivery side of pump as per detail specification.	4 Nos.
11.	M.S./ CI Dismantling Joint of 500 mm for common manifold pipe.	1 No.
12.	M.S. D/F Pipe for delivery of 300mm size of 8 mm thickness along with flanges hardware like Nut, Bolts, Washers & Rubber Sheet, complete for joining pipes, valves, etc.	400Kg
13.	M.S. C.I. D/F 300 x 500mm as per distance prices delivery side	4 Nos.
14.	M.S. S/F 300 mm Bend of 90/45 deg for jointing to common main fold and pump outlet.	4 Nos.
15.	M.S. D/F Pipe for common manifold of 500mm size of 8 mm thickness and of lengths as required along with flanges & hardware like Nut, Bolts, Washers & Rubber Sheet complete for joining pipes, valves, etc.	2500 Kg
16.	3½ core x 400sq.mm Aluminum Armored cable from MCCB to pump hose MCCB including accessories like lugs, gland. For connection of Transformer MCCB Panel to Motor Panel.	300 Mtr.
17.	3½ core x 185sq.mm Aluminum Armored cable from Panel to motor including accessories like lugs, gland. For connection of Panel to Motor.	250 Mtr.
18.	EOT crane of 3 ton capacity of approved make shall be provided in the intake well pump house	1 Set
19.	MOTOR CONTROL PANEL: Motor control panel shall be as per detail specification alongwith soft starters 4 Nos. As per specification.	1 Set
20.	Earthing work using G.I. Plate of 600 x 600 x 6mm, G.I. Strip 25 x 3 mm, Complete hardware of earthing like coal, salt, galvanized nut-bolts, funnels, G.I. Pipes etc., and main hole cover for earthing pit. Complete	4 Nos.
21.	Tools accessories as per specification.	1 Set
22.	Installation and commissioning of all above items including painting, trial run of 3 months and testing	1 Job

PART- B

SCHEDULE FOR ITEMS FOR CLEAR WATER PUMPSET (PROPOSED)

S.No	Particulars.	Qty.
	DESIGN, SUPPLY, FIXING, COMMISSIONING, TRIAL RUN OF FOLLOWING AS PER DETAILED SPECIFICATIONS GIVEN ON ANNEXURE “E”	
1.	Centrifugal pump for 142 LPS at 50 M total head with positive as per detail specification along with Coupling, Coupling guard, Base Plate & Foundation bolts for above pump along with suitable HP Electric Motor as per detail specification. Pump efficiency minimum 80% at duty point.	4 Nos.
2.	Suitable HP Electric motor 3 phase, 415V, foot mounted type TEFC, 1450 RPM as per detail specification.	4 Nos.
3.	Sluice valve of PN 1.0 size 350mm for suction side of pump as per detail specification.	4 Nos.
4.	Sluice valve of PN 1.0 size 300mm for delivery side as per detail specification.	4 No.
5.	Non-Return valve of PN 1.0 size 300mm for delivery side of pump as per detail specification.	4 Nos.
6.	Sluice valve of PN 1.0 size 500mm for manifold pipe line as per detail specification.	1 No.
7.	Non-Return valve of PN 1.0 size 500mm for common manifold pipe line as per detail specification.	1 No.
8.	Pressure gauge of dial size 150mm, 0-14 kg/cm ²	4 Nos.
9.	D/F Flow meter of electromagnetic type size 500mm for installation on manifold pipe as per detail specification.	1 No.
10.	M.S. D/F Pipe for suction as per site requirement of 350mm size along with flanges hardware like Nut, Bolts , Washers & Rubber Sheet complete for joining pipes, valves, etc.	800 Kg
11.	M.S./ CI Dismantling Joint of 350 mm for suction side of pump as per detail specification.	4 Nos.
12.	M.S. D/F Pipe for delivery of 300 size along with hardware like Nut, Bolts , Washers & Rubber Sheet complete for joining pipes, valves, etc.	600 Kg
13.	M.S. D/F 300mm Bend of 45°/90° for jointing to common main fold and pump outlet.	4 Nos.
14.	M.S. D/F Pipe for common manifold of 500 mm size and of following lengths along with flanges & hardware like Nut, Bolts , Washers & Rubber Sheet complete for joining pipes, valves, etc.	2500 Kg
15.	3½ core x 400sq.mm Aluminum Armored cable including accessories like lugs, glands. For connection of Transformer MCCB panel to Motor Panel.	300 Mtr.
16.	3 core x 240 sq.mm Aluminum Armored cable from starter to motor including accessories like lugs, gland. for panel to Motor.	200 Mtr.
17.	HOT Crane 3 Ton capacity with 6 mtr. span& 6mtr. lift of chain & 40 x 40 mm sq. bar etc. complete as per specification.	1 Set
18.	MOTOR CONTROL PANEL: Motor control panel shall be as per detail specification, along with 4 Nos, soft starters as per specification.	1 Set
19.	Earthing work using G.I. Plate of 600 x 600 x 6mm, G.I. strip 25 x 3mm, Complete hardware of earthing like coal, salt, galvanized nut-bolts, funnels, G.I. Pipes etc., and main hole cover for earthing pit. Complete, as per IE Rule.	4 Nos.
20.	Accessories as per specification.	1 Set
21.	Installation and commissioning of all above items including painting, trial run of 3 months and testing	1 Job

PART – C-1

**SCHEDULE OF ITEMS FOR CLEAR WATER PUMPING STATION SUB
STATION.**

S.No.	Particulars.	Qty.
	DESIGN, SUPPLY, FIXING, COMMISSIONING, TRIAL RUN OF FOLLOWING AS PER DETAILED SPECIFICATIONS GIVEN ON ANNEXURE “E”	
1	33/0.415 kV 500 KVA Transformer having as per detail specification.	2 No.
2	33 kV Lightning Arrestor.	6 Set.
3	33 kV DO Fuse Unit.	4 Set.
4	33 kV A.B. Switch Complete with Rod/ Handle.	2 Set
5	ACRS Conductor.	200 M.
6	33 kV Pin Insulator.	18 Nos.
7	33 kV DISC Insulator.	54 Set.
8	Hardware kit, complete for laying of ACSR Conductor & inter connection from A/B Set, L/A Set, D/O Set, Pin & Disc Insulator upto transformer.	2 Set.
9	3½ core x 400 sq.mm Aluminum Armored cable from Transformer to MCCB panel including accessories like lugs, glands.	150 M.
10	Main panel having 400 Amp MCCB for fixing near transformer.	2 Set
11	Earthing work using G.I. Plate of 600 x 600 x 6mm, G.I. Strip 25 x 5 mm, Complete hardware of earthing like coal, salt, galvanized nut-bolts, funnels, G.I. Pipes etc., and main hole cover for earthing pit. Complete	14Nos.
12	I Section 200 x 100 - Length as required . Channel 100 x 50 , etc. – as required.	4700 Kg.
13	Fencing work using 50 x 50 x 5mm size vertical post of 3 Mtr. length and 50 x 50 x 5mm size struts for even corner of 3 Mtr., Wire mesh of 3mm thick with netting size of 100 x 100mm of height 2 Mtr., M.S. Flats of size 25 x 3mm size for vertical & horizontal support., Hardware material, like Nut, Bolt, G.I. Wire, etc. for fencing., Gate of 3.5 Mtr. Wide & height of 1.5 Mtr. of Iron Steel.	51 RM
14	Metalling	1 Lot.
15	Street lighting poles of height – 8.5 Mtr. Sodium Vapor Lamp of 250 Watts & fitting for Sodium Vapor lamp with hardware complete.	4 Nos.
16	Cables of 2.5sq.mm x 2 core copper armored cable for street lighting load.	300mtr
17	Drawing preparation for sub – station and approval from safety electrical inspector.	1 Job
18	Charging permission for sub – station and approval from safety electrical inspector.	1 Job
19	All civil work relating to erection of poles, fencing work, construction of platform for transformer, earth pit chambers.	1 Job
20	Installation and commissioning of all above items including painting, trial and testing	1 job
21	ACCESSORIES	
	Rubber Hand Gloves.	1 Set.
	Ball Pin Hammer with Wooden Handle.	1 Set.
	Screw Driver 8” & 12”	1 Set.
	Shock Treatment Chart.	4 Nos.
	Danger Notice Board.	1 Nos.
	Fire Stand with Fire Bucket in sub-station.	1 Nos.
	Insulated Player.	1 Set.
	Fire extinguisher 4.5 Kg.	1 Set.
	D.O. Operating rod 33 kV fiber H.D.	1 Set.
	Discharge rod with accessories fiber.	1 Nos.
	Helmet H.D.	1 Set.

PART – C-2

**SCHEDULE OF ITEMS FOR CLEAR WATER PUMPING STATION SUB
STATION.**

S.No.	Particulars.	Qty.
	DESIGN, SUPPLY, FIXING, COMMISSIONING, TRIAL RUN OF FOLLOWING AS PER DETAILED SPECIFICATIONS GIVEN ON ANNEXURE “E”	
1	33/0.415 kV 500 KVA Transformer having as per detail specification.	2 No.
2	33 kV Lightning Arrestor.	6 Set.
3	33 kV DO Fuse Unit.	4 Set.
4	33 kV A.B. Switch Complete with Rod/ Handle.	2 Set
5	ACRS Conductor.	200 M.
6	33 kV Pin Insulator.	18 Nos.
7	33 kV DISC Insulator.	54 Set.
8	Hardware kit, compete for laying of ACSR Conductor & inter connection from A/B Set, L/A Set, D/O Set, Pin & Disc Insulator upto transformer.	2 Set.
9	3½ core x 400 sq.mm Aluminum Armored cable from Transformer to MCCB panel including accessories like lugs, glands.	150 M.
10	Main panel having 400 Amp MCCB for fixing near transformer.	2 Set
11	Earthing work using G.I. Plate of 600 x 600 x 6mm, G.I. Strip 25 x 5 mm, Complete hardware of earthing like coal, salt, galvanized nut-bolts, funnels, G.I. Pipes etc., and main hole cover for earthing pit. Complete	14Nos.
12	I Section 200 x 100 - Length as required . Channel 100 x 50 , etc. – as required.	4700 Kg.
13	Fencing work using 50 x 50 x 5mm size vertical post of 3 Mtr. length and 50 x 50 x 5mm size struts for even corner of 3 Mtr., Wire mesh of 3mm thick with netting size of 100 x 100mm of height 2 Mtr., M.S. Flats of size 25 x 3mm size for vertical & horizontal support., Hardware material, like Nut, Bolt, G.I. Wire, etc. for fencing., Gate of 3.5 Mtr. Wide & height of 1.5 Mtr. of Iron Steel.	51 RM
14	Metalling	1 Lot.
15	Street lighting poles of height – 8.5 Mtr. Sodium Vapor Lamp of 250 Watts & fitting for Sodium Vapor lamp with hardware complete.	4 Nos.
16	Cables of 2.5sq.mm x 2 core copper armored cable for street lighting load.	300mtr
17	Drawing preparation for sub – station and approval from safety electrical inspector.	1 Job
18	Charging permission for sub – station and approval from safety electrical inspector.	1 Job
19	All civil work relating to erection of poles, fencing work, construction of platform for transformer, earth pit chambers.	1 Job
20	Installation and commissioning of all above items including painting, trial and testing	1 job
21	ACCESSORIES	
	Rubber Hand Gloves.	1 Set.
	Ball Pin Hammer with Wooden Handle.	1 Set.
	Screw Driver 8” & 12”	1 Set.
	Shock Treatment Chart.	4 Nos.
	Danger Notice Board.	1 Nos.
	Fire Stand with Fire Bucket in sub-station.	1 Nos.
	Insulated Player.	1 Set.
	Fire extinguisher 4.5 Kg.	1 Set.
	D.O. Operating rod 33 kV fiber H.D.	1 Set.
	Discharge rod with accessories fiber.	1 Nos.
	Helmet H.D.	1 Set.

Note: The above scope of work and others details are minimum and not limited and Bidders are advised to visit the JMC office and site in advance to verify the balance scope of work with concerned Nodal official Amrut Mission Jagdalpur before quoting the rates. Any items/components which may not be mentioned in the scope of work, but are necessarily required for successful commissioning of the Plant/system with desired outputs and complete functions in all respects will be deemed to inclusive in quoted cost by the bidder and nothing extra shall be paid by JMC

ANNEXURE – E-3

SPECIFICATION FOR SPIGOT AND SOCKET CENTRIFUGALLY CAST (SPUN) DUCTILE IRON PIPE CLASS K-9& K-7 WITH INSIDE CEMENT MORTAR LINING PRESURE PIPE IN RAW WATER PUMPING MAIN, CLEAR WATER PUMPING MAIN& DISTRIBUTION SYSTEM NETWORK

1.0 SCOPE OF WORK :

The scope of work shall be as below :

- 1.1 Providing, laying, jointing, interconnection, testing & commissioning for Raw water pumping main, Clear water pumping main&Distribution system of D.I. pipe class K-9& K-7 Under Augmentation Water Supply Scheme for Jagdalpur town.

Sr.No.	Dia & Type	Length (m)
Raw water pumping main		
i	600mm Ø DI K-9	347
Clear water pumping main		
ii	150 mm DI K-9	682
iii	200 mm DI K-9	1725
iv	250 mm DI K-9	65
v	300 mm DI K-9	1669
vi	350 mm DI K-9	
vii	400 mm DI K-9	872
viii	450 mm DI K-9	
ix	500 mm DI K-9	
x	600 mm DI K-9	

- For Distribution System
100 to 450 mm dia DI pipe class K-7– 199926.18 Mtr

Diameter (mm)	Length (m)
100	131466.82
150	35220.18
200	16488.79
250	10418.1
300	4372.53
350	892.25
400	1014.44
450	53.07

- For Road Crossing By Push through method

Diameter (mm)	Length (m)
200	30
250	30
300	30
400	30
500	30
600	30

Including valves, fittings, road restoration, and all allied civil works

- Consumer meters with HSC -23832 no

Using Polyethelene – Aluminium - Polyethelene (PE-AL-PE) Composite Pressure Pipes

Diameter (mm)	Nos.
15	22615
25	730
30	487

- Providing Installing and commissioning Electromagnetic Bulk Flow Meters –
Total 46 numbers

Diameter (mm)	Nos.
150	17
200	4
250	8
300	4
350	8
400	3
500	2

Including valves, fixtures, road restoration, concrete encasing and all allied civil works

The work of providing, laying, testing DI pipeline in project area including excavation cutting concrete road, tar road and restoring to the original shape after lowering the pipes including protecting public services and making good if damaged, including valves, pressure relief valves, DI and MS specials, interconnection with the existing DI pipelines if any, fixing of all the appurtenances such as chambers, road boxes, all the road crossings, railway crossings if any, hydraulic testing of pipe line, performance of the network commissioning to rated capacities and trial run for six months including all cost etc complete.

The work shall include but not limited to the following

LAYOUT DRAWINGS OF PUMPING MAINS:-

The drawings showing tentative alignment and layout of the pumping mains, ground configuration and other necessary details are enclosed along with these specifications. The contractor shall have to submit the detailed layout drawing, sufficient to show the details as mentioned below-

- R.L. of ground, invert level of pipes and H.G.L. at every 30 m interval.
- Location of horizontal and vertical bends.
- Degree of bends, degree or radius of curves, tangent distance for curves.
- Location and covering length of all valves and other appurtenances.

- Details and description of all specials.
- Location and size of supporting pillars, bridges and culverts to cross the waterways.
- Location and sizes of thrust blocks and anchor blocks.
- Location and sizes of valve chambers.
- Details, dimensions and plan including complete description of expansion joints and flanges.
- The layout plan submitted by the contractor, can be altered or modified by the Engineer-in-charge to suit the requirement depending upon the field conditions before or even after the acceptance of the tender or during the course of execution of work and the contractor shall not claim for compensation in any way on this account.

1.1 ISI mark socket and spigot centrifugally cast (spun) Ductile Iron Pressure pipes class K-9 and K-7 with inside cement mortar lining conforming to IS:8329-2000 with suitable rubber gasket (Push on) joints as per IS:5382-1985 duly inspected by SGS/RITES with all ductile iron fittings and ISI marked sluice valve conforming to IS 9523-2000 including testing and commissioning.

- 1.2 Excavation in trenches in all types of strata for laying & jointing of above pipe line with required depth and width as per specification.
- 1.3 Providing and fixing D.I. D.F. sluice valve including testing & jointing with cost of nut, bolts, rubber insertion duly inspected by SGS/RITES (Make - Kirloskar/IVC,/VAG, Durga Upadhaya)
- 1.3.1 Providing and fixing following DI double flange ISI mark sluice valve fitted with cast iron cap including jointing and testing with cost of jointing materials (Make - Kirloskar/IVC/VAG/Durga/Upadhaya) duly inspected by DGS&D/SGS/RITES.
- 1.3.2 Providing, laying & jointing D.I./ MJ fittings conforming to IS 9523:2000 duly inspected by DGS&D/SGS/RITES
- 1.4 Providing & fixing following cast iron double Air valve duly inspected.
(Make - Kirloskar/IVC/VAG/Durga/Upadhaya)
- 1.5 Construction of Brick &RCC valve chambers in all the places where sluice valve, Air valve and non-return valve are provided, Anchor Blocks, Pedestal etc. as required as per specification. The internal dimension of Brick &R.C.C. chamber shall have clear space of 500 mm all around in valve. This clearness can be modified only after with instruction issued by the Engineer in charge looking to the site conditions.

- 1.6 Back filling of trench as per IS:12288-1987.
- 1.7 Providing and making all interconnections as required to charge the laid pipe lines under scope of work.
- 1.8 In case, the shifting of any existing, water pipe line/sewage line is considered necessary by the Jagdalpur Municipal Corporation, such service lines will have to be shifted by the contractor for which the payment shall be made for the actual work done as per approved rate of this contract.
- 1.9 The firms/contractors are directed to submit the details plan and elevation of all the pipelines showing the dimensions of all components and other details. The contractor shall set up an office with an access to JMC official with proper seating arrangements. The contractor shall provide one AC Bolero/ Scorpio vehicle with driver and POL for inspection work during the entire work period exclusively for JMC officials. The contractor shall propose colour scheme with at least three alternatives and after approval only the work shall be started. All the valves and electromechanical fittings shall be SCADA & PLC compatible with actuators (Excluding the cost of Actuators) for implementation of SCADA in future. The successful bidder shall assist the JMC in the process of getting the grants from State/ Central Governments. The contractor has to procure and install informatory board's displaying Name of work at the location given by JMC at his own cost.

2.0 D.I. PIPES

2.1 MANUFACTURE :-

The pipes shall be ISI Mark and confirming to IS:8329:2000. The pipes should be duly inspected by D.G.S. & D./SGS/RITES before supply.

2.2 HYDROSTATIC TEST

- 2.2.1 Pipes shall be tested hydrostatically at a pressure of 5.0 MPa. To perform the test, pressure shall applied internally and shall be steadily maintained for a period of minimum 15 seconds during which pipes may be struck moderately with a 700 grams hammer. The pipes shall withstand the pressure test and shall not show any sign of leakage, seating or other defects of any kind.

2.3 TOLERANCES :

- 2.3.1 The tolerance shall be permissible as per IS:8329-2000.

2.4 COATING :

- 2.4.1 All the D.I. pipes should be internally in lined with cement mortar and externally out coated with metallic zinc coating having finishing layer as indicated in Annexure A, as per IS 8329-2000.

2.5 MARKING :

- 2.5.1 Each pipe shall have cast, stamped or indelibly painted on it the following appropriate marks :

- a) Indication of the source of manufacture.
- b) The nominal diameter.
- c) Class reference
- d) Mass of Pipe, and
- e) The last two digits of the year of manufacture.

Marking may be done :

- a) On the socket faces of pipe centrifugally cast in metal mould, and
- b) On the outside of the socket or on the barrel of pipe centrifugally cast in sand mould.

2.5.2 Any other marks required by the purchaser may be painted on.

3.0 DUCTILE IRON FITTINGS :

3.1 The Ductile Iron fittings shall be ISI mark conforming to IS 9523-2000.

3.2 COATING :

- 3.2.1 Fittings and accessories shall be normally delivered internally and externally coated.
- 3.2.2 The external coatings shall be applied with zinc rich paint with finishing layer as included in Annexure "A" of IS 9523:2000.
- 3.2.3 The internal Linings shall be applied with portland cement mortor (with or without additions) as included in Annexure "B" of IS 9523:2000.

3.3 MARKING :

- 3.3.1 Each fittings shall have as cast, stamped or indelibly painted on it, the following appropriate marks :
 - a) Indication of the source of manufacture,
 - B) The nominal diameter,
 - C) The last two digits of the year of manufacture,
 - d) PN rating flanges when applicable, and
 - e) Any other mark required by the purchaser.

3.3.2 Marking may be done on the barrel of castings or on the outside of the sockets.

3.4 BIS Certification Marking

The fittings may also be marked with the Standard Mark.

4.0 LAYING AND JOINTING :

4.1 SITE PREPARATION :

- 4.1.1 Preliminary work required to be done before laying of pipe lines includes pegging out, clearing and disposal of all shrubs, grasses, large and small bushes, trees, hedges, fences, gates, portions of old masonry, boulders, and debris from the route.
- 4.1.2 Where trees have been felled, the resulting timber shall be stacked properly and disposed of as directed by the authority. Tree roots within a distance of about 0.5 metre from either side of the pipeline should be completely removed before laying pipe lines.
- 4.1.3 All other serviceable materials, such as wood, bricks and stones, recovered during the operation and clearing the site, shall be separately stacked and disposed of as directed by the authority.

4.2 FORMATION :

- 4.2.1 **GENERAL :** Before pipe line is laid, proper formation be prepared for pipe line
- 4.3 Excavation and Preparation of Trenches for Laying Underground Pipe Lines.
 - 4.3.1 The width of the trench at bottom between the faces of sheeting shall be such as to provide not less than 300 mm clearance on either side of the pipe except where rock excavation is

involved. Trenches shall be of such extra width, when required, as will permit the convenient placing of timber supports, strutting and planking, and handling of specials.

- 4.3.2 Special consideration should be given to the depth of the trench. In agricultural land, the depth should be sufficient to provide a cover of not less than 900 mm so that the pipe line will not interfere with the cultivation of the land. In rocky ground, rough grazing or swamps, the cover may be reduced provided the water in the pipe line is not likely to freeze due to frost.
- 4.3.3 It may be necessary to increase the depth of pipe line to avoid land drains or in the vicinity of roads, railways or other crossings.
- 4.3.4 Care should be taken to avoid the spoil bank causing an accumulation of rain water.
- 4.3.5 Where pipes are to be bedded directly on the bottom of the trench, it should be trimmed and levelled to permit even bedding of the pipe line and should be free from all extraneous matter which may damage the pipe or the pipe coating. Additional excavation should be made at the joints of the pipe so that the water main is supported along its entire length.
- 4.3.6 Where excavation is through rocks or boulders or at locations of B.C. soils the pipe line should be bedded on concrete bedding or on at least 150 mm of fine grained material, or other proper means are used to protect the pipe and its coating. Material harmful to the pipe line should not be used.
- 4.3.7 Temporary under pinning, supports and other protective measures for building structures or apparatus in or adjacent to the trench should be of proper design and sound construction.
- 4.4 **ROCK EXCAVATION** - The term "rock" wherever used in this standard, shall have the same meaning as given in terminology in IS:1200 (Part 1)- 1974.
- 4.4.1 **Blasting** - Blasting for excavation shall be permitted only after securing the approval of the authority and only when proper precautions are taken for the protection of persons and property. The hours of blasting shall be fixed by the authority. The procedure of blasting shall conform to the requirements of the authority.
- 4.5 **Stacking Excavated Material** - All excavated material shall be stacked in such a manner that it will not endanger the work or workmen and it will avoid obstructing footpaths, roads and driveways. Hydrants under pressure, surface boxes, fire or other utility controls shall be left unobstructed and accessible during the construction work. Gutters shall be kept clear or other satisfactory provisions made for street drainage, and natural water-courses shall not be obstructed.
- 4.6 **Barricades, Guards and Safety Provisions** - To protect persons from injury and to avoid damage 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 roadways. All materials, piles equipment and pipes which may serve as obstruction to traffic shall be enclosed by fences or barricades and shall be protected by illuminating proper lights when the visibility is poor. The rules and regulations of the local authorities regarding safety provisions shall be observed.
- 4.7 **Maintenance of Traffic and Closing of Streets** - The work shall be carried including closing of road/street in such a manner which will cause the least interruption to traffic. Where it is necessary for traffic to cross the open trenches, suitable bridges shall be provided.
- 4.7.1 Suitable signs indicating that a street is closed shall be placed and necessary detour signs for the proper maintenance of traffic shall be provided.
- 4.8 **Protection of Property and Structures** - Trees, shrubbery, fences, poles, and all other

property and surface structures shall be protected unless their removal is shown on the drawings or authorized by the authority. When it is necessary to cut roots and tree branches, cutting shall be done under the supervision and direction of the authority.

Temporary support, adequate protection and maintenance of all underground and surface structures, drains, sewers and other obstructions encountered in the progress of the work, shall be provided under the direction of the authority. The structures, which may have been disturbed, shall be restored after completion of the work.

- 4.9 **Protection of the Existing Service** - As far as possible, the pipe line shall be laid below existing services, like water and gas pipes, cables, cable ducts and drains but not below sewers which are usually laid at greater depth. Where it is unavoidable, pipe line should be suitably protected. A minimum clearance of 150 mm shall be provided between the pipe line and such other services. Where thrust or auger boring is used for laying pipe line across roads, railways or other existing utilities, large clearance as required by the existing utilities, as required shall be provided. Adequate arrangements shall be made to protect and support the existing services during the laying operations. The pipe line shall be so laid as not to obstruct access to other services for inspection, repair and replacement. When such utilities are met with during excavation, the authority concerned shall be intimated and arrangements should be made to support and protect the utilities in consultation with them and in case of such damaged services will be repaired at the cost of contractor himself.
- 4.10 **Back-Filling** - For the purpose of back-filling, the depth of the trench shall be considered as divided in to the following three zones from the bottom of the trench to its top :
- a) Zone A : From the bottom of the trench to the level of the centre line of the pipe.
 - b) Zone B : From the level of the centre line of the pipe to a level 300 mm above the top of the pipe, and
 - c) Zone C : From a level 300 mm above the top of the pipe to the top of the trench.
- 4.10.1 Back-filling in Zone A shall be done by hand with sand, fine gravel or other approved material placed in layers of 80 mm and compacted by tamping. The back-filling material shall be deposited in the trench for its full width of each side of the pipe, fitting and appurtenances simultaneously.
- 4.10.2 Back-filling in Zone B shall be done by hand or approved mechanical methods in layers of 150 mm special care being taken to avoid injuring or moving the pipe. The type of back-fill material to be used and the method of placing and consolidating shall be prescribed by the authority to suit individual locations.
- 4.10.3 Back-filling in Zone C shall be done by hand or approved mechanical methods. The types of back-fill material and method of filling shall be as prescribed by the authority.
- 4.10.4 Back-fill under permanent Pavement - Where the excavation is made through permanent pavements, curbs, paved footpaths, or where such structures are undercut by the excavation, the entire back-fill to the sub grade of the structures shall be made with sand in accordance with
- 4.10.5 Paved footpaths and pavements consisting of stone, gravel, slag or cinders shall not be considered as being of a permanent construction. Method of placing and consolidating the back-fill material shall be prescribed by the authority.
- 5.0 **LAYING OF PIPES :**
- 5.1 **Laying Underground** - Pipes should be lowered in to the trench with tackle suitable for the weight of pipes. For smaller sizes, up to 250 mm nominal bore, the pipe may be lowered by the use of ropes but for heavier pipes, either a well designed set of shear legs or mobile crane should be used. When lifting gear is used, the positioning of the sling to ensure a proper balance, should be checked when the pipe is just clear of the ground. If

sheathed pipes are being laid, suitable wide slings or scissors dogs should be used.

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

5.2 **Pipe Line Anchorage -**

This shall be provided as per relevant BIS 5330:1984 with up to date amendments.

6.0 **TRANSPORTATION, HANDLING AND INSPECTION :**

6.1 **General** – Ductile iron pipes are less susceptible to cracking or breaking on impact but the precautions set out should be taken to prevent damage to the protective coating and brushing or damage of the jointing surfaces.

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

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

7.0 **HYDRAULIC TESTING :**

7.1 After a new pipe line is laid and jointed, testing shall be done for :
mechanical soundness and leak tightness of pipes and fittings ;
leak tightness of joints; and
soundness of any construction work, in particulars that of the anchorages

7.2 The completed pipe line shall be tested for a pressure given in IS 8329:2000, Hydro static
7.3 test pressure in field shall be carried out as per clause 6.4.4.2 **Testing of pressure** pipes of
Manual of Water Supply and Treatment of CPHEEO.

3% amount withheld for hydro static Testing of Pipeline work shall be released after
successful hydro static testing of that particular section of pipeline.

8.0 **FLUSHING AND DISINFECTION OF MAINS BEFORE COMMISSIONING :**

8.1 The pumping main & distribution mains shall be disinfected before commissioning as per
provisions given in CPHEEO manual and IS 5822:1970.

9.0 **REMOVAL, RESTORATION AND MAINTENANCE OF PAVED FOOTPATHS
ETC. AFTER LAYING OF PIPE :**

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

9.2 **Restoration of Damaged Surface and Property** - Where any pavement, shrubbery, fences
poles or other property and surface structures have been damaged, removed or disturbed
during the course of work, such property and surface structures shall be replaced or repaired

after completion of work. The permanent pavement shall not be restored to a condition equal to that before the work began but the top surface of the removed pavement shall be levelled and finished in such a manner as the traffic may pass smoothly. After proper compaction and settlement only it shall be made to original as per the type of road top is existing

- 9.3 **Cleaning-up** : All surplus materials, and all tools and temporary structures shall be removed from the site as directed by the authority. All dirt, rubbish and excess earth from the excavation shall be hauled to a dump and the construction site left clean to the satisfaction of the authority.

10.0 **APPURTENANCES :**

The following appurtenances shall be suitable designed and fixed on the suitable points on the conveyance main.

10.1 **SLUICE VALVES :**

The sluice valve shall be installed as per direction of engineer - in- charge. The sluice valve shall be class PN 1.6 up to 600 mm dia & class PN 1.0 above 600 mm dia conforming to IS 14846:2000 duly inspected by DGS & D/SGS/RITES & shall be of IVC/Kirloskar/VAG/Durga/Upadhaya make.

10.2 **CAST IRON DOUBLE AIR VALVES :**

Double orifice type cast iron double Air Valves shall be fixed coupled with isolating sluice valve and at the suitable points based on detailed design. The Air valves shall conform to IS 14845-2000. The valves shall be IVC/Kirloskar/VAG/Durga/Upadhaya make duly inspected by DGS & D/SGS/RITES.

10.3 **BRANCH CONNECTIONS :**

“T” outlet with manually operated sluice valves shall be provided in the distribution pressure Main for Branch connections.

- 10.4 The appurtenances shall be located in such a way that these are clearly and easily accessible for operation and maintenance.

11.0 **CONSTRUCTION OF CHAMBERS FOR APPURTENANCES :**

11.1 **CHAMBER FOR APPURTENANCES :**

The suitable RCC chambers shall be constructed around the appurtenances and valves fixed on the line, the minimum working space shall be 500mm on all sides. The chamber shall have Pre cast RCC cover conforming to IS:456-2000 suitable for heavy traffic loads.

11.2 **CIVIL WORKS :**

All the allied civil works necessary for laying and jointing of pipeline shall be a part of this contract; therefore, the contractor shall design and carry out the necessary civil works such as thrust blocks, anchor blocks, chambers for appurtenances and necessary earth work. All the civil works shall be designed and carried out as per the relevant Indian Standard Code of practice. All the materials used on civil work should be of a quality approved by Executive Engineer. Rejected material shall be removed from the site immediately at the cost of contractor.

12.0 **TESTING, COMMISSIONING OF PIPE LINE, TRIAL RUN AND DEFECT LIABILITY PERIOD :-**

After completing the job of laying and jointing of pipe line the contractor will do testing, commissioning and operation & maintenance for a period of one year including training of personnel. The repairing of bursting and leakage of pipeline during this period shall be done by the contractor at his cost including cost of all materials. The water for testing and

commissioning of pipe line will be made available by the Department free of cost at the time when convenient to the deptt. In case of delay in making available the water for testing the time extension will be given to the contractor without penalty for such period. Defect liability period shall be six months from the date of completion of work.

13.0 Inspection of Pipes, valves & fittings

Inspection of the pipes, valves & fittings will be done by the DGS&D/SGS/RITES. The departmental officials may also inspect at factory site.

14. THRUST BLOCKS

- 14.1 Thrust blocks are required to transfer the resulting hydraulic thrust from the fitting or pipe on to a larger load bearing soil section & shall be designed as per ISS.
- 14.2 Thrust blocks shall be installed wherever there is a change in the direction of the pipe line, size of the pipe line or the pressure-line diagram, or when the pipe line ends at a dead end. If necessary, thrust blocks may be constructed at valves also.
- 14.3 Thrust blocks shall be constructed taking into account the pipe size, water pressure, type of fitting, gravity component shell when laid on slopes and the type of soil. The thrust blocks shall be designed and provided as per Appendix 6.6 of the CPHEEO Manual.
- 14.4 When a fitting is used to make a vertical bend, it shall be anchored to a concrete thrust block designed to have enough weight to resist the upward and outward thrust. Similarly at joints, deflected in vertical plane, it shall be ensured that the weight of the pipe, the water in the pipe and the weight of the soil over the pipe provide resistance to upward movement. If it is not enough, ballast or concrete shall be placed around the pipe in sufficient weight to counteract the thrust.
- 14.5 When the line is under pressure there is an outward thrust at each coupling. Good soil, properly tamped is usually sufficient to hold pipe from side movement. However, if soft soil conditions are encountered, it may be necessary to provide side thrust blocks or other means of anchoring. In such cases only the pipe on each side of the deflected coupling shall be anchored without restricting the coupling.
- 14.6 Pipes on slopes need be anchored only when there is a possibility of the backfill around the pipe sloping down the hill and carrying the pipe with it. Generally for slopes up to 30° good well drained soil, carefully tamped in layers of 100 mm under and over the pipe, right up to the top of the trench will not require anchoring.
- 14.7 For steeper slopes, one out of every three pipes shall be held by straps fastened to vertical supports anchored in concrete.

15 DISINFECTION OF PIPE LINE BEFORE COMMISSIONING:

- 15.1 Pipeline carrying potable water shall be suitably disinfected before commissioning as per guidelines given in CPHEEO Manual & relevant IS codes.
- 16.0 Operation and Maintenance for 60 months to be carried out by the agency.

17.0 DLP for 12 months to be carried out by the agency.

18.0 SUPPLY AND LAYING, JOINTING OF DUCTILE IRON PIPES AND SPECIALS Standards

Except as otherwise specified, the Indian/International Standards and Codes of Practice in their latest version shall be adhered to for the design, manufacturing, inspection, factory testing, packing, handling and transportation of product. Should any product be offered conforming to other standards, the equipment or products shall be equal to or superior to those specified and the documentary confirmation shall be submitted for the prior approval of the Engineer in Charge. DI pipes of ISO standard shall also be accepted.

Casting

The pipes will be centrifugally cast (spun) Ductile Iron pipes for Water, conforming to the IS 8329. The pipes used will be with push on joints (Rubber Gasket Joints). The class of pipe to be used shall be of the class K-9.

Surface coating

The pipes shall be coated with Metallic Zinc coating as per appendix A, with a finishing layer of bituminous paint, and have factory provided cement mortar lining in the inside as per the provisions of Appendix B of the IS 8329.

Standard length

The pipes will be supplied in standard lengths of 5.50 and 6.00 meters with chamfered ends suitable for push-on jointing. Each pipe of the push on joint variety will also be supplied with a rubber EPDM gasket, conforming to the IS: 5382. Any change in the stipulated lengths will be approved by the Engineer – in charge.

Manufacture of Gaskets

The gaskets should also be supplied by the manufacturer of the pipes. They should preferably be manufactured by the manufacturer of the pipes. In case they are not, it will be the responsibility of the contractor to see that the manufacturer of the pipes get them manufactured from a suitable manufacturer under its own supervision and have it tested at his/sub contractor's premises as per the contract. The pipe manufacturer will however be responsible for the compatibility and quality of the products.

Flanged joints

The flanged joints will conform to the Clause 6.2 of IS 8329. The pipe supply will also include one rubber gaskets for each flange.

Hydraulic test at works

Each and every pipe shall be tested hydraulically by the manufacturer as specified under clause 11 for the pressures specified in table 1 of IS: 8329. The test shall be carried out before application of surface coating and lining except Zinc coating which may be applied before the hydrostatic test.

Test for Gaskets

The test reports for the rubber gaskets shall be as per acceptance tests of the IS 5832 and will be in accordance to Clause 3.8 and contractor shall submit the test certificate issued by the manufacturer with the pipe supply, without which payment for pipe supply shall not be released.

Third party inspection

The inspection and testing of the pipes shall be carried out by the employer and/ or inspecting agency appointed by the employer, in the manufacture's workshop. The pipes

will be subjected to following tests for acceptance:

- Visual and dimensional check as per Clause 13 and 15 of IS 8329 for length, internal and external diameter, wall thickness, deviation from straight length and joviality.
- Mechanical Tests as per Clause 10 of IS 8329 for Tensile Strength and Brinell Hardness Test.
- Hydrostatic Test as per Clause 11 of IS: 8329.

The sampling for the above tests shall be as per the provisions under clause 9 of the IS:8329. All the tests shall be conducted in presence of the inspecting agency. The pipes shall be dispatched only after issue of the test certificate by the inspecting agency for satisfactory test results as required. The inspection charges for such tests shall be paid by the contractor to the inspecting agency.

Retest

If a test piece representing a batch fails in the tensile or Brinell hardness test in the first instance, two additional tests shall be made on test pieces selected from two other pipes from the same batch. If both the test results satisfy the specified requirements, the batch shall be accepted. Should either of these additional test pieces fail in the test, the batch shall be deemed as not complying the required standards and shall be rejected.

Marking

- All pipes will be marked as per Clause 18 of IS 8329 and show as below:
- Manufacturer name/ stamp
- Nominal diameter
- Class reference
- A white ring line showing length of insertion at spigot end

Packing and Transport:

The pipes should be preferably transported by road from the factory and stored as per the manufacturer specifications to protect damage.

SPECIFICATIONS FOR DUCTILE IRON FITTINGS (SPECIALS)

General

The Ductile Iron (DI) fittings shall be D.I. fittings shall be ISI marked as per IS : 9523-2000, suitable for Tyton joints to be used with Ductile Iron pipes with flanged and Tyton jointing system.

Types of specials

The following types of DI fittings shall be manufactured and tested in accordance with IS: 9523 or BS: 4772

- Flanged socket
- flanged spigot
- double socket bends (90° , 45° , $22\frac{1}{2}^{\circ}$, $11\frac{1}{4}^{\circ}$)
- double socket branch flanged tee
- all socket tee
- double socket taper

All the fittings shall be of PN 1.6 pressure rating

Supply

All the DI fittings shall be supplied with one rubber ring for each socket. The rubber ring (EPDM) shall conform to IS: 12820 and IS: 5382. Flanged fittings shall be supplied with

one rubber gasket per flange and the required number of nuts and bolts.

Manufacture of Fittings / Specials

The metal used for manufacture of DI Fittings / Specials shall conform to the appropriate grade as specified in IS : 1865-2005. Two side lugs shall be provided on each Socketed fitting, across all types and sizes along with Lifting loops on fitting across all types and sizes from DN 400 & above. D.I. Fittings shall also contain a Stub, minimum length -15mm x dia.- 10 mm., which can be cut at random to carry out Metallographic test to ascertain minimum 80% Graphite Nodularity as per Clause – 9.1 of IS : 1865-2005, in the form - V or VI as per IS : 7754-2003. Fittings manufactured through Induction furnace route only shall be used. The fittings should also be supplied by the manufacturer of the pipes. They should preferably be manufactured by the manufacturer of the pipes. In case they are not, it will be the responsibility of the contractor to see that the manufacturer of the pipes get them manufactured from a suitable manufacturer under its own supervision and have it tested at his/sub contractors premises as per the contract. The pipe manufacturer will however be responsible for the compatibility and quality of the products.

Lubricant for ductile iron pipes and specials

General

This section covers the requirements for lubricant for the assembly of Ductile Iron pipes and specials suitable for Tyton push-in rubber ring joint.

Specifications

The lubricant has to have the following characteristics:

- Must have a paste like consistency and be ready for use
- Has to adhere to wet and dry surfaces of DI pipes and rubber rings
- To be applied in hot and cold weather; ambient temperature 0-50°C, temperature of exposed pipes up to 70°C
- Must be non toxic
- Must be water soluble
- Must not affect the properties of the drinking water carried in the pipes
- Must not have an objectionable odour
- Has to inhibit bacterial growth
- Must not be harmful to the skin
- Must have a shelf life not less than 2 years

Acceptance tests

- They shall be conducted in line with the provisions of the IS 9523

Packing for DI specials and Rubber Gaskets

All the DI fittings shall be properly packed with jute cloth. Rubber rings shall be packed in polyethylene bags. Rubber rings in PE bags and nuts, bolts etc. shall be supplied in separate jute bags.

LAYING AND JOINTING OF DI PIPES AND SPECIALS

Use of tackle

Pipes should be lowered into the trench with tackle suitable for the weight of pipes. For smaller sizes, up to 200 mm nominal bore, the pipe may be lowered by the use of ropes but for heavier pipes suitable mechanical equipment have to be used.

Cleaning

All construction debris should be cleared from the inside of the pipe either before or just after a joint is made. This is done by passing a pull-through in the pipe, or by hand, depending on the size of the pipe. All persons should vacate any section of trench into which the pipe is being lowered

Laying on steep slopes

On gradients of 1:15 or steeper, precautions should be taken to ensure that the spigot of the pipe being laid does not move into or out of the socket of the laid pipe during the jointing operations. As soon as the joint assembly has been completed, the pipe should be held firmly in position while the trench is back filled over the barrel of the pipe.

The designed anchorage shall be provided to resist the thrusts developed by internal pressure at bends, tees, etc.

The assembly of the pipes shall be made as recommended by the pipe manufacturer and using the suitable tools.

Jointing

The socket and spigot ends of the pipes shall be brushed and cleaned. The chamfered surface and the end of the spigot shall have to be coated with a suitable lubricant recommended by the manufacturer of the pipes. Oil, petroleum bound oils, grease or other material which may damage the rubber gasket shall not be used as lubricant. The rubber gasket shall be inserted into the cleaned groove of the socket. It has to be checked for correct positioning. The two pipes shall be aligned properly in the pipe trench and the spigot end shall be pushed axially into the socket either manually or with a suitable tool specially designed for the assembly of pipes and as recommended by the manufacturer. The spigot has to be inserted up to the insertion mark on the pipe spigot. After insertion, the correct position of the socket has to be tested with a feeler blade

Deflection of the pipes

Deflection of the pipes -if any- shall be made only after they have fully been assembled.

The deflection shall not exceed 75 % of the values indicated by the pipe manufacturer.

Anchoring of the pipeline

Thrust blocks shall be provided at each bend, tee, taper, end piece to prevent undue movements of the pipeline under pressure. They shall be constructed as per design of the Engineer according to the highest pressure during operation or testing of the pipes, the safe bearing pressure of the surrounding soil and the friction coefficient of the soil. This item shall be payable as per the provision under BOQ.

Measurement and payment

The net length of pipes as laid or fixed shall be measured in running meters correct to a cm.

Specials shall be included and measured in the total length. The portion of the pipe at the joints (inside the joints) shall not be included in the length of pipe work.

Excavation and preparation of trenches for laying underground pipeline:-

The trench shall be so dug that the pipe may be laid to the required alignment and at required depth. When the pipeline is under a roadway, a minimum cover of 1.2 m shall be provided, in other cases the minimum cover of 0.75 m above the crown of the pipe shall be provided. The trench shall be shored, wherever necessary and kept dry so that the workman may work therein safely and efficiently.

Recovery of other serviceable material:-

All serviceable materials such as wood work, bricks, masonry etc. recovered during the

operation of cleaning or excavations, which, in the opinion of the Engineer-in-Charge are suitable for reuse in restoring the surface, shall be separately stacked and disposed-of as directed by Engineer-in-Charge.

Dewatering:-

Dewatering shall be carried out by the contractor, wherever necessary. The discharge of the trench dewatering pumps shall be conveyed either to drainage channels or to natural drains and shall not be allowed to spread over in the vicinity of work place.

Trenching:-

The excavation of trenches shall be carried out by hand or machines. The width of trench shall be kept to a minimum consistent with the working space required. At the bottom, between the faces, it shall be minimum 200 mm clearance on either side of the pipe. However this is for the safety of the trench, the method of laying and jointing the pipe and the need to avoid damage to pipe coating.

Preparation of bottom of trench:-

The bottom of the trench shall be properly trimmed to permit even bedding of the pipeline. The curvature of the bottom of the trench should match the curvature of the pipe as far as possible, subtending an angle of 120° at the centre of the pipe. Where rock or boulders are encountered, the trench shall be trimmed to a depth of at least 100 mm below the level at which the bottom of the pipe is to be laid and filled to a like depth with non compressible material like sand or crusher dust or moorum of adequate depth to give the curved seating.

Special foundation in poor soil:-

Where the bottom of the trench at subgrade is found to consist of material, which is unstable to such a degree that in the opinion of 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 pipe, consisting of piling, timbers or other materials, in accordance with the direction of the Engineer-in-Charge, shall be constructed.

Excavation in hard rock by blasting:-

Blasting for excavation shall be done only when the contractor obtains the license for the same and only when proper precautions are taken for the protection of persons and property. The hours of blasting shall be fixed by the Engineer-in-Charge. The procedure of blasting shall conform to the requirement of licensing authority. The excess excavation by blasting shall be filled up by 1:4:8 cement concrete. The contractor shall have to make his own arrangement for procurement and storing of explosives required for blasting. Rubble available from excavation of hard rock, shall be the property of the contractor, for which recovery of Rs. 65/- per cum of the quantity of hard rock excavated shall be made from his running account bills.

Braced and sheeted trenches:-

Open-cut trenches shall be sheeted and braced as required by Engineer-in-Charge and as may be necessary to protect life and property or the work. When closed sheeting is required, it shall be so driven as to prevent adjacent soil from entering the trench either below or through such sheeting.

Stacking of excavated material:-

All excavated materials shall be stacked in such a manner that it does not endanger the work and avoids obstructing footpaths and roads, hydrants under pressure, surface boxes, fire, or

other utility controls shall be left unobstructed and accessible until the work is completed. Gutters shall be kept clear or other satisfactory provisions made for street drainage and natural watercourses shall not be obstructed.

Barricades, guards and safety provisions:-

To protect persons from injury and to avoid damage 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 roadway. All materials, piles, equipments and pipes, which may obstruct traffic, shall be enclosed by fences or barricades and shall be protected by proper lights when visibility is poor. The rules and regulations of the local authorities regarding safety provisions shall be observed.

Maintenance of traffic and closing of streets:-

The work shall be carried out in such manner that it causes the least interruption to traffic, and the road/street may be closed in such a manner that it causes the least interruption to the traffic. Where it is necessary for traffic to cross open trenches, suitable bridges shall be provided. Suitable signs indicating that a streets is closed shall be placed and necessary detour signs for the proper maintenance of traffic shall be provided.

Structure Protection:-

Temporary support, adequate protection and maintenance of all underground and surface structures, drains, sewers and other obstruction encountered in the progress of the work shall be furnished under the direction of the Engineer-in-Charge. The structures, which may have been disturbed, shall be restored upon completion of the work.

Protection of property and surface structures:-

Trees, shrubbery fences, poles and all other property and surface structure shall be protected unless their removal is shown on the drawings or authorized by the Engineer-in-Charge. When it is necessary to cut roots and tree branches such cutting shall be done under the supervision and direction of the Engineer-in-Charge.

Avoidance of the Existing Service:-

As far as possible, the pipeline shall be laid below existing services, such as water and gas pipes, cables, cable ducts and drains but not below sewers, which are usually laid at great depth. If it is unavoidable, pipeline should be suitably protected. A minimum clearance of 150 mm shall be provided between the pipeline and such other services. Where thrust or auger boring is used for laying pipeline across road, railways or other utilities, larger clearance as required by the concerned authority shall be provided. Adequate arrangements shall be made to protect and support the other services during laying operations. The pipeline shall be so laid as not to obstruct access to the other services for inspection, repair and replacement. When such utilities are met with during excavation the authority concerned shall be intimated and arrangements made to support the utilities in consultation with them.

Restoration of sewerage system:

If the sewer lines are coming in the way of pipeline alignment, it shall be properly restored either by constructing manholes on both sides and connecting it with similar sewer line, so as not to disrupt the services of the sewerage system or by laying the pipeline below or above the sewerage system as per the directions of Engineer-in-Charge.

Preparation of Formation for Sections of pipe line to be laid above Ground:-

Formation should be prepared by cutting high grounds and filling in low areas. Care has to be taken while fixing the alignment and gradient of the pipeline, to balance the cutting and filling quantities, as far as possible, with minimum of lead. Care should also be taken to ensure that pipe rests fully either on cutting or on bank.

Disposal of surplus material:

Excavated material in excess than required for backfilling the trenches, shall be disposed off as per the directions of Engineer-in-Charge. Surplus excavated stuff available at one section shall be used for back filling at other reaches, wherever required.

Extra material required for back filling:

If in any case, it is required to bring the soil for back filling from outside, it should be of good quality and should not have chemicals e.g. sulphates, chlorides, conductivity etc., which may cause corrosion to pipes, specials and other structures, beyond the permissible limits.

Road, rail and river crossings: -

The mode of laying the pipeline, crossing road, railway or river shall be determined so as to satisfy the requirement of the authority concerned.

SPECIFICATION FOR PUSHING

The pipes pushed through the Railway / Road Embankment should have minimum cushion of 2.00 m (Or as shown in the Railway's approved Drawing) above the pipes. The cautionary boards should be kept at sufficient distance from the point of crossing. The pushing should be done with the use of Hydraulic Jacks / Winch Machine as per the standard procedure of the Railway's. Every precaution should be taken that while pushing no settlement takes place in the track/ Road. The embankment should be protected with sand bags to avoid any seepage during working. The temporary thrust bed / thrust wall constructed for pushing should be dismantled after completion of pushing work. The M.S. Pipe barrels shall be field welded with electric arc welding machine. The entire work should be carried as per the latest specification of the Railway Department for pushing of pipe work. Jacking of the M.S. Pipes to form the opening under the Railway track under running traffic condition maximum allowable deviations from the Theoretical alignment will be limited to 200 mm Horizontally and 100 mm Vertically. Any deviation beyond this tolerance will be rectified by the tenderer at his own cost . Any temporary structures such as thrust walls etc. shall be dismantled immediately after completion of the Pushing work. Minor seepage water which can be dewatered manually by bucket etc shall be done by the contractor and no extra payment will be paid for this how ever if the subsoil water is heavy and needs dewatering by pumps then it will be paid as per regular practice of PHED/PWD.

HIGHWAY CROSSING

Wherever it is necessary to cross the Highways, the proposed pipelines should be crossed by the

trenchless method. The pipes to be crossed are for raw water, treated water and sewage pumping mains. The pipe shall be laid inside the MS pipe casing with proper slope and alignment. The necessary arrangement viz, Jacking pits & receiving pits, Equipments, including men and material required for jacking the MS sleeve pipe by trench less method and laying the pipe inside MS sleeve pipe shall be arranged by contractor.

JACKING OF STEEL SLEEVE PIPE

The hydraulic pipe jacking can start after completing the Jacking pit. The hydraulic pipe jacking by tunneling method. A guide frame is fixed on the firm support of the Jacking pit. The main jacking station with hydraulic cylinders shall fixed on the guide frame and to the abutment structure thrust block made of concrete or steel plate at the end of the pit. Mild Steel make jacking pipes (IS 3589-2001 with material grade is Fe 450) of required dia and length as per requirements are lowered on the guide frame and jacked section wise through the ground from the Jacking pit to the Receiving pit by means of hydraulic jacks. Each length of protective steel pipe is welded to the jacked pipe. Thus, the soil is removed by hand mining under the protection of a cutting shoe and moved through the jacked section to the surface. Depending on the existing soil the jacking pipes have to be lubricated with bentonite liquid. Boulders or other obstacles can be removed with the help of winches without any handicaps. Before arriving to the receiving pit construct the receiving pit. After completion of jacking procedure cut off the cutting shoe and remove out from Receiving pit. Completion of all inspection and handing over of each Section/Package of Pipe Jacking Works with protective steel pipes to the Engineers for inspection and after approval from Engineers Contractor to install his standard sewer pipes.

GROUND SUPPORT AND DEWATERING

The excavated area will be protected by the machine's shield and subsequently the pipes in order to minimize possible settlement of ground above the pipeline. In addition to that the bore is supported by bentonite suspension, which also reduces the friction between the pipes and the soil. Any dewatering if required shall be arranged by the contractor. There is no separate payment for dewatering.

CONSTRUCTION OF JACKING PIT

Jacking pit shall be constructed, of size of min. 4.5 m x 3.5 m. This size will vary depend upon the length of MS pipe. The depth of pit shall be such that it will suit the Jacking pipe depth. Proper timbering to be provided with the support of walls & struts during excavation. Required thickness of RR stone masonry wall in cement mortar 1:4 shall be provided for all four sides of the pits. 200 mm thick M 15 PCC floor shall be provided in the pit. A 400 mm thick reinforced concrete thrust or steel plate of suitable thickness wall to be provided to resist the Jacking force. The contractor may propose the alternate construction material such as concrete wall, brick masonry etc. during construction stage. Besides, the pit dimension may be changed to suit the site condition & requirement. Therefore, it is advisable that contractor should consider all these probable changes & method of workings and quote the rate accordingly.

RECEIVING PIT

The receiving pit shall be constructed with the same material and method adopted for Jacking

pit. The size of receiving pit shall be 2.5 m length x 2.5 m width. The depth of it shall be as required to suit the jacking pipe depth. The receiving pit to be constructed as per drawing and as directed by Engineer.

SEQUENCE OF WORK

- Inspection of pits (including abutment structure, as per attachment) and approval (requirements as per structural analysis).
- Installation of hoist at starting pit.
- Measurement of height and slope for jacking.
- Installation of main jacking station and guide frame.
- Fixing of frame to the firm support.
- Make opening in the wall for beginning of jacking.
- Installation and adjustment of cutting shoe.
- Installation of bentonite liquid station.
- Transportation of Mild Steel pipe from stock yard to jacking station.
- Installation and adjustment of first steel pipe (3.00 metres long) or and as directed by Engineer.
- Fixing of steel pipe and cutting shoe by welding.
- Start of jacking by hydraulic pressure from the main jacking station.
- Lubricate the annular space by the bentonite liquid.
- Excavation of soil by hand mining under the protection of the cutting shoe.
- Transportation of soil through the jacked section with the *help* of tipper to the jacking pit and remove by hoist.
- After jacking of 3.00m installation and adjustment of the next steel pipe.
- Joint both the pipes by welding.
- Continuation of jacking, hand mining and installation of steel pipes for done alignment and slope of designed sewer and as instructed by Engineer.
- Before arriving to the Receiving pit construct the Receiving pit.
- After completion of jacking procedure cut off the cutting shoe and remove out from receiving pit.
- Dismantling of jacking station and guide frame and remove out from Jacking pit.

Final Inspection of each Section /Package of Pipe Jacking Works to the Engineer, Contractor to install his standard sewer pipes.

QUALITY CONTROL

Control of dimension of Jacking and Receiving pit (as per structural analysis).

Visual checks of each Steel Pipe against damages, disturbances and irregularities as well as measurement of the dimension of wall thickness and inner width. Supervisor will keep record for the pipes delivered to site directly from the factory.

Control of jacking direction and slope as per construction drawings before and during and after jacking.

Control of welding seam (tightness and thickness)

SAFETY MEASURES

In order to ensure safety during jacking procedure for all labour and the public, the following measures will be implemented :

- a. Signal hats and/or signs have to be erected in order to warn and divert the traffic around the concerned area, where pits are opened.
- b. Pedestrians will not be allowed to enter the area closer than 3 metres to an open pit or the control unit, unless there is sufficient barricading.
- c. A gas monitor has to be used for every entrance and work into the pits or line. Before access, the monitor shall be moved down to the bottom of the pit minimum 5 minutes by rope. When poisonous condition is detected, the area will not be entered.
- d. Accessing people shall use protective clothes, gloves, rubber boots, helmet, head lamp and additional all safety measures including an oxygen bottle with rescue mask has to be available on site all the time.
- e. A ventilation blower shall be used in the jacking section.
- f. Pre-arrangements with the next hospital have to be ensured in case somebody is injured.
- g. A first aid kit must be available on site at every time.
- h. No stay below hanging goods such as pipes.
- i. Use fire extinguisher for fire protection.

MEASUREMENTS

The measurement for State Highway crossing by push through method shall be in running meters.

MS Pipes and specials underground, outer coating:

Coating

All underground buried mild steel piping shall be protected by the application of hot coaltar enamel and fibre glass wrapping.

The coating shall consist of one coaltar primer coat, one coaltar enamel coat, wrapping of fibre glass and one more coat of enamel and then a final wrap of enamel impregnated fibre glass.

Pipe surface shall be cleaned thoroughly by shot or sand blasting process. The cleaning shall ensure that the pipe surface shall be free from millscale, rust, oil, welding scale and other foreign materials.

The priming paint shall be of material recommended by the manufacturer. Freshly primed pipe shall be handled carefully to prevent damage. Any damaged areas shall be re-primed before applying enamel.

The material to be used as enamel shall be Shalimar coaltar enamel and fibre glass manufactured by Fibre Glass Pilkington of India Ltd., or approved equal.

Enamel shall be moisture and dirt free at all times prior to and at the time of heating and application. The primed surface shall be dry and clean at all times and the enamel shall be applied not later than 3 days after application of primer. Along with first flood coat of enamel, single spiral wrap of fibre glass inner wrap shall be applied overlapping at least 25 mm. It shall be seen that fibre glass impregnates in the first flood coat. Second coat of enamel and second wrap of bitumen impregnated fibre glass or kraft paper shall be applied in the same way. The total thickness of the coating shall not be less than 4 mm.

Each end pipes left bare for welding purpose shall be hand coated and wrapped after field welding is completed and the pipe has been hydro-tested.

SPECIFICATION FOR BULK FLOW METER

The Flow meter shall have following Salient features

- Suitable for conductive liquid.
- Absolutely maintenance free.
- Full bore type.
- Remote electronics.

- Simple & cost effective construction.
- Outstanding accuracy.
- Empty pipe indication.
- Universal power supply.
- Communication port.

DESCRIPTION

The bulk flow meters of electromagnetic full bore type are micro-controller based full bore type electromagnetic flow meter with remote electronics specially used for various industrial applications. These flow meters shall accurately measure the flow rate of conductive liquids & slurries in closed pipes. The meters shall be of simple & rigid design, the flow meter shall be an obstruction less & maintenance free instrument in place of conventional mechanical flow measuring device. The use of 'Pulsed DC' technology offers highest ability & better measuring accuracy in the form of electrical signal 4 - 20 mA DC linearly proportional to volumetric flow in case where electric supply is available and battery operated (With one additional battery) wherever instructed by JMC. The instrument is based on Faraday's law of electro-magnetic induction. A magnetic field is generated by the instrument in the flow tube. The fluid flowing through this magnetic field generates a voltage that is proportional to the flow velocity. Corresponding electrical output is provided with respect to measuring voltage.

TECHNICAL SPECIFICATIONS

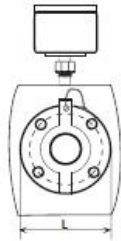
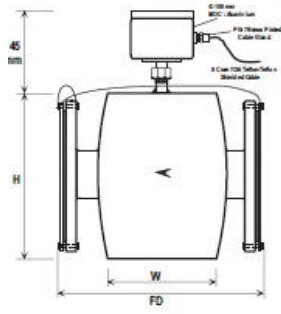
Media : Liquids (Conductive)	
Basic Application : Water	
Conductivity	: $3 - 5 \mu\text{S/cm min}$
Viscosity	: 200 cp max
Recommended flow rate	: Min./max. full scale value($v \sim 0.3$ or 10 m/s) velocity
Nominal Size	: 15 NB to 1000 NB
Excitation	: Pulsed DC coil
Type of Output : 1) 4 - 20 mA DC	, Isolated 2) Pulse
Remote Electronics Cable	: 25 mtr max
Remote Display	: 16 x 2 LCD - 4 digit for Flow Rate & 8 digit for Totalised Flow
Calibration Range	: As per requirement or (Factory Standard Calibration)
Accuracy	: +/- 0.5% F. S
Linearity	: +/- 0.5%
Repeatability	: +/- 1%
Process Temperature	: Rubber: 85 0C Max & PTFE: 100 0C Max
Process Pressure	: 10 kg/cm ² max
Material of construction	: Lining - Rubber / PTFE (Teflon) Flange - CS / MS / SS Electrode - SS 316L / Hastalloy C / Platinum Coil Housing - MS / SS 304
Power Supply	: 1) 24 V DC, External 2) 90 - 250 V AC, 50 Hz
Power Consumption	: < 10 VA
Isolation	: 1.4 KV between Input, Output & Power Supply
Response Time	: < 100 mSec
Temperature Coefficient	: +/- 0.1% per 0C
Remote Electronics	: IP- 66, 2" pipe mount type
Sensor construction	: As per IP- 68
Process Connections	: ASA 150 flanged, as per table B 16.5
Mounting	: In-Line (Horizontal OR Vertical)
Operating Conditions	: Temperature 0 to 55 0C / Humidity 5 to 95% non condensing

OPTIONAL

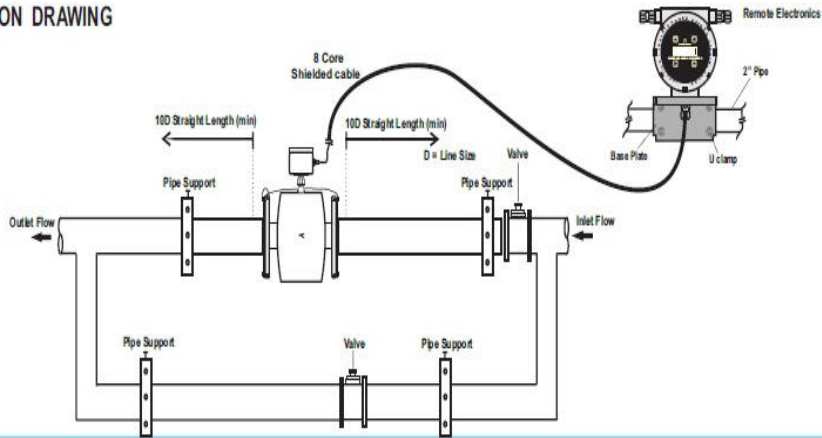
Communication Port	: RS 485 with MODBUS RTU Protocol
GSM Telemetry	: GSM Module Inbuilt in Electromagnetic Flowmeter with SMS facility & Programmable (Showing Flow rate & Flow totalizar)
ELMAG	: 200R with Remote Electronics

Note :- For process conditions other than above arising actually at site after execution of components please consult factory.

DIMENSIONAL DETAILS



INSTALLATION DRAWING



Specification - Pilot-operated, hydraulic water-level and flow control valve

1. Flow with Attitude/Level control valve:

The Weir/Globe pattern Control valve will maintain a maximum water level in the elevated reservoir, stopping the inflow of water when the level reaches the maximum-allowed level. The valve will stay closed until the water level drops to a preset minimal value, and the open fully. While the valve is in opened position it will regulate the water flow rate to the tank. The rate of flow should be regulated within the whole range of potential flows. The control circuit will include a device/speed-control that will extend the closure time, in a way that the inlet pressure will not generate water hammer. The valve should be with latch solenoid for remote on/off function.

2. Specification of Flow Control/Pressure Reducing Valves.

- a) The control valves shall be designed for flow control application for providing precise control over the flow rates/pressure range,
- b) The body of the control valve shall be designed and hydro tested for the applicable pressure rating, considering the surge pressure as per provisions in BS-EN- 12266-1-2013 or any other equivalent standard.
- c) The control valves shall be designed to cause minimum head loss. The calculation method confirming to ANSI/ISA-75.01.01-2007 (IS/IEC 60934-2-1 Mod) -2012 for flow equations for sizing of Flow control/pressure Reducing valves shall be adopted. This approach allows valves from various manufacturers to be compared using the same approach, thus ensuring that the best valve is selected for the application. Fisher's Control valve Handbook, latest international standards/publications may also be referred in the above context.
- d) The seal at the seat ring should give leak tight malleably. The valve shall pass through seat leakage test as per ANSIFCI-70-2-2006 Class VI or any other equivalent standard.
- e) The material of all components of valve/internal working parts shall be corrosion resistant for chlorinated water.
- f) Wherever capability with SCADA or RTU local PLC is required, digital communication port RS 232/485 fiber optics having connectivity as per industry standard protocol should be provided (RTU shall be provided by contractor and contractor shall also comply with the capability requirements).
- g) Provision of battery operated option should be there in case of power failure

A- Plunger Type Flow Control/Pressure Reducing Valve:

In addition to (a) to (g) above-

1. Plunger valves shall be provided with electrical actuators having the control facility for intermediate valve positioning by connecting external signal.
2. The electric actuators shall be designed to provide the required torque for operations in the flow and pressure conditions of the water transfer system. Gear assembly shall be provided as necessary.
3. The flow path with annual flow cross section in any open position shall be rotationally The movement of piston. Plunger by means of Crank/shaft/spindle drives shall be Axial/Linear along with irreversible worm gear box including position indicator.
4. The general design requirements of the valve, Gear assembly and electric actuators described in the tender will be applicable to the flow control valves also.
5. A hand wheel shall be provided for plunger valves so that operations of the valve can be carried out when the power supply of valve has failed. The torque requirements at the hand wheel shall be such that one person can operate the valve. Hand wheel shall be positioned to give good access for operational personnel.

6. Hand wheel shall be provided with integral locking device to prevent operation by unauthorised persons.
7. A selector switch shall be provided on the actuator for remote/local/hand operation of the valve

3. Material of Construction for Plunger type Flow Control Valve

Body (Global Type)	Ductile Iron GGG40 – DIN 1693 or EN-JS 1030
Plunger /piston	Stainless steel AISI-304/Gr 1.4301
Piston Guides	Bronze Welded Overlay/SS
Shaft Crank/Spindle	Stainless steel AISI-420/Gr 1.4021
Seat Ring	Stainless steel AISI-316/Bronze
Seal (O-Ring/Quad ring)	Synthetic Rubber-Buna-N/EPDM (FDA/WRAS approved)

Bearing Bush	Bronze
Bolts	SS A4
Eye bolt for lifting	Galvanised steel- 1.0401
Slotted cylinder/Strainer	Stainless steel
Coating(Both inside & Outside)	Fusion Bonded Epoxy,min 250 micron(NSF/FDA/WRAS approved)

B- Diaphragm Type Flow Control /Pressure Reducing Valves:-

In addition to (a) to (g) above---

- i. Diaphragm type flow control/pressure deducing valves shall be of single/double chambered self actuated Automatic valves i.e operated from line fluid pressure itself. For continuous regulation or an intermediate positioning, the control valves shall be provided with two solenoid valves with facility of connecting the external signal.
- ii. Commands/electric signals for positioning of the control valve (for SCADA compatibility) will be from RTU.
- iii. The diaphragm must with stand a mullins Brust Test of a minimum of 25 bar per layer of nylon fabric and shall be cycle tested 100000 times to insure longevity.
- iv. The internal valve component shall be assessable removable and repairable and repairable without removing the valve body from pipeline.
- v. These valves should be of self regulating type when power supply is not available

4. Material of construction for Diaphragm type flow control Valves:

Suitable material of construction to the above specified valves should be as noted in the table below:-

Body and cover (weir/ Globe Type)	Ductile Iron ASTM A 536 Or DIN 1693-GGG 40
Diaphragm and Resilient seal disc	Flexible, non-wicking nylon fabric reinforced synthetic elastomer-Buna-N EPDM/NYLON reinforced rubber (FDA/WRAS approved)
Seat Ring	Stainless steel 304/316 or above, raised, replaceable inline & onsite
Stem	Cast steel/Stainless Steel 304/316(replaceable inline & onsite)
Spring and Bearing Bush	Stainless Steel AISI-302/304/316
Disc guide, disc retainer & Diaphragm washer	Cast Steel/Stainless Steel AISI-304/316, Bronze & Coated Steel
Seal	Synthetic rubber-Buna-N/EPDM (FDA/WRAS approved)
Pilot	Body: Stainless Steel, AISI-304/CF or Brass/Bronze Elastomer :NBR
Tubing	Stainless Steel AISI-304/Copper/Flexible Nylon Tubing
Nut-Bolts and Studs	Stainless Steel AISI-304-ASTM-A 193 B7
Solenoid Valve (IP 65)	Brass, SST 304/316

Throttling Plug	To have the linear flow (non turbulent flow),if required, V-shaped or U-shaped throttling plug may be provided.
Coating (Both inside & outside)	Fusion Bonded Polyester/Epoxy, min 250 micron (NSF /FDA/WRAS approved)

Maintenance

- The bidder should propose a recommended five year set of spare parts per a batch of 5 valves of the same diameter and quote their price.
- The bidder should specify the warranty period.
- The valve should require low maintenance. No set periodic packing or parts replacement should be required.
- The valve's pilot control loop should include a low maintenance, inline "self-cleaning" control-filter.
- The typical weight of any control chambers and trim assembled as a complete unit, regardless of valve diameter, shall not exceed the permitted lifting weight for a single person as defined in the regulations. Disassembly will not require usage of sophisticated, heavy lifting devices such as cranes of any type. Should such devices be required – these are to be provided and installed at the assembly site by the supplier.

Note: The above scope of work and others details are minimum and not limited and Bidders are advised to visit the JMC office and site in advance to verify the balance scope of work with concerned Nodal official Amrut Mission Jagdalpur before quoting the rates. Any items/components which may not be mentioned in the scope of work, but are necessarily required for successful commissioning of the Plant/system with desired outputs and complete functions in all respects will be deemed to inclusive in quoted cost by the bidder and nothing extra shall be paid by JMC

SPECIFICATION FOR METER

SCOPE OF WORK & SPECIFICATION OF WORK :

THE WORK INVOLVES :

Name of Work:-Supply and Installation of Multi Jet, dry dial, inferential type, horizontal, Magnetically coupled, class 'B' water meters Conforming to IS- 779 : 1994 and ISO 4064: 1993 standard with EEC/ MID certification mark, with IP 68 protection class copper can register with 5 mm tempered mineral glass cover, successful Life Cycle Test Certificate from FCRI and AMR compatibility with 5 years warranty complete with brass nuts and nipples with all accessories and service connection including Excavation, dewatering, cost of jointing materials, fittings and all other allied related works.

1. The Site shall be handed over to the successful contractor by JMC. The contractor has to coordinate with the the distribution network contractor, as per the instructions of JMC and allocate the magnitude of meters to be connected in every zone. A reconnaissance survey has to be carried by the contractor in complete project area and shall quantify zone wise requirement of the consumer meters. The requirement of such meters zone wise shall be submitted to JMC for approval in writing and after the approval of JMC only the supply order shall be placed.
2. The contractor shall submit a bar chart showing schedule of all the activities and probable time frame required to complete the same within a week's time from the work order.
3. The contractor shall carry out third party inspection from the approved TP agencies such as SGS/ EIL/ RITES etc. also he should inform the JMC about the schedule of manufacturing and testing and arrange a visit of JMC officials to the factory to inspect the process.
4. Every meter must carry the serial no with embossed mark and batch number in which the inspection has been done. Also the name of JMC shall have to be embossed on each meter.
5. The contractor shall depute one site team for making awareness in the public about the advantages of the meters and how they can bring the monthly charges down by using water sensibaly. The team shall guide the public regarding the use of meters, meter reading and charges to be paid by the public on actual consumption of water. The contractor shall prepare a check list in coordination and approval of JMC depicting the above facts and shall take the signature of the citizen where the meter has been installed along with the necessary documents pertaining to JMC and produce the same for release of installation amount.
6. The contractor shall also take photograph of the complete system installed along with GPS point and the consumer information. The contractor needs to submit all information in GIS format to the JMC as a submission / completion report.
7. The lumpsum item to include
Excavation
 - a. The excavation of the trenches include excavation of the pit for making house service connections from the already laid line to the respective house including all the labour, cost of material used for excavation in soft strata below CC roads the size of the pit shall be minimum but not limited to 1.00m x 1.0m x 0.70m below the CC road lowest bed surface. The pit shall be well excavated below the existing pipe line to facilitate flawless fixing of the strap on the pipe line. The pipe shall be cleaned well from all the foreign material prior to start the fixing activity.
 - b. The excavation for excavating CC road surface including chiseling and cost of all manual, mechanical means for cutting the sides to facilitate the excavation in soft rock or hard strata, the size of the pit shall be but not limited to 1.0m x 1.0m x 0.50m. The provision shall be

applicable for hard strata if met with on upper side or either on the lower side of the pit.

c. Dewatering

The dewatering from pipeline either from the pools of ground water or from the charged pipe line shall be pumped out from the pit and the pipe line shall be made dry to make the connections of the house service connection. The dewatering shall be of but not limited to 1 BHP/Hour




d. Cutting the parent pipe if required

The contractor has to make cutting of pipe wherever necessary with filing and champharing and making the mouth clean for fixing the fittings







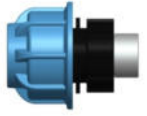
Making strap joint

e. The strap joint shall be of best quality confirming to ISO as detailed below

Providing & Supply 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 elastomeric 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 elastomeric seal matching to the curvature of the pipe. The seal shall be of elastomeric 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.

S. N.	Discription	Dimension	Material	Load /Pressure testing	
1	Strap Saddle suitable for CD/ DI/ HDP etc pipe	A) outlet (inch) shall be from 1/2" B) Strap available for pipe dia 50mm to 600mm.	1)Body shall be of Ductile Iron or Industrial polymer 2)Strap & other hardware shall be of SS 304 3)Seal shall be of Nitrile /EPDM/Silicon	Shall be Tested for 15 kg/cm2	
2	PP Ferrule with Sealing on Top cap	Shall be from 1/2" (15mm)	1) Pigmented UV resistant virgin polymer ,other material shall be Derlin /Silicon rubber 2) Insert shall be SS 304	Shall be Tested for 15 kg/cm2	
3	Both Side Commpression Elbow	1)Suitable for pipe dia from 1/2"(20mm)	1) Shall be made of UV resistant virgin polymer 2) Insert shall be of SS 304 3) "O" ring shall be of EPDM/Nitrile	Shall be Tested for 15 kg/cm2	

**TENDER DOCUMENT FOR AUGMENTATION& REORGANISATION TO JAGDALPUR WATER
SUPPLY SCHEME UNDER AMRUT MISSION GOVERNMENT OF CHHATTISGARH**

4	PP Ball Valve 20 mm/ 1/2"	1)Suitable for pipe dia from 1/2"(20mm)	1) Pigmented UV resistant virgin polymer ,other material shall be Derlin /Silicon rubber 2) Insert shall be of SS 304	Shall be Tested for 15 kg/cm2	
5	PP "Y" Strainer with built-in Air valve	1)Suitable for pipe dia from 1/2"(20mm)	1) Pigmented UV resistant virgin polymer ,other material shall be Derlin /Silicon rubber 2) Insert shall be of SS 304	Shall be Tested for 15 kg/cm2	
6	Water Meter Protection Box – PP/ Nylon 6 with positive Locking arrangement	278mm(L) X 232mm (W)X 175mm(H)	Virgin Industrial PP with UV resistant high impact pigmented fiber polymer	Shall be Tested for 15 Kg / Sq inch	
7	Female threaded (SS304) compression Elbow	1)Suitable for pipe dia from 1/2"(20mm)	1) Shall be made of UV resistant virgin polymer 2) Insert shall be of SS 304 3) "O" ring shall be of EPDM/Nitrile	Shall be Tested for 15 kg/cm2	
8	Male Threaded (SS304) compression Elbow	1)Suitable for pipe dia from 1/2"(20mm) to 1-1/2"(50mm)	1) Made of UV resistant virgin polymer 2) Insert is of SS 304 3) Oring is of EPDM/Nitrile	Tested for 15 kg/cm2	
9	Female Threaded (SS304) Straight Compression adaptor	1)Suitable for pipe dia from 1/2"(20mm) to	1) Shall be made of UV resistant virgin polymer 2) Insert is of SS 304 3) "O" ring is of EPDM/Nitrile	Shall be Tested for 15 kg/cm2	
10	Male Threaded (SS304) Straight compression Adaptor	1)Shall be suitable for pipe dia from 1/2"(20mm)	1) shall be made of UV resistant virgin polymer 2) Insert shall be of SS 304 3) "O" ring is of EPDM/Nitrile	Shall be Tested for 15 kg/cm2	

f. Fitting the compression joints

The compression joints, bend, adopters and other fittings shall be fixed as per the latest norms in this field

g. Fitting the nipples and pipes

Providing and fixing Polythelene- Aluminium- Polythelene (PE-AL-PE) composite pressure pipes conforming to IS 15450-2004 UV. Stabilised with carbon black having thermal stability for hot and cold water supply, capable to withstand temperature up to 80⁰ C including jointing & testing of joints as per the direction of the engineer in charge. External work.

SPECIFICATIONS FOR MULTILAYER COMPOSITE PIPES AND ASSOCIATED FITTINGS

1. MULTILAYER COMPOSITE PIPES (As per IS 15450:2004):

1.1. Description:

Co-extruded polyethylene composite pressure pipe as per IS 15450:2004 having welded aluminium tube reinforcement between inner and outer polyethylene layers being bonded to Aluminium tube by a melt adhesive with welded aluminium tube of itself being capable of sustaining internal pressures. The Composite Pipes will have pressure rating of 13.8 Kg/Cm² at 230 C. and 11.0 Kg/Cm² at 600C. The pipes should also withstand 6 Kg/Cm² pressure at 800C operating temperature.

1.2. Pipe Dimensional Details:

The dimensional details will be as under:

Description	Pipe Size						
	1014	1216	1620	2025	2532	3240	4050
Minimum Outside Diameter (mm)	<u>14</u>	<u>16</u>	<u>20</u>	<u>25</u>	<u>32</u>	<u>40</u>	<u>50</u>
Minimum Wall Thickness (mm)	<u>1.70</u>	<u>1.75</u>	<u>2.00</u>	<u>2.45</u>	<u>2.80</u>	<u>3.40</u>	<u>4.00</u>
Standard Coil Length (meters)	<u>200</u>	<u>200</u>	<u>200</u>	<u>100</u>	<u>50</u>	<u>50</u>	<u>50</u>
Minimum Aluminium Thickness (mm)	<u>0.20</u>	<u>0.20</u>	<u>0.25</u>	<u>0.25</u>	<u>0.30</u>	<u>0.30</u>	<u>0.30</u>
Minimum Outside PE Layer Thickness (mm)	<u>0.40</u>	<u>0.40</u>	<u>0.40</u>	<u>0.40</u>	<u>0.40</u>	<u>0.40</u>	<u>0.40</u>

2. ASSOCIATED FITTINGS:

The composite compression fittings shall be manufactured from engineering polymer blend with DZR brass inserts. The fittings when tested alone or in assembly with composite pipe shall comply with the requirement as required for the duty conditions applicable for pipe.

3. TECHNICAL PREQUALIFICATIONS FOR PE-AL-PE PIPE MANUFACTURER

- The Contractor must submit the copy of the BIS licence granting the ISI mark Certification for materials having BIS specifications and being used in the contracted job.
- The Quality Control Laboratory of the manufacturer should be well equipped to carry out all the acceptance tests specified in IS 15450:2004 standard. Having laboratory recognized by IAPMO India will be added advantage.
- The manufacturer of Pipes & Fittings must have ISO 9001-2008 certification for its Quality system.
- The contractor shall undertake to only supply materials manufactured by such pre-approved manufacturers.
- The contractor shall also obtain a letter of confirmation from the manufacturer that the manufacturer will be fully support the warranty given by the contractor and will also support and depute the engineer for testing the system so installed.
- The Contractor shall submit a note from the manufacturer for site testing procedure.

- The installed capacity of the manufacturer of PE-AL-PE Composite Pipes should be minimum 50 Lac meters per annum. The Contactor shall submit the certificate from the manufacturer on the available installed capacity at the manufacturing facility.
- The contractors must provide an undertaking from the manufacturer to have access to the factory to witness the manufacturing and testing facilities.
- The contractors must provide an undertaking from the manufacturer to the effect that the manufacturer will supply pipes, fittings and specials required for successful and timely execution of the project without any interruption irrespective of any possible dispute between the manufacturer and contractor.
- The pipe, fittings, specials as a system must pass all the tests specified in Annexure A of 15450:2004.

4. TEST PRESSURES FOR ON-SITE TESTING:

- Test duration should not exceed 24 hour.
- Maintain the test pressures at 1.5 times the operating pressure of the system.
- In no case test pressure should be more than 15 bar.

5. INSTALLATION PROCEDURE

The manufacturer's "users' manual for pipe & fittings" should be submitted for installation instructions in detail.

6. PRECAUTIONS:

- a) Pipe should be stacked carefully so as to prevent them falling or causing damage with any external sharp edged material.
- b) It must be ensured that end caps are retained when pipes are stacked in storage yard.
- c) Where pipe will be connected to heavy items such as pumps or valves, the pump or valve should be supported directly using the support brackets
- d) The pipe should be protected from any heavy load/impact and drilling or nailing etc.
- e) Where these pipes are provided under the ground, adequate top sand cover should be provided.
- f) Proper sand bedding must be provided for laying the pipe in trenches.

The rate to include providing and fixing of PE-AL-PE pipes upto 6 m length for each connection. If the length of pipes required to be increased beyond 6 m then the payment for the extra length of pipe shall be regulated by PHE unified SOR 2012 with upto date amendments as per

CG PHE USOR P.NO.333, I.NO. 32.27. The payment for fixing of these pipes shall be deemed to be considered in the lumpsum offer. The provision of PE-AL-PE pipes shall be as per the dia of

connection i.e. shall be suitable for 15mm, 20mm and 25mm dia connections as per the numbers mentioned in the schedule.

h. Fixing the ball valve

Providing, Supply and installation of PP/Composit Ball Valves in PN1.6 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, all taxes related to central, state & municipal, inspection charges, transportation up to site, transit insurance, loading, unloading, stacking etc. complete.

i. Installation of the consumer meter

Supply and Installation of Multi Jet, dry dial, inferential type, horizontal, Magnetically coupled, class 'B' water meters Conforming to IS- 779 : 1994 and ISO 4064: 1993 standard with EEC/ MID certification mark , with IP 68 protection class copper can register with 5 mm tempered mineral glass cover, successful Life Cycle Test Certificate from FCRI and AMR compatibility with **5 years warranty** complete with brass nuts and nipples.

j. Providing and fixing the protective box

Weight shall not be less than 850 gms.

Load carrying capacity 15 Kg/ Cm² Certificate of Testing along with consignment - More than pedestrian load

- Unique lock and key arrangement shall be provided and least Metallic to be used to make it weather proof

- Unique Pipe gripping arrangement shall be provided to secure Water Meter Box in place.

- Unique flap shall be provided to avoid mud/ sludge/ reptiles to reside inside

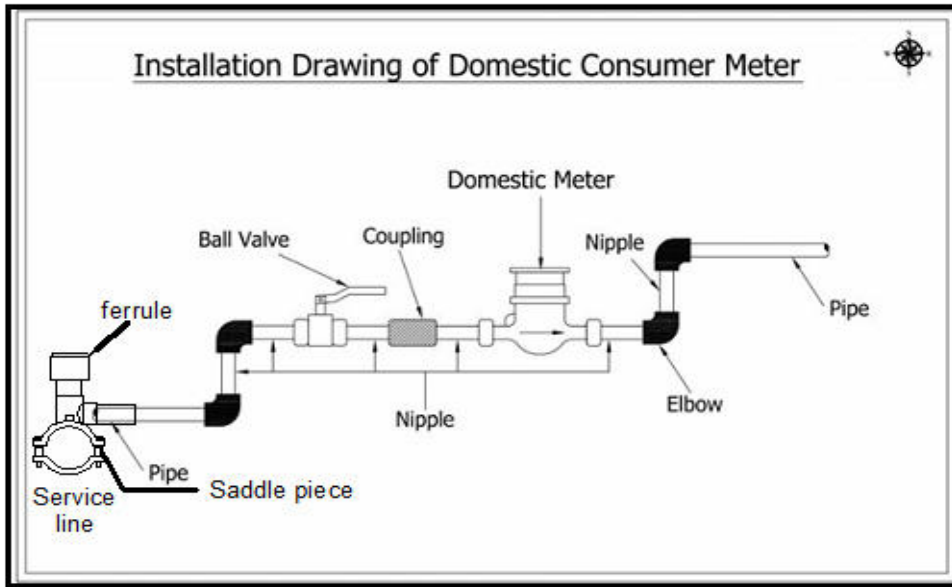
- Can be mounted on wall as well as use on ground.

k. Testing and making water tight the complete system

After successful installation the complete system shall be checked for water tightness and any drops or leakage shall be rectified to the fullest satisfaction of the engineer in charge. The contractor shall take a signature of the person in whose house the connection has been installed, that the 1. Connection has no leakages in it 2. The site restoration work has been done satisfactorily 3. The ball valve is functioning properly. 4. The meter wheel is functioning properly 5. The contractor has performed the volume delivery test and the units in the meter are exactly matching with the volume of water 6. The actual pipe is consumed Rmt against this house service connection.

The rates quoted by the contractor shall be inclusive of all the above activities and specification

except the the extra length of MDPE pipes which shall be regulated as per the clause g mentioned above.



The drawing shown above is for the general idea of the system to be installed at each house service connection, however the contractor shall consider other additional fittings also which are necessary and may get it complied in the prebid meeting.

Note: The above scope of work and others details are minimum and not limited and Bidders are advised to visit the JMC office and site in advance to verify the balance scope of work with concerned Nodal official Amrut Mission Jagdalpur before quoting the rates. Any items/components which may not be mentioned in the scope of work, but are necessarily required for successful commissioning of the Plant/system with desired outputs and complete functions in all respects will be deemed to inclusive in quoted cost by the bidder and nothing extra shall be paid by JMC

ANNEXURE – E-4 WATER TREATMENT PLANTS:

Design, construction, testing & commissioning of 35 MLD capacity Water Treatment Plant inclusive of all civil works, providing & installation of all mechanical & electrical PLC SCADA monitoring and control system equipments, Add 2 Filter Bed in Existing 9 MLD WTP& Demolish Old 4.5 MLD WTP

Scope of work:-

I. Detailed Breakup for Civil Works:

Item No.1: Aeration cascade, Inlet channel & Parshall flume <ul style="list-style-type: none">a. Inlet channel & measuring flumeb. Remaining works & after three months trial run
Item No.2: Chemical House, Office – <ul style="list-style-type: none">a. Complete Brick masonry, doors, windows & Sanitationb. Complete plastering & painting work & all remaining items
Item No.3: Flash Mixers (2No.) <ul style="list-style-type: none">a. Hydraulic testing & all others remaining works
Item No.4: Two Lamella Plate or Tube Settler / Clarifiers -- <ul style="list-style-type: none">a. Complete wallingb. Hydraulic testing and all remaining works
Item No.5: Filter House & Additional 2 Filter beds <ul style="list-style-type: none">a. Complete Foundationsb. Complete Wallingc. Complete Filter house including doors & windows and others associated works.d. Hydraulic testing and all remaining works
Item no.6: Construction of Clear Water Reservoir <ul style="list-style-type: none">a. Hydraulic testing and all remaining works
Item no.7: Wash water Tank <ul style="list-style-type: none">a. P.C.C. & Excavationb. Foundationsc. Complete supporting structure up to bottom slabd. Bottom slabe. Vertical wallf. Roof slabg. Hydraulic testing & all remaining work

Item No.8: Clear Water Pump House

- a. Complete brick masonry, doors, windows & sanitation
- b. Complete plastering & painting work & all remaining items

Item No.9: Chlorine room / Tonner stone

- a. Foundation s
- b. Column & beam
- c. All remaining works

Detailed Scope of work for Electro-Mechanical Works

- a. Parshal flume & Ultramagnetic Flow meter (1 no.)
- b. Filters and filter house (dual media filter)
- c. Chemical house
- d. Clear water sump(515 kl) & pump house with EOT 5 ton gantry crane
- e. Recirculation system for used back wash water
- f. Electrification of buildings of wtps and Intake site including panel board and power wiring complete
- g. Illumination work(with leds for producing 300 lux illumination) complete
- h. Laboratory equipment , glass ware & chemicals etc.
- i. Centrifugal Pumps, 4 Nos, (2 W+ 2S), Discharge =510 m³/hour, Head = 50m, Pumping hours- 22 Hrs including valves, piping, electrical panel, EOT crane including installation , testing commissioning and trial run for 12 months.
- j. One 33/0.415 kV, 500 kVA Sub-station installation, tesing and commissioning complete.
- k. **PLC-SCADA Automation , monitoring and control system work** for all new and existing Raw Water Pumps & Clear Water Pumps & all treatment Units of Proposed WTP based on Lamella Clarifier & recirculation of wastewater with provision and to cover distribution system including OHSRs , electro magnetic bulk flow meters.

Note: The above scope of work and others details are minimum and not limited and Bidders are advised to visit the JMC office and site in advance to verify the balance scope of work with concerned Nodal official Amrut Mission Jagdalpur before quoting the rates. Any items/components which may not be mentioned in the scope of work, but are necessarily required for successful commissioning of the Plant/system with desired outputs and complete functions in all respects will be deemed to inclusive in quoted cost by the bidder and nothing extra shall be paid by JMC.

The designs and drawings shall be got approved from Govt. Engineering College in CG/ NIT at the cost of contractor and then submitted to JMC. The successful bidder shall first submit the General arrangement drawing accomodating all the existing units and submit the same for the approval of PDMC. After this he shall submit the hydraulic design and after due approval only he shall prepare the structural designs and architectural drawings and get it approved from Govt. College/NIT and finally submit it for the approval of competent authority through PDMC the cost of all the approvals from engineering college shall be in the scope of

contractor.

1. Proposed work in existing 9 MLD WTP- Provision of additional 2 filter beds 3.5mx 6.0 m with actual filtration rate of 2500 Lit/Sqm/hr are proposed for augmentation of 14.0 MLD capacity besides the existing filter bed, recirculation of waste water & sludge complete including testing, installation and commissioning with 03 months trial run. Existing Water Treatment Plant capable of delivering 9.0 MLD in which Add 2 filter beds 3.5 m X 6.0 m with actual filtration rate of 2500 Lit/Sqm/Hr are proposed for the augmentation to 14.0 MLD capacity besides the existing filter bed & Proposed WTP delivering 35 MLD of filtered water comprising of Civil works, providing and fixing of electrical, mechanical equipment including testing & satisfactory trial run as mentioned above, with a guarantee for entire work for 12 months or 2 consecutive rainy seasons which ever is more with a provision of over loading of plant with 25% except inlet and outlet control arrangements which should be designed to permit a 100% overload for emergent occasions. This work shall comprise of the following items :-

The principal requirement is a spacious and convenient layout. The structure should represent a pleasing appearance with aesthetic features forming a balance between function and form. The interiors of the structure shall be eye appealing and in keeping with the objectives of the plant viz., production of pure and wholesome water.

While designing and constructing, it should be ensured that all materials, design, construction and fabrication details for different units including doors and windows conform to the IS-specifications and codes of practice wherever available and in their absence, to the established standards.

The scope of work includes but shall not be limited to the provision of the following :-

- Study of available data with department and if required collection of additional field data's and site investigations.
- Planning and design of most economical type of treatment plant to generate 35mld wholesome water conforming to relevant IS Code in 22 hours, with due consideration of future expansion.
- The detailed design including hydraulic and structural design, development and preparation of detailed plant working drawings, diagrams and cable schedules and detailed structural steel fabrication drawings, preparation of design reports, manufacture and testing at places of manufacture, transport, delivery, erection, building-in, setting to work, commissioning, testing of all plant required for the Water Treatment Works,

The contract is including but not limited to pipelines, pumping installations, blowers, compressors, machinery, apparatus, station pipe work, lifting, handling, ventilation equipments, electrical equipments, instrumentation, control, compatible PLC / SCADA interfacing lighting systems, earthing, fire safety and lightning protection systems, materials, articles, fittings and accessories, ancillary works of all kind and nature required for installations of the highest possible operative standards and for compliance with the standards prescribed in the Specification and with the particulars and guarantees entered by the Contractor in the schedules.

Treatment Process

The Water Treatment Plant will be based on Lamella clarification followed by rapid gravity sand media filtration. It will consist of following treatment units:

- Cascade aerator
- Inlet Chamber and inlet channel
- Measuring flume and flow measuring equipments
- Chemical house and chemical feeding equipments including automatic valve operation system with audio visual annunciation at the central control panel
- Flash Mixer
- Clarifloculators (one or Two unit of total 35 MLD capacity)
- Rapid gravity filters
- Disinfections arrangements
- Laboratory & Laboratory equipments
- Clear water sump well and pump house
- Recirculation arrangement

The source of water is Indravati river supplemented by NH-Bridge anicut from which raw water will be pumped to the Treatment Plant which is proposed to be constructed at near the existing WTP. The plant should have arrangements for flow measurement, chemical dosing, chemical mixing, mechanical flocculation and clarification, filtration by rapid sand gravity filters, disinfections by pre and post chlorination, chemical storage and laboratory & Laboratory equipment.

- (B) The plant should be capable of treating the raw water to get the filtered and chlorinated water 35 MLD in 22 hours excluding wash water requirement per day. It should also be possible to overload the treatment plant by 25%.

(C) Characteristics of Raw water:

The quality of raw water to be dealt which is indicated in the analysis reports enclosed (Annexure-I) for guidance. Normally in fair weather, the water is clean, In Mansoon its turbidity ranges from 500 to 3000 ppm. The treatment Plant should be capable of dealing with such a turbidity and colors, without variation in quality of filtered water.

(D) Filtered water standards :

The filtered water should be generally in conformity with the standards specified in IS 10,500(2012). The tenderers shall be required to give guarantee for the performance standards, which should be satisfied by filtered water effluent, when the plant is working at the maximum rate of filtration samples for this purpose, shall be collected at filtered water outlet prior to chlorination and get tested at such laboratory as may be specified by the Executive Engineer and results of such tests shall be final and binding on both the parties.

The Executive Engineer shall decide the manner and frequency of sampling of raw water and filtered water.

(E) Performance Standards:

The filters performance standards as specified in “Manual of water supply and Treatment

1999” para 2.2.9 shall have to be achieved.

(F) Acid Reaction:

The Filter water shall not have an acid reaction in any circumstances and shall contain not less than 10-PPM alkalinity, measured in terms of calcium carbonate.

The P^H value of the filter effluent shall be between 7.0 and 7.5. The chemical characteristics of the filtered water shall be in confirmation to standards.

(G) Guarantee for the Equipment:

All the mechanical equipment and appurtenances supplied and erected by the tenderers shall be covered by a guarantee for satisfactory working for a minimum period of 12 months or 2 consecutive rainy season whichever ever is more,. From the date of satisfactory commissioning of the plant. The tenderer at his own cost, such replacement being arranged by tenderer as expeditiously as may be directed by the Executive Engineer shall replace any defective parts detected during this guarantee period.

(H) The tenderer shall supply and deliver a full set of spares for working of the plant, continuously for 2 years. These spares price shall be quoted separately with full details for the parts offered.

(I) Testing and Inspection:

All pipes and other castings subjected to pressures, shall be hydraulically tested to 2 times the designed pressures as directed by the Executive Engineer.

The entire work during manufacturing and erection, shall be subjected to inspections by the departmental staff (i.e. Executive Engineer or his nominees) for which adequate facilities, shall be extended by the tenderers at his cost.

(J) Completion Drawings:

The tenderer shall furnish on completion of the work and handing over the same to the Department, three sets of white print plans mounted on cloth, showing the working detail of the several components, units of the plant and equipments, including civil works (i.e. building etc.) installed and erected, together with a descriptive specification for the daily working, operation and maintenance and also a list of spares along with the plant. The original cloth tracings of the above completion plans, shall also be handed over to the Department for record. A section of filter media together with its density, sizes, depth and specifications, shall be enclosed in triplicate duly attested.

2. Raw Water:

Raw water will be taken from the Indravati River about 2 Kms away from the WTP campus and pumped to the treatment plant. **The typical analysis for physical, chemical and bacteriological characteristics of raw water samples of River water is enclosed.** The

bacteriological pollution is not expected to exceed the M.P.N. count of 2400 coliforms organism per hundred Mili liters. The turbidity of raw water during dry season is as low as 5 PPM but during monsoon as high as 1000 PPM. The raw water results may deviate but in any case the standards of clear water must be achieved.

3. Standards for purified water:

The purified water shall meet the standards as mentioned in latest water supply and treatment manual published by CPHEEO para 2.2.9

4. Treatment :

The treatment should comprise of the following process:

- 4.01 Alum dosing and flocculation
- 4.02 Coagulation and settling
- 4.03 Filtration by Rapid Gravity filters
- 4.04 Disinfection using gaseous chlorine

DETAILS OF COMPONENTS:-

1. CASCADE AERATOR

The raw water rising main of 600 mm dia D.I. K-9 pipe will be laid by contractor up to the cascade aerator. The connection of this raw water rising main with the cascade aerator is included in this contract.

The raw water will be taken to cascade aerators, which will be suitably designed for dissipating the incoming hydraulic energy. The residual pressure at the end of raw water pumping main can be provided as 5.0M. The tenderers can design the filter plant keeping in view this provision.

2. MEASURING FLUME AND EQUIPMENTS: -

2.1.0 Design: The flume shall be designed for a flow of 35 MLD (with a provision of 100% over loading) with free board of not less than 30 cm. The measuring flume shall have a side chamber for float. The flume shall be open channel type working on the principles of parshall flume. The flow indicator (meter) shall be provided inside the gallery or within permanent structure and not in open area.

2.1.1 Construction: The entire construction shall be R.C.C. M-30 and shall be perfectly water tight and suitably supported on R.C.C. columns.

2.1.2 Accessibility: The walkway of 1.20-meter width with G.I. Pipe railing as per specification given in item number 6.20 shall be provided.

2.1.3 Electrical and Mechanical Equipments : The dial type flow indicator should be provided near the flume to indicate the flow. The flow indicator shall have a capacity of measuring a maximum flow of 35 MLD including 25% overloading at ultimate flow. The weir plate will have brass edges, which shall be graduated to read in liters per hour. The weir shall operate with clear free fall condition. It shall be ensured that the weir plates does not get submerged due to afflux. The dial of indicator shall be properly lighted. Necessary arrangements for proper desilting of stilling chamber shall be to be provided.

INLET CHAMBER :

It shall be provided to collect the raw water from cascade aerator. It shall be designed for designed. Capacity. It shall be in R.C.C. minimum grade M-30. The chamber shall serve the purpose of dissipating the kinetic energy of incoming water and also provide necessary static head for flow through treatment plant, during normal and emergent loading condition. The residual head at the end of pumping main will be minimum 5 m, which may be kept, is consideration during the design.

INLET CHANNEL:

It shall be designed for 100 % over loading of designed capacity with flow measuring arrangement Parshall Flume type with dial type flow indicator. The raw water channel shall be constructed in minimum grade R.C.C. M-30 concrete supported on columns at minimum 2.00 mts, center to center in R.C.C. minimum grade M-25. A puddle collar shall be provided to receive water.

FLOW MEASURING ARRANGEMENT:

The flume shall be designed for 100 % overloading of a designed flow (with a provision of 100% over loading) with free board of not less than 30cm. The measuring flume shall have a side chamber for float. The flume shall be open channel type. The entire construction shall be in R.C.C. and shall be perfectly water tight and suitably supported in R.C.C. columns. The walkway of 1.0-meter width with **SS 304 pipe** railing as per specification given shall be provided. The Ultrasonic flow Meter flow meter shall be provided near the flume to indicate the flow. This will also be fitted with a sensor to transmit the flow rate to PLC –SCADA Automation system. The flow indicator shall have a capacity of measuring a maximum flow of 50 MLD including 50% overloading. The weir plate will have brass edges which shall be graduated to read in liters per hour. The weir shall operate with clear free fall condition. It shall be ensured that the weir plates do not get submerged due to afflux.

3. CHEMICAL HOUSE AND CHEMICAL FEEDING EQUIPMENTS:

3.1.0 DESIGN:

The building shall be constructed in two floors. To facilitate proper transportation of alum into the chemical house (at ground floor) a ramp shall be provided at the entrance, which shall have a 2.5 M wide steel rolling shutters.

In the first floor there shall be adequate numbers of alum solution tanks, automatic alum dosing equipments and a weighing machine of steel yard type platform for weighing alum up to 5 M.T. A chain pulley block of 2 M.T. capacity with complete chain and bucket shall also be provided at the first floor to lift alum from the ground floor, Sophisticated lifting arrangement will be preferred. An opening of 2 M x 1.5 M shall be provided in the slab for lifting alum, with proper railings as specified in item no 6.2 Maximum dose of the alum shall be 8 grains/gallon and maximum strength of solution shall be 10%. The capacity of tanks shall be such as to hold 8 hours requirement at maximum demand with 0.30 m depth extra for free board. Minimum 2 alum solution tanks should be provided.

LIME DOSING TANKS:

For lime dosing 2 tanks of 8 hours capacity with lime dosing equipment capable of administering lime dose of 0.7 grains/gallon with 10% strength are to be included in the L.S. offer. A suitable space for storing chemicals like Alum & lime of 50 sqm

should be provided.

The height of alum stack should not be taken more than 2 m with 30% open space for passage. The other specification of alum store shall be as per para 6.3.3.2 of manual. As an optional item the tenderers are advised to quote for variable rate proportioning feeder including all accessories. The alum solution tanks shall be constructed in R.C.C. M-30. The inner walls of alum tanks shall be painted from inside with 3 coats of Chloro rubber paint. The other specifications of alum solution tanks shall be in accordance with para 6.3.1.1. of manual.

3.2 CONSTRUCTION:

The entire construction of Alum store and chemical house shall be in R.C.C. M-30 columns and beams with second class brick panellings of thickness not less than 20 cm in 1:3 cement mortar in external and internal walls. The clear height of the chemical house at ground floor and first floor shall not be less than 4.0M. The floor of the store shall be of kota stone.

3.3 MECHANICAL AND OTHER EQUIPMENTS:

A dissolving tray of R.C.C. M-30 with holes or slots shall be provided on tanks for placing the alum cakes. The alum solution tanks shall be fed with pure water by means of G.I. Pipes medium class and valves of adequate size from wash water tank. The solution tank shall be provided with brass gauge plate level indicator. The alum mixing paddles shall be of alloy resistant to mix the alum of enough section & size. There shall be paddles at least at two places, driven by a Central shaft. It shall be driven by electric motor, through worm gear. Necessary wash out arrangements shall be provided. The solution dose shall be drawn in to a constant head stainless steel dosing tank and fed in to a raw water just where it leaves the measuring notch. The dose of the alum solution should be capable of being set and varied manually. The dosing and feeding equipments shall be provided with 100% stand by. The alum solution shall be fed by gravity only. The alum solution tank shall be lined by 6 mm thick H.D.P.E. sheets at bottom and sides. Each alum solution tank should have a 90 cm wide platform. The platform should have a railing as per item no.6.20. The platform should be located at an elevation to have a clear head room of 2.5 m from ceiling. The top of the solution tank should not be higher than 1 meter from the top of operating platforms.

4. PRE-TREATMENT WORKS-FLASH MIXER :

- 4.1 During summer algal growth is anticipated. Arrangement to prechlorinate water with a dose of 2 PPM is essential at the entry point.
- 4.2 Flash Mixer will be a circular well of not less than 1.50 m dia with a detention period of at least 30 second and shall have a capacity of treating 35MLD in 22 hours. The dia shall also be such as to accommodate fixing of a motor and reduction gear and leaving some working space around.

4.2 CONSTRUCTION:

The flash mixer shall be constructed in R.C.C. M-30. The unit shall be provided with R.C.C. slab in M-30 partly covering the tank, for locating the driving unit of the mixer and for approach to the same. The agitators of flash mixer and alum mixing paddles shall be of M.S.R.L. or M.S. F.R.P. With stainless steel shaft. The dosing, feeding equipments will not have any stand by.

4.3 ACCESS :

The walkway of 1.20 m shall be provided with railing as specified in item no.6.20

4.4 ELECTRICAL AND MECHANICAL EQUIPMENTS :

The following shall be provided :-

- 4.4.1. Frame agitators with rubber lined M.S. blades/stainless steel blades and rubber lined M.S. vertical shaft mounted on bearing of sufficient strength to prevent vibrations or access fabricated.
- 4.4.2. Electric motor of suitable horse power, starter & reduction gear. The shaft speed of propeller should be more than 100 R.P.M. and ratio of propeller dia to tank dia should be 0.3. It should fulfill the requirement of para 5.4.2.2. of manual in water supply and treatment published by CPHEEO.
- 4.4.3. Desludging arrangements consisting of adequate length of suitable dia R.C.C. pipes class A and 250/300 mm dia valves class PN 1.6 with operating gear. It is important that the waste water discharge shall be in the nearby nalla/natural drain. The water invert level should be fixed so as to enable discharge in nalla/natural drain in monsoon also through gravity.
- 4.4.4. Protecting covers of G.I. sheets 8 gauge for motor, giving good architectural view duly painted.
- 4.4.5. Recirculation arrangement from wash water to clear water sump with tanks, motors, pumps, sand filters etc complete

Scope of recirculation arrangement is within the scope of work. The recirculation arrangement needs one 10 Minutes capacity sump (of the back wash volume) below the back wash outlet, two sludge drying beds and one desludging pump to discharge the sludge to the drying beds. The water collected in this sump shall be admitted to the inlet chamber after silt deposition, by suitable pump and DI pipes to the inlet chamber. The contractor can also suggest system for recirculation which can be approved along with the designs.

5. FLOCCULATION TANK

Polyelectrolyte /Alum as coagulant aid will be used. The principal objective in coagulant mixing is to obtain rapid and uniform dispersion of the chemical in the water to ensure that chemical reactions are completed in the shortest possible time. The addition and

mixing of chemicals to the main flow of water is a continuous process and is described as rapid mixing.

It shall be designed with properly designed inlet and outlet arrangement with due consideration to the better efficiency of settling, mechanical sludge cleaning arrangement with sludge effluent pipe etc. complete.

It shall be designed to provide a detention time of 30 minutes at design flow. Other design parameter viz depth of water, velocity of flow, paddle area, peripheral velocity of blade. Velocity gradient G and the factor GT shall be generally in accordance with CPHEEO manual Para 7.4.3.2. Mechanical Type Flocculators. Coagulated water will be admitted through the central hollow shaft near the water surface and then will flow radially outwards uniformly in all directions through slots. The velocity of flow through these slots should be about 0.2 to 0.3 m/s. Flocculation paddles 2 or 4 in numbers depending upon design will be mounted on a vertical shaft, which will be rotated by A.C. motor 3 phase 415 v. The partition wall and the floor slab of Flocculators shall be of R.C.C. Area of opening at the bottom of partition wall should be large enough to maintain sufficiently low velocity of flocculated water.

MECHANICAL AND ELECTRICAL EQUIPMENTS :

This includes providing and erecting necessary mechanical & electrical equipments with required electrical wiring, switches etc. complete.

In flocculator paddles made of S.S. grade 216 Section 50mmx50mm dia S.S. plate clamped to central S.S. shaft of 65.0 mm dia through C.I. special flanges shall be provided. The total paddle area should be between 10 to 25% tank sectional area in the plane of the shaft. The tenderer can provide his own design. The blade shall be of S.S. plate. The S.S. shall be provided with guide bearings at the bottom suitable for under water use. The flocculator shall have two arms, each having four paddles. The flocculator driving mechanism for each arms shall comprise of motors of ALSTOM/Kirloskar/Jyoti/Crompton make 440 volts, 3 phase, A.C. Motors of suitable H.P./ with Siemens/Kilburn/M.E.I./L.T.L.K. make starter connected by worm reduction gear of suitable ratio through flexible couplings (or V pulley drive) and transmitted through pinion and bevel wheel driven, the bevel wheel being fitted with radial cum thrust bearing. Bevel shaft shall be connected to flocculator shaft through rigid couplings.

(5)-A INFLOW ARRANGEMENT -

बवहनसंजमक जमत तिवड सिी उपगमत पूसस इम बवदअमलमक जव जीम पदसमज वी संडमससं बसंतपपिमत जीतवनही चतमबेज त्पण्ण चतमेनतम चपचम वत ङ वत क् वध् वी नपजंडसम कपण प्जीवनसक इम चवेपडसम जव तमहनसंजम वत जवच सिवू जव पदकपअपकनंस नदपजण जीम चपचमेीसस इम संपक वअमत पितड इमककपदह दक ंज नदपवितड हतंकमण जीम अमसवबपजल वी सिवू जीतवनही जीपे बवदकनपज ीसस

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(6)**LAMELLA CLARIFICATION:** Lamella clarifiers of RCC construction shall receive the raw water and recycled backwash water from flocculator. The lamella clarifiers shall be of square construction, with bottom of circular configuration, suitable for sludge scraper mechanism. Within each of the lamella clarifiers lamella plates shall be provided so that the incoming solids can be distributed in between the lamella rows whereby the flocs can enter the lamella packs in the lower portion through special inlet feed ports. The clarified water overflow shall take place over adjustable overflow weirs on the upper edge of the plate pack. Each of the lamellas (the water layer in between two plates) has an individual overflow, which ensures an equal distribution of solids and water over the whole of the projected sedimentation area. The overflow weirs are attached to both upper corners of the plate rows. The Inclined plates shall be so spaced that the distance between the successive plates is maintained suitable for the inlet water quality and degree of treatment required, so that the flow through the plates shall be laminar. The plates shall be of PVC with thickness between 2 mm to 4.5 mm thick suitably reinforced as in normally used in such application.

As a standard the angle of the plates is 50° to 55° to the horizontal or as per suitable design of bidder. The incoming flow shall be directed into the influent channels between the plate packs from the bottom, then to the lower sections of the plate pack walls to feed ports through which the suspension enters the plate packs properly. Water enters and exits the system through channels, which are divided into two sections:

- Lower section (inlet flume) for incoming raw water.
- Upper section (outlet trough) for outgoing clarified water.

The bottom of the upper channel section prevents flow from streaming uncontrolled in the basin. Outside the channel walls, holders are attached for support of lamella plates, which are inclined at 60° to the horizontal. It is possible to take out each plate individually for cleaning and maintenance purposes. After entering the lamella cell, the water flows between the plates. Clarified water is directed to the adjustable outlet weir launder. These outlet launders lead clarified water towards the common collecting channel, connected to the filters. The sludge, which shall be settling on the floor of the Lamella clarifiers shall be scrapped by a mechanical scrapper to the central pit, from where the thickened sludge shall be discharged into the sludge sump continuously through a telescopic bleed device. The sludge carrying piping shall be provided with flush connection. The flocculated water from the flocculation tanks shall be fed by gravity into R.C.C. lamella clarifiers. The influent enters the clarification basin and is then directed through a series of parallel plates. The sludge settles on the plates and slides down and is collected in the central sludge hopper by

a central driven mechanical scraper mechanism. The sludge shall be drained continuously from the lamella clarifier bottom through a telescopic bleed device and shall be sent for dewatering or disposed. The lamella clarifier shall be fitted with a series of inclined plates. Distribution and entry velocities shall be kept minimum to optimize the hydraulic flow regime resulting in full plate utilization, maximum efficiency and better effluent quality. There shall be a weir launder with orifices. The plates shall be arranged in such a way that it can be easily removed even during operation.

(6)A- NUMBER OF UNITS:

Minimum 2 no. Lamella Clarifiers of equal capacities shall be provided for the total designed flow with provision for 25% overloading under emergent condition. The inlet and outlet arrangement will however, be designed for 100% overloading.

(6)-B SLUDGE REMOVAL IN FLOCCULATORS AND CLAFIERS

- i. The withdrawal of sludge from plain sedimentation tanks and clarifier / Flocculators be carried out into a terminal sludge collection tank for disposal into the sludge drying beds by pumping. Suitable pump sets and pump house have to be provided at the sludge collection tank
- ii. Each clarifiers / Flocculators shall be provided with a scraper system to direct sludge to sludge pockets for piping to sludge control chambers. Separate draw-off pipes and valves shall be provided for each sludge pocket
- iii. Each clarifiers / Flocculators shall be provided with a sludge control chamber. The chambers shall incorporate equipment for both continuous and intermittent sludge draw-off. Hydrant connections shall be provided at each chamber for flushing / washing down purposes.
- iv. The sludge from the clarifiers / Flocculators shall be collected in the sludge receiving tanks. The pump house with suitable pumping machinery shall be provided adjacent to the sludge receiving tank for pumping out the sludge from the tank into the sludge drying beds followed by effluent disposal to the nearby water body with environmental acceptance and arrangement to pump this into inlet channel.

(6)-C De-sludging Control and Plant

Plant for the de-sludging system and control shall be located in the central control house as appropriate Control

- a. The system shall be designed to carry out the following operations:
 - i. Intermittent de-sludging alone

- ii. Continuous de-sludging alone
 - iii. Intermittent and continuous de-sludging simultaneously.
- b. Pumping of sludge from sludge receiving tank into the sludge drying beds.

(6)D Clearing of Blockages

- i. Compressed air and pressure water shall be used to facilitate purging of sludge pipes and pockets in the event of blockages.
- ii. Control of each sludge valve shall originate from a manually pre-set electrical multi-range adjustable timer with means of independent adjustment of frequency (time between draw offs) and duration (length of draw-off) of desludging together with 'hand/off/auto' switching, 'state' lights (indicating state viz. 'open/close') and associated sludge control panels. Each Clarifier shall be provided with its own independent sludge control system, with the associated panel located in the central control house.
- iii. Facilities for sequential sludge discharge shall be provided. Manual override facilities both for initiation of a discharge sequence and for operation of individual valves shall be provided. Valves controlled automatically on an intermittent basis shall be pneumatically operated straight through type or eccentric plug type, and shall be arranged to be 'fail safe' (e.g. on power or pneumatic failure, discharge valves shall close) and initiate an audible and visual alarm state at the Filter control Block. It shall be possible to open the valve manually by using a lever or similar, under fail-safe conditions; alternative facilities such as compressed air bottles (one for each clarifiers / Flocculators or foot pumps (minimum two), shall be provided for manual operation of valves. Each pneumatic valve shall be provided with a manually operated guard valve and a manual bypass facility.
- c. Continuous desludging of clarifiers shall be by adjustable bell mouth devices with cast iron bodies and bronze guides. The devices shall be provided with operating headstocks and suitably located position indication scales and arranged to operate in parallel with the intermittent desludging valves.
- d. During the periods of temporary shutdown, it is required that sludge scraping and sludge evacuation equipment shall continue to run until all heavy solids have been removed from the system which could otherwise compact during the shutdown period and cause difficulties on start up.
- e. Hydraulic design: The total hydraulic design capacity of the sludge withdrawal and discharge system shall not be less than 10% by volume of the MWF.

- f. Sludge disposal pipe work: The pipe work for clarifiers / Flocculators sludge system (within structures) shall be of RCC NP3 and shall enable to empty tank into the sludge well by gravity. Valves shall be of cast iron-rubber lined type, epoxy painted outside. The valves shall be easily accessible for manual operation. The pipe work for sludge pumping shall be in cast iron / ductile iron.

(6)E- Drainage of Lamella Clarifier

Each tank shall be provided with facilities for complete gravity drainage of all water and sludge from both the main body of tank and from sludge concentrates. All valves, pipe work required for discharge to and connection with the main drainage system shall be provided, so that a tank may be emptied within 6 to 8 hours. These drains shall discharge into the main works drainage duct to be provided by the Contractor.

300 mm dia D/F PN-1 electrically/ manually operated C.I. Non rising spindle sluice valve confirming to B.I.S. standards and bearing ISI mark is to be provided for each clarifier. One M.S. steel operating shaft with 25mm dia extension complete with C.I. head stock, 200 mm dia hand wheel and brass indicator plate for operation of sluice valve for each clarifier is to be provided. The valve shall be taken into SCADA loop for automatic drain disposal

For each clarifier bridge 2 Nos. 450mm wide made out of M.S. black medium class pipe to IS 1239 rung ladder painted primer and paint, fixed to clarifier bridge structure for access inside the clarifier zone/ flocculation zone be provided.

(7) RAPID GRAVITY FILTERS

The clarified water from the lamella clarifier will flow to the Rapid Gravity Declining Rate filter of dual media type through clarified water channel. The filters shall be designed for the flow of 35000 m³ in 22 hours. At least 6 no of filter beds has to be provided according to the availability of the space. Each filter bed will be of twin type and the area to be calculated accordingly.

The maximum filtration area of an individual filter will not exceed 100 m². The average filtration rate (total flow rate through all filters divided by the filtration area of all on line filters) at maximum capacity will be not more than 6 m³/m²/hr with two filters off line for washing & maintenance. The filters will allow for a maximum headloss of 1.8 m across the filter media. The filter run should normally be not less than 24 hours with a loss of head not exceeding 1.8m.

The filter shall be of declining rate type. Each filter bed self- contained and capable of

working under full or part load independently of the other. Arrangement have to be made for incoming water to be uniformly distributed between the various filters and individual on each filter bed. Each filter inlet will include isolation penstock. In filtering mode, the water will be fed into the filter, above the filter media, in such a manner that the filter media is not disturbed.

The filters shall be designed to operate under normal filter rate of 6 Cum/Sqm/Hr but the inlet and the outlet control arrangements shall be designed to permit a 100% over load for emergent occasions as per provision made in para 7.6.3.3 of manual on W.S. & Treatment.

Dimensions of the filter unit should be as per para 7.6.3.5. of the manual of the “ water supply & Treatment “ published by CPHEEO.

Quality and quantity of gravel & sand shall be as per 7.6.3.6 to 7.6.3.10 of some manual.

Automatic effluent controller capable of operation between 50% to 160% of the normal flow. Make should be mentioned.

Piezometers should be provided to determine the loss of head occurring at any time during the filter run. One set of photometers should be provided for each filter unit.

Compressed air should be used in the air wash system to secure effective scrubbing action.

The quantity of wash water used should not exceed 2% of the total amount of water filtered.

The air should be forced through a piping system (independent of the under drains) at the rate of 375 LPM/Sqm of the filter area at 0.18 kg/cm², pressure for a duration of 5 minutes following which wash water shall be introduced at a rate of 300 LPM/Sqm of the filter area.

The duration of the washing process should not exceed ten minutes.

Both the filtered water and the water for washing should pass at uniform rates throughout the area of each filter.

The water standing on the bed at the close of the wash should be clear with a turbidity not exceeding 10 JTU.

The air wash and under drain system should be exactly in accordance with the para 6.6.3.12 (b), 6.6.3.13 and 6.6.3.9 of the manual on water supply and treatment published by CPHEEO.

The capacity of air blowers provided should be such that there is 100% stand by arrangement.

The capacity of the wash water tank shall be adequate for the complete wash for 2 filter units at a time for a period of at least 10 (Ten) minutes. The size of the inlet pipe connected to wash water tank must be such as to ensure filling in 2 hrs. and the size of outlet pipe from the wash water tank to the filter must be such as to ensure flow of water within the period of one complete wash of two filter units.

Electrically driven wash water pumping units should be provided at least in duplicate. Each pump should be capable of filling the wash water tank in two hours with 100% stand by.

The wash water is proposed to be disposed off in nearby nalla through gravity. The wash water gutter invert level should therefore be fixed considering H.F.L. of nalla/natural drain so that drainage by gravity during flood can be possible.

(8) **FILTER MEDIA**

The filter bed will be as per CPHEEO Manual on Water Treatment and water Supply.

(9) **Back Wash Water System**

The wash sequence will include air scouring followed by water washing. The air scour rates selected to provide collapse pulse washing. This will be followed by a water only rinse at a wash-water rate selected to ensure re-stratification of the filter bed.. There should be no mud balls after washing. Also, there should be no air binding during filtration or during washing. Provision for necessary sump & pump house shall be made by the bidder.

The following wash rates shall be adopted for filter wash.

- Conjunctive Air/Water wash rate: min. 45 m³/m²/hr
- Water wash rate : not less than 12 m³/m²/hr (Bidder to ensure re stratification media after each back wash)

A pressure relief system will be provided to prevent damage to a filter floor should its design pressure rating be exceeded for any reason. Drain valves will be provided to allow each individual filter to be drained. Also hand railing should be provided to all filters to safe guard against accident as per factory Act. All the filter valves shall be pneumatically operated with manual override arrangement. The minimum size, of pipeline and valves shall be of as per bidders design and required to be approved by the consultant.

The backwash shall be arranged at such a pressure that the sand should expand to about 130 to 150 % of its undisturbed volume. The backwash shall be of air water type. The air shall be introduced for duration of 5 minutes and then the wash water shall be introduced through the same under drains for 10 minutes. For introducing air and water the piping may be same or separate. it shall be worked out by the firm with due consideration to the economy.

(9) **A- WASH WATER TANK -**

It is advisable and economical also if wash water tank is constructed above the clear water control chamber. Its capacity will depend on the total loss of head due to expansion of sand. Loss in under drainage system loss in incoming pipe and height of wash water gutter with respect to under drainage system. The bottom of wash water tank shall be at a height of about 9.00 mt to 11.00 m, the capacity of wash water should be varied from 2 to 6% of filtered water and should be sufficient for at least 10 minutes wash of one filter or 5 to 6 minutes wash of two filters. The minimum capacity of tank should be designed for washing two filters at a time. It shall be of R.C.C. with minimum grade M-30. The most preferable shape is Rectangular. The corners of tank shall be rounded off. The top slab of tank shall be of R.C.C. minimum grade M-30 with sufficient number of manholes and ventilators of 100mm dia C.I. with Cowels and the aluminium ladder of 0.45 mt wide from top to bottom of tank.

A float operated mechanical gauge shall be provided. The arrangement should be fixed in such a way that during excessive wind flow it should not be disturbed. It shall have meter scale painted with enamel paint with black and red colour on white colour back ground. A

RCC staircase from ground to top of tank shall be provided by contractor. It shall have the railing either on both sides or on one side as per site conditions.

(9) B-- APPURTENANCES -

a. RATE OF FLOW CONTROLLERS –

Since it is proposed to provide declining rate filtration hence one rate of flow controller shall be provided. In this case filter influent shall be entered below the low water level of filters so relatively large influent header pipe or channel will serve all the filters. It shall be provided with influent valve for each individual filter.

b. FILTER GAUGES -

It shall be provided to measure accurately the rate or flow through each filter box and to determine the loss of head occurring at any time during the filter run. It must be simple in operation and easy in handling by the maintenance staff.

(10) FILTER UNDERDRAIN SYSTEM

The design parameters in under drainage system shall be as given in Para 7.6.3.9 of CPHEEO manual. The under drain system with central manifold or laterals either perforated in the bottom or having umbrella type strainers on top shall be provided. The central manifold and laterals shall be of UPVC Class 10. As per economy all pressure pipe shall be of cast Iron, concrete or other materials.

PIPE GALLERY: Effluent wash and waste water pipes all together with the sluice valves are placed in the pipe gallery should be well designed with minimum 2.00mt width provided with a ladder or steel rungs to make it for the maintenance staff easily accessible to the bottom. It should be well ventilated. It should have a sufficient slope to drain out the wash water or other leakage water. The two pipe galleries shall be provided one gallery for effluent pipe Air and wash water pipes and other Gallery specially for draining out the wastewater of filters. It shall be designed by contractor and preferably of R.C.C. pipe. It shall be connected with wastewater sump. The system will avoid the unnecessary congestion of the pipes and avoid the hindrances in cleaning of pipe galleries. One shall be towards the module chambers side and other towards the influent header pipe side it should be constructed with minimum R.C.C. grade M-30.

(10)-A RATE OF FILTRATION -

The rate of filtration shall be taken as 5.0 m³/m²/hour. The inlet and outlet arrangements shall be designed to permit 100% overload for emergency conditions.

(10)-B CAPACITY OF FILTER UNITS-

The capacity of filter should be such that the number of unit can take care of the total quantity of water to be filtered and with optimum efficiency to keep the filters working without undue overloading at any time.

(10)C---SIZE OF FILTER UNIT -

Where the filters are located on both sides of pipe gallery, the ratio of length to width of a filter box shall be about 1.25 to 1.33. A minimum 2 mt depth of water shall be provided above filter media. The filters shall be constructed in R.C.C. of minimum grade M-30.

(10)D FILTER MEDIA -

Filter media will be as per CPHEEO Manual .

(11)FILTER CONTROLS:

All the Inlet, Outlet, backwash, air and drain water valves for the individual bed of Filter shall

be pneumatically Operated butterfly valves. The filter bed operation shall be carried out through local as well as remote control panel with PLC system.

After backwash of the filter beds, the waste water shall be collected in dirty water sump & recycled back to plant. The adequate size of chambers with CI frame, cover, rungs shall be provided be of Constant head type. **The filters shall be arranged in one row with a FILTER GALLERY of 4 mtrs to accommodate pipe and a filtered water channel.** The minimum WALK WAY near the filter should be 1.5 mt. wide and PIPE GALLERY should be minimum 4.0 m wide to accommodate all the pipes and valves and have a proper slope to drain out the wash water through wash water pipe. All sluice valves on each filter shall be pneumatically actuated, with manual override facility. The pneumatic cylinders of double acting type shall be actuated by solenoid valves which shall be arranged on a console placed in front of each filter unit. An air filter and lubricator shall be provided near individual solenoid valve console before the header for air scour to each console.

The filter consoles shall be fitted with pilot lamps to indicate shut and open positions of the respective valves or sluice gates actuated by limit switches mounted on the cylinders. The consoles shall be provided with push bottom starters for each of the wash pump and air blower motors with indicating pilot lamps. The consoles shall also be provided with arrangements to give an audio visual signal to the central control room and to the wash pump/air blower room in case of emergency.

Two electrically driven air compressors mounted on a pressure storage tank for supplying air for actuating the pneumatic cylinders, shall be provided. The displacement of the compressor and the capacity of the storage vessel shall be so designed that it will be available at all times with one unit in operation, sufficient quantity of air under required pressure to actuate the cylinders when the filters are washed one after the other at intervals of 30 minutes. The compressors shall be fitted with a pressure to actuate the cylinders when the filters are washed one after the other at intervals of 30 minutes. The compressors shall be fitted with a pressure switch to maintain the required pressure in the storage vessel and a drier for dehumidifying to ensure dry air to the cylinders. An audio visual alarm shall be installed in the central control room to indicate failure

of the pressure system. One compressor shall work at a time and the other one shall be standby. The compressors be rated at 15 bar and provided with a pressure switch each with both cut-in and cut-out facilities.

The waste water from filter backwashing process will be reused. For this, a sump shall be provided to recover the waste water from where it will be pumped into the raw water channel upstream of the venturi throat for blending it with the incoming raw water. A waste water sump of suitable capacity with 2 Nos. (1W + 1S) recirculation pumps shall be provided for pumping the backwash waste. The storage tank shall be provided with an overflow weir to discharge the excess quantity of waste water into separate system as would be identified by Municipal Corporation Jagdalpur and necessary sewer lines shall be provided to connect existing brick sewer from plant. There shall be a provision for measurement of the filtered water output from the plant, over a rectangular weir, with the help of ultrasonic flow meter.

- Filters shall be of the declining rate type with filtration rates varying by $\pm 20\%$ of the average over a filter run length. At the start of the filter run, when the bed is clear the filtration rate shall be 20% above the average value whilst at the end of the filter run the filtration rate shall be of 20% below the average value.

- Clarified water shall be fed to each filter from the inlet channel through a submerged penstock opening.
- At the outlet of each filter the filtered water shall flow through an adjustable valve or 'setting valve', which shall limit the maximum flow to 20% above average flow. The valve setting shall be adjusted during commissioning in order to achieve the required range of filtration rates between clean bed and dirty bed conditions to within $\pm 20\%$ of the average flow through the filters.
- A separate valve drain shall be provided to drain the underflow chamber. Emergency access to the underside of the filter floor shall be provided.
- Filter valves and penstocks shall be fitted with electric actuators with facility for manual operation.
- Each filter shall be equipped with instruments for measurement of the differential head across the filter bed. Measurement accuracy shall be $\pm 2\%$ of the measured value. Each measurement instrument shall be equipped with stainless steel needle isolating and drain valves.
- A control console for each filter shall be installed in the gallery.
- These consoles shall be equipped such that the operator can initiate the backwashing operation manually.
- The control consoles for each filter shall include the following facilities and indications as a minimum:
 - Start filter wash cycle -key operated push-button;
 - Manual/automatic key operated selector switch;
 - Filter water holding tank full-lamp;
 - Open/close push buttons for each actuated valve and penstock;
 - Open/close indication for each valve and penstock-lamp;
 - Filter ready for wash-lamp;
 - Filter washing - lamp;
 - Filter in service - lamp;
 - Filter out of service
 - Wash water pump tripped - lamp;
 - Air scour blower tripped - lamp
- Filters shall be washed in sequence automatically under the control of a preset timer, adjustable from 12 to 36 hours. Filter backwashing shall be inhibited to prevent two filters washing simultaneously and also to prevent wash initiation when the filtered water holding tank has insufficient water in storage.
- Programmable Logic Controllers (PLCs) may be used for filter washing controls, with each filter being controlled by a dedicated PLC with the initiation controlled by a central PLC. PLCs shall be arranged so that failure of one unit does not disable the automatic washing of more than one filter.
- Lamps in the monitoring room shall indicate the state of each filter, i.e. filter in service, filter washing and filter wash overdue.
- Filter washing time cycles shall be manually adjusted to suit the monitored turbidity levels.

FILTER VALVES AND MOTIVE POWER SYSTEM

- Butterfly valves shall be used for the filters in preference to penstocks or sluice valves unless the penstocks or sluice valves proposed are of a size which can be operated easily by one man.
- Filter valves which require to be operated as part of the washing cycle shall be operated by pneumatic power. The system shall be capable of operation in the event of electric power failure and details shall be provided by tenderers, as to how this will be done. The time taken to open or close any valve shall generally be between 10-30 seconds.
- Compressors for valve/penstocks operation duties shall be in duplicate with duty/standby units including receivers, provided to serve only the filters. The standby unit shall be so arranged to automatically operate if the duty unit fails and also initiate an alarm state on the filter block control room enunciator. The rating/capacity of each compressor shall be designed to serve a total of 3 filters, and to enable valves on at least three filters to be operated simultaneously.
- The compressor installation shall be designed to satisfy conditions for maximum air demand and shall ensure the duty compressor does not start more than six times in any hour and the running time of the duty compressor shall not exceed 35 minutes in any one hour. The standby compressor unit and receiver shall be identical in size.
- To avoid overheating, an integral cooling system shall be provided for each compressor unit.

PIEZOMETER TAPINGS

- In two filters (to be selected by the Engineer-in-Charge's), six piezometer tapings shall be provided for each filter to determine the head loss gradient across the media.
- The Contractor shall provide and fix on the two filter front walls in an accessible position (with standing platform if necessary) all the necessary puddle pipes, strainers, manometers, tubes, calibrated scales, mounting boards and fixing brackets, interconnecting small bore tubing, cocks and fittings.

PAVING :-

A paving in front of clear water control chamber 4.0 mt. wide shall be provided by contractor. The paving shall be in grooved vetrified tiles good in appearance and colour, laid over M-25 cement concrete.

STAIR CASE :-

The stairs made of brick masonry in cement mortar 1:4 with anti skid tiles shall be provided. The staircase shall be provided to connect ground level to the floor of control room and wash water pump or air blower floor to the operating plate from of control room.

(11)A-- EFFLUENT AND WASH WATER PIPE -

The effluent pipe shall be designed for a velocity of 0.9 to 1.8 mt./second and wash water pipe for a velocity of 1.5 mt/second. These shall be C.I. double-flanged class .Pipes confirming to I.S. 7181 - 1984 and C. I. specials shall be confirming to I.S. 1538-1976. The sluice valve provided shall be confirming to I.S. 14846-2000.

(11)-B---MODULE CHAMBER OF CLEAR WATER CONTROL CHAMBER

It shall have sufficient space to accommodate sluice valves of effluent pipes, effluent discharge weir and clear water effluent pipe feeding to clear water sumps. It shall have

sufficient circulation space minimum 2.00 mt of ground floor where the module chambers shall be minimum ceiling height of floor shall be 4.00 Mt. The ground floor shall be easily accessible by providing aluminium ladders. Arrangement for effluent sluice valves, air blowers piping, Wash water tank etc. It shall be framed structure of minimum R.C.C. M-30 grade concrete. At a height of minimum 10.00 Mt. the wash water tank shall be provided for storing the water for washing the filters. The capacity of wash water tank is given in Para 7.6. The panels of framed structure shall be constructed of chimney brick masonry with cement mortar 1:5 and plastered with mortar 1:5 the ground floor as well as first floor shall have sufficient ventilation of about 30% of floor area. As far as possible natural ventilation shall be provided the window shall be of Aluminium . Z-section provided with 4 mm thick transparent glass. The gate shall be provided on all the four sides. The main gate shall be made of aluminium automatically closing type fitted with glass and the other gates one towards filter sides and other towards chlorine room side and open area side shall be made of Z section of Aluminium fitted with glass. The windows of Aluminium frame shall be opened outside fitted with mosquito net with all arrangements of opening and closing the window stoppers etc. complete.. The flooring in chamber shall be anti-skid tiles as approved by the Engineer-in-Charge in writing with good finish upto 30-cm. height. The ground floor shall have drainage arrangement to easily drain out water in case of cleaning the water from module chamber.

(11)C---AIR BLOWER -

The Air blowers shall be designed for a free flow of Air 36 to 45 Cum/hr. at a pressure of 0.35 mt/hrs for a duration of 5 minutes. The material used for the pipe and specials should be anticorrosive preferably C.I. Class LA double flanged and C.I. Sluice valves conforming to I.S. 14846. These shall be mounted in clear water control chambers at about 1.00 mt.-depressed floor from operating floor of effluent sluice valves.

(11)D---BACK WASH WATER PUMP :-

It shall be designed for 1.00 Hr. i.e. pump shall be in position to fill wash water tank in 1 Hr. There shall be two pumps in which one will act as stand by unit. These pumps shall be provided on the air blower floor. The pump shall be of centrifugal type with a suitable motor to operate on $415 \pm 10\%$ volt, 50 Hz. B class of insulation and degree of protection at IP-56, the suitable Auto Transformer Starter panel, Cable, suitable rating capacitors and Stabilizer. These pumps shall be provided and fixed by the contractor. The pump shall be provided suitably NRV, and sluice valve of PN 1.0. The size of the pipe to fill the wash water tank shall be designed by the contractor. The pipe shall be C.I. double-flanged class A with bell mouth at the top. The delivery pipe in wash water tank connecting to different filter to sluice valve shall be designed by contractor and made of C.I. double-flanged class A conforming to I.S. code in practice. The scour and over flow pipe also be designed and provided by the contractor. The overflow pipe shall be connected with the clear water sump pipeline or clear water sump whichever is nearer. Scour pipe shall be connected with the waste water line of filter going to waste water sump of chamber with necessary C.I. sluice valves.

(11) E---MODULES: -

The module chamber shall be R.C.C. constructed for each filter bed separately. It shall have two compartments. In one compartment it shall have clear water effluent pipe with sluice valve. It shall be operated from the operating platform. The second compartment will be used for collecting the clear water spill over the weir; The height of weir shall be higher than the maximum water level in the filter in order to avoid the negative head. It shall be lined with tiles of standard make, preferably in sky blue colour. The top of the module chamber shall be covered with M.S. framed cover divided in two parts, fixed with glass of minimum 4mm

thick the cover shall be so fixed that it should be easily opened at the time of maintenance. The module chamber shall also have arrangement for draining out the dirty water (at the time of maintenance). The minimum 600mm. R.C.C. Class NP2 pipe with sluice valves should be provided. The entire module chamber shall be connected with the one waste water line & finally disposed of either in drain constructed in front of this block or in waste water collection sump. Sufficient head room above the module chamber shall be provided. A M.S. ladder from floor to the top of the module chamber shall be provided.

(12) CHEMICAL HOUSE: A chemical house shall be provided for storage as well as installation of dosing facilities such as alum, lime & polyelectrolyte

(i) **Alum Dosing System:** Two Nos. dosing tanks are to be provided at the first floor of chemical house. Dosing tanks should be having electrical, mechanical, interconnecting, pipeline network for dosing. Epoxy lining shall be provided in both the tanks. Required electrical, mechanical arrangement shall be provided in both the tanks. Two basket type strainers shall be provided in the solution delivery pipe line for the dosing pump. Electrically driven mechanical agitators shall be provided for continuous stirring of the solution in the tanks. There will be two nos dosing pumps for dosing Alum at the dosing point. The dosing of Alum will be done based on the Flow and Turbidity of the raw water. The dosage will be determined by doing jar test in the Laboratory. Each tank will hold 5% solution for 12 hours. The alum dosage should be considered as 50 ppm for design.

(ii) **Polyelectrolyte Dosing System:** Two nos. dosing tanks are to be provided at the first floor of chemical house. Dosing tanks having electrical, mechanical, inter-connecting pipeline network for dosing shall be provided. Epoxy lining shall be provided for continuous stirring of the solution in the tanks.

There will be two nos dosing pumps for dosing Polyelectrolyte at the dosing point. The dosing of Polyelectrolyte will be done based on the Flow and Turbidity of the raw water. The dosage will be determined by doing jar test in the Laboratory. Each tank will hold 0.5% solution for 12 hours. The polyelectrolyte dosage should be considered as 0.3 ppm for design. Electrically driven mechanical agitators shall be provided for continuous stirring of the solution in the tanks.

The minimum storage shall be for 3 months for filter alum and 3 months for hydraulic lime and other chemicals. Store for the chemicals shall be provided below chemical dosing room.

The minimum ceiling height shall be 4 mt. In order to avoid moisture the minimum plinth height shall be 0.90 mt. The floor should be made damp proof and it should be filled about 0.60 mt. with sand and bituminous coating shall be provided over it in order to avoid the moisture. The flooring shall be of concrete with acid resistance tiles cladding on the floor & in the sides upto 2.0 mt. height. The building shall be constructed in R.C.C. framed structure in M-25 grade concrete and panels shall be of second class brick masonry in cement mortar 1:6 and plaster in cement mortar 1:4. The specification of brick shall be as given in the specifications. The roof of this storage room shall have an opening of 2x2 mt. to facilitate lifting of chemicals. The arrangement for lifting and weighting of chemicals shall be provided by contractor from first floor of chemical house. Adequate ventilation and lighting will be provided. It should be easily accessible to the trucks for unloading the chemicals. The main entrance shall be 3.00 mt. wide and 3.50 mt. height with rolling shutter. The height of alum stack should not be taken more than 2.0m with 30% open space for passage.

INSPECTION CHAMBERS: All inspection chambers shall have white tiles on all the inside four walls and at the bottom also. Proper lighting arrangement “inside” shall also be provided.

- All pipes specials and valves should be of case iron double flanged and should carry ISI marks conforming to the relevant I.S. Specification duly inspected by SGS/RITES. Pipes and other conduits including valves and gates should be designed to carry water as per the requirements mentioned in manual on W.S. and Treatment and respective I.S. Specifications. The firms/contractors should state clearly in the tenders the size of the various pipes, specials, valves which shall be provided by them. They should also indicate the velocities at which the necessary water would pass through these and the time taken for the water to be delivered at different points.
1.20 meters wide walk way should be provided all rounding all the filter beds with G.I. Pipe railings.
- Sufficient space for housing the air blowers and pumps for filling wash water tank should be provided in the filter housing building.
- A separate enclosure for housing chlorine tonners with adequate working space and proper ventilation of chlorine gas and inflow of fresh and cool air should also be provided in this building.
- **An office area of minimum 60 sqm carpet area should be provided.**
- 2 sanitary blocks consisting of 1 W.C. one urinal and wash basin having a carpet area of 9 sqm should be provided, 1 in the ground floor of the building and 1 in the first floor of the buildings. A septic tank of suitable capacity shall also be provided at proper place for safe disposal.
- The minimum width of the operation gallery shall be 1.50. m.
- A laboratory of 60 sqm area should be provided at the first floor of this building.
- The filter beds, shall be open to sky i.e. there shall be no roofs over the filter beds.

PERFORMANCE CAPABILITY:

For Rapid Gravity filters, the performance standards should be in accordance with para 6.6.8.2 of Manual On Water Supply And Treatment published by CPHEEO

CONSTRUCTION

The filter house cum administrative building shall be in R.C.C. M-30 framed structure in two floors. The clear height between the floors should not be less than 4.0 m. A R.C.C. stair case connecting the floor shall be provided. Cast iron foot holds for getting into central gutters of each filter should be provided.

- 6.14 Decorative G.I. Pipe railings should be provided with CI Decorative heavy posts of suitable dia and 1.0 meter long fixed rigidly in cement concrete at 1.50 m apart with 3 rows of horizontal 25 mm dia medium class G.I. Pipes including painting etc. minimum 3 Nos. of such G.I. Pipes should be provided for the railings around circular structures but the spacing should be up to 2 meters.

The same specification of railing shall be adopted where ever necessary. The railing shall be of good architectural design. The bends, corners and horizontal/vertical stays properly finished so as to offer a fine and stream line look.

The filter house shall be R.C.C. M-30 framed structure. Filter walls should be of RCC M-30 plastered on water retaining structure. All bricks masonry work should be in cement mortar with 1:3 and should be plastered with 1:3 C.M. on both the sides. The thickness of the plaster shall be 20 mm from one side and 12 to 15 mm on another side for all the brick masonry work.

- 6.15 All inside surface shall have three coats of acrylic distempering painting of approved quality and shade. The front elevation and exterior finish of the building shall be designed aesthetically and architecturally. The JMC reserves the right to alter the front elevation of filtration plant/filter house if it does not appeal to the JMC on contractor's cost. The exterior plastered walls should be painted with three coats of approved, quality and shade epoxy paint. All doors, (Except central main door), windows and ventilators shall be of Best quality Aluminium framed glass panelled. The position of windows and ventilators should be such that these will be opened outside and closed easily when necessary. The total shutter area of doors, windows and ventilators shall not be less than 30% of the floor area.
- 6.16 The central main external door shall be Aluminum fully glazed as per I.S.148-1961 and 1081-1960. The size shape and finish of the door shall be specially selected so as to improve the get-up of filter house. The entrance of the filter house shall preferably be in the form of foyer, with suitable porch to house atleast two parallel vehicles, in front.
- 6.24 **PERFORMANCE CAPABILITY:**
For rapid gravity filters, the performance standards should be in accordance with para 6.6.8.2 of manual on water supply and treatment published by CPHEEO.

1.1 MCC AND CONTROL PANEL WILL BE PLACED AT THE GROUND FLOOR:

1.1.1 CHEMICAL HOUSE shall be provided to accommodate various facilities such as

- Chemical storage facility for one month period
- MCC Room
- Chlorination facility with provision of storage chlorine Cylinders (if required)
- Alum dosing facility with electrically operated Lifting arrangement of 1.5 T capacity monorail.
- Office / Lab
- Storage Room
- Toilet, connected sewerage drainage line with chambers

Chemical House is provided with ground and first floor area so as to have free access to various facilities. Adequate lifting arrangement shall be provided at dosing area, Chlorination.

1.1.2. THE CHEMICAL HOUSE IS PROVIDED WITH SUFFICIENT CARPET AREA FOR EACH FACILITY AS PER TENDER CONDITION.

- Design & Construction of Cascade Aerator or any other suitable system, for removal of iron in incoming Raw water.
- Design & Construction of Lamella Clarifier and Flocculator

- Supply and erection of Dosing equipments of coagulants, including chemicals with facilities to store Alum and chemicals for 60 days.
- Design and construction of Flash mixers.
- Design & Construction of Distribution chamber for clarifiers / Flocculators.
- Design & Construction of Clarifiers and Flocculators.
- Design & Construction of Dual media sand filters, filter galleries, wash water tank, filter back wash system and filter control block.
- Design & Construction of chlorination plant building, facilities for post and/or pre chlorination and storage of chlorine cylinders for 60 days requirement.
- The sludge, from plain sedimentation tank, clarifier and Flocculators is to be collected in sludge receiving tanks by gravity and disposed into sludge drying beds with drainage facilities to reuse at flax mixer/ inlet channel. The back wash water from filter is to be collected into settling tanks by gravity and to be recycled after settlement by pumping, raw water inlet channel. The overflow from various units shall be connected to the storm water drains for safe disposal to the nearby water bodies with environmental acceptance.
- Monitoring and instrumentation with their housing.
- Electrical works including incoming cable from substation to main control panel, Motor Control Centres, local control and panels compatible PLC/SCADA, interfacing, power and control cabling, plant ventilation and lighting etc.
- Pipe lines, valve chambers, service water installation, sampling and water quality monitoring, instrumentation and other miscellaneous works associated with the plant.
- Levelling the treatment plant site and landscaping.
- Storm water drain and sewers with appurtenances.
- Administrative building, laboratory, store, and for SCADA / control arrangements housing building, i/c services such as electrical, Lighting, water supply, sanitation and air conditioning facilities. (The air conditioning facilities shall be provided only for control room having SCADA system and other instrumentation.)
- Guard Room - with not less than 60 sqmt floor area with toilet facilities and Building services.
- Internal roads with storm water drains, landscaping and lighting etc.
- Training of Nagar Nigam personnel in operation and maintenance of the plant during the last six months of trial period before commencement of 05 years Operation and Maintenance including warranty and replacement.

1.1.3 EQUIPMENT'S FOR HANDLING CHEMICALS :

The Platform type-weighting machine 'Avery make' or equivalent of capacity 2.00 tonne for weighing the chemicals shall be provided. For transportation of chemicals from storeroom to the solution tank, an electric operated hoist of 2.00-tonne capacity of approved make shall be provided. The chemical should be loaded in the steel tray attached to wire rope.

1.1.4 SOLUTION TANK :

A Platform for construction of solution tank at a height of about 2.00 mt. from first floor level shall be provided. The solution tank will be designed for the worst condition of Turbidity for alum dosing to the designed flow. The minimum number of solution tank shall be two so that one will be stand by unit. The capacity of tank shall be designed for 8 Hrs. capacity with 0.30 mt. free board. The feeding arrangement shall be automatic based on flow. It shall be designed for 10% strength of solution. The solution tank shall be constructed in R.C.C. minimum M-30 grade and inside surface shall be lined with acid resistance material like F.R.P. or epoxy resin. The lime solution tank shall be designed for a dose of 5% strength of lime solution using 87% pure hydrated lime for the design flow for the period of 8 hrs. Each tank shall have platform at least 0.75 mt. wide to allow the worker to stand for handling the chemicals and preparation of solution the platform shall have railing up to a minimum height of 0.75 mt. The height of the solution tank shall not be more than 1.50 mt. from the first floor to the platform M.S. ladder 0.60 mt. wide shall be provided and it shall also be provided from solution tank platform to top of solution tank.

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1.1.5 DISSOLVING TRAYS :

The weighted chemical shall be placed into the tray. These trays shall be made up of cement concrete with perforations both at sides and at the bottom. The weight of these trays shall be such so as to handle easily by the workers.

●
1.1.6 CHEMICAL FEED DEVICES :

The solution feed device will depend upon the point of application. The pump type of feeder shall be preferred, chemical feeder in which the solution from the chemical solution tank shall be flown by pump through a strainer and through the float valve into the orifice box. It shall include the necessary piping arrangement with G.M. valve for drains, overflow, and delivery pipe as per I.S. standard. It shall also have necessary agitating arrangement coupled with motor as per standard. It shall also have the provision to return the excess flow to solution tank.

1.2 BY PASS CHANNEL

- Raw water channel to filters by passing lamella Clarifier and flocculator
- From Clarifier to clear water sump by passing filters.

The channels shall be designed as a one unit provided with sluice gates arrangement for isolation of channels. These channels shall be designed for capacity with 20% over load.

- Cascade Aerator - shall be designed in circular shape with circular Gullet to collect water.
- From flocculators to clear water sump by passing filters.
- Lamella Clarifier. - Designed for the distension time as per the provisions in CPHHEO Manual, it shall have properly designed inlet and out let arrangement with due consideration to the better efficiency of settling, mechanical sludge cleaning arrangement with sludge effluent pipe etc. complete.

The necessary pens stock with simple operating arrangement shall be provided as per I.S. 3042-1965 or some alternative arrangement, which suits to the proposal. It shall be constructed in minimum M-30 grade concrete and columns shall be minimum M-25 grade concrete.

1.3.1 MODULE CHAMBER ROOM OR CLEAR WATER CONTROL CHAMBER ROOM :

It shall be designed to accommodate module chambers of all filters including weir, wash water tank pump and air blowers. The height should be sufficient so that the wash water tank may be constructed above it.

1.3.2 CHLORINE HOUSE AND CHLORINE CYLINDER STORE ROOM :

It should have sufficient space to accommodate liquid or gaseous feed chlorinator with weighing machine of 2 ton capacity. The cylinder storing room should have the sufficient capacity to accommodate cylinder/tonner for at least 60 days storage. It should be forced ventilated, easily accessible from at least two sides. It should have arrangement near the ramp to unload the truck by providing chain pulley arrangement at a height of minimum 5 m. A suitable scale showing delivery should be incorporated in the chlorinators. A weighing balance of suitable capacity shall also be provided to measure the quantity of chlorine in the chlorine tonner.

The chlorinators shall be housed in a separate room attached to the filter house the area of which should be sufficient to house **at least four chlorine tonners**. The tenderers are advised to quote for both types of chlorinators. The department reserve & the right to select the more suitable one. There should have a separate entrance. **The carpet area of chlorine room shall not be less than 20 sqm excluding the space required for chlorine tonner**. This room shall be a part of filter house. All the requirements specified for civil works in case of filter house shall be applicable for this also except that the doors and windows frame shall be wooden. Other requirements of chlorine room and the chlorinators shall be as per para 7.5.5 of manual on water supply and treatment published by CPHEEO. Suitable exhaust arrangement for chlorination plant should be incorporated.

The room where chlorine tonners will be stored shall be properly located and designed for facility of removing and bringing in chlorine tonners. A suitable rail trolley may also be provided for bringing and taking out the tonner from the room. **The storage space of at least 50 sqm shall be provided with proper ventilation adjacent to the chlorination rooms.**

VENTILATION:

For chlorine stores - 2 Nos. 600 mm dia exhaust fans.

Chlorination room - 1 no. 600 mm dia Exhaust fan

In chlorine stores a monorail RSJ for handling minimum 2 T capacity shall be provided. The entry to store shall be from out side of the plant. The tonners shall be unloaded directly into the store from the transporting vehicles. The doors and windows of the chlorine room and chlorine store shall be wooden only.

The tenderer shall be required under this contract to supply 4 brand new chlorine tonners with a nominal capacity of holding 1 M.T. of liquid chlorine. The tonners should be as per relevant standard specifications. The tenderers should also submit the test certificate and

other certificate from the competent authority to enable these cylinders to be put in to use.

The tenderers shall also arrange to procure liquid chlorine in these tonners for running the plant for six months of trial period. The tenderers shall bear all the cost of chlorine required and transportation in this period. These cylinders shall be taken over by the department only after these have worked up to the satisfaction of the Deptt.

1.3.3 STORAGE TANK FOR NEUTRALIZATION OF CHLORINE :

Solution storage tank of minimum dimension 3.00x3.00x2.00 mt. size should be provided with fire resisting tiles cladding. It should be easily accessible from chlorine house or storage room.

1.3.4 CLEAR WATER STORAGE TANK :

Designed for minimum 45 minutes detention period, divided in two compartments capable for isolation provided with scouring arrangement overflow arrangement, manholes, air ventilation cowels, ladders etc.

1.3.5 CLEAR WATER PUMP HOUSE :

It should have sufficient space to accommodate minimum six Nos of Vertical Turbine pumps for one pumping mains for including cable ducts, surge protection (If so required), NRV, suction pipe etc. complete. It should have sufficient height to accommodate the gantry crane of suitable capacity. It should have additional **store room of minimum size 5.00x4.00x4mt. Switch Board room of size 3.00x6.00mt and office room minimum 4.00x6.00mt. in size and toiled units.**

1.3.6 LABORATORY BLOCK :

There should be one laboratory block of minimum size 10.00x6.00mtx 4m provided with one Chemist room, one office room and remaining part for storing the chemicals and conducting the test, toilet. WC block should be attached with laboratory.

1.3.7 WASTE WATER COLLECTING SUMP AND WASTE WATER LINE :

The waste water or sludge water from flocculator, Lamella clarifier and declining filter plant and other units shall be collected in waste water collecting tank of at least 4 days detention time and depth according to the levels. It shall have such level that the waste clear water tank can be cleaned easily. The overflow of waste water from tank will be directly discharged by gravity away from treatment plant to the natural Drain. The chambers shall be provided at maximum 60.00 mt. Internal and at turning and where ever necessary. The diameter of pipe should be R.C.C. class NP2 or as designed by the contractor.

1.3.8 WASTE WATER PIPE FROM FLOCCULATOR, FILTER, CLEAR WATER SUMP:

The waste water line from all the units R.C.C. class NP2 up to the waste water sump shall be provided.

1.3.9 SLUDGE DRYING BEDS :

Sludge drying beds shall be designed for 5 to 7 days cycle, the settled sludge from waste water sumps will be taken to drying beds and filtrate will again be carried to flash mixer for reuse.

1.40. INTERNAL AND EXTERNAL ELECTRIFICATION :

It should be done as per details given and as per IS S/B.I.S./I.E. Rules

2.0 COMMISSIONING AND TESTING OF PLANT;

2.1 BASIC INFORMATION:

The source of water Right Bank canal located near Indravati River in Jagdalpur District Bastar. It will get collected in Intake well by 900mm connecting main. Then raw water shall be pumped out by 600 mm dia. DI pipe(Class K-9) rising main from raw water Intake well-cum pump house up to the premises of proposed 35 MLD Water Treatment Plant.

The quality of raw water for design purpose shall be ascertained by the contractor however a copy of water sample test certificate has been attached for reference

2.2 LOCATION OF TREATMENT PLANT :

Location of treatment plant is near Old WTP Jagdalpur, District Jagdalpur and sufficient land of 9000 sq-m area is available for this purpose.

2.3 SITE TOPOGRAPHY &GEOLOGY :

The site is normally flat. The contour plan detail of site is enclosed.

2.4 BEARING CAPACITY OF SOIL :

This is the responsibility of the contractor to test and check the bearing capacity of soil and submit it with the design. This bearing capacity should be tested by plate load bearing test method by any Govt. Engg. College.

2.5 TREATED WATER QUALITY :

The plant as a whole and the units individually should show efficiency as per requirement given in BIS specification and manual on water supply & treatment by CPHEEO New Delhi. In case of any confusion BIS specification shall get the precedence to all manuals.

2.6 GUARANTEES OF CLARIFIED WATER AND FINAL TREATED WATER :

All works for the processing and treatment of raw water shall be designed for a capacity of 35 MLD (considering 22 hours pumping only). The performance tests on the treatment works shall be carried out at the flow inclusive of over loading of treated water.

Clarified water quality shall meet the following standards :

Turbidity	-	Not more than 15 NTU
Suspended solids		Not more than as per IS:10500
-		

Treated water quality after filtration and chlorination shall meet the following standards

Color	-	Should be free from color with 3 or less on Coblat scale.
Turbidity	-	Not more than 1 NTU or less.
Suspended Solids	-	Not more than as per IS:10500.
Taste & Odour	-	Unobjectionable
Residual aluminium	-	Not more than 0.2 mg/l
Coliform Organism	-	Nil

(MPN/100/ml)

2.7 CHLORINATION :-

The chlorinator shall be designed for a dosing of 5mg/L. It shall be designed for designed water flow. The chlorinator shall be vacuum type chlorinator with 100% stand by. If any change in requirement of chlorine comes the firm may suggest and quote the rate accordingly, the liquid chlorine shall be supplied in tonners. The contractor shall have to make arrangement for Brand new chlorine tonners with a nominal capacity of holding one MT of liquid chlorine for minimum three months requirement. The tonners should be as per relevant IS standard specifications. The contractor should also submit the required test certificate and other certificate to enable these cylinders to be put into the use. These tonners shall be taken over by the department only after these have worked up to the satisfaction of the department, after O&M. The chlorinator shall be fixed up by the firm with all required accessories. Due to corrosive nature of chlorine it should be conveyed through either heavy wrought or steel pipe on flexible annealed copper to be tested for 35kg/cm² working pressure. The long pipeline shall be avoided. The chlorine gas lines shall be used. The gasket used shall be made of antimony lead (with 2 to 3% antimony) or asbestos sheet. Screwed fitting shall be forged steel construction. Pressure indicators shall have Teflon diaphragms or silver foil protectors. Pressure reducing valves shall be of bronze or metal with a Teflon diaphragm.

- a) The dosing rate shall be manually set and each chlorinator shall be equipped with a 0 to 5 mg/l scale and a manual dose setter over the complete range.
- b) Mal-operation of the duty chlorination system shall be indicated in the chlorination room and the monitoring room in order that manual changeover to the standby system can be initiated.
- c) Chlorinator shall be fitted with a pressure switch to provide an alarm in the event of bursting disc or pressure relief to atmosphere.

2.8 CHLORINE HOUSE: -

It shall be situated in an isolated place and near to the feeding place in order to avoid the long tubing. It should have at least two doors. The ventilation shall be provided at the bottom of the floor. It shall be well lighted. In the proposed chlorinator an auxiliary water system shall be provided. The suitable capacity of tank and a pump shall be provided, capable of filling it with in 30 to 60 minutes. The structure shall be R.C.C. framed with masonry panels in cement mortar 1:6 and plastered in cement mortar 1:4. The flooring of room shall be have acid resistance tiles laid over cement concrete 1:2:4. An exhaust at sufficient height from bottom, of 300 mm dia shall also be provided. The ventilator shall be of aluminum Z section fixed with 4 mm thick glass in order to avoid the corrosion; it shall be opened outside, a ramp on the main door of 2.0mt. wide to connect the G.L. to the plinth level of chlorine house shall be provided.

2.9 ROOM TO STORE CHLORINE CONTAINERS:-

The capacity of the room shall be to store the minimum chlorine toners for three months looking to the requirement of 5mg/l, average dose the minimum requirement of room shall be provided with rails and trolley as per requirement. It shall be constructed at an isolated place near to the chlorine house for the chlorinator. It shall be constructed in R.C.C. M-25 concrete framed structure and shall have same specification as for chlorine room. Suitable numbers of exhaust fan of 450mm dia of G.E.C. or Khetan make or equivalent standard make painted with Anticorrosive paint shall be provided.

2.10 Deleted.

2.11 EMERGENCY KIT: -

It shall consist of various tools appliances like gasket, Yokes Studs. Tie rods, hoods, clamps, spanners, mild steel channels kits, screws pins etc. complete. It shall cover the total precautionary arrangement parts, which shall be required at the time of chlorine leakage. All the Gad gets shall be designed for using in controlling or stopping the leakages from valves, fusible plugs, and sidewalls of cylinder used for handling chlorine.

2.12 CHLORINE RESIDUAL MONITORING

- a. One chlorine residual sampling and transmitting unit for settled water shall be provided at outlet of clarifiers. Residual chlorine monitoring shall be arranged by collecting water from the clear water reservoir.
- b. The chlorine residual monitoring system shall be designed to measure free available chlorine. The signal from the measuring cell transmitter shall be indicated on the panel in the chlorine house with repeat indication and recording in the Control Block monitoring room.
- c. A chlorine residual recorder shall be installed as a floor mounted unit in the chlorination room and actuated by a 4 to 20 mA signal from a residual chlorination measurement cell mounted above ground level in the clear water reservoir outlet chamber.
- d. This cell shall be fed with a continuous supply of treated water from the outlet main of the clear water reservoir. A suitable sampling pump shall be supplied to feed the water to the measuring cell.
- e. A signal shall be transmitted to the monitoring room and shall be used to activate a chlorine residual indicator to be mounted in the monitoring room panel.
- f. High and low chlorine residual level alarms shall be annunciated in the monitoring room and in the chlorination room.
- g. All necessary sampling pumps, pipe work and isolation valves, for delivering clear water to the cell shall be provided.

2.13 FIRE EXTINGUISHING - ARRANGEMENT:-

Suitable fire extinguishers shall be provided and placed in different position in pump house and chlorine storage room besides buckets filled with sand and placed at different places in clear water control chamber, chlorine room pump house shall also be provided.

2.14 WATER SAMPLING:

Continuous comparison of water samples is required and the equipment provided shall include a suitable drained bench containing two clarity bowls complete with all interconnecting pipe work, automatic sampling pumps and drainage facilities for samples drawn from:

2.15 Raw water at the inlet works;

2.16 Clear water reservoir outlet.

The bench shall be sited in the reception area of the administration building. In addition a suitable sampling arrangement shall be included in the laboratory to enable samples to be obtained as follows :

- a. Raw water at the inlet works;
- b. Clarifier inlet;
- c. Rapid gravity filter inlet;
- d. Clear water reservoir outlet;
- e. Supernatant

The sampling arrangement shall include all interconnecting pipe work, automatic sampling pumps and taps, adequate sink and drainage, all incorporated into a satisfactory sample bench.

In addition, convenient means shall be provided to obtain samples manually from each filter beds outlets and sample cocks shall be provided locally at the clear water reservoir outlet.

2.17 Sludge Drying Beds

Sludge from the waste water recovery tank shall be discharged by open impeller type sludge pumps to the drying beds. The sludge from clarifiers, Flocculators and etc., shall be pumped to the sludge drying beds directly through a suitable designed, pumping main. The sludge drying beds shall be with RCC M25 floor, supported by CC bed concrete of not less than (1:3:6) prop., and with side walls of RCC M25 with proper granular material filled up over suitable drainage system designed and laid for collecting the filtrate and to discharge the same to the inlet chamber and arrangement to discharge it into nearby natural drain shall also be provided.

The drying beds shall be so sized that each can contain four times the average daily production of sludge from the waste water recovery tanks as well as from the sludge produced from clarifiers / Flocculators etc they shall be designed for a cycle period of 5 to 7 days.

Filtrate from the drying bed under drains shall be discharged in to the inlet chamber the discharge shall meet the standards for discharge into inland surface waters. When a drying bed is full to a depth of 200mm with dried sludge, the sludge shall be dug out and used for landfill wherever required.

3.0 SAFETY EQUIPMENT: -

- Self contained air-breathing apparatus with gas mask 6 numbers.
- Gas leakage detector orthotolodine(OTA) impregnated paper type leak detection system eight numbers.
- Four chlorine gas leak detectors shall be supplied and installed, each with a single, detector cell, two for the drum room, one for the evaporator room and one for the chlorination room to alarm in the event of a chlorine leak.
- The chlorine leak detectors in the drum room shall be mounted at each end of the drum room. The chlorine leak detectors shall have two adjustable alarm levels sensitive to chlorine concentrations above 1 ml/m³, and the range of adjustment of alarms shall facilitate selection of the following alarms:

low level	-	2ml/m ³
high level	-	4ml/m ³

The low level alarm shall initiate local audible and visual alarms.

The high level alarm shall initiate local audible and visual alarms, audible and visual alarms outside the buildings, alarms in the monitoring room, it shall shut down the chlorination systems, isolate chlorine drums and stop all the extract fans./ Warning signs shall be provided in English and Hindi.

- Compressed air cylinder recharging facilities comprising of 40 liters capacity cylinder with recharging kit to refill service cylinder or breathing apparatus - 2No.
- Protective Clothing - Rubber & P.V.C. clothing 2 numbers.
- First Aid Facility - Emergency Oxygen Kit 5 No. First Aid Box complete for artificial respiration to neutralize Inhaled chlorine effect - 4 No. First Aid printed chart. It shall be mounted on a glass framed wooden board in chlorine room.
- Weighing Machine - The weighing machine of standard make of two tonne capacity shall be provided to record the weight of cylinder.
- Emergency safety showers & eye wash- the contractor shall provide two safety showers and eye bath units. These units shall be installed at location approved by Engineer-in-charge.

3.1 UNLOADING ARRANGEMENT: -

An arrangement with chain pulley block of 2 tons capacity at a height of minimum 5.00 m. supported on M.S. beam section. It shall be provided at the entrance of chlorine storage room to unload the toners.

4.0 CLEAR WATER SUMP :-

The clear water from the module chamber shall be conveyed to the clear water sumps either through pipe or channel designed for a velocity 0.9 to 1.8 m/sec. The selection of pipe or channel shall be made on the basis of economy. The pipe if openly laid according to level shall be D.I. class K-9 Tyton joints and if covered then R.C.C. if the channel is provided, then it should be of R.C.C. M-30 grade and covered with the R.C.C. cover slab it shall be in horse shoe shape as far as possible. The levels shall be so fixed up so that the tank up to water depth shall be totally underground. The tank shall be designed for a capacity for a minimum detention period of 45 minutes. A minimum free board of 0.5 mt. should be provided below the roof beam. The floor of sump shall be designed in such way that it shall have a slope of 1:20 towards the inlet end. The shape of tank may be circular or rectangular as per design and economy consideration preferably sump should have two compartments connected with each other by electrically operated sluice valves in order to facilitate the cleaning of sump. It should be constructed in R.C.C. with a minimum grade M-30 concrete and shall be provided with pressure release system to relieve the uplift pressure. The sump should be covered at top with R.C.C. slab. The top slab shall have adequate number of manhole chambers of size 0.9 x 1.20 m in each compartment fixed with M.S. cover and frame painted with primer & anticorrosive paint and locking arrangement. There should be 100 mm. dia C.I. or M.S. ventilators painted with primer and anticorrosive paint with C.I. cowls in each quadrant of beams on the roof shall be provided. The top of roof shall be sloped out ward to drain out rain water easily. An aluminium ladder 0.45 mt. wide in one-man hole of both chambers shall be provided by contractor. The inlet and outlet pipes shall be located at a diagonally opposite end in order to minimize the short-circuiting and turbulence effect. An overflow pipe designed to maintain level shall be provided. The scour pipe shall be laid from bottom of clear water sump to waste water sump. All the pipes shall

be fitted with sluice valve as per I.S. standard and wherever necessary provided with inspection chambers.

A locally mounted dial type digital level indicator to indicate the water level along with a suitable sensor coupled with the PLC SCADA Automation system shall be provided.

4.1 CLEAR WATER PUMP HOUSE :-

A R.C.C. M-30 clear water sump of capacity with considering the 45 minutes storage capacity below invert clear water chamber should be provided. The sump should be covered at top with R.C.C. roof slab and necessary ventilating cowls, man hole with C.I. frame and cover, scour pipe with C.I. valve, inlet arrangement, Aluminium ladder, digital water level indicators etc. should be provided in the sump well. The contract also includes the construction of clear water pump house which should be suitably located near the clear water sump well. This clear water pump house shall be a part of the plant. An area of approximately 40 sqm should be provided for the pump house to accommodate 3 nos. centrifugal pumping sets. The height of pump house should be at least 4 M. The pump house should also be capable of accommodating bus-bar channel, starter, O.C.B., sluice valve, reflux valves and flooring for electrical cables concrete work for delivery pipe line, trench etc. for clear water pumping main of 600 mm dia in the pump house and also the supporting structures for cables and pipes. The tenderer shall also quote for supply and erection of 5 M.T. Capacity electrically operated gantry Crane. Centrifugal pump sets with accessories will be installed in clear water pump house, by other agency. The foundation and floor design of pump house should be done properly and due considerations for vibration should be given in its design. The lay out of pump house should be capable for future expansion. The difference of level between the floor of pump house and the invert of sump well shall not be more than 1.0M in any case. Preferably there should be positive suction head. Further, the height of plinth of pump house above ground level shall not be less than 0.6 M. The lay out of the WTP shall be arranged in such a way that in no case the rain water can enter the pump house on the pump floor.

GENERAL

- There should be interconnecting channels, pipes, valves etc. for bye pass arrangement so that any individual unit can be put out of operation without affecting the working of others the bye pass arrangement shall also be designed to carry 25% additional flow during emergency.
- Electric Motors shall be covered in properly designed and shaped 8 gauge G.I. sheets to protect them against weather effects.
- The Treatment units shall be provided with desludging arrangement including sluice valves with operating rod and wheels and piping to lead sludge to the wash out system. There should be automatic arrangement to operate and also the manual in the case of failure of the automatic device.

- The provision of the driving units for Flash Mixer, flocculator and clarifiers shall be inclusive of all electrical connection and control, switch gear over load alarms etc. necessary for the designed efficiency and safety in working and up-keep of the plant.
- All the treatment works shall have proper walkways around the minimum width of 1.20 M and shall be shapped aesthetically. There shall be a pipe railing of architectural design and the bends, corners and vertical stays and the horizontal railing properly, finished so as to offer a fine & streamline look. The number and placing of the walkway to be such that it will enable the operating staff to approach to the electrical motors and other essential portion of treatment work easily.
- All the C.I. Pipes used in the plant shall be of double flanged class “B” conforming to I.S. 1537 latest addition duly inspected by SGS/RITES.

- The C.I. special should be double flanged conforming to IS 1538-1976 duly inspected by /SGS/RITES.

The C.I. Valves should be of double-flanged class II with I.S.I. Mark duly inspected by SGS/RITES.

In no place operating rod of any valve or mechanism or any other obstructions shall come in 1.2 m walkway.

- Fire extinguishers for each building at every floor shall be provided, and fixed as per the relevant i.S. Specification.
- Overflow from clear water sump shall be connected to sludge disposal system and should have free fall.
- Provision of SCADA and PLC with complete automisation of proposed WTP including the cost of Computers & peripherals, data loggers, including successful operation & maintences.
- Provision for Plantation & Butification of WTP premises.
- Glazed tiles of best quality to all water retaining faces and filter manifold as per the directions of Engineer in Charge

- **INLET CHANNEL WITH PARSHALL FLUME IN WTP:**

Minimum Free Board	300mm
Velocity of Flow	0.5 – 0.75m/sec
Retention time	Deleted

- **PERFORMANCE STANDARDS OF RAPID GRACITY SAND FILTER:**

For rapid gravity filters, the performance standards should be in accordance with para 7.8.2 RAPID SAND FILTERS of Manual on water supply and treatment published by CPHEEO.”

- **CLEAR WATER SUMP for 35 MLD WTP:**CF pumps are provided in the Clear Water Sump.

- **DESIGN FLOW FOR 35 MLD WTP:**The Water treatment Plant shall be designed for 35MLD for 22 hours running per day plus 3 % of back wash water recirculation.
- **PLC SCADA AUTOMATION SYSTEM:**The complete SCADA-PLC Automation monitoring and control system will be provided with Uninterrupted Power Supply for trouble free operation of WTP.
- **VALVES AND APPURTENANCES:** The CI/ DIDF valves shall be provided conforming to IS 14846:2000 as per QAP by DGS&D, RITES/SGS Third Party Inspection.
- **SLUDGE DISPOSAL STANDBY ARRANGEMENT FROM THE 35 MLD WTP:**As a standby arrangement, the wastewater and sludge disposal shall be done in the nearby nallah at a level above HFL as approved by the Engineer-in –Charge.
- **RAW WATER FOR TESTING OF WATER RETAINING STRUCTURES:**Only raw water will be made available to the contractor by JMC for hydraulic testing purpose after which the structure and pipelines are required to be disinfected by the contractor at no extra cost.
- **SANITARY BLOCK IN WTP AND RAW WATER PUMP HOUSE:**Minimum area of sanitary block shall be 9 sq-m to be provided in the proposed Water Treatment Plants and Raw Water Pump House.
- **Air Wash System IN 35 MLD WTP:**The Air Wash System is required to be designed as per para 7.6.3.13 Surface Wash. For this free air of about 36-45 m³/hour (600-900 LPM/sq-m of the filter area) at 0.35 kg/sq-cm is forced through the under drains until the sand is thoroughly agitated for a duration of about 5 minutes.
- **UNDER DRAIN PIPE IN WTP FOR THE FILTER BEDS:**The M.O.C. of under drain pipe shall be UPVC Pipe Class 10 kg/cm² conforming to IS; 13592(1992)-UPVC Pipes for Soil and Waste Discharge System.
- **BACK WASHIN OF FILTERS OF WTP:**(a)Refer para 7.6.3.12 High Rate Backwash of the CPHEEO Manual according to which the pressure at which the wash water is applied is about 5 m head of water as measured in under drains .
(b)Capacity of Back Wash overhead storage tank must be sufficient to supply wash water to 2 No. filter units at a time .refer para 7.6.3.12 of CPHEEO Manual
- **WEIGHING MACHINE IN WTP:**Platform type weighing machine shall be of capacity 5MT to be provided by the Contractor at no extra cost.
- **LIME DOSAGE FOR WATER TREATMENT:**The lime dosing rate should be 20 ppm.
- **CHLORINE ROOM, STORE & CHLORINE TONNERS FOR 35 MLD WTP:**The sizes of Chlorine room, Chlorine store and numbers of tonners to be provided by the Contractor are as follows:
 - (a) Chlorine Room- --30 sq-m
 - (b) Chlorine Store-- 20 sq-m
 - (c) No. of Chlorine Tonners—4 Tonners (1 No. tonner in reserve).
- **CLEAR PUMP HOUSE:**Carpet Area of Clear Water Pump House for 35 MLD Water treatment Plant shall be atleast 20 m x 10 m. Sump shall be of the capacity of 45 minutes storage and shall be placed in such a way to make the positive suction..
- **ADMINISTRATIVE BLOCK & LABORATORY BLOCK FOR 35 MLD WTP:**Administrative Block shall be -60 Sqm for 35 MLD WTP and laboratory shall be of atleast 60 sq-m.
- **RCC SLAB AT PLINTH LEVEL OF RAW WATER PUMP HOUSE:**The RCC slab

and flooring at the plinth level will be provided as per design requirement.

- **FLASH MIXER FOR 35 MLD WTP:**(a)MOC of shaft and impeller of the Flash Mixer is SS 316.
(b)Turbine type impellers will be used in flash mixer .In the design of mechanical flash mixer unit, a detention time of 30 to 60 seconds is provided. The relatively high powered mixing devices should be capable of creating velocity gradients of 300/s or more. The usual ratio of impeller diameter to tank diameter is 0.2 to 0.4 and shaft speed of propeller greater than 100 RPM imparting tangential velocity greater than 3 m/s at the tip of the blade. Refer para 7.4.2.2 Mechanical Devices of CPHEEO Manual
- **FLOW METER FOR RAW WATER & CLEAR WATER IN WTP 35 MLD CAPACITY:**Ultrasonic flow meter will also be provided for flow measurement in the WTP.
-

FRONT ELEVATION

The site for construction of water treatment plant is located in Jagdalpur town. The treatment plant should be so oriented and designed to give very good architectural view and appearance.

The front elevation shall be architectural to the satisfaction of the department and the department reserves the right to make additions and alteration in the front elevation on contractor's cost.

The structure should represent a pleasing appearance with aesthetic features forming a balance between function and form. The interiors of the structure shall be eye appealing and in keeping with the objectives of the plant, viz. production of pure and wholesome water. The porch must be provided to the main building having sufficient space to accommodate atleast two four wheel vehicles at a time in parallel.

SPECIFICATION FOR MECHANICAL WORKS

- Submerged structural parts (Steel) except hot rolled sections shall not be less than 6 mm thick.
- Prime movers and allied components such as electrical motors, starters, switches, reduction gears, drive mechanisms, bearings, plunger blocks, etc. shall be standard make.
- All rotating machinery, particularly gears shall be designed with adequate safety margins and service factors.
- All water submerged parts rotating mechanical parts and steel pipe under water shall be adequately protected after surface treatment. Oil, grease, dirt, soil and all surface contaminations from structural and fabricated steel parts shall be removed by cleaning with solvent vapour alkali emulsion or steam. Loose rust or paint weld spatter etc. shall be removed by hand chipping, scraping, sanding, wire brushing and grinding the bare finished shafting,

finished flanges and other mechanical surface protected by grease or rust protection measures.

- Structural Mechanism support and super structures, walkway, hand rails with PVC tops Fabricated shaft etc. shall be protected with at least one coat of primer and two coats of paint is 800-1962 (up to amended) code of practice for use of structural steel in general building construction should be followed. The department for procurement of any materials shall issue no permits.
- The tender must be inclusive of operation of the plant for the twelve months trial run period free of charge by contractors trained and qualified Engineers who should be completely familiar with the equipments supplied and erected and they shall train the departmental staff in operation of the plant within that period. Detailed operation manual as well as the drawings of equipments supplied, should also be supplied by the contractor free of cost. The cost of electrical energy. Chlorine Gas, and payment to departmental staff for operation of the plant, WILL BE PAID by the Department during this period.

Performance Guarantee must be demonstrated by the test run for this period of three months. The tenderers must furnish bonds covering items of work like mechanical and electrical equipments, piping etc. for one year or two consecutive rainy seasons which ever is more as a guarantee of satisfactory operation and rectification of any defects in the work, material or equipment furnished by them by way of repairing or replacement at their own cost. The tenderers must furnish the service of competent representatives for this period to instruct the plant operating personnel in the maintenance and care of flow indicators, rate controller, piezometers etc. and to conduct tests.

SPECIFICATION FOR ELECTRIC WORKS

- The work shall be carried out strictly in accordance with latest India Electricity rules, especially as per latest specifications of Chhattisgarh Electricity Board and relevant I.S. Specification.
- The size and type of wiring shall be suitable for A.C. supply at 440 (+5%) volts, 3 Phase, 50 cycles for Power and 220 Volts for lightening.
- All phase wire shall be inside concealed single metal conduit and pipe shall be properly earthed.
- Suitable protection by means of cut-out shall be provided in such live conductors for every circuit.
- Lighting arrestor along with suitable earthing arrangement as per relevant I.S. specification shall be provided.
- All switches and fittings shall be of superior type as directed by the Engineer-in-charge.
- For the work of wiring for lighting of building shall be carried through surface

PVC conduit pipe as per the specification of SOR for electrical works 2010 w.e.f. 15-04-2010 issued by E-in-C, P.w.D., Raipur with up to date amendments. The tender shall be inclusive of electric connections for power from main board to drive unit and light.

ELECTRICAL WORK SPECIFICATIONS:

- The scope of work shall not include work of providing; laying and fixing of power cable from electrical sub station to main distribution panel. The contractor shall provide wiring for power and light in open PVC conduit as per specifications of SOR as specified above.
- The contractor shall provide and fix at proper places all around the plant/clarifloculator/clear water sump, 16 nos. LED lights of 80 watts on suitable, & work in open during rains. However the department shall have right to increase illumination level by 5% without any extra payment.
- Specifications for main distribution board :
The panel board shall be designed for the complete electrical load of treatment works, e.g. for prime movers of mechanical equipments of flash mixer, clarifloculator with its and carriage, alum and lime solution tank, chlorine boosters, wash water pumps, air blowers, Sampling table etc. and for entire load of internal and external electrification e.g. light, flood lights, LED, ceiling Fans, Cooling Fans, Coolers, refrigerator etc.

It shall consist of 4 bus bars of suitable section, designed for capacity considering above electrical load, ammeters and volt meters of suitable range with rotary selector switches, phase indicator lamps with switches, OCB or ICTPN switches of adequate capacity with HRC fuse. The panel board shall be cubical non draw out type with panel openings either from front or rear side for carrying out inspection, operation and maintenance. Suitable ICTPN rewirable fuse units of adequate capacity shall be provided for lighting load. This panel board shall be housed in a room near blowers and wash water tank filling pumps. The total area of room for blowers, pumps of WWT filling and panel board shall be a minimum 30 sqm. After completion of wiring the contractor shall fill in the necessary form required by CSPDCL Authority for getting connections and shall hand over the installation in complete working condition to the satisfaction of the Engineer-in-charge. The charges required to be paid to CSPDCL for obtaining electrical connections shall be arranged by the Department.

The tenderer has to work out details of illumination and arrangements and submit necessary drawing for acceptance of the Engineer-in-charge. Light fixtures shall be of Philips/GEC or any other standard makes to the entire satisfaction of the Engineer-in-charge.

The suitable capacity LED should be provided in the filter house. Industrial type nitrous enamel reflectors complete with original choke, starters etc. manufactured by G.E.C./Phillips or any other standard make. The required LED shall also be provided in the operation gallery to give a uniform lighting.

The inspection boxes shall be fitted with corrosion proof fittings 2 x TL 20 watts. GEC make or equivalent in Phillips or any other standard make. A common switch board shall be provided for the starters for the pumps, air blowers, compressors and other pumps. These shall be provided in wash water tank feed pump house along with necessary cables to the various motors. The panel shall be completed with incoming triple pole switch, Voltmeter, Ammeter and isolating switches for the various pilot lamps etc.

The tenderer shall also include the cost of providing and laying the incoming power box cables from the main sub station to be constructed by the department in the same premises to panel in the wash water pump room and also the wiring in VIR in heavy gauge conduit from indoor motors.

- Operation and Maintenance for 5 Years

The contractor shall operate and maintain the water treatment plant including all the civil structures, electro-mechanical equipments, pipes, pipe specials, instrumentation provided by him in 35 MLD plant. He will maintain spares with stores for the proper upkeep of the WTP. List of spares is given below.

LIST OF SPARES:

For repairs and proper upkeep of the WTP in case any repair to any equipment is required, no extra payment will be paid to the contractor.

For non compliance of the water quality parameter a penalty of Rs. 5000/- for one event in a day shall be levied.

i) Residual chlorine at outlet of clear water pump house ≤ 3 ppm

Lastly the contractor shall provide the following staff for the O & M on daily basis:

I)	Superintendant Manager	-	1
II)	Junior Manager	-	1
III)	Operators	-	2
IV)	Laboratory	-	1
	a) Chemist	-	1
	b) Helper	-	1
V)	Fitter	-	2 per shift
VI)	Mechanic	-	1 per shift
VII)	Electrician	-	1 per shift.

Every day atleast 3 times raw water and treated water report shall be made available to Engineer in Charge.

5.0 DATASHEET FOR LAMELLA CLARIFIER

(TO BE FILLED BY THE BIDDER)

Flowrate (m³/h) :

Overload (%) :

Quantity :

Material of Construction :

Outside :

Internals :

Plate :

No. of Plates :

Plate gap :

Angle of Inclination of Plate :

Projected Surface Area :

Depth of Clarification Zone :

Depth of Sludge Collection Zone :

Surface loading rate :

Length of the Settler :

Width of the Settler :

Height of Settler :

Sludge Scrapper Mechanism :

MOC :

KW/RPM :

Speed :

Quantity of Sludge Generated (Kg/day) :

Concentration of sludge generated (%) :

Reference Plant :

Name of the Client and address :

Capacity of the plant (Minimum 10 MGD) :

Whether certificate has been enclosed :

Outlet Turbidity achieved :

Whether it is for drinking water application :

Year of commissioning

5.1 DATA SHEET FOR RAPID GRAVITY DUAL MEDIA FILTER

(TO BE FILLED BY THE BIDDER)

Flow rate (m ³ /h)	:
Overload (%)	:
Quantity	:
Material of Construction	:
Whether the design is for Twin Bed	:
Size of the each Filter Bed	:
Total height of each Filter	:
Size of the Filter House	:
Width of the Filter Gallery	:
Minimum headloss for design	:
Filter Media	:
Sand Coal	:
Effective Size	:
Uniformity coefficient	:
Particle density:	:
Hardness	:
Whether nozzle system has been considered	:
Type of nozzle	:
Nozzle density	:
MOC of Nozzle	:
Size of the nozzle	:
Surface loading rate (m ³ /m ² /h)	:
Air Scouring rate	:
Air blower capacity (m ³ /h)	:
Head of Air Blower (mwc)	:
Type of Air Blower	:

Conjunctive Backwash water rate	:
Final wash water rate	:
Quantity of backwash water generated	:

1.0 LABORATORY BLOCK, OFFICE AND CONTROL ROOM :-

The laboratory block may be isolated or connected with the other units. The tentative area of laboratory block shall be 120 sqm to accommodate one A.C. Room as Control Room, Office Room, chemical room or laboratory room for testing and attached toilet block. It shall have permanent building specifications with RCC floor and roof. With RCC frame work.. The door or laboratory room & A.C. room shall be of Aluminum of size 1.20 x 2.00 Mt. self-closing type fixed with 4mm thick glass and over with rolling shutter shall be provided (only in the laboratory room). The A.C. room shall have thermocouple ceiling with steel bedding and PVC sheet over the mosaic flooring. The A.C. shall also be provided by contractor. The capacity of A.C. shall be decided by contractor and of Voltas, LG, Samsung or equivalent standard make. All around the laboratory room a platform of 1.00 Mt. wide shall be provided to put up the instruments and in two corners of wall wash basin as per I.S. Specification fitted with water supply shall be provided. It shall have two numbers of exhaust Fan of 300mm dia Crompton, G.E.C., Bajaj, Khetan or equivalent make. Below the platform the Almirah for storing the chemicals fitted with wooden frames with door shall be provided. If the laboratory block is provided isolated to the module chamber in other building then a water sampling table, for visual examination and collection of raw, settled filtered and chlorinated water shall be provided in laboratory room. The testing platform and stands shall be clad with acid resistance tiles. The following instruments shall be provided as per I.S. Specification for laboratory by contractor.

All throughout the length and breadth of the WTP installation building Kota Stone Flooring of minimum 25mm thick shall be provided as per the specifications given in Annexure-E.

6.1 REQUIREMENT OF EQUIPMENTS FOR WATER TESTING LABORATORY

S. No.	Name of Equipment's	Required quantity
1	Refrigerator (310 Liters)	1 No.
2	Incubator 37 ⁰ c±05 ⁰ c (Bacteriological) 220 Volt A.C.	1 No.
3	pH Meter (Digital(0-14 pH range)	1 No.
4	Nephelometer direct reading (Range 0-1000)	1 No.

5	Spectrophotometer visible range 220 to 850 mm	1 No.
6	Jar test apparatus with variable speed control 10 to 1000 RPM.	2 No.
7	Conductivity meter (systronics)	1 No.
8	Water distillation plant (15L/day)	1 No.
9	Auto calve (Cabinet 15 Atm pressure)	1 No.
10	Hot Air Oven 30 lit. cap 100° to 180°c	1 No.
11	Water bath 6 to 8 concentric 0 to 50°c	1 No.
12	Dissolve oxygen Analyser (Digital)	1 No.
13	Chlorine comparator	2 No.
14	Heating metal (Capacity 1 Litre)	1 No.
15	Magnetic stirrer (1 Liter capacity speed control)	1 No.
16	Laboratory Balance 0 to 200 gm	1 No.

6.2 REQUIREMENT OF CHEMICALS FOR WATER TESTING LABORATORY

S.No.	Name of Equipment's	Required
1	Phenolphthaline Indicator	1 Lit.
2	Mehayal orange indicator	1 Lit.
3	Sulphuric acid N/50	2 Lit.
4	Potassium Chromate 5%	1 Lit.
5	Silver nitrate	200 gms.
6	Manganese Soleplate	1 Kg.
7	Sodium thisulphate	1 Kg.
8	1-10 Pheneptheline	200 gms.
9	Hydroxylamine Hydrochloride	200 gms.
10	Eriochrome black 'T'	100 gms.
11	Murexide	20 gms.
12	E D T A N/50	5 Lit.

REQUIREMENT OF GLASSWARE FOR WATER TESTING LABORATORY

S.No.	Name of Equipment's	Required
1	Graduated pipette of capacity 1 ml.	5No.
	- do - 2 ml.	5No.
	- do - 10ml.	5No.
	Ordinary pipette of capacity 10 ml.	5No.
	- do - 25 ml.	5No.

2	Graduated Measuring Cylinder Capacity 10 ml.	5No.
	- do - 50ml.	5No.
	- do - 250ml.	5No.
	- do - 1000 ml.	5No.
3	Reagent Bottles of Capacity 250 ml.	10 No.
	- do - 500ml.	10 No.
4	Nester's tube of capacity 50 ml.	5 No.
	- do - 100ml.	5 No.
5	Conical flask of capacity 100ml.	5 No.
	- do - 250ml.	5 No.
	- do - 500ml.	5 No.
	- do - 1000ml.	5 No.
6	Beakers of capacity 100ml.	5 No.
	- do - 250ml.	5 No.
	- do - 500ml.	5 No.
	- do - 1000ml.	5 No.
7	Test tube with rim of size 25 x 250	100 No.
	- do - 15 x 150	100 No.
8	B O D Bottle 300 ml.	15 No.
9	Funnel 4	15 No.
10	Filter paper (Whatman's) No.1	4 Pkt.
	- do - No. 40	4 Pkt.
	- do - No. 42	4 Pkt.
12	Desiccators	1 No.

6.3 REQUIREMENT OF ACCESSORIES & MATERIAL FOR LABORATORY

S.No.	Name of Equipment's	Required quantity
		2 No.
1	Water Sampler (Steel) of capacity 2 Lit. - do - 5 Lit.	2 No.
2	Gas Cylinder	2 No.
3	Burners (Bunsen Marks) ½" Pipe with tuner tone	4 No.
4	Wire basket 5 x 5 x 5	2 No.
5	Burette Clamps (Nickle plated)	4 No.
6	Tongs stainless steel 13"	2 No.
7	Spatula steel 8"	10 No.
8	Test tube stand (Iron)	10 No.
9	Rubber cork various sizes	50 No.
10	ICE Box (thirmocal)	3 No.
11	Iron Box with clamp	6 No.
12	Blotting paper	10 Sheets

13	Wire gage 6 x 6"	6 No.
14	Stop Watch	1 No.
15	Nessler's tube stand	5 No.
16	Sample Box	2 No.
17	Brown Paper	5 Sheets
18	Pipette Stand	3 No.
19	Non-absorbent cotton	1 Kg.
20	Test tube brush (Nylon)	10 No.
21	Burette brush	10 No.

6.4 REQUIREMENT OF CHEMICAL FOR BACTERIOLOGICAL TEST

S.No.	Name of Equipment's	Required quantity
1	Mac conkey Broth (D S)	1 Kg.
2	Mac conkey Broth (S S)	1 Kg.
3	Peptone	1 Kg.
4	Lactose	1 Kg.
5	Sod Chloride	1 Kg.
6	Bile Salt	0.5 Kg.
7	Natural Red	100 Gms.
8	Brilliant green bile lactose Broth (BGIB)	4 Kg.
9	Tryptophe broth	4 Kg.
10	Sprit	

7.0 SITE ROADS :-

Site roads shall be a minimum of 3.5 m wide with a 1m shoulder either side. The carriageway shall have camber of 1 in 40 to drain rain water from its surface. A concrete gutter shall be provided at either side of the road. The inner radius of bends shall allow the easy passage of large lorries. Parking for at least 8 Vehicles shall be provided at the administration building.

The sub base shall be 150 mm of hard granite cubes. The base shall be two layers each a minimum of 75mm thick, the top layer shall be 40mm down graded metal of 100mm as placed thickness compacted to 75 mm, the bottom layer is 65mm down graded metal of 100mm as placed thickness compacted to 75mm. The wearing coat will be asphalt concrete 20mm thick or the contractor may choose to construct CC road.

SIGN AND WARNING BOARDS

All buildings and treatment units shall be provided with sign boards as directed by the Contractor indicating the name and function of these at no extra cost to JMC for the proposed WTP.

All the signboards displaying name of the technical units and directions shall be written in English and Hindi.

The main signboard erected at the main gate of the plant shall have matter written in English & Hindi.

At the start of construction work the contractor shall erect signboards one at the entry of the construction site and another near the temporary site office displaying all the project related information like name of the work, client, AMRUT MISSION, value of the works, start and completion date as per contract, capacity of the plant, number of units and other details as directed by Engineer-in-Charge. The size of the board shall be decided in consultation with the Engineer-in-Charge.

Necessary sign and warning boards shall be supplied and erected at the locations to be specified by Engineer-in Charge. The size of the board shall be 1200 mm x 1200 mm minimum or as directed by Engineer-in-Charge. The signboard shall be partially reflective Flex type on SS Grade 304 minimum 1.2 mm thick supported with frame of aluminium channels / double back channels minimum 3 mm thick through aluminium rivets. The signboard shall be subsequently attached to the post(s) through steel bolts. The posts shall be 75 mm diameter galvanized steel with welded top cap in case the signboard is supported on one post only, however, if two posts are used to support the signboard the diameter of each shall be minimum 40 mm and thickness 1.6 mm. The steel posts shall be embedded in RCC footing of size as approved by the engineer or as per the design. The total height of the post shall be 1800 mm + size / depth of the signboard. For larger size boards, more than 1200 mm x 1200 mm, the contractor shall submit the designs and drawings, wind load calculations, etc for approval of Engineer-in Charge prior to its construction.

8.0 SITE DRAINAGE: -

The site drainage system shall be designed to dispose of overflows from tanks and rain water in a manner to prevent damage to any structures. The drainage may use pipelines, culverts, conduits or open channels to convey the water to a safe disposal site leading to nearby water body. Open channels shall be lined.

9.0 TELEPHONE SYSTEM :-

A telephone system shall be provided. The system shall originate in the administration building and shall be controlled by a receptionist. Telephone instruments shall be installed in the offices in the chemical building, the workshops, the filter monitoring room and the main offices of the administration building. The connection of an outside line to the system will be provided by JMC.

10.0 PROCESS CONTROL :

General

The automatic process control of the plant shall typically be based on the use of a number of programmable logic controllers (PLCs). These shall be located within control panels.

The supervisory monitoring of the entire treatment plant shall be implemented by a site SCADA system provided in the administrative building control room by the contractor. The contractor shall also provide a static mimic panel of minimum 2m x 1m size within the administration building control room with the main processes engraved on mosaic tiles and with edgewise instruments displaying all main flows and levels (local raw water and clear water tank levels, residual values, number of filters in service etc.), together with indicator lamps for combined faults for each process/area of the works. It is intended that the operator

will investigate each local area for the individual faults displayed.

The SCADA system shall be provided and located in the administrative building at the water treatment works at Jagdalpur.

The SCADA system shall comprise the following ;

An industrial grade latest personnel computer (PC). This shall be provided to the latest industry standard conducive to the efficient and effective operation of the selected SCADA software package. It shall be provided with both diskette and CD drives. The fixed drive shall be sized to permit the operation of the system and the storage of the following ;

- In excess of 2000 historic alarms data;
- Not less than 7 months archive data.
- Plus not less than 50% spare capacity.
- One latest industry standard 20" colour monitor;
- Mouse;
- 132 column alarm/event latest dot matrix printer with fan fold paper attachment;

Colour inkjet screen dup printer with multiple single sheet feeder (the printer shall be suitable for use at the local SCADA system);

Metal computer desk with vinyl work surface and one pedestal draw unit and one cupboard unit, the desk shall accommodate the PC and alarm/event printer and permit two operators to sit side by side. The desk shall be purpose built, attractive, durable and ergonomic and it shall be sized to have not less than 50% spare work surface when accommodating the PC and printer. The desk shall incorporate an integral power distribution system to supply equipment mounted on desk;

full height two door metal storage cupboard with three shelves; 2 Nos

upholstered swivel chairs;

Printer trolley/s to accommodate the report and screen dump printer.

The Contractor shall provide proprietary SCADA software for the central SCADA systems. The SCADA software shall be windows based. It shall have a proven track record for similar applications in the water industry and shall be supported within India.

The SCADA system shall be the same as that used for the local SCADA systems. The software package selected shall provide facilities for the provision of the following :

- Colour graphic screen representation of each plant area including system overviews;
- Alarm annunciation and historic logging of alarms;
- Historic event logging.
- Real time and historic trending of analogue variables;
- Preparation of simple reports;

Archiving of system variables for retrieval on to third party machines operating industry standard spreadsheet and database software and onto machines using the SCADA software,

which shall permit trend graphs of the archived data to be recreated.

The Contractor shall configure the SCADA system to provide facilities to: display status, values and totals in a graphical and tabular format (see note 1); annunciate alarms including details of the time the alarm occurred (see note 3); provide facilities for the operator to :

- (i) acknowledge alarms
- (ii) view a journal of unacknowledged alarms;
- (iii) view a journal of the last 200 alarms acknowledged and unacknowledged;
- (iv) carry out real time (see note 4) and historic trending of analogue values (see note 3).
- (v) carry out data archiving of all analogue values to optical disk (see note 5); prepare daily, weekly, monthly and annual reports (see note 6).
- (vi) The SCADA system shall be configured by the Contractor to carry out any additional requirements needed to assist in the effective and efficient operation and monitoring of the water transmission system.

Notes:

(i) overview of the treatment works; active colour graphic flow diagrams for each process and section of the works sufficient to convey to the operations staff and power supply and control system at all times.

(ii) A comprehensive screen navigation system shall be provided giving access to all screens via a system of menus and short cuts (i.e. it shall be possible to follow from one screen to another by clicking the mouse cursor on screen 'hotspots' to effect the move from one screen to another and back against)

(iii) The software chosen shall have a comprehensive alarm handling capability with the ability to annunciate, acknowledge, sort and maintain a historic record of current and past alarms including details of when the alarm occurred, when it was acknowledged and when it returned to normal.

(iv) The system shall be capable of storing real time data for one day and historic data for 7 months.

(v) The sample rates for archiving shall be the same as for trending. The archives shall be stored in daily files. The system shall provide separate storage capacity to store archives for one year. A warning alarm shall be provided to the operator to advise that archiving to disk should take place or archived data will be overwritten.

It shall be possible to;

Reintroduced the data derived from archiving and view the archived data facility;

Display the data using industry standard spread sheet or database software in tabular format on a third party machine;

- The SCADA system shall manipulate the data it receives in order to prepare reports in order to provide the Employer with a schedule of throughput and power consumption for the period concerned. The reports shall be generated on demand and automatically as required.

The Contractor shall monitor summary status of all the treatment works as follows:

- Water level raw water and clear water reservoirs;
- Process flows and totalized quantities;
- Water quality values
- Status of each process;
- Reservoir high high and low low level alarms;

- Power outage present;
- Power consumed per day;
- Individual power consumption;
- Power factor;
- Water treated **quantity** in the last complete 24 hour period (midnight to midnight, time selectable);
- Total power outage house per day.

The SCADA system and its ancillary equipment shall be powered via an uninterruptible power supply with a hold up time at full output of the UPS for 30 minutes. The full output of the UPS shall correspond to the maximum imposed load plus 20%.

- **Control Modes**

For all drives, two basic modes of operation shall be available ;

- a. manual control;
- b. automatic control

The selection of control mode shall be by way of a switch at the respective control panel starter section. In manual mode, the drive shall be controlled by start and stop pushbuttons at the control panel. In automatic mode, the drive shall be controlled to the dictates of the area PLC program.

Manual control shall inhibit automatic control and vice versa. On transfer from manual to automatic mode a delay of 10 seconds shall prevent any immediate start-up of the drive.

It shall be possible to operate electrically actuated valves either:

- a. locally, at the valve; or
- b. remotely, at the specified control panel.

The selection of the control mode being at the valve actuator, at the control panel there shall be a further switch to select either manual control or automatic control. Manual control shall be from open and close pushbuttons on the panel, auto control shall be via the respective PLC.

The PLC program for automatic control of plant may also contain a number of control options to allow the starting and stopping of all drives, speed control of variable speed equipment, opening and closing of all actuated valves, etc. Other options may include constant speed control, flow proportional control or constant level control.

The Contractor shall provide a means by which the operator may easily select which control option is to be active.

- c. Duty/Standby Rotation**

Where individual items of plant or areas of plant operate in a duty/standby configuration, the status of the item or area shall be automatically selected by the area PLC. This may either be on a 'time run by duty drive' or a 'time elapsed' basis.

Rotation of duty/standby shall take place during the first controlled stop after the preset time has expired. If a normal controlled stop does not occur within a period of 8 hours after this time an alarm shall be raised in order to prompt a manually initiated changeover.

Duty/standby pump drive groups larger than two shall be rated as follows:

	Duty 1	Duty 2	Stand by
Drive	1	2	3
Drive	2	3	1
Drive	3	1	2

On initial start up the system shall default to the lowest numbered pump being duty 1 and the second pump duty 2.

11.0 EMERGENCY LIGHTING :

Emergency luminaries shall be provided in all areas and so arranged to provide sufficient illumination to allow safe evacuation from all buildings under power failure conditions. Emergency luminaries shall be of the type utilizing fluorescent lamps and provided with self-contained rechargeable batteries of the sealed type to give a three-hour illumination period with the batteries fully charged. A visual indication that the charger is operational shall be provided. Where considered appropriate the emergency luminary can be incorporated as part of the normal luminaries where they utilize the main lamp at a reduced output for three hours. Emergency luminaries shall be so arranged that they are illuminated by the failure of the local lighting current. Key switches shall be provided as required to facilitate testing of the emergency luminaries.

As a minimum emergency luminaries shall be positioned at or near (within 2 metres) the following points:

- a. each exit door
- b. near each staircase so each flight receives direct light
- c. near changes of direction
- d. near fire fighting equipment
- e. at each change of floor
- f. near each intersection
- g. outside each final exit and close to it.

External

External lighting shall be employed throughout the site to illuminate all site roads, turning areas, car parks, paths, tanks and building perimeters.

The following average levels of illumination are required :

Car Parking areas	5 lux
Access Roads, Pedestrian Walkways	10 lux
Lorry Loading and turning Areas	20 lux
Top of Tanks	50 lux
Building Perimeters	50 lux

The access road lighting scheme shall be designed in accordance with the requirements of BS 5489 : Part 3 : 1989 (group B5/6). Column heights shall be 5 meters and each lantern shall incorporate a photocell for control. At each position where a section of road lighting columns is fed a selector switch shall be provided having the following functions

- | | | |
|-----|---|--------------------------------------|
| ON | - | Access road lighting permanently ON |
| OFF | - | Access road lighting permanently OFF |

AUTO - Access road lighting under photocell control

Some flexibility in positioning of road lighting units is allowed but generally units shall be positioned at intersections and junctions with spacing not exceeding 30 metres \pm 10%.

12.0 ELECTRIFICATION :-

12.1 Earthing :

General

Protective conductors shall be provided for all electrical installations and associated mechanical Plant and Equipment, exposed steel work and buildings. Protective conductors shall be provided in accordance with the requirements of IS 3043 and the latest edition of the I E Wiring Regulations/Code of Practice for Electrical Wiring Installation IS 732.

Earthing Conductor

Earth electrodes where used shall be galvanized, iron rods in accordance with IS 3043 having outer diameter not less than 38mm. The rod shall penetrate a minimum of three metres below ground level. Where multi-rods are used a distance of not less than the driven length shall separate them.

Earth rods shall have hardened tips and caps and be extendable. Galvanized iron flats buried at a minimum depth of 600mm shall be used for interconnection of rods.

Where soil conditions make the use of rod type electrodes impracticable a grid configuration may be used comprising horizontally buried bare galvanized iron strip of dimensions 50mm x 10mm minimum. GI strip shall be buried at a minimum depth of 600mm.

Each earth electrode rod if used shall be provided with an approved non-ferrous clamp for the connection of the earthing conductor or tape as required. These connections shall each be housed in individual concrete inspection chamber set flush to the finished ground level and shall allow disconnection for testing of individual electrodes. The chamber shall be permanently marked 'Electrical Earth'.

All materials used for the earth electrode installation shall be purpose made for the application and site conditions and shall be approved by the Engineer-in-Charge.

Unless otherwise stated all excavation of trenches for the installation of the earth electrodes and the inspection pit shall be carried out by the Contractor. After the earth installation has been completed the Contractor shall demonstrate to the Engineer-in-Charge that the resistance of the electrodes to earth and the continuity of the earth network are within the limits specified. Any additional earth electrodes and test instruments required for the tests shall be provided by the Contractor.

Marker posts and plates shall be provided to mark the route of buried tape electrodes. The markers shall be similar to those provided for cable routes.

Main Earthing Terminal

A main earth terminal shall be installed in an approved location adjacent to the incoming supply to a building. This shall be labelled and comprise a 50mm x 6mm minimum cross section copper strip as per IS 3043. The bar shall be of sufficient length to accommodate bolted earth bonding connections from transformers, major items of Plant and Equipment and electrical switchgear, building structural steel work, concrete reinforcement, the earth electrode system and the lightning protection system. The earthing conductor shall be clearly marked as such and shall be accessible for disconnection to facilitate testing of the earth electrode system. For small installations an earthing terminal comprising a single brass stud of 12mm minimum diameter shall be acceptable.

Instrument Earth

A separate instrumentation earth shall be established in each control panel. This shall comprise one or more copper earth bars not less than 25x6mm cross-section electrically isolated from the steel work of the panel and amounting of power cables. The instrument earth bar or bars shall be connected radially to the main earth bar of the control panel.

The instrument earth bar shall be provided for earthing the signal earth connection of each instrumentation and control device and the screen or screens of each instrument cable.

The earth bar shall have sufficient brass terminals to terminate all devices etc. as detailed plus not less than 25% spare terminals.

The screens of instrumentation signal cables shall be earthed at one point only. This shall normally be the nearest instrument earth bar at the control panel end. Instrumentation signal screens shall be cut back and insulated at the field end.

The overall earth resistance shall be brought down to less than one ohm.

12.2. Colours :

All cables cores shall be colour coded throughout their length and shall be so connected between switchboard, distribution board, plant and equipment and accessories, that the correct sequence or phase colours are preserved throughout the system.

The colour coding should be as follows :

3 phase	red, yellow and blue
single phase or dc	red and black
Earth	green / yellow
Control	blue (dc), red (ac)

Conductors

Copper or aluminium conductors shall be used for power cables and copper conductors for control and instrumentation throughout. Cores of cross-sectional area greater than 4 mm². Small power and control cables shall be of a minimum cross section of 2.5 mm².

Internal wiring of control panels shall be of a minimum cross-section 1.5mm² flexible and standard.

Instrumentation and control cabling shall be of a minimum cross-section 1.5mm² for external use and 1.0mm² for internal use.

Cable Fixing

Ties and strapping shall be suitable for securing cable and cable groups to cable tray or ladder. They shall be resistance to chemicals. Plastic coated metal ties used in order to obtain corrosion resistance shall not be acceptable. Nylon ties shall be resistant to the effects of ultra-violet light and shall be self-extinguishing.

Large single cables shall be secured with cable clamps or cable cleats.

Cable Identification:

At each end of each cable, in a uniform and visible position a label shall be fixed on the cable in accordance with the cable schedule. Labels shall be made of PVC and shall be indelibly marked to the approval of the Engineer-in-Charge. The label shall be retained using proprietary nylon strips passing through two fixing holes at either end of the label. If the cable gland is not normally visible, then the label shall be fixed inside the panel by means of screws.

Marketing Location of Underground Cables :

The location of all underground cables shall be engraved on brass or other non-corrodible plates to be fixed to the exterior surface of all walls of buildings 300mm above ground level and directly above the point where cables pass through the wall.

In addition concrete marker posts shall be installed at intervals of not more than 50m at all junctions and changes of direction along the cable route. Such marker posts shall be not less than 200mm high and of substantial construction. A drawing or sample of a typical marker post shall be submitted for the approval.

The markers shall be marked 'electric cable' in English and Hindi.

12.3 Lamp Test

Facilities shall be provided to test all lamps on an assembly. This shall comprise a common lamp test section. Operation of the lamp test circuit shall energise a relay in each section of the assembly in order to light each lamp and enunciator. The lamp test circuit shall pass through auxiliary contacts on section isolators if fitted. A short time delay shall ensure that the lamp test supply is retained to allow visual checking of all lamps.

On small assemblies, less than ten starters, individual lamp test buttons on each section shall be acceptable unless otherwise specified.

12.4 Telemetry Outstation : This section shall house the telemetry outstation and associated cable marshalling equipment.

The interior of the telemetry outstation section shall be accessible without isolation of any drive or circuit. Therefore all voltages in excess of 24V shall be screened to prevent access.

Each circuit shall be protected by an MCB such that maintenance work can be carried out with the minimum of interference to running plant.

Interconnection of inputs and outputs to the telemetry outstation shall be made via single edge knife type terminals to allow easy disconnection.

Analogue signals for connection to any telemetry outstation shall be connected via a signal isolator which shall allow disconnection of the outstation signal without disturbance to the operation of the works.

12.5 Emergency stop Circuitry : Each drive or group of drives shall be provided with an emergency stop facility which shall comprise a red coloured, mushroom headed, stay-put-twist to release push button. The work shall be carried out strictly in accordance with latest Indian electrification rule, latest specification of M.P.E.B. and relevant I.S. specification.

Electrification of chemical room, module chamber room, chlorine room, chlorine storage room, clear water pump house, office room, store room, L.T. switchgear room, toilet blocks, laboratory block etc. shall be done by contractor in such a manner that standard level of illumination is obtained. The wiring shall be concealed only. Separate pipes shall be provided for ordinary, power wiring and circuit wiring. Circuits shall be decided as per rules. Power wiring shall only be done in rigid steel conduit pipes. All accessories and pipes shall be I.S.I. Mark. In wiring copper conductor shall be used. The electrification shall be done by experienced electrical worker, having valid license. The contractor shall provide MCC for the load of complete Treatment Plant except the clear water pumps load.

The general requirements for lighting fixtures and wiring is given below. The tenderer shall however work out details of illumination and arrangement and submit necessary drawings to the departments. The drawing should be approved by "Chief Electrical Inspector" or his subordinate authorized officer.

DETAILED RECOMMENDED LEVEL OF ILLUMINATION

S.No.	Unites	Recommended Level of Illumination
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1	Module Control Room	300 Lux
2	Rooms and passages	200 Lux
3	Office, wash water pump house.	300 Lux
4	Filter gallery	200 Lux
5	Inspection boxes	300 Lux
6	Stores	200 Lux
7	Chlorine room and cylinder room	200 Lux
8	Chemical House	200 Lux
9	Laboratory	300 Lux
10	Sanitary blocks	150 Lux
11	Around clariflocculator	150 Lux
12	Around filters	200 Lux
13	Around clear water sump and channel	150 Lux

The switches and switch fuse unit shall be I.S.I. mark confirming to 4064 & 4047 - 1967.

Approved make fluorescent tube fittings rust resistant, stove enamelled type with copper wound choke, capacitor, starter, holder etc complete with LED Lamps of 2 x 20 watts shall be provided. Approved make and accepted standard H.P. sodium vapour lamp, street lighting luminaries, consisting of metallic housing, highly polished aluminium mirrors, clean acrylic covers, gasket and equipped with accessories such as ballast. Condenser igniters skirted ceramic lamp holder suitable for 250 watt HPSV lamp complete with sun lamp shall be provided by the contractor.

Approved make air circulatory fans mounted on motor floor in order to cool the motors shall be provided by the contractor.

Approved make ceiling fans of 1200 mm. sweep and pedestal fan 380 mm. size shall be provided by the contractor.

The tender shall also include the cost of providing and laying the cables from I.T. switch gear room to different units, street light fitting (except from sub-station) fitting for wash water pump, air blower and additional fitting for blowers is pump house, surge vessel etc.

Approved make means, Phillips, Compton, G.E.C. or equivalent makes only,

- The street light fitting shall be mounted on steel tubular poles swaged type as per I.S. 2713 complete including fixing on ground with concrete block with base plate etc. of 7.00 M. height.
- All equipment's and material shall be suitably designed and guaranteed for normal life and satisfactory operation under the climatic conditions prevalent at site. They should perform as per the characteristics without showing any sign of overload, overheating etc.
- Detailed specification shall be given for all the mechanical and electrical equipment's duly guaranteed for their satisfactory performance for at least 12 months from the date of commissioning of plant.
- Before putting the plant in operation all electrical installations, wiring etc. shall be certified by the contractor and clearance from Govt. electrical Inspector shall be taken.

MOTOR CONTROL CENTER/DISTRIBUTION BOARDS :-

There shall be fixed execution design in sheet metal housing and shall be suitable for power and light requirement and equipment's under the contract. A distribution board with M.C.B.

shall be located in chemical house to provide power to alum and lime mixing agitator. Power supply to this distribution board shall be from main M.C.C. in pump house. This M.C.C. in form of L.T.O.C.B./A.C.B. shall be provided and fixed by the contractor in pump house. The cooling etc. shall also be done by contractor.

The weather proof distribution board to energize flash mixer, clarifloculator shall be located at suitable point.

For external and internal illumination in the module chamber room, a separated D.B. shall be mounted in this room. This D.B. shall consist of control for wash water pump air compressor and lighting etc.

For external and internal lighting of chlorine room and storage room a separate D.B. shall be mounted. This will connect with L.T.O.C.B./A.C.B.

A separate D.B. shall be mounted to control the external and internal lighting of pump house. A.D.B. for control of street light shall also be mounted in the pump house.

12.6 STARTER / PUSH BUTTON :-

For motors up to 15 H.P. D.O.L. push button starters shall be used. Motors above 15 H.P. shall have air break manually / electrically operated star delta starters.

CABLES: -All power and control cables should be of standard make and I.S.I. mark

12.7 EARTHING FOR MOTORS :-

As per I.E. rule, 440 V motors shall be earthed to two independent earth station common to all motor/M.C.C. etc. using shortest routes, and by interconnecting earth wires / strips lightning Arrestor shall be provided at two distant location of buildings.

The earthing shall be done after digging the pit of standard size and depth with 600 mm x 600mm x 3 mm thick copper earth plate including accessories and providing masonry enclosure in C.M. cover plate having locking arrangement and G.I. watering pipe 20mm. size 2.7 m. long etc. with charcoal or coke and salt filling etc. complete.

12.8 LIGHTENING CONDUCTOR :-

Lightening conductor of 25mm dia 300mm long copper tube having single prong at top with 85mm. dia thick copper base plate including holes shall be provided. It shall have 20 x 3mm thick copper strip with necessary support to connect the strip to surface up to earthing plate. It shall be provided at the top of wash water tank.

14.0 SCADA SYSTEM

The SCADA System should be synchronized with the intake canal up to Cascade Aerator of the proposed WTP of 35 MLD capacity scheme and should have the devices to control discharge of canals off. The equipment manufacturing and software development centers quality management system should confirm to ISO 9001 standards, certificate should be enclosed. The Contractor shall have wide network of multi skilled industry experienced engineers to undertake comprehensive installation, maintenance and commissioning services for water data logging applications amongst other services such as maintenance and optimization, meter verification, field tests for hydraulic modelling, network design and investigation. Engineers shall be available at locations close to the region. The consortium partner shall have well developed processes and job management systems to support efficient operation of large scale turn key projects and ongoing maintenance.

14.1 Supply of Spares and Tools:

The scope includes supply of recommended spares and set of tools as specified in the Bid document.

14.2 Operation and Maintenance:

The scope also includes operation and maintenance of the scheme for a period of 5 years after successful commissioning and establishing the design parameter as per relevant IS standard. In the scope of work, attempt has been made to cover all the items of work and accessories. However, in case mention of any component or accessory is left out, which may be necessary to complete the work in full manner and commission the job Successful, the same shall be deemed to have been included in the scope of work

- SPECIFICATIONS for Demolition of WTP

The following are the general specifications of the work to be performed by the Contractor. However, additional tasks that may comprise the actual scope of work shall be determined the Contractor. While it is believed that the requirements set forth in the ITQ are the logical requirements, the Contractor will be required to include any and all materials or work required to perform the work in a professional manner.

It will be the Vendors responsibility to visit the project site prior to submitting a quote to verify all dimensions shown and determine the characteristics of existing facilities which will affect performance of the work, but which may not be shown on drawings or described within these Specifications.

The water treatment plant structures shall be demolished and excavated down to their foundation below grade level.

All underground piping and conduit shall be cut to 2 to 3 feet below grade level.

- a) It is the Contractor's responsibility to obtain all necessary permits, licenses and certification prior to commencing the work.
- b) The Contractor shall remove all tanks, foundation, side walk and equipment from the site. Piping and conduits shall be removed from graded surface to 2 to 3 feet below grade. No materials to be removed shall be stored at the site or in the yard for a time period to exceed one (1) week. The Contractor shall be responsible for disposal and final disposition of all materials deemed to be scrap, salvage, and for debris except where otherwise noted. Contractor shall dispose of all other items off the site and in conformance with all existing applicable laws and regulations.
- c) Any salvage value for any material removed from the site may be collected and retained by the Contractor.
- d) Accumulated storm water in any of the tanks may be pumped out and discharged at the project site.
- e) The Contractor shall be responsible for performing any and all structural dismantling required to facilitate removal of equipment. It will be the responsibility of the Contractor to dispose of any debris resulting from said dismantling.
- f) All work shall be carried out in strict conformance with all local, state and federal applicable safety regulations.
- g) There will be no tree removal required.

- h) The Contractor shall exercise precautionary measures to minimize dust emissions as necessary, which may include, but shall not be limited to, periodic sprinkling or wetting of the site.
- i) The Contractor shall be responsible for adhering to all existing applicable state, county and local regulations concerning the disposal of demolition, construction and hazardous waste material.
- j) Site should be leveled and graded after demolition is complete. There is no requirement to bring in off-site fill material.

Note: The above scope of work and other details are minimum and not limited and Bidders are advised to visit the JMC office and site in advance to verify the balance scope of work with concerned Nodal official Amrut Mission Jagdalpur before quoting the rates. Any items/components which may not be mentioned in the scope of work, but are necessarily required for successful commissioning of the Plant/system with desired outputs and complete functions in all respects will be deemed to be inclusive in quoted cost by the bidder and nothing extra shall be paid by JMC

ANNEXURE - “E-5”

SCOPE OF WORK & SPECIFICATION OF WORK : FOR OHSR

Construction of OHSR’s of capacity and staging height as mentioned below:

SNo.	Location	Capacity	Staging	Inlet Dia. In mm	Overflow Dia in mm	Outlet Dia, in mm
1	Dharampura	300000	20	150	150	250
2	Army Training Centre	850000	15	150	150	250
3	Jaiswal Colony	750000	20	200	200	350
4	Wardhaman Colony	650000	20	200	200	350
5	Lal Bagh	1250000	20	250	250	400
6	Hathkachora	650000	20	200	200	300

1. Details of scope of work for 6 nos OHTS, but not limited to followings:-
 - i. **Dharampura Proposed OHSR of 300 kL at 20 m staging**
 - a) Geotechnical investigations for determination of SBC
 - b) Approval of Design and Drawings as per tender document
 - c) Construction of of Levelling course of PCC(1:2:4) for foundation of OHSR complete.
 - d) Casting of RCC complete staging
 - e) Casting of vertical walls of reservoir/container complete
 - f) Casting of Top Dome Slab
 - g) Providing and Fixing of ISI Mark DI Pipes and specials for Inlet, Outlet, Scour & Overflow and ISI mark DI Double Flanged Heavy duty specials and Duck Foot Bends and DI Sluice Valves with Dismantling Joints etc. complete at site including approval by the Third party Inspection.
 - h) RCC Valve Chambers with RCC Covers. RCC Stair Case from Ground Level to Balcony and from Balcony to roof of the OHT.
 - i) Providing and Fixing of all accessories such as Lightening Arrestor and Earthing Pit, Digital Water Level Indicator, MS Ladder from Roof to inside of Floor Level Tank, Ventilating Cowls/Shaft, Manhole Covers with Frame complete at site including approval by the Third Party Inspection.
 - j) Construction of Control Room below OHSR of area not less than 250 Sqm with all Fixtures, Valves,Pipes for Scada Monitoring.
 - k) Providing and Supplying of S.S. Hand Rail for Stairs Balcony and at the Roof, Flooring, etc.
 - l) Architectural Treatment, Plinth Protection & Drainage And Boundary Wall.
 - m) Distempering and Painting as per Specifications.
 - n) Successful water tightness testing of work
 - o) Testing and Commissioning
 - p) Others works (if any) to complete the Job.

ii. Army Training Centre OHSRof 850 kL at 15 m staging

- a) Providing and Fixing of ISI Mark DI Pipes and specials for Inlet, Outlet, Scour & Overflow and ISI mark DI Double Flanged Heavy duty specials and Duck Foot Bends and DI Sluice Valves with Dismantling Joints etc. complete at site including approval by the Third party Inspection.
- b) RCC Valve Chambers with RCC Covers. RCC Stair Case from Ground Level to Balcony and from Balcony to roof of the OHT.
- c) Providing and Fixing of all accessories such as Lightening Arrestor and Earthing Pit, Digital Water Level Indicator, MS Ladder from Roof to inside of Floor Level Tank, Ventilating Cowls/Shaft, Manhole Covers with Frame complete at site including approval by the Third Party Inspection.
- d) Construction of Control Room below OHSR of area not less than 250 Sqm with all Fixtures, Valves,Pipes for Scada Monitoring.
- e) Providing and Supplying of S.S. Hand Rail for Stairs Balcony and at the Roof, Flooring, etc.
- f) Architectural Treatment, Plinth Protection & Drainage And Boundary Wall.
- g) Distempering and Painting as per Specifications.
- h) Successful water tightness testing of work
- i) Testing and Commissioning
- j) Others works (if any) to complete the Job.

iii. Jaiswal Colony OHSR of 750 kL at 20 m staging

- a) Geotechnical investigations for determination of SBC
- b) Approval of Design and Drawings as per tender document
- c) Construction of of Levelling course of PCC(1:2:4) for foundation of OHSR complete.
- d) Casting of RCC complete staging
- e) Casting of vertical walls of reservoir/container complete
- f) Casting of Top Dome Slab
- g) Providing and Fixing of ISI Mark DI Pipes and specials for Inlet, Outlet, Scour & Overflow and ISI mark DI Double Flanged Heavy duty specials and Duck Foot Bends and DI Sluice Valves with Dismantling Joints etc. complete at site including approval by the Third party Inspection.
- h) RCC Valve Chambers with RCC Covers. RCC Stair Case from Ground Level to Balcony and from Balcony to roof of the OHT.
- i) Providing and Fixing of all accessories such as Lightening Arrestor and Earthing Pit, Digital Water Level Indicator, MS Ladder from Roof to inside of Floor Level Tank, Ventilating Cowls/Shaft, Manhole Covers with Frame complete at site including approval by the Third Party Inspection.
- j) Construction of Control Room below OHSR of area not less than 250 Sqm with all Fixtures, Valves,Pipes for Scada Monitoring.
- k) Providing and Supplying of S.S. Hand Rail for Stairs Balcony and at the Roof, Flooring, etc.
- l) Architectural Treatment, Plinth Protection & Drainage And Boundary Wall.
- m) Distempering and Painting as per Specifications.
- n) Successful water tightness testing of work
- o) Testing and Commissioning

p) Others works (if any) to complete the Job.

iv. Wardhaman Colony OHSRof 650 kL at 20 m staging

- a) Providing and Fixing of ISI Mark DI Pipes and specials for Inlet, Outlet, Scour & Overflow and ISI mark DI Double Flanged Heavy duty specials and Duck Foot Bends and DI Sluice Valves with Dismantling Joints etc. complete at site including approval by the Third party Inspection.
- b) RCC Valve Chambers with RCC Covers. RCC Stair Case from Ground Level to Balcony and from Balcony to roof of the OHT.
- c) Providing and Fixing of all accessories such as Lightening Arrestor and Earthing Pit, Digital Water Level Indicator, MS Ladder from Roof to inside of Floor Level Tank, Ventilating Cowl/Shaft, Manhole Covers with Frame complete at site including approval by the Third Party Inspection.
- d) Construction of Control Room below OHSR of area not less than 250 Sqm with all Fixtures, Valves,Pipes for Scada Monitoring.
- e) Providing and Supplying of S.S. Hand Rail for Stairs Balcony and at the Roof, Flooring, etc.
- f) Architectural Treatment, Plinth Protection & Drainage And Boundary Wall.
- g) Distempering and Painting as per Specifications.
- h) Successful water tightness testing of work
- i) Testing and Commissioning
- j) Others works (if any) to complete the Job.

v. Lal Bagh OHSRof 1250 kL at 20 m staging

- a) Providing and Fixing of ISI Mark DI Pipes and specials for Inlet, Outlet, Scour & Overflow and ISI mark DI Double Flanged Heavy duty specials and Duck Foot Bends and DI Sluice Valves with Dismantling Joints etc. complete at site including approval by the Third party Inspection.
- b) RCC Valve Chambers with RCC Covers. RCC Stair Case from Ground Level to Balcony and from Balcony to roof of the OHT.
- c) Providing and Fixing of all accessories such as Lightening Arrestor and Earthing Pit, Digital Water Level Indicator, MS Ladder from Roof to inside of Floor Level Tank, Ventilating Cowl/Shaft, Manhole Covers with Frame complete at site including approval by the Third Party Inspection.
- d) Construction of Control Room below OHSR of area not less than 250 Sqm with all Fixtures, Valves,Pipes for Scada Monitoring.
- e) Providing and Supplying of S.S. Hand Rail for Stairs Balcony and at the Roof, Flooring, etc.
- f) Architectural Treatment, Plinth Protection & Drainage And Boundary Wall.
- g) Distempering and Painting as per Specifications.
- h) Successful water tightness testing of work
- i) Testing and Commissioning
- j) Others works (if any) to complete the Job.

vi. Hathkachora OHSR of 650 kL at 20 m staging

- a) Providing and Fixing of ISI Mark DI Pipes and specials for Inlet, Outlet, Scour & Overflow and ISI mark DI Double Flanged Heavy duty specials and Duck Foot Bends and DI Sluice Valves with Dismantling Joints etc. complete at site including approval by the Third party Inspection.
- b) RCC Valve Chambers with RCC Covers. RCC Stair Case from Ground Level to Balcony and from Balcony to roof of the OHT.
- c) Providing and Fixing of all accessories such as Lightening Arrestor and Earthing Pit, Digital Water Level Indicator, MS Ladder from Roof to inside of Floor Level Tank, Ventilating Cowls/Shaft, Manhole Covers with Frame complete at site including approval by the Third Party Inspection.
- d) Construction of Control Room below OHSR of area not less than 250 Sqm with all Fixtures, Valves, Pipes for Scada Monitoring.
- e) Providing and Supplying of S.S. Hand Rail for Stairs Balcony and at the Roof, Flooring, etc.
- f) Architectural Treatment, Plinth Protection & Drainage And Boundary Wall.
- g) Distempering and Painting as per Specifications.
- h) Successful water tightness testing of work
- i) Testing and Commissioning
- j) Others works (if any) to complete the Job.

Note: The above scope of work and others details are minimum and not lim Bidders are advised to visit the JMC office and site in advance to verify the scope of work with concerned Nodal official Amrut Mission Jagdalpur befo quoting the rates. Any items/components which may not be mentioned in th of work, but are necessarily required for successful commissioning of the Plant/system with desired outputs and complete functions in all respects wi deemed to inclusive in quoted cost by the bidder and nothing extra shall be JMC

1.1 In addition to above the works also involves but not limited to followings:-

- (ii) Designing, Construction, testing and commissioning of 6 nos. R.C.C. Elevated Service Reservoir at various locations with with different staging heights with maximum water depth 4.0m for OHT's and including providing and fixing of ISI mark DI pipes and specials for Inlet, Outlet, scour and over flow delivering up to 5.0 metre away from R.C.C. outer columns of reservoir, ISI mark DI double flanged heavy duty specials and duck foot bends conforming to IS 1538-1976, and DI sluice valves class PN 1.6 conforming to IS 14846:2000 of IVC/Kirloskar/VAG/ Durga/Upadhaya make with dismantling joints. etc. R.C.C. valve chambers with R.C.C. cover and providing and fixing of all accessories such as lightening arrestor, digital water level indicator, RCC stair case from ground level to Balcony and from balcony to roof of the O.H.T. and M.S. ladder from roof to inside floor level of tank, ventilating cowls/ shaft, manhole covers with frame and S.S. (Stainless Steel) pipe railing for stairs balcony and at roof, flooring etc. all complete as per detailed specifications on lump sum basis. The designs and drawings shall be got approved from NIT/ Govt. Engineering College and then submitted to JMC at the cost of contractor.

(iii) Design, construction, testing and commissioning of 6 no RCC elevated service reservoir of capacity & staging Height each to fill up all the Overhead Tanks mentioned in above table at various locations in Jagdalpur Town. Construction of Control Room below OHSR of area not less than 250 Square Meters with all fixtures, valves, pipes for SCADA Monitoring.

1.2 The Service Reservoir should be circular in shape supported over circular columns. The depth of water in the tank shall the difference of level between lowest supply and full supply level of the tank and shall not be greater than 4.0m for OHT's. The foundation, columns, bracings etc. should be so designed, so as to have a provision for construction of a single story building between the G.L. bracing and first bracing with R.C.C. roof and brick walls. The live load of roof slab shall be taken as 150 kg/m² and the dead load of roof slab shall be taken as 360 kg/sqm. The position of bottom of bracing shall be so fixed that the head room of ground floor if constructed should be approximately 3.5m. The construction of such building works is not included in this lump sum contract except specified.

Free board for the container of OHT shall be 30 cm.

2.0 GENERAL

2.1 The work of construction of R.C.C. Over Head Service Reservoirs involves specialised workmanship, hence requirement of higher standard than general concrete work is essential. The as the base level for determination of staging height. The contractor shall construct proper plinth protection surrounding the GL brace to give finished look after construction.

height of staging will be reckoned from an assumed ground level at the site and main road

- level to the site, i.e., the ground level at the site or road level which ever is higher shall be treated
- 2.2 The contractor has to carry out plate load test at OHT site to ascertain bearing capacity for all design purposes. At other locations the contractor can use other renowned practices but the SBC shall be got certified by the Govt Engineering / Polytechnic Colleges at the cost of contractor and also checked & verified by conducting suitable Soil Bearing Capacity conforming to relevant IS code. Indtz type tanks shall not be allowed.
- 2.3 The offer shall include provision for 1.2 m wide R.C.C. balcony at bottom slab level, railing on balcony and at roof level, lightening arrestor, digital water level indicator, 1.2 meter wide RCC stairs from ground level to balcony and 0.70 m (with stainless steel railing & posts including blister) wide RCC stairs from balcony to roof of the tank. Steel ladder from roof of the tank to floor of the tank, all pipes and fitting (including puddle collars) up to duck foot bends and from duck foot bend up to minimum 5.0 meters outside the supporting structures i.e. RCC column including C.I. valves etc. including their painting and architectural treatment, protection and drainage work .
- 3.0 **S.B.C.**
- 3.1 SBC of the soil is to be got tested by contractor by conducting suitable Soil Bearing Capacity conforming to relevant IS code, however the min SBC for design shall be 5.0 T/SqM and the max shall be 20 T/SqM for design purpose
- 3.2 **TRIAL PIT**
Contractors are advised to carry out there own trial pit section to get the idea of soil condition.
- 4.0 **STEEL :**
- 4.1 The contractor shall have to arrange himself the entire quantity of steel required for the completion of the work under contract, No steel shall be supplied by the department. No extension of time will be granted by the department for non availability of or non procurement of steel in time or late supply of steel or for any other reasons what-so-ever. Steel shall conform to relevant IS code.
- 4.2 The steel for reinforcement shall be ISI mark thermo mechanically treated bars conforming to relevant IS code. a test certificate shall be required to be furnished to the department in support thereof. The stresses in steel for design purposes should be taken as specified in IS Code 3370 (Part-II) 1965 amended up to date.
The weight of steel shall standard & as per ISI
- 4.3 In additions, the contractor shall be required to get tested the random samples of the Steel brought at site to see whether they conform to relevant I.S. specifications. The cost of such tests shall be borne by the contractor.
- 5.0 The contractor shall have to make his own arrangement for requirement of electric power and telephone connections for construction work, if they desire these facilities. The department shall provide assistance by way of recommendation only.
- 6.0 For blasting operation, if required in foundation, excavation, the contractor will make his own arrangement for license, permits and blasting materials from competent authority.
- 7.0 The contractor will have to make his own arrangement for water, required for execution of the works. For testing of tanks, the department will provide water at ground level near the tank. However all other arrangement for testing of tank shall have to be made by the contractor at his own cost.

- 8.0 The tank will have a 1.2 m wide balcony all around the tank at bottom slab level.
- 9.0 The RCC stairs of 1.2 m width from ground level to the balcony at bottom slab level should be provided. The width of the R.C.C. stairs from balcony to roof of the tank shall be 0.70 m.
- 10.0 Stainless Steel railing of 25mm dia, in three rows shall be provided for RCC stairs from ground level to balcony, around the balcony, one side on stairs from balcony to roof of the tank and around the roof slab.
- 11.0 The Railing post shall consist of 150 mm dia RCC posts having four nos. T.M.T. bars of 8 mm dia, 1.2 m clear height @ 1.2 m c/c. These bars shall be welded with the main reinforcement of RCC stairs, balcony and roof slab. The RCC post shall be very carefully fixed and embedded into concrete.
- 12.0 A steel ladder shall be provided from man hole on the top slab to the inside floor of the tank. The steel ladder 600 mm wide shall comprise of 2 nos. 100 mm x 12 mm steel flat section stringers and 2 nos 20 mm dia M.S. bar footrest at 400 mm c/c. The bars of 20 mm dia shall be inserted in to the flat section by drilling holes in the flat and the bars shall be welded with the flat from inside and outside. The ladder shall be finished at welded joints so that all sharp edges are removed. The ladder shall be painted with chlorine resistant epoxy paints.
- 13.0 To avoid any unauthorised person to climb the over head tank, the entry at the bottom of the stair case should be closed with suitable arrangements.
- 14.0 Two C.I. Manhole covers and frame of approved quality 455 mm x 610 mm internal dimension weighing not less than 38 kg shall be provided. The weight of cover shall be 23 kg and weight of frame 15 kg.
- 15.0 Air vents wherever necessary shall be 150 mm dia swan neck type or ventilating shaft, as per design.
- 16.0 To avoid any accident at the time of cleaning or maintenance of the tank, the opening of the out let and scour pipes should be covered with aluminium Jali of suitable size.
- 17.0 **Lightening conductor**:- Copper Lightening conductor shall be provided & fixed with proper earthing arrangements as per relevant IS Specification.
- 18.0 **By-Pass Arrangement** : While erecting CIDF / DIDF pipes for Inlet, Outlet and Overflow arrangement it will be and washout arrangement as well By-pass Arrangement shall be made directly connecting the Inlet pipe with Outlet Pipe before Inlet pipe entering the MBR / OHT and which shall have a controlling valve which will be closed always except when needed for Repairs, O&M of MBR / OHT.
- 18.0 **Water level indicator** :- Digital/ mercury Water level indicator shall comprise of electronic sensor system for accurate level marking with mercury level and all the allied fittings such as electronic display board and battery backup etc complete
- 19.0 **M.S. Clamps** :- The MS clamps 50mm x 10 mm should be provided at 3.0 M C/C for clamping all the vertical pipes, the clamps should be fixed in bracing with nut bolts.
- 20.0 **Painting** :- Painting of OHT, exposed surface of sump well & RCC pump house shall be done with premium smooth emulsion paint as per manufacturers specifications to give protective & decorative finish. The inside of container above water level and the roof from inside shall be painted with Epoxy paint to avoid corrosion due to chlorine. The

horizontal piping shall be laid up to outlet inlet open flow chambers 5 m away from the GL brass.

21.0 WORKMAN SHIP :

21.1 EXCAVATION :

The depth of excavation will generally be guided by the underground strata and the safe bearing capacity of the foundation soil and as directed by the Engineer-in-Charge. The contractor has to carry other tests of under ground strata/soil at his own cost. No payment will be made to the contractor for carrying out test or on account of any variation in the soil bearing capacity & design change due to strata. No dewatering shall be payable under any circumstances whether natural, artificial man made.

21.2 FILLING FOUNDATION WITH BED CONCRETE (Levelling course) :

The foundation shall be laid over bed concrete (i.e. levelling course) of at least 150 mm thick or more, with at least 1:2:4 (M-150) concrete with 40 mm gauge graded metal or the prescribed mix as per instruction of Engineer-in-Charge and as per relevant I.S. Code.

21.3 REINFORCED CONCRETE WORK :

It shall be strictly as per Annexure 'EVI' special condition. The concrete mix and minimum cement concrete specified in Annexure 'EVI' shall be rigidly followed all RCC work shall be carried out as per IS 456:2000. Where the concrete has not fully hardened all laitance shall be removed by scrubbing the wet surface with wire or bristle brushes, care being taken to avoid dislodgement of the particle of aggregate. The surface shall be thoroughly wetted and all free water removed. The surface shall then be coated with neat cement grout. The first layer of concrete to be placed on this surface shall not exceed 15 CM (or 6") in thickness, and shall be rammed against old work, particulars attention being paid to corners and close spots. Concrete should be thoroughly compacted and fully worked around the reinforcement around embedded fixes and into corner of the form work.

21.4 MEASURING (Concrete mix proportioning) :

The quantity of cement shall be determined by weight. The quantities of fine and coarse aggregates shall be determined either by volume or by weight. The proportion of fine and coarse aggregate shall be in accordance to para 8 of IS 456-2000.

21.5 MIXING :

Concrete shall be mixed in a mechanical mixer. Mixing shall be continued till there is a uniform distribution of the ingredients and the mass is uniform in colour and consistency but in no case the mixing shall be done for less than two minutes the contractor can use cement admixtures, plasticizers for enhancement of the quality of concrete but no extra payment shall be made on this account.

21.6 TRANSPORTING :

Concrete shall be handled from the place of mixing to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of any ingredients and maintaining the required workability.

21.7 PLACING AND COMPACTING :

The concrete shall be placed and compacted before setting could commence and should not be subsequently disturbed. Methods of placing should be such that there is no segregation (Concreting) shall be carried out continuously up to construction joints, the position and arrangement of which shall be determined by the designer. When the work has to be resumed on surface which has hardened, such surface shall be roughened. It shall then be swept clean, then the roughly wetted and covered with a 12 mm layer of mortar which shall be freshly mixed and placed immediately before the placing of the concrete.

21.8 MECHANICAL VIBRATION :

When mechanical vibrations for compacting concrete are used, reduced water content should be adopted. Over vibration or vibration of very wet mixed is harmful and should be avoided when-ever vibration has to be applied externally the design of form work and the disposition of vibrators should receive special consideration to ensure efficient compaction and to avoid surface blemishing.

21.9 CURING :

The concrete shall be covered with a layer of old gunny bags or canvass or similar absorbent material and kept constantly wet for at least twenty eight days from the date of placing of concrete.

21.10 FORM WORK

21.10.1 The form work shall conform to the shape lines and dimensions as shown on the drawings and so constructed as to remain sufficiently rigid during the placing and compacting of concrete, and shall be sufficiently tight to prevent loss of liquid from concrete. Only well designed and proper steel form work shall be used.

21.10.2 The form work shall be cleared off. All rubbish particularly chippings, shaving and saw dust shall be removed from the interior of the forms before the concrete is placed and the form work in contact with the concrete shall be cleaned and thoroughly wetted or treated with an approved composition.

21.11 STRIPPING OF FORM WORK :

22.11.1 In no circumstance form work should be struck off until the concrete reaches the strength of at least twice the stress to which the concrete may be subjected at the time of stripping.

22.11.2 In normal circumstances i.e. temperature above 20⁰ C form work may be struck after expiry of the following periods as per IS 456-1978.

- (A) Vertical sides of slabs, beams and columns 48 hours.
- (B) Bottom of slabs under 4.5 M Span : 7 days
- (C) Bottoms of slabs over 4.5M Span : 14 days
- (D) Bottoms of beam under 6 M Span : 14 days and
- (E) Bottoms of beam over 6 M Span : 21 days

The form work should be left longer, as it would assist the curing. The number of props, their sizes and position shall be such as to be able to safely carry the full dead load of the slab, beam or arch as the case may be together with any live load likely to occur during curing or further construction.

22 MATERIAL :

22.1.1 STEEL :

All metal for reinforcement shall be free from loose mill scale, loose rusts, oil and grease or other harmful matter. The steel used for reinforcement shall be cleaned immediately before placing the concrete.

22.1.2 PLACING :

All reinforcement shall be placed and maintained in position shown in the drawing. It is very difficult and costly to alter concrete once placed. It is, therefore very important to check the reinforcement and its placing before being covered.

22.1.3 SIZE AND QUALITY OF STEEL BARS :

The steel bars used for reinforcement shall be strictly as per relevant IS Specifications, and the contractor shall have to produce the test certificate of the Steel to be used.

22.2 AGGREGATES :

All aggregates shall conform to all provisions and test methods of IS 383-1970

22.3 STORAGE OF MATERIALS :

Cement shall be stored properly in a dry ventilated buildings.

23.0 DESIGN MIX :

23.1 The contractor shall submit mix designs for each strength the proposed slump proportional weight of cement saturated surface, dry aggregates and water. The mixes shall have to be designed as per relevant I.S. Specification.

23.2 The proportion of the concrete shall be such as to work readily into forms angles and ground the reinforcement without excessive manipulation, segregation of water gain.

23.3 The water content shall not be increased from the amount required by the design mix unless cement at required water cement ratio added. The Engineer-in-charge may require additional cement without extra compensation to the contractor if he considers that concrete does not produce the required strength.

24.0 TEST :

24.1 All tests as specified in the I.S. Specifications codes and required for the execution of the work shall be carried out by the contractor at his cost as per instruction of Engineer-in-charge.

24.2 FIELD TESTS :

The contractor shall provide all arrangements for field test to exercise proper quality control over works specifically for test mentioned under para 25.1. The contractor will also establish a field Laboratory consisting of all relevant equipment as required for testing of materials such as aggregate, sand, cement, steel and crushing machine with calibration duly certified by Government Engineering/ polytechnic college.

24.3 All double flanged pipes shall be ISI mark (D.I. pipe conforming to relevant IS code) and D.F. cast iron puddle collars, bell mouths and other specials required for inlet, outlet, over flow and scour shall be ISI mark conforming to IS 1538:1976 required for inlet, outlet, overflow and

scour will be supplied and fixed in position by the contractor from desired inside level of the tank to duck foot bend one metre below G.L. and further providing and fixing all double flanged D.I. Pipes and specials from duck foot bend on ward up to minimum 5.0 m outside the supporting structure of the tank (i.e. RCC column) shall also be supplied and fixed by the contractor including testing of the fittings and joints with cost of the materials and joints. All the fittings shall be cast iron mechanical joint fittings suitable for DI pipes as per I.S. Specifications.

The arrangement for inlet, outlet, overflow and scour pipes shall be such that all these pipes are independent of each other and each of these shall have bell mouths at their ends. The top of bell mouths of inlet and overflow shall be at F.T.L. and top of bell mouths of outlet shall be 15 cm above floor of the tank, whereas the bell mouth of scour pipe shall be flushed with floor level. All these vertical pipes shall terminate with flanged duck foot bends bottom fixed one meter below ground level. Further D.F. pipes should be provided up to minimum 2.0m away from the supporting structure of the tank.

All these duck foot bends shall be fixed with sluice valves class PN 1.6 of IVI/IVC/Kirloskar/VAG/ Zolotto make with dismantling joints. The contract also includes providing and fixing of sluice valves, RCC Valves chambers and chamber covers. The size of valve chambers shall be such that a clear space of minimum 500 mm is available on all sides of the valve. All the valves, fittings and pipes and specials shall be third party tested.

All the pipes and specials required for above shall be fixed during concreting. Specials which are to be embedded in concrete shall have puddle collars at the centre of concrete thickness.

The dimensions of the CI/DI/MS DF pipes shall be as under: -

Note – All the CI/DF/ DI DF/MSDF pipes, valves & specials should be duly inspected and approved by SGS/RITES.

The pipes above 500mm shall only be MS DF pipes/ CI/ DI DF pipes, for diameters below 500mm shall invariably CI/DI DF pipes

24.4 Scour pipe of OHT should be connected to the nearest natural drain/sewerage line available with pipes and other required specials provided by the department but including testing by the contractor.

25.0 The tank & sump well will have to be tested for the water tightness as per IS 3370 and it will be the responsibility of the contractor to make it water tight. Any defects, shrinkage or other faults which may appear within six months from the commissioning of the tank arising out of defective or improper materials or workmanship are upon the direction of the Executive Engineer to be amended and made good by the contractor(s) at his/their own cost and in case the contractor fails to rectify the defect the Corporation/ JMC of C.G. may recover from the contractor (s) the cost of making good the works.

The arrangements of water for construction and testing shall be done by the contractor at his own cost.

For testing purposes, the contractor will have to conduct a test of water tightness of the reservoir & sump well to the entire satisfaction of the department. The responsibility of structural stability shall also rest solely with the contractor. The refund of earnest money and security deposit contemplated in the agreement clause 15 shall be refunded only after expiry of defect liability period after the satisfactory commissioning of tank.

26.0 No charges for the plastering if required for proper finishing of the surface of structures shall be paid under any circumstances.

- 27.0 The contractor shall be required to submit the detailed completion drawing in six copies of the work immediately on completion of the work.
- 28.0 The work shall be treated as completed when the same is completely tested and handed over to the department including site clearance.
- 29.0 The tenderer should give at time of tendering the outline of architectural appearance, design and drawing.
- 30.0 The tenderer shall have to produce the complete design and working drawing of each component of structure before starting of work and get the same approved by the Engineer –in-charge.
- 31.0 Special considerations should be given in the preparation of design for seismic forces.
- 32.0 The structural design of R.C.C. service reservoir shall be done on continuity theory and rotation of joints.
- 33.0 Due consideration for wind pressure should be taken in the design of structure, as per provision of relevant IS specification, the wind pressure may be take as per the wind pressure map of India in IS 75 – 1964 with special consideration to the previous experience of wind pressure experienced in the locality.
- 34.0 All duck foot bends shall be fixed and anchored properly in concrete blocks to prevent any displacement of pipe due to water trust.
- 35.0 The contractor may note that the department may not be in a position to acquire or make available sufficient land (space) for collection, storage of construction materials and equipment's and working. It shall therefore be contractor's responsibility to make arrangement of land space for this purpose.
- 36.0 In case there is any delay in land acquisition by the department by the concerned competent authority the contractor shall only be allowed extension of time on this account. No compensation for financial claim shall be accepted.
- 37.0 If under unavoidable circumstances or for reasons beyond control of the department, the proposed site of construction of tank is required to be changed/shifted, the contractor shall have to take up construction at alternative site, and the contractor shall not have any claim on this account.
- 38.0 The R.C.C. elevated tank shall be designed, executed and tested in accordance to relevant I.S. Specification.
- 39.0 The firms/contractors are directed to submit the details plan and elevation of all the overhead tanks showing the dimensions of all components and other details.
- 40.0 The contractor shall set up an office with an access to JMC official with proper seating arrangements.
- 41.0 The contractor shall provide one AC Bolero/ Scorpio vehicle with driver and POL for inspection work during the entire work period exclusively for JMC officials.
- 42.0 The contractor shall propose colour scheme with atleast three alternatives and after approval only the work shall be started.
- All the valves and electromechanical fittings shall be SCADA & PLC compatible with

- 43.0 actuators for implementation of SCADA in future.
The successful bidder shall assist the JMC in the process of getting the grants from State/
44.0 Central Governments.
The contractor has to procure and install informatory board's displaying Name of work at
45.0 the location given by JMC at his own cost.

**Commissioner
Municipal Corporation
Jagdalpur**

SPECIAL CONDITIONS

DESIGN, CONSTRUCTION OF R.C.C. ELEVATED SERVICE RESERVOIRS INCLUDING TESTING AND COMMISSIONING

The relevant IS standard specifications shall be strictly followed.

GENERAL INSTRUCTIONS :

- 1.0 Elevated service reservoir should be designed to provide architectural appearance and all the related civil features should be as per appearance.
- 1.1 The RCC columns supporting to the tank should necessarily be round shape and not square or rectangular. The top i.e. water container may be circular/square or rectangular.
- 1.2 On the bottom floor of the water container cast iron or stainless steel grating should be provided over the supply outlet and scour outlet. This is essential to prevent any accident for the labour attending to periodical cleaning of the tanks. One such accident occurred at Sehere when two persons in succession were sucked in to the scour pipe, the top of which could not be seen because of calcium deposits due to regular use of bleaching powder. Cast Iron grating 20x20mm or stainless steel square 20x20mm can be used with square frames on top of the outlet.
- 1.3 The over flow pipe 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 reservoir in case supply valves of the distribution system are not open. The over flow pipe should always be kept open for draining any excess storage in the tank.
- 1.4 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 is extremely important for development of good compressing strength in any concrete structure.
- 1.5 It is advisable to use metal derived from igneous rock preferably of basaltic of granite origin. 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.
- 1.6 It is extremely essential the contractors undertaking the work should have a concrete mixer with them. No hand mixing shall be allowed. Ready Mix Concrete obtained from a Batching & Mixing Plant only shall be used for construction of all components of OHTs & MBR from RCC foundation upwards.
- 1.7 In no case the concrete should be laid without vibration. It is desirable 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, of suitable diameters which is an essential T&P for laying concrete.

FOLLOWING SPECIFICATIONS SHOULD BE STRICTLY FOLLOWED :

2.0 CEMENT AND CONCRETE :

2.1 Minimum Strength of Concrete :

Minimum strength of concrete for components of elevated tank will be as below :-

Columns staging	- M25 (250 kg/sqcm)
Tank including roof	- M30 (300 kg/sqcm)

2.2 **Minimum Cement Content**

From durability considerations minimum cement content shall be as below (conforming to IS 456) :-

- Concrete - M25 - 350 kg/cum
- Concrete - M30 - 400 kg/cum

2.3 **Cover of Concrete :**

The minimum cover shall be 40 mm for all the reinforcement. For foundations this cover shall be 60 mm.

2.4 **Cement**

The cement shall be ordinary port land cement/port land slag cement/concrete special cement conforming to ISS.

2.5 **Water Cement Ratio :**

Water Cement Ratio shall not be more than 0.45 this means 22.5 Litres of water per 50 kg. bag cement.

2.6 **Use of Construction Chemicals :-**

When the water cement ratio is less, the strength and durability of concrete is good. It is advisable to use plasticisers in concrete and reduce water cement ratio up to 0.4. Plasticisers manufactured by reputed companies are recommended. Proportion of plasticiser to be used shall be as per the instruction manual supplied by the manufacturers.

2.8 **Construction Joints :**

Construction joints be treated in accordance with IS 456:2000. The surface of already laid concrete be cleaned by water jet and cement slurry be applied. Cement mortar 10mm thick of the same proportion as in concrete be applied and then fresh concrete of the lift be laid. The form work must overlay 100 mm on the already laid concrete.

2.9 **Minimum Dimensions and Shapes :**

Minimum Dimensions shall be as below :

- Circular columns - 400 mm
- Tank wall 200mm
- Bottom slab/ Dome 150mm
- Top slab 150 mm

Note -

Rectangular/square columns are not allowed Circular shafts are also not allowed.

***Footing** - The depth of footing on the face of the column shall not be less than 1/3rd of the spread of footing from the face.*

3.0 **STEEL : (Conforming to relevant IS code of water retaining structures)**

3.1 Minimum steel: Design requirements as set out in relevant codes in respect of steel shall be fully satisfied. However, following minimum steel should be provided.

- (a) Vertical steel in columns 0.8% of cross sectional area actually required and 0.3% where

- larger section than actually required is provided.
- (b) Horizontal link in columns Not less than 8 mm dia at 200mm c/c or 10 mm dia not more than 300 mm c/c.
- (c) Exposed RCC surface On both faces when thickness is 150 mm or more
2 kg/sqm in perpendicular direction
The above requirement is satisfied if
8 mm bars @ 200mm c/c OR 10 mm bars @ 300mm c/c
are provided.
Even if design steel is less than above, the above
minimum shall be provided.
- (d) Steel in tank As per provision of IS 3370 subject to minimum as set
out in (b) above.

3.2 Maximum spacing of reinforcement :

Maximum spacing of main reinforcement in slab or walls shall not more than 150 mm centre to centre. The spacing of secondary bars, such as distribution steel or vertical bars in columns.

3.3 Type of Steel :

The steel for reinforcement shall be thermo mechanically treated bars conforming to ISS.

Detailing of Steel

Before commencing the work, Executive Engineer in-charge should study the drawing. It must be insisted that the designer provides details of the shape of each bar its diameter, length and numbers of each category in a schedule of reinforcement. This must be incorporated in every working drawing.

4.0 Protection work Drainage :

At the ground level, 100 mm thick cement concrete flooring in M10 should be provided for an area which is 1.5metre more than the dimensions of tank on all sides. This should be laid in a slope of 1:60 from the centre and drain be constructed around for outlet of water.

5.0 Approval of Design & Drawing :

The contractor will submit the detail design & drawings of the R.C.C. elevated reservoirs within 30 days from the date of issue of written order to commence the work for approval of the competent authority of the Department in five copies through PDMC.

DESIGN, CONSTRUCTION OF R.C.C. FRAMEDED SWITCH ROOM BELOW OHSR FOR
MONITORING THE SCHEME

The IS standard specifications shall be strictly followed.

GENERAL INSTRUCTIONS :

The switch room should be designed to provide architectural appearance and all the related civil features should be as per appearance.

The area of the switch room is tentative but the contractor shall prepare the plans as best fitted within the frame work of OHSR with all the amnities as described in latest building code and as per the need of the project.

The switch room shall invariably RCC framed structure with brick masonry walls, plastered internally and externally, base slab and roof slab, balconies and chhajja with parapet wall, two individual sanitary units and one common wash room each for ladies and gents, flooring with vitrified tiles, simple pop to floors, acrylic OBD inside and washable acrylic exterior painting, aluminium glazed and panelled doors and windows, two major monitoring rooms and one residential unit with a kitchen.

The contractor shall submit the detailed plan with building specifications for the switch room to Engineer –in- charge and after the approval only the work shall be started

Note: The above scope of work and others details are minimum and not limited and Bidders are advised to visit the JMC office and site in advance to verify the balance scope of work with concerned Nodal official Amrut Mission Jagdalpur before quoting the rates. Any items/components which may not be mentioned in the scope of work, but are necessarily required for successful commissioning of the OHT/Plant/system with desired outputs and complete functions in all respects will be deemed to inclusive in quoted cost by the bidder and nothing extra shall be paid by JMC

ANNEXURE - “E-6”

Scope of work:-

PLC-SCADA

1.0 GENERAL

*Supply, installation, testing and commissioning of control instrumentation and PLC-SCADA based automation with monitoring and control at –

1. Raw water pumping (intake) at Indravati
2. Raw water intake well
3. Flow Control Valves
4. Centrifugal pumps for clear water pumping and OHTs in Jagdalpur
5. Control valves with electrical actuators
6. Provision for communication and data transfer with 1 more WTPs (9 MLD)

1.1 With trial run for 12 months followed by 05 years of complete O & M including & replacement and warranty after 12 months of defects liability period. Jagdalpur augmentation water supply scheme is under AMRUT Mission.

1.2 The job implies all works from preliminary investigation to the final commissioning. Scope of Automation & Instrumentation includes the design and installation of system, sufficient to monitor the designated flows of raw/clear water. This System envisages a Master Control Centre (SCADA) to be established in an existing constructed building in WTP.

1.3 The tenderer is required to arrange complete automation work, until the whole system is handed over to the Department. Testing will also have to be carried out at contractor's cost and it will be the responsibility of tenderer to ensure that respective guarantees are achieved.

1.4 The automation work is required to be done for 2 Raw water pumping stations, WTP of 35 MLD capacity & Existing 9 MLD capacity, clear water pumping stations and over head tanks at Jagdalpur.

The work include providing redundant PLC's / RTU's to collect the data and transmitting it on GSM backbone to LCS to be installed at 2 No. pumping stations and further transmitting the data on GPRS backbone to MCS to be installed at WTP, Jagdalpur.

The work also include supply of electromagnetic flowmeter, pressure sensors, water level sensors, depth sensors, valve actuators and for distribution outlet at OHSR's (all existing and proposed), auto-phase reversal relays including Supply of all equipment and connected hardware & software for MCS and LCS like LCD monitors, UPS and connected software & hardware, cabling and related licences if required so, complete in all respect.

PLC- SCADA Automation system should be able to control the functioning of all raw water pumps, all treatment units of 35&9 MLD WTP, Clear water pumps and the valves at the inlet and outlet valves of all connected OHSRs & their digital level indicators, FCVs, pressure gauges and all bulk flow meters.

For selection of field instruments and control system or anything related to instrumentation, the Contractor shall follow the specifications contained herein. The Contractor shall be required to provide all equipment, accessories, cabling, earthing, providing necessary transducers/sensors, system hardware/software, programming logic etc. to achieve the functional requirements described herein. The civil and electromechanical work associated with installation of the instrumentation equipment shall be in the Contractor's scope.

The scope for Control Instrumentation and PLC-SCADA based automation System shall include but not limited to: PLC panel, SCADA Workstation, Control Desks, Control & Signal Cables and Accessories and associated equipments and appurtenances (Valve actuators, electric motors, blowers etc).

The specific Scope of the PLC-SCADA System for WTP shall involve:

1. Monitoring and Visualization of normal filter cycle of each bed.
2. Monitoring and Control of Backwash Cycle of each bed based on loss of head
3. Monitoring and Visualization of Water Quality and Flow parameters including recording and retrieval in the form of Shift / day / monthly reports.
4. Manual Operation through Control desks.

The Contractor shall provide on-Site training during Trial run for 06 months and commissioning to Engineers and Process Operators.

Instrumentation at WTP shall include:

- Ultrasonic Level Transmitters for Filter beds level (LOH)
- Filter Control beds
- Turbidity & pH Analyzer at Raw water inlet.
- Turbidity, pH&chlorine analyzer at Clear water.
- Level transmitter at Wash water tank
- Open channel flow meter at RAW water inlet channel (Par shall flume shall be provided with Flow Vs Head Data).
- Open channel flow meter at Clear water channel (Par shall flume shall be provided with Flow Vs Head Data).
- LED Display Panel to display Parameters at office room of WTP.
- Level transmitter at clear water sump / tank

The scope includes providing SCADA software for real-time monitoring, data acquisition, data monitoring etc. Detailed Specifications are spelt herein:

General requirements

The control systems for the Water Treatment Plant (WTP) shall be based on the use of Programmable Logic Controllers (PLCs). The various modes of controls shall be Auto, Semi-automatic and Manual. Remote operation facilities shall be provided for operating the equipment from the local SCADA system.

In future, the Employer's Representative proposes to install a Master SCADA system for central monitoring and for remote operations of the WTP, CWPS, all the water-works in the water supply system and the distribution system. The local SCADA systems and the PLCs shall be capable of interfacing / networking with the future industry standard SCADA system.

In the event of failure of the automatic controls or by operator choice it shall be possible to revert to semiautomatic or manual operation of each item of Plant independent of the PLC functions. The field instruments shall also form an integral part of the control system.

Design requirements of Instrumentation and Control

General

Instrumentation and Control system shall be designed, manufactured, installed and tested and approved by engineer-in-charge by an experienced system integrator to ensure high standards of operational reliability. Instruments mounted in field and on panels shall be suitable for continuous operation. All electronic components shall be adequately rated and circuits shall be designed so that change of component characteristics shall not affect plant operation.

All I&C equipment shall be new, of proven design, reputed make, and shall be suitable for continuous operation. Unless otherwise specified, all instruments shall be tropicalised. The outdoor equipment shall be designed to withstand tropical rain and temperature variation from 0 to + 50⁰ C. wherever necessary, space heaters, dust and waterproof cabinets shall be provided. Instruments offered shall be complete with all the necessary mounting accessories. The control equipment installed inside the control room should be designed to work at 35⁰ C and the instruments in sheltered place outside the control room at 45⁰ C.

Electronic instruments shall utilize solid state electronic components, integrated circuits, microprocessors, etc., and shall be of proven design.

For transmitting instruments, output signal shall be 4-20 mA DC linear having two wire systems.

Unless otherwise stated, overall accuracy of all measurement systems shall be $\pm 1\%$ of measured value, and repeatability shall be $\pm 0.5\%$.

After a power failure, when power supply resumes, the instruments and associated equipment shall start working automatically.

The instruments shall be designed to permit maximum interchange ability of parts and ease of access during inspection and maintenance.

Unless otherwise stated, field mounted electrical and electronic instruments shall be weatherproof to IP-65.

The instruments shall be designed to work at extremes of the ambient conditions of temperature, humidity, and chlorine contamination that may prevail. The instruments shall be given enough protection against corrosion.

Lockable enclosure shall be provided for the field mounted instruments wherever required.

All field instruments, and cabinets / panel-mounted instruments shall have tag plates / name plates permanently attached to them.

The performance of all instruments shall be unaffected for the $\pm 10\%$ variation in power supply voltage and $\pm 5\%$ variation in frequency simultaneously.

All wetted parts of sensors shall be made out of non corrosive material capable of working with chlorine content of 5 ppm.

For all instruments (transmitting analogue signals) installed in the field (outside pump house), surge protection devices (SPDs) shall be provided at both ends of the connecting cable for the protection against static discharges / lightning and electromagnetic interference.

Pressure transmitters shall be provided with two valve manifold and a test port, so that in situ calibration can be carried out.

Two wire transmitters shall be provided with on-line test terminals.

The ranges of all instruments shall be suitable for the application in the process.

Instruments of similar type shall be of same make for appropriate inventory of spares, ease of maintenance and training.

The Indian agents of imported equipment shall have establishment to provide after sales maintenance facilities.

Erection requirements

The locally mounted instruments shall be installed on appropriate rigid supports, having minimum vibrations. The instruments shall be installed away from hot objects.

The instruments shall be protected against physical damage or liquid splashing by providing metallic/ fibre glass enclosures or canopies.

All transmitters / transducers shall be installed nearest to the sensing point and at a place convenient to get access for maintenance.

The field instruments i.e. the instruments mounted outside the control panel shall be mounted at a convenient height of approximately 1.5 m above grade platform.

While installing the instrument, provision shall be made to carry out in-situ calibration. Isolation valves and drain valves shall be provided to the field instruments wherever required.

Instrumentation cables shall be separately laid, away from electrical cables. The instrumentation cables from the field mounted instruments shall be terminated on the control panel without any joints.

Double compression glands shall be used for glanding the cable in field instruments and instrument control panel.

Metallic tag number plate shall be provided for each instrument.

Instrument Power Supply Cables and Instrumentation Signal Cables

Cables shall be capable of satisfactorily withstanding without damage, transportation to site, installation at site, and operation under normal and short circuit conditions of the various systems to which the respective cables are connected when operating under the climatic conditions prevailing at the site as indicated in this specification.

Cable joints in instrument signals and power supply cables shall not be permitted.

Cables shall be capable of satisfactory performance when laid on trays, in trenches, conduits, ducts and when directly buried in the ground.

Cables shall be capable of operating satisfactorily under a power supply system voltage

variation of $\pm 15\%$, a frequency variation of $\pm 5.0\%$.

Laying Of Cables

A distance of minimum 300mm shall be maintained between the cables carrying low voltage AC and DC signals and a distance of minimum 600mm shall be maintained between HT cables and signal cables. In outdoor areas, the cables shall be directly buried. Each instrumentation and power supply cable shall be terminated to individual panel/ terminal box. Identification of each cable shall be by proper ferrules at each junction as per cable schedule to be prepared by Contractor.

Cables shall be laid in accordance with layout drawings and cable schedule which shall be prepared by Contractor and submitted for approval.

All cable routes shall be carefully measured and cables cut to the required lengths, leaving sufficient amount for the final connection of the cable to the terminals on either end. Various cable lengths cut from the cable reels shall be carefully selected to prevent undue wastage of cables. A loop of 1 meter shall be left near each field instrument before terminating the cable. Cables shall be complete uncut lengths from one termination to the other.

All cables shall be identified close to their termination point by cable numbers as per cable interconnection schedules. Identification tags shall be securely fastened to the cables at both the ends.

Programmable Logic Controllers

Codes and Standards

The design material, construction features, manufacture, inspection and testing of Programmable Logic Controllers (PLC) shall comply with all currently applicable statutes, regulations and safety codes. The PLC shall comply with the latest applicable standards and codes. If any such standards are not applicable then the same shall comply with the available recommendations of professional institutes like NEMA, IEC, ANSI, ISA, IEEE, DIN and VDE.

Design and Installation requirements

This shall comprise of programmable systems based on operational logic for safe and automatic operation of the pumping stations and the treatment plant to produce required quantity of drinking water of specified parameters. PLC shall be provided as a stand-alone controller to perform combinational and sequential logic functions, status monitoring and reporting functions with counter and timer facilities, for each station.

PLC shall comprise of necessary processors, Input /Output (I/O) modules, communication interface modules and man-machine interface required to perform the desired functions.

PLC shall have the following attributes as a stand-alone controller:

1. It shall carry out sequential start/stop logic implementation for operation of the pumps.
2. It shall carry out computation and interfacing for data acquisition, data storage and retrieval.
3. It shall accept downloaded program from a programmer.
4. It shall have different functional modules to perform the desired functions.
5. It shall scan the inputs in time cycles and update the status of inputs/outputs.
6. To avoid spurious output because of output module failure, all commands shall be associated with release signals. Release signals shall include information on healthiness of the hardware, software and power supply modules.

7. It shall have relays, counter/timer functions, internal registers/ flags, watch dog timer, set/reset facilities, up-down counter etc.
8. It shall have provision for spare input and output modules.

The PLC system shall be expandable and shall be modular in construction so as to carry out the future expansion without any hardware modifications.

The PLCs shall have analog and digital signal monitoring capability for checking the healthiness of the signals. In case of detection of any unhealthy signal "PLC trouble" alarm shall be generated. In case of failure of a PLC, the status of all the outputs of the PLC shall be stay put.

PLC shall be 32 bit microprocessor based with state of the art technology. System components shall be carefully chosen so that the reliability of the PLC shall be high. PLC shall use open standard bus protocols and structures for all communication within and outside the system.

In case of system failure or power supply failure all the outputs shall attain pre-determined fail safe condition. Spurious signals shall not cause equipment operation. Check back before execution features shall be incorporated.

The PLC used shall have a proven record in the type of application concerned and in the prevailing environmental conditions.

It shall be possible to perform the simulation functions and testing the program by changing the status of contacts and monitoring the output.

The PLC system shall support 'hot swapping' of I/O modules i.e., removal and insertion of I/O modules under power on condition.

The design of system configuration and development of PLC software shall be undertaken by the PLC manufacturer or System Integrator authorized by the PLC manufacturer. They shall have previous experience in similar applications and shall have a service center at a reasonable distance so as to provide services at a short notice.

Particular requirements for PLC

Sl. No	Description / Component	Requirement
1.	Functions	As per the control logic and input/output list
2.	Expandability	50% of installed capacity
3.	Interposing relays	Shall be provided for all the digital outputs (DO) including spare DO and for digital inputs wherever required.
4.	Optical isolation for all digital inputs and outputs and galvanic isolation for analog inputs	Required
5.	Mounting	Inside the control panels with viewing glass on the door
6.	CPU and power supply module redundancy	Required (In hot standby mode)
7.	<u>Processor</u>	

Sl. No	Description / Component	Requirement
a)	Diagnostic function performance	Required
b)	Minimum 32 bit performance with floating point capability	Required
c)	Memory module	To store programs, standard software to perform logic functions and diagnostic functions
8.	Inputs and Outputs	Refer I/O schedule in the respective sections of the pumping stations and WTP
9.	System Loading	Max. 60% under worst loading Conditions
10.	Power supply to sensor / transmitters	Required
11.	Type of input	Binary, analog and pulsed as required.
12.	Outputs	Binary signals (Relay outputs for driving MCC Starter coils, driving motorized valves etc.); analog and pulsed as required.
13.	Spare I/O	20% of each type, wired to terminal block
14.	Accessories	Laptop computer for programming along with all necessary adapter, laptop carrying kit, cables, connectors and accessories (1 No. common for RWPS , WTP and CWPS) Proprietary PLC programming and documentation software along with all cables and connectors for loading on laptop computer and on local PC based SCADA system
15.	Interface (Hardware and Software) to Local SCADA system	Required
16.	Communication port to be provided for interface to Local SCADA system	RS 232/ RS 485 communication with local SCADA is required to be provided (with suitable converters as applicable)
17.	Communication port for interfacing with temperature scanners (for pumping stations)	Required
18.	Communication port for interfacing with Multifunction meters/ Motor Protection Relays	Required
19.	Communication port for interfacing with flow indicator totalisers	Required

Central Processing Unit

The Central Processing Unit (CPU) shall be high performance processor with modular configuration suitable for real time process. High inherent reliability, self checking, error-recovery and trouble-shooting features shall be source of the features of CPU.

Communication between CPU and peripherals shall be by an I/O bus. The individual device, interfaces shall be capable of being plugged into the I/O bus.

CPU shall have a real time clock capability to accept a time synchronization pulse from external communication system and adjust its internal clock with the pulse.

CPU shall have extensive self diagnostic facilities and watch dog timers to identify faults at card levels.

The CPU word length shall be 32 bit or more. The CPU shall have at least 50% spare capacity after commissioning of the application.

Automatic restart of the system on resumption of power shall be provided.

Memory Unit

Memory unit shall comprise of highly reliable memory chips which are industry standard, proven design with fast random access and suitable for operation in process environments. Main memory shall be modular and facility shall be provided for upgradation and expansion of memory to meet future demands.

Sufficient program memory and data memory space shall be provided. At least 50% extra memory space shall be provided over the actual requirements. System initialization and application software shall be stored in EEPROM or EPROM with necessary hardware. Running data shall be stored in a RAM with internal battery back-up. The battery back-up provided shall last for at least one month with life of battery a minimum of 3 years. Appropriate programs for application software modification shall be provided.

Input Output modules

1. Standard rack mounted I/O modules with plug-in cards shall be provided. Field wiring shall be terminated in screwed terminal blocks and interconnected to the processor I/O system with pre-fabricated cables and plug in card type connectors.
2. 20% extra I/Os of installed capacity for each type shall be provided as spares and shall be wired to the terminal block of the control panel. Provision shall be made for future expansion of extra I/O modules of the installed capacity.
3. Some of the common features of the I/O modules shall be as follows:
 - (a) All inputs shall be terminated with input protective network and necessary isolating barriers.
 - (b) Filters for noise rejection.
 - (c) Provision for isolation of faulty channels.
 - (d) Input /output status shall be indicated by LEDs.
 - (e) Test points and fault indication LEDs shall be provided to carry out module testing.
 - (f) Surge withstand facility as per IEEE standards.
 - (g) All the modules shall be of addressable type.
 - (h) Protection for continuous overload upto 20% of all input ranges.
 - (i) All outputs shall be provided with fuse protection and fuse failure detection. The fuses may be mounted externally from the output module.

- (j) All the modules shall be of addressable type.
 - (k) The I/O modules shall have diagnostic features i.e., in case of failure of any I/O channel an alarm "PLC trouble" shall be generated automatically.
 - (l) Internal battery back up.
4. Analog input modules
They shall consist of an input isolation unit, signal conditioning unit and an analog to digital converter (ADC). In addition, the following features shall be provided:
- (a) Cross talk attenuation.
 - (b) Provision for monitoring of the ADC for overflow detection.
 - (c) Gain amplifier with high common mode rejection ratio.
 - (d) Accuracy for analog signals shall be minimum + 0.5%.
 - (e) Screwed terminals with fuse and LED for indication of 'fuse blown' shall be provided for each analog input.
5. Digital input modules
The following design features shall be provided.
- (a) Contact bounce protection.
 - (b) Choice of type of contacts.
 - (c) Screwed terminals with fuse and LED for indication of 'fuse blown' shall be provided for each digital input.
6. Digital output modules
The digital output module shall provide contact closure output by driving relays. The features to be provided are as follows:
- (a) Contact bounce protection.
 - (b) Relay output to operate pump motors and motorized valve actuators.
 - (c) Fail safe position in case of output module failure and fault indication.

The digital input and digital output modules shall not have more than 16 channels in each module. The analog input modules shall not have more than 8 channels in each module.

Default values

Every operator selectable parameter shall be provided with a default value held in EPROM or EEPROM in the relevant PLC.

The default value shall be used if no other value has been entered through the local SCADA system or if the value entered through the local SCADA system has been lost. The default values shall be made available for interrogation by the local SCADA system at all times.

Sensible and logical default values shall be inserted prior to the start of system tests. The default values at the time of handing over the plant shall be those found operationally suitable during commissioning.

The PLCs shall make available for interrogation by the local SCADA for bits corresponding to the following PLC faults:

- (a.)Failure of PLC as indicated by the PLC watchdog relay;
- (b.) Failure of each I/O card;
- (c.)Failure of communication link
- (d.) Status of 24 V DC power supply for I&C system.

Software

The on line real time operating system supplied shall be proven for similar application and shall be

able to support all the equipment/peripherals.

PLC programming shall be carried using latest available industrial standard formats for logic. The PLC programming shall be prepared using the PLC manufacturers recommended windows based PLC coding and documentation software. The PLC code shall be structured in the manner of the best industry standard and have comprehensive subroutine and rung annotation. Ladder program will be preferred.

The PLC shall be commissioned using RAM memory storage modules which shall be replaced with an Erasable read only memory (EPROM) or electrically erasable read only memory (EEPROM) when testing is complete.

Programming Unit

The Contractor shall supply a laptop computer (common for use at WTP and CWPS, ESR) preloaded with required softwares. The configuration of the laptop PC shall be latest available at the time of execution of Contract. The licensed copies of the various softwares shall be provided which will include software for programming and operating system for PLC, proprietary PLC programming and documentation, SCADA application, latest Office software, latest Antivirus, latest Adobe Acrobat Reader and Diagnostics software.

The laptop computer shall be provided with all necessary adapter, laptop carrying kit, cables, connectors and accessories.

The proprietary PLC programming and documentation software shall have facilities for:

- (a) Carrying out program revision management
- (b) Insertion of comprehensive program subroutine and rung comments
- (c) Search and find and search and replace 'contacts' and 'coils'
- (d) Simulation functions and testing of the program by changing the status of contacts and monitoring the outputs
- (e) Preparation of coil and contact list and their locations and memory maps.
- (f) Make system backup copies while the system is online
- (g) Upload and down load programs to the PLC on line
- (h) Carry out on line monitoring and fault finding on the PLC.

Operator Interface Unit

OIU shall be provided for the PLC system on the front facia of the control panel.

The OIU shall consist of panel mounted industrial grade unit with Color LCD screen and tactile key pad. It shall be environmentally protected and designed for plant room use with a 'wipe clean' finish.

The OIU shall provide facilities to:

- (a) Display status of Plant in a graphical and tabular format (i.e. running, stopped, fault etc.)
- (b) Display analog values on the appropriate graphic screen (displays shall change color when in fault conditions or when data is suspect);
- (c) Annunciate alarms associated with the area of the plant concerned including details of the time the alarm occurred
- (d) Provide facilities for the operator to:
 - adjust process set points;
 - select process modes;
 - select number of running pumps;
 - provide all other facilities required for operation of the Plant;
 - acknowledge alarms;
 - view a journal of unacknowledged alarms;

- view a journal of the alarms acknowledged and unacknowledged.
- Display process set points;
- Display a total running hours log of local transmission pump drives.
- Provide real time and historic data
- Any additional features required to assist in the effective and efficient operation of the plants.
- Security systems shall be provided to prevent unauthorized adjustment of process set points.

Graphic screens shall be provided as follows:

- (a) Main and subsystem menus;
- (b) Pumping system overview (i.e. providing details of Nos. of pumps running, total flows, reservoir/ sump level, power supply status etc.)
- (c) Transmission main local surge suppression equipment tabular status format screen;
- (d) Screens to permit viewing and modifying of process set points
- (e) Tabular screen of pumping plant status and values
- (f) Running hours log for pumping stations.

The screens shall display data commensurate with their size and the area of and the number of Plant items covered. The Contractor, in addition to the specific screen requirements stated above shall be responsible for providing any additional screens to ensure comprehensive coverage of the Works.

The software chosen shall have a comprehensive alarm handling capability with the ability to annunciate, acknowledge, sort and maintain a historic record of current and past alarms including details of when the alarm occurred, when it was acknowledged and when it returned to normal.

Tests for Programmable Logic Controller (PLC)

The following tests shall be carried out for the PLC

- Scanning rate check for analog signals
- Scanning rate check for digital signals
- PLC cycle time check
- Processor redundancy check
- Power supply redundancy check
- Processor failure alarm check
- Power supply failure alarm check
- Card level failure detection check
- Failsafe output check on failure of output module
- Sensor failure detection check
- Status indication check for healthiness of each input/output channel and module
- Status indication check for power supply for each module
- Isolation check for input/output module
- Input filtering check for noise level
- Processor – battery back-up check
- Controller functioning check on under voltage and over voltage
- Ladder logic program check by simulation of inputs and outputs
- Functional check of programming units.

Acceptable makes of the PLC system are Rockwell Automation, Schneider, Siemens, and Tata Honeywell or equivalent as approved by Employer's Representative.

PC Based Local SCADA

The PC based local SCADA system shall consist of an industrially rugged Personal Computer and shall be a high performance processor with modular configuration suitable for real time process applications. The SCADA system shall consist of following:

- (1) 21” (color, low radiation) VDU with rack mounted shall be latest at the time of supply
- (2) Printers
 - 1 No. 132 column printer shall be provided for on line printing of alarms and event logging.
 - 1 No. A3 size color graphic laser printer shall be provided for report generation and color screen printing.
- (3) Keyboard and Mouse
 - The keyboard and mouse shall be industrially rugged having built in touch pad and 3 keys for mouse functions.
- (4) 21” color monitor or better shall be provided.
- (5) A separate control desk shall be provided for the PC along with 21” color monitor, key board, mouse and 2 numbers printers.

The system shall be provided with Open system standards windows based supervisory, control and data acquisition (SCADA) software and shall support industry standard protocols for third party interfacing required in future for master SCADA system connectivity. The software package chosen shall be a market leader and have a proven record of use within the water industry for similar applications.

The PC based SCADA system shall provide facilities to:

1. provide color graphic screen representation each plant area and system.
2. overviews
3. display status of Plant in a graphical and tabular format (i.e. running, stopped, fault etc.);
4. display analog values on the appropriate graphic screen (displays shall change color when in fault conditions or when data is suspect);
5. display status and values at other down stream plants as required.
6. annunciate alarms associated with the area of the plant concerned including details of the time the alarm occurred;
7. provide facilities for the operator to:
 - adjust process set points;
 - select process modes;
 - provide all other facilities required for operation of the Plant;
 - acknowledge alarms;
 - view a journal of unacknowledged alarms;
 - view a journal of the last 200 alarms acknowledged and unacknowledged.
 - display process set points;
 - provide real time and historic trending of local analogue values;
 - issue commands for start-stop operation of pumps;
 - Issue commands for opening/ closing of motorized valves;
8. provide data archiving of all local analogue values;
9. prepare daily, weekly and monthly reports (providing details of daily, monthly and weekly throughputs against numbers of pump running hours and power usage);
10. display a total running hours log of local transmission pump drives;

11. any additional features required to assist in the effective and efficient operation of the pumping station and water treatment plant;
12. Power monitoring using various analogue/ digital inputs provided from the HT switchgear as listed in the I/O list;
13. Security systems shall be provided to prevent unauthorized adjustment of process set points.
14. Provide continuous and effective monitoring and control of equipment.
15. On-line data monitoring and control
16. Database for both real time and historical data management
17. Safety tagging and interlocks operation
18. PLC program uploading and downloading
19. Interoperability with the other packages such as Geographic information system (G.I.S.), Water demand forecast, Management Information System (MIS) for effective Water Management etc.

Notes:-

- i. Graphic screens shall be provided as follows:
 - main and subsystem menus;
 - pumping system overview (i.e. all pumping stations providing details of No. of pumps running and standby, total flows, reservoir levels, power supply status etc.);
 - Treatment plant overview (i.e. Clariflocculators in use, number of filters in operation, backwash, maintenance, recycling reservoir level and backwash reservoir level, input raw water flow to treatment plant, output flow of treated water from treatment plant and turbidity, pH of raw and clear water etc.);
 - over view of the local pumping station providing details of reservoir level, total flow and Nos. of pumps running;
 - overview of power system;
 - overview of control system;
 - screens to permit viewing of process set points;
 - tabular screen of Pumping Plant status and values;
 - The time and power frequency shall always be displayed in a corner or reserved space on the screen.
 - running hours log for Pumping.

The screens shall display data commensurate with their size and the area of and number of Plant items covered. The Contractor, in addition to the specific screen requirements stated above shall be responsible for providing any additional screens to ensure comprehensive coverage of the Works.

A comprehensive screen navigation system shall be provided giving access to all screens via a system of menus and short cuts (i.e. it shall be possible to follow the process from one screen to another by clicking the mouse cursor on screen 'hotspots' to effect the move from one screen to another).

- ii. The software chosen shall have a comprehensive alarm handling capability with the ability to annunciate, acknowledge, sort and maintain a historic record of current and past alarms including details of when the alarm occurred, when it was acknowledged and when it returned to normal.

- iii. The sample rates required for the displaying of trends shall be software settable with predefined access level and shall typically be as follows:

- One sample every 15 seconds for flow values;
- One sample every 30 seconds for levels;

The system shall be capable of storing real time data for one day and historic data for 60 days.

- iv. The sample rates for archiving shall be the same as for trending. The archives shall be stored in daily files. The system shall provide capacity to store archives for 60 days. A warning alarm shall be provided to the operator to advise that archiving to disk should take place or archived data will be

overwritten. It shall be possible to:

- Reintroduce the data derived from archiving to the PC based local SCADA system and the archived data viewed using the trend facility;
- Display the data using industry standard spread sheet or database software in tabular format on a third party machine.

v. The Contractor shall provide latest technology (at the time of supply) based industrial Magneto-Optical (MO) disc drive or DAT drive with the PC based SCADA system in order to download archive data or to upload previously stored archive data onto electronic storage media. The MO or DAT disc drive shall be suitably protected against the environment. It shall be built as an integral part of the industrial PC offered for the local SCADA system.

b) Design requirements of the system shall take into consideration following criteria:

- (1) Fail Safe Design
- (2) System Availability
- (3) Equipment Reliability
- (4) Expandability
- (5) User friendly to operate and maintain
- (6) Fault Monitoring and Diagnostic Capability

c) Time Stamping and Synchronization

- i) Real time clocks shall be provided in all PLCs as well as in the local SCADA stations.
- ii) The local SCADA system and PLCs shall be synchronized. Further facility shall be provided in local SCADA system to synchronize its time with Master SCADA system time (in future).
- iii) Time Synchronization with all PLCs in a plant (e.g. WTP) shall be done at start-up and periodically. Contractor shall indicate the corresponding period.
- iv) The maximum time error at any time between PLCs and the local PC based SCADA system shall not exceed 5 m-sec.
- v) The time stamping of PLC shall be made available to the local SCADA system for the data, alarms, events etc. logged in database.

Test on local SCADA

The following tests for various items of local SCADA system including power supply system shall be carried out as a part of FAT in addition to other tests indicated by Contractor in FAT document.

Functional

All cubicles shall be energized and the power supplies tested on the panel and internal lighting arrangements examined.

The boards shall be examined to check that there are no Status Error LEDs lit.

The peripherals like printers etc. shall be energized and proper operation of peripheral checked by self tests on equipments which have the facilities and others like VDUs, by connecting them to the system.

The system I/O shall be simulated and checked upto LOCAL SCADA system database.

By varying the different inputs at random and checking to ensure that right status reporting is done on the LOCAL SCADA system, the healthiness of all channels shall be checked with rated load connected.

Displays : The following shall be functionally checked

Mimic display: Symbols, colors, for correct/ approved format etc.

Control Operations: Simulated command operations from SCADA without any malfunctioning.

Status changes: Representation of open/close facility and mode of operation

Variables: Engineering units, updating representation

Events and alarms: Generating of alarms, events by verifying inputs at random, color code, formatting, and printing

Trend: proper selection, presentation under different time scales and printing

Reports: Reports shall be checked for correct/ approved format, logging intervals, printing intervals, data accuracy etc.

Response Time Checking:

System response time shall be tested after simulating the full I/O and Man machine interface system.

Time taken from object status change to the presentation of object status on the display.

Time taken to generate and display single alarm and multiple alarms (upto 50) from the time of alarm condition.

Time taken to display a complex picture with all variables from the time of calling the display.

The accuracy of alarms on VDU and printer.

Time stamping accuracy between LOCAL SCADA and PLC times.

Other Tests on local SCADA

Fail safe operation of local SCADA system during total (including battery) backed power failure and restoration.

Fail-safe operation during on-line connection and removal of hand held maintenance unit, if any.

Check of detecting and reporting of failure of subsystem connected to the network on VDU status display.

Check of error free data transfer on Communication system along with modems/communication interfaces.

Check of hard copy unit functions by printing of process pictures.

Check of maintenance, backup (logic/programs, IO database, historical database, system configuration etc.) functions by connecting them to the system.

Acceptable makes of the Local SCADA System are Rockwell Automation, Schneider, Siemens, and Tata Honewell or equivalent as approved by Employer's Representative.

Instrument Control Panel

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. Control Panels and instrument enclosures shall provide a degree of protection as follows:

- Indoor Installation : IP 52
- Outdoor Installation : IP 65

Control Panel shall be free standing 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. These shall be dispatched in advance so that they may be installed and leveled when concrete foundations are poured.

Cable entries to the panels shall be from the bottom with fire retardant spray compound sealing. Control panels shall be provided with louvers along with washable micron filters AIRIN – AIROUT fans. The control panels shall be designed for front as well as rear access.

The CP shall provide separate areas for the PLC, internal power distribution, instrumentation, field cabling termination and for Surge protection devices (SPDs).

Mounting

All equipments 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. Cut-outs and wiring for free issue items, if any, shall be according to corresponding equipment manufacturer's drawing. Cut-outs, if any, provided for future mounting of equipment shall be properly blanked-off. Wherever required, panels/desks shall be matched with other adjacent panels/desks in respect of dimensions, color, appearance and arrangement of equipment on the front.

Earthing for Instruments

The panel shall be equipped with an earth bus securely fixed along the inside base of panel.

All metallic cases of relays, 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 a LED lighting fixture rated for 20 watt, 230V, 1 phase, 50 Hz 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, 3 pin receptacle with a switch and neon indication. 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

The incoming power supply to the control panel shall be 230 VAC, 50 Hz. Contractor shall provide necessary transformers, converters, inverters and other associated hardware required to generate the requisite power supply. Generally, voltage levels for control schemes and power supply for instruments shall be 24 V DC. Power supply to all the instruments mounted outside the control panel shall be provided from the power supply units in the control panel. In case the instruments require power supply other than 24 V DC, the Contractor shall provide the necessary converters. 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. The battery and battery charger shall be provided for this purpose and sizing of the same shall be based on the entire load of instrumentation system.

Level measuring system

Level measurement system shall consist of level transducer, level transmitter, digital level indicator and any other items required to complete the level measuring system.

To reduce the effect of water turbulence in reservoirs / tanks, averaging facility should be provided in the transmitter unit for providing steady readings. Stilling pipe shall be provided for level electrodes. The design and application of the level measuring system shall take into account the reservoir construction, the material, size, shape, environment, process fluid or material, the presence of foam, granules, size etc.

For ultrasonic type and radar level transducers, the design and installation shall avoid any degradation of instrument performance due to spurious reflections, absorption, sound velocity variations, sensor detection area, temperature fluctuations, specific gravity changes and condensation. Facilities shall be provided for rejection of spurious reflection.

The level transmitters shall be mounted in suitable weatherproof lockable pedestal enclosures near the level sensor.

On-line pH Measuring System

- (a) The pH measuring system shall consist of a pH electrode, pH transmitter, digital pH indicator, electrode holder assembly and any other item required to complete the pH measuring system.
- (b) The pH transducer shall be rugged in construction and shall be suitable for continuous operation. pH transducer shall include measuring electrode, reference electrode, and a temperature compensator electrode. All wetted parts of the transducers shall be of non-corrosive material.
- (c) The pH transmitter output shall be isolated, and shall be suitable for transmitting over long distances.
- (d) The electrode holder assembly shall be of such a design that it contains some water even when sampling pump is cut off and shall be provided with flow regulating device.
- (e) A sampling system consisting of sampling pump / pressure reducing valves, flow regulator, rotameter, filter assembly etc. shall be provided. The sample water will be connected to a cabinet containing pH analyzer equipment and pH transmitter.

D) General		
1	Overall accuracy of measurement loop	±1% of measured value
2	Standard pH solutions for on site calibration	For pH 4,7 and 10 shall be provided
II) pH Sensor		
1	Type	Encapsulated combined electrode
2	Mounting	On flow through assembly
3	Automatic temperature compensation	Required
4	Standard cable for connecting sensor and transmitter	Required
III) pH Transmitter		
1	Type	Indicating type with Back-lit LCD / LCD display
2	Mounting	Field
3	Input	From pH electrodes and temperature compensator
4	Zero and span Adjustment	Required
5	Enclosure material	Non corrosive
6	Enclosure Protection	IP-65 of IS 13947 Part I
7	Output	4 to 20 mA(Isolated) for connecting to pH indicator
IV) Digital pH Indicator		
Specifications shall be as given under 'Digital Panel Meters'.		

The acceptable makes are HACH, Emerson Process Management or equivalent as approved by Employer's Representative.

Online Residual Chlorine meter

Residual chlorine (RCI) measuring system shall consist of RCI transducer, RCI transmitter, digital RCI indicator and any other item required to complete the RC measuring system.

RCI transducer shall be rugged in construction and shall be suitable for continuous operation. RCI transducer shall work on Amperometric/ Colorimetric Principle. It shall also consist of an integral pH sensor for compensating against pH changes and integral temperature sensor for compensating against temperature changes.

A sampling system consisting of sampling pump / pressure reducing valves, flow regulator, rotameter, filter assembly etc. shall be provided. The sample water will be connected to a cabinet containing RCI analyzer equipment and RCI transmitter.

The RCI sensor enclosure shall be of such a design that it contains some water even when sampling pump is cut off and shall be provided with flow regulating devices.

The RCI transmitter output shall be suitable for transmitting over long distance.

I) General		
1	Overall accuracy of measurement loop	± 5% of measured value
II) Residual Chlorine Sensor		
1	Type	Amperometric/ Colorimetric
2	Automatic Temperature Compensation electrode	Required

3	Automatic pH compensation electrode	Required
4	Range	Adjustable over full span
5	Sensitivity	0.1 mg/Lit
6	Standard Cable Connecting sensor and Transmitter	Required
III) Residual Chlorine Transmitter		
7	Type	Indicating type having back-lit LCD/LED display
8	Mounting	Field
9	Input	From Residual chlorine sensor
10	Output	4-20 mA (Isolated)
11	Zero and Span Adjustment	Required
12	Enclosure material	Non corrosive
13	Enclosure Protection	IP-65 of IS 13947 Part I
IV) Digital Residual Chlorine Indicator		
Specifications shall be as given under 'Digital Panel Meters'.		

The acceptable makes are Hach, Emerson Process Management or equivalent as approved by Employer's Representative.

Online Turbidity Measuring System

Turbidity measuring system shall consist of turbidity detector assembly, turbidity transmitter, digital turbidity indicator, and any other item required to complete the turbidity measuring system

Turbidity detector shall operate on Nephelometric measurement principle. Turbidity detector shall have ratiometric measurement system and shall be suitable for insertion / flow through type mounting. It shall be possible to calibrate the turbidity meter at site, with a formazine standard or a glass cube.

Turbidity detector shall be rugged in construction and shall be suitable for continuous operation. It shall have an integral bubble trap arrangement.

Turbidity transmitter output shall be isolated and shall be suitable for transmitting over long distances.

A sampling system consisting of sampling pump / pressure reducing valves, flow regulator, rotameter, filter assembly etc. shall be provided. The sample water will be connected to a cabinet containing Turbidity analyzer equipment and turbidity transmitter.

I) General		
1	Overall accuracy of measurement loop	±2%
II) Turbidity Sensor		
1	Type	Optical sensor
2	Material For Wetted Parts	Non corrosive
3	Cleaning Facility	Required
4	Bubble Trap	Required
5	Measuring Principle	Ratio-metric
6	Color Compensation	Required
7	Range setting	Selectable
8	Calibration Standard	Required, Standard Formazine solution or Glass cube.
9	Accessories Standard cable for connecting sensor and transmitter Standard Glass cube or	Required

	formazine solution for calibration	Required
III) Turbidity Transmitter		
1	Type	Indicating with back-lit LCD /LED display
2	Mounting	Field
3	Input	From Turbidity sensor
4	Output	4-20 mA DC (Isolated)
5	Zero and Span Adjustment	Required
6	Enclosure material	Non corrosive
7	Enclosure Protection	IP-65 of IS 13947 Part I
IV) Digital Turbidity Indicator		
Specifications shall be as given under 'Digital Panel Meters'.		

The acceptable makes are HACH, Emerson Process Management, Sigrist or equivalent, as approved by Employer's Representative

Drawings for Instrumentation and SCADA

The following drawings for the instrumentation and control, SCADA and associated communication and power supply systems covered under this specification shall be submitted for review and approval:

Sr. No.	Description
1.0	P&I Diagram
2.0	Instrument list with tag numbers, range, sizes, makes and model numbers
3.0	Data sheets and catalogues for all instruments, alarm annunciator and instrumentation and control cables
4.0	<u>Control Panel</u>
4.1	Overall dimensional drawing, fabrication details and Bill of material for the instruments mounted on the front fascia and inside the control panel.
4.2	Front fascia layout showing all instruments with cut-outs and bezel dimensions, construction details and interior G.A. drawings for control panels/ consoles
4.3	Wiring diagram with terminal details of each component, terminal block details, power supply distribution scheme with loads and bill of quantities of all panel mounted instruments for control panels/ consoles.
4.4	Bill of material for the instruments mounted on the front fascia and inside the control panel.
5.0	Loop diagrams for all field mounted instruments. (The loop diagram shall contain tag numbers, terminal number, I/O address, cable no. etc.)
6.0	List of alarms provided on alarm annunciator
7.0	<u>PLC System</u>
7.1	Input / Output list for PLC indicating grouping of various signals in each module
7.2	PLC system configuration indicating interfacing
7.3	PLC block logic diagram with descriptive control logic write-up and software program listing
7.4	System hardware details along with bill of material for PLC system
7.5	Screens of Operator Interface Unit (OIU)

Sr. No.	Description
8.0	Installation sketches of instruments
9.0	Battery and Battery Charger
9.1	Front facia layout, overall dimensions, wiring diagram, indicating terminal details and bill of quantities for battery charger panels
9.2	Calculation of Ampere Hour capacity for the battery backup.
9.3	Catalogues and Data sheet
10.0	I&C system configuration drawing indicating instruments, PLCs and PC based local SCADA system.
11.0	Functional Design Specification containing summary of the Contractor's proposal for the sequence of operation and design intent (For CWPS and WTP, ESR)
12.0	<u>PC based local SCADA system</u>
12.1	Data sheet and catalogues for PC, printers and DAMS software
12.2	Details of communication protocol and data structure
12.3	Screens of the PC based local SCADA system
13.0	Catalogues, data sheet and sizing calculations for UPS and battery for PC based local SCADA system
14.0	Detailed cable installation layout drawings indicating route of cables, type of laying, etc.
15.0	Cable Schedules and Interconnection cable schedules
16.0	Operation and maintenance manuals for PLCs, local PC based SCADA system, battery and battery charger panel, UPS and all instruments
17.0	Control room layout drawing
18.0	Data sheets, catalogues, control wiring drawings with terminal details for motorized valve actuators.
19.0	List of spares for I&C system, PC based local SCADA system including power supply systems
20.0	Operation and Maintenance and Instructions Manuals
21.0	As built drawings
22.0	Documents for system training

Inspection requirements

All tests as required, both at the factory i.e. Factory Acceptance Test (FAT) before dispatch, and at site after installation i.e. Site Acceptance Tests (SAT), shall be carried out. Detailed Test reports and certificates shall be submitted. Test reports and test certificates for bought out components shall be submitted for approval by engineer-in-charge. These components shall also be included in the integrated FAT.

The list of tests to be carried for both FAT and SAT along with test instruments to be used shall be furnished with the Bid for review by the Employer's Representative. Contractor shall indicate the place of FAT and the test facilities available.

Prior to testing, all relevant documentation and sufficient briefing about the tests shall be given to Employer's Representatives who would witness the testing.

In addition, testing done during manufacturing and assembly in the factory such as heat run, component testing, circuit testing etc, for similar equipment shall be demonstrated to the

Employer's Representative.

Instrumentation and Control

To ensure that a well engineered and contractually compliant system is delivered by the Contractor, the Factory Acceptance Tests (FAT) shall be performed

Factory Acceptance Test (FAT-Applicable For Inspection Category A)

- (a) A Factory Acceptance Test, which shall be witnessed by Employer's Representative, is required for the system. No equipment shall be shipped without written confirmation by the Employer's Representative that the system has successfully passed its factory acceptance test.
- (b) The purpose of the FAT is to qualify the system as meeting all contractual requirements. The test shall verify the performance and functional integrity of the individual subsystems, including active interfaces between subsystems and shall demonstrate the proper operation of equipment/systems.
- (c) Factory Acceptance Tests shall be conducted according to test plan with detailed test procedures. The test plan and procedures shall be submitted by the Contractor for review and shall be subject to approval by the Employer's Representative.
- (d) In order to ensure that the FAT will be successfully and expeditiously completed, it shall commence only after the successful completion of a preliminary FAT (Pre FAT). The intent is for the Contractor to detect and correct most design, integration and performance problems before the Employer's Representative come to the factory for the FAT. The Pre FAT shall be supervised by the person designated to serve later as the Contractor's Inspector of the FAT, and each test shall be formally signed off by that person. The signed off test results shall be sent to the Employer's Representative for review before the Employer's Representative comes to Contractor's factory for FAT.
- (e) A complete set of system documentation, including design and maintenance documents, user manuals and the test plan and procedures shall be available during the FAT.
- (f) The list of tests to be carried for both Factory Acceptance Test (FAT) along with test instruments to be used shall be furnished for review by the Employer's Representative. Contractor shall indicate the place of inspection and the test facilities available.
 - i) The testing of all the equipment and accessories shall be carried out as per latest applicable Indian/International standards recommendations.
 - ii) Prior to testing, all relevant documentation and sufficient briefing about the tests shall be given to Employer's Representative's who would witness the testing.
 - iii) The FAT to be performed in the factory shall include but not be limited to following:
 - a) Tests for guaranteed technical parameters
 - b) Integrated functional tests
 - c) Burn-in tests
 - d) Hydrostatic tests
 - e) Calibration tests
 - f) Power supply variation test
 - g) Alarm/Diagnostic check

Tests on Instrumentation System

(1) Type Tests

The Contractor shall submit the test certificates for the 'Type Tests' to the Employer's Representative for approval. The type tests (as applicable) for the instruments shall be as follows:

- 'Burn In' test for electronic components
- Humidity test for electronic instruments
- Weather protection as per IS 13947
- Hysteresis test
- High voltage test

- Short circuit protection test
- Material test

(2) Routine Tests

All instruments shall be subjected to the routine tests (as applicable) mentioned below at the manufacturers works (Factory Acceptance Tests) to ensure correct functioning.

i. Calibration of the instruments

All the instruments shall be calibrated for accuracies as per applicable standards. The calibration shall be carried out at 0%, 25%, 50%, 75% and 100% of the range of the instrument in both increasing and decreasing directions. The instrument shall be acceptable if the accuracy and repeatability are better than those specified. The instrument used for testing shall hold a valid calibration certificate from a recognized laboratory.

(3) Over range protection test

All transmitters, digital panel meters, digital flow indicator cum integrator shall be subjected to the over range protection test.

(4) Performance test

All the instruments shall be tested by connecting to the specified power supply for the performance test.

(5) Power supply variation test

All the instruments shall work satisfactorily for the specified power supply variation. Accuracy and linearity shall not change.

(6) Hydrostatic test

All flow sensors and pressure sensors shall be tested to withstand 150% of the rated pressure. The sensitivity, accuracy and calibration of the sensors shall not deteriorate at this over-range. There shall not be physical damage.

(7) Repeatability test

All instruments shall be subjected to repeatability test over the full range at 0%, 25%, 50%, 75% and 100 % of the full range in both increasing and decreasing directions. Readings for each measurement mentioned above shall be taken for establishing the repeatability.

(8) Dimensional check

The dimensions of all the instruments shall be checked thoroughly and shall be tabulated in a good format.

i. Wherever applicable, following dimensions shall be checked/ noted

- Total length
- Insertion length
- Diameter
- Mounting head
- Process connection size etc.

ii. For panel mounted instruments and transmitters following dimensions shall be checked

- Width
- Height
- Depth

Bezel dimensions and cut-out dimensions for panel mounted instruments etc.

Uninterruptible Power Supply

The Contractor shall provide Uninterruptible Power Supply (UPS) unit for providing power supply to the local SCADA system.

- The UPS shall be sized to **provide 4 hours of full load.**
- The UPS shall have the following features:
- The UPS shall be on-line type and shall be microprocessor controlled. It shall contain a static bypass switch which shall operate in the event of UPS failure, overload or manual initiation in

order to transfer the load to mains without interruption to power supply..

- The door of the enclosure shall be in the front.

Operation and Maintenance

Contractor has to run the SCADA automation system for 12 months trial period after successful completion of the project. 05 years O& M including replacement and warranty shall start thereafter.

The contractor shall provide 2 years spares at the SCADA station proper upkeep of the SCADA automation station. List of spares shall be as follows:

For any one day non functioning of the SCADA system will result in the deduction of 1/30th of the monthly payment due to the contractor.

Atleast two trained supervisors shall be deputed by the contractor for proper functioning and preparation and supervision of the daily reports indicating treatment efficiency of each unit

Daily reports shall be submitted to the Engineer in Charge.

Items for Instrumentation / Automation / SCADA

Item / Component	Recommended makes
Programmable Logic Controllers (PLC)	Rockwell (<i>Allen Bradley</i>) / Siemens / Honeywell
Moulded Case Circuit Breaker (MCCB)	Siemens / Schneider M.G. / Jyoti / L&T
Relay and Contactors	Siemens / Alstom / Jyoti / ABB / L&T
Cables	Tropodur / Finolex / Asian / Gloster / Incab / Universal / Polycab
Panel Enclosures and Consoles	Rittal / President / Cutler Hammer
Switch fuse Disconnecter	L & T, FN Type, Siemens 3 KL Type, GEPC
Multi-Function Energy Meters	Enercon, L & T, SOCOMEC
Capacitor bank	Crompton Greaves, Khatau Junker, Malde, L & T
Cable Termination kit	Raychem, Denson, M-Seal
Battery	HBL NIFE, Exide, Amco
Battery Charger	Chaabi Electrical, Masstech
Ultrasonic Type Level Measurement Device	Endress+Hauser / Krohne Marshall / Hycontrol UK.
Pressure switch	Indfoss, Switzer, Tag Process Instruments
Pressure gauge	WAREE, WIKA, AN Instruments, Guru, Hitek
Flow switch	Switzer, General Instrument, Forbes Marshall
Pressure Transmitter	Emerson, Foxbro, Druck, Endress – Hauser, ABB, Honeywell Automation
Engineering cum Operator work Station	IBM, Compaq, Dell
Local Supervisory Station	IBM, Compaq, Dell
HMI Software	Wincc, Rs View, Monitorpro, Intellution, Indusoft
Alarm Annunciator	Minilec, Peacon, ICA, APLAB
Uninterruptible Power Supply	HI-Real, Pulse, Tata Libert, APC, APLAB

TENDER DOCUMENT FOR AUGMENTATION& REORGANISATION TO JAGDALPUR WATER
SUPPLY SCHEME UNDER AMRUT MISSION GOVERNMENT OF CHHATTISGARH

Lightening Protection Unit	MH Inst, Crompton Greaves, MTL, Pepper & fuchs, Rittmeyer, Cirprotec
Instruments & Control Cables	Delton, Asian, Serval, TCL, Thermopad
Receiver Indicator/Digital panel Meter	Masibus, Yokogawa, Lectrotek, NISHKO, SaiTech, MTL INSTS
Conductivity level switch	Pune techtrol, SBEM, Krohne Marshall, E+H, NIVO
Computer (Servers & Workstation)	HP-Compaq / IBM / Dell
Laptop	HP / Dell / Sony / Toshiba
Printer	Samsung, HP, CANNON

Note: The above scope of work and others details are minimum and not limited and Bidders are advised to visit the JMC office and site in advance to verify the balance scope of work with concerned Nodal official Amrut Mission Jagdalpur before quoting the rates. Any items/components which may not be mentioned in the scope of work, but are necessarily required for successful commissioning of the Plant/system with desired outputs and complete functions in all respects will be deemed to inclusive in quoted cost by the bidder and nothing extra shall be paid by JMC

ANNEXURE – E-7

WORK & SPECIFICATION FOR ALLIED CIVIL WORKS

SCOPE OF WORK & SPECIFICATION OF WORK :

Designing, providing and constructing allied civil work such as i) Compound Wall OHT sites and electric sub station with main Gate ii) Providing supplying erecting and commissioning computer, peripherals and furniture and other miscellaneous items including communication telephone and Internet connection iii) Plantations, landscaping and beautifications at construction sites iv) Providing and fixing in position copper lightning conductor v) Designing and Constructing Cement Concrete Road at WTP site & vi) Desilting, Dewatering & Screening in Existing Intake-well

The scope of work includes but not limited to as listed below:

- Construction of boundary wall with chain linked wire fencing, gate, watchman room, landscaping including internal roads, drains (With RCC pipes upto plot boundary)
- The open space between Inlet works, Lamella Clarifier, Filter House, chemical house and Back wash reservoir and other vacant portion between the units shall be finished with pavers block, of minimum 1.8m width
- Providing dormitory unit with a lavatory for accommodation of guards, near the guard room.
- Provision of internal pathways (concrete chequered tiles) by the side of Aerator, parshall flume, flash mixer, Lamella Clarifier, filter house for ease of accessibility.
- All the vacant spaces other than different units in the Water Treatment Plant is to be developed, upgraded & beautified by proper gardening installation of fountains, statues, etc. A proposal in this regard is to be submitted by the successful bidder. The whole area of the WTP shall be levelled and beautification plan shall be submitted before taking up the work.
- Preparation of As-built drawings after completion of the works, duly approved by the Engineer-in-charge.
- Earthwork in excavation / Cutting / Dismantling of road crust upto required level for laying of pipes / pipeline including de-watering, removal of soil and disposal.
- Backfilling inlayers, Road restoration, including re-laying of bituminous / concrete roads, as applicable, as per site conditions

Supply, Installation, testing and commissioning of LED based Solar Photovoltaic garden Lighting system as per the requirement spelt out in the scope of work. Supply, Installation, Testing & Commissioning of Solar-----Photovoltaic (SPV) GARDEN LAMP POST system, LED based 18 watts as per MNRE specification and as per the drawings and including 5 years warranty including replacement and warranty

- Preparation and submission of “As Built Drawings” for approval of the Engineer-in-charge.
- All works shall be executed as per the directions of the Engineer-in-charge.

1. GENERAL :

- 1.1 Design and Drawings : The contractor shall have to submit his own design for all

works under this sub work showing plan elevation and section and the design of compound wall, Cement concrete Road and landscaping drawing and items it wants to incorporate in the said works and execution thereof. Detailed calculations and drawings shall have to be submitted by him for scrutiny within a month from the date of issue of work order. Detailed designs shall include calculations for foundation for RCC work and for other structures provided in the drawings. The responsibility for the designs, constructions structural stability shall however rest solely with the contractor and he shall have to make good any damage or loss to the govt. due to defects if any in the above mentioned or any other work carried out by him. The contractor shall submit four sets of completion drawings immediately after completion of the work.

- 1.2 The complete guidance as to the pattern of landscaping shall be obtained from Engineer-in-charge who will earmark the positions of structures in available land in consultation of all concern and the available space left for landscaping and area beautifications fall under this sub work, which is binding to the contractor.
- 1.3 The Design of compound wall will be on framed column structure with necessary plinth beam and panel with BB Masonary or RCC will be the sole prerogative of the contractor. The safety of the wall and protection available due to the compound wall in the enclosed area is the base of designing. Sufficient weep holes and drainage arrangement for free flow of storm water from the enclosed area shall also be considered. Minimum height of compound wall shall not be less than 1500 mm. Suitable and easy operational MS gate with GI pipe where necessary shall also be provided with adequate locking system and provision for barring the entry of stray animals in the enclosed area shall also be the deciding factor for the complete work of Compound Wall.
- 1.4 Design of RCC road approaching the WTP site shall be structurally designed for a minimum motorable width of 3500 mm. The drawing for the same shall also be provided by the contractor. The necessary strengthening of foundation course shall also be considered for designing.

SPECIFICATIONS GOVERNING BUILDING WORKS AND SUCH ITEMS IN COMPOUND WALL

ITEM OF EXCAVATION IN ALL TYPES OF SOFT AND HARD STRATA GENERAL

The Excavation shall be applicable for all types of strata by manual / machine means. The item will also include bailing out of water by manually or pumps to keep the trenches reasonably dry for all further works of foundation.

The item includes all shoring and strutting that may be required during as per drawing excavation, and for this purpose shoring and strutting shall also be carried out by the

contractor.

ITEM OF PLAIN / REINFORCED CEMENT CONCRETE

PROPORTIONS OF CONCRETE FOR TYPES OF WORK

- i) M-100 – For leveling course and foundation of building footing etc.
- ii) M-200 RCC Road work
- iii) M-250 for Construction of foundation in framed structure of Quarters and Compound Wall

GENERAL SPECIFICATIONS OF THIS WORK SHALL BE AS PER STANDARD SPECIFICATION OF PUBLIC WORKS DEPARTMENT

SAND AND METAL

All fine aggregate shall conform to IS 383 and test for conformity shall be carried out as per IS 2386 (Part I to VIII). The fineness modulus of fine aggregate shall neither be less than 2 nor be greater than 3.5.

Well graded B. T. metal conforming to IS 383 shall be used. Tests for conformity shall be carried out as per IS 2386 (Part I to VIII).

CEMENT

Ordinary Portland Cement of Ultratech, Vikram, Ambuja, ACC, Birla Gold, JK make or equivalent conforming to IS of 43 grade / 53 grade shall only be used. 43 grade cement shall be as per IS 8112-1989 and 53 grade shall be as per IS 12269 – 1987. Every batch of cement delivered at site should accompany the manufacturer's test certificate. In addition to this, cement samples from each batch shall be got tested by Engineer at cost of contractor from approved testing laboratory.

REINFORCEMENT

The contractor has to procure the M.S. reinforcement bars from open market at his cost. Re-rolled steel bars will not be accepted. The bars shall be scrapped thoroughly for removing any scale, rust, etc. before use in work. Bars that may be found defective in any way shall not be allowed to be used. The reinforcement is to be fabricated and placed in position as per the approved design

COVER BLOCKS

For bottom covers of beams, slabs etc. separators or cover blocks of precast cement mortar of suitable size with wire embedded as directed will be used and tied to the reinforcement bars between layers of reinforcement.

CONCRETE

The PCC / RCC works shall be as per IS 456-2000. Design mix M-20 and M-25 shall be used for construction as specified. Minimum cement consumption for M-20 and M-25 concrete shall be 350 Kg/Cum and 375 Kg/Cum respectively. Mix design shall be prepared by the contractor and got approved from Proof Consultants or approved testing laboratory.

WATER

The water shall be used as per clause IS 456-2000. The pH of water shall be in the range of 6.5 to 8.00

MIXING

Normally the standard cement consumption will be as under for one cum of concrete with finishing.

1:3:6(M-10)	1:2:4 (M-15)	1:1.5:3 (M-20)	1:1:2 (M-25)
4.40 bags	6.40 bags	7.9 bags	8.90 bags

For any other mix the cement consumption shall be decided by the Engineer. The consumption is mentioned above shall be for the gross RCC work actually cast. The cement required for finishing, rendering cement wash etc. should be in addition to above.

CONCRETE LAYING

The forms shall first be lightly moistened before laying concrete. The concrete shall be placed in position within 20 minutes after adding water to the mix and shall be slowly deposited in its place and not thrown or dumped from a height. It shall be placed in uniform layers. For vertical wall of water retaining structure, water stoppers shall be provided.

TAMPING, RAMMING AND CONSOLIDATING

For all R.C.C. works, which are considered by the Engineer to be important mechanical vibrators, shall be invariably used by the contractor at his cost. The contractor shall provide at least 2 vibrators in good working condition, so as he has one as a stand by and to prevent interruption in work. The concrete being laid shall be vigorously vibrated during laying and also rodded by bars where vibrator can not reach so that dense and complete fillings are assured. The contractor shall make his own arrangement for procuring vibrators at his cost.

CURING

All R.C.C. work will be watered and kept constantly wet for 28 days after initial set casting by means of wet gunny bags and ponding as directed by the Engineer-in-charge. This operation shall start immediately after initial set of the concrete. Should the contractor fail to water the concrete continuously it may be done by the department immediately at contractor's cost. Any defect observed due to lack of proper curing of concrete shall be rectified / work redone by the Contractor at his cost.

REMOVAL OF FORM

It shall be generally as under subject to the written approval and modification by the Engineer-in-charge.

Vertical form works to walls, beams	16-24 hours
Soffit form works to slabs (prop. to be refixed immediately after removal of formwork)	3 days
Soffit form works to beams (prop. to be refixed immediately after removal of formwork)	7 days
1. Spanning up to 4.5 m.	7 days
2. Spanning over 4.5 m.	14 days
1. Spanning up to 6.0 m.	14 days
2. Spanning over 6.0 m.	21 days

ITEM OF TOR STEEL REINFORCEMENT FOR RCC WORKS

1. The item provides for supply of **Tor Steel bars**, cutting, bending, binding with wire and placing in position.
2. For plain and reinforced cement concrete works, the reinforcement steel shall consist of following grades of reinforcing bars.

Grade Designation	IS Specification	Strength(Mpa)	Elastic Modulus
T.M.T.	I.S.1786	415	200

3. The binding wire shall conform to Specification A-15 of Standard Specification of Public Works Department, Latest Edition.
4. Bending reinforcement conform accurately to the dimensions and shapes in the details drawings (approved) or as directed by the Engineer-in-charge.
5. Bars shall be bent cold only. In no way bending by heat will be allowed.

Bar with kinks, bends or cracks shall not be used.

Details of length, size, laps and bending diagram shall be got approved from the Engineer.

As far as possible full length of bars shall be placed as per drawing details. When full lengths are not available, bars with short lengths be supplies only after written permission of the Engineer. Bars shall be lapped as specified in IS : 456-2000 with due regards to the grade of concrete. Welding may be used for large diameter of bar only after permission of Engineer.

Welding, if permitted shall conform to PWD specifications.

All reinforcement shall be accurately placed in position with spacing and cover shown in detailed drawing and firmly held during the placing and setting of concrete. Bars shall be tied at all intersections. Binding wire of 1.63 mm or 1.22 mm diameter (about 16 or 18 gauge) shall be used. Spacing of the bars shall be maintained by means of stays, blocks, ties, spacers, hangers or other approved supports at sufficient close intervals so that bars will not be displaced during placing. Vibrating or compacting concrete, placing bars for reinforcement on a layer of fresh concrete, as the work progress will not be permitted. The use of pieces of broken stones or bricks or wooden blocks for maintaining spacing or cover shall not be permitted. Layers of bars shall be separated by precast cement blocks, spacer bars or other devices.

Full details of numbers, sizes, lengths, weights, laps, welds, spacing of bars placed in position in different parts of the work shall be recorded by the contractor and furnished to the Engineer or his representative to show that all reinforcement has been placed correctly as per sanctioned drawing or as directed by the Engineer in writing before placing concrete. No concrete shall be placed in position until the correctness of reinforcement is checked by the Engineer and has given permission in writing to place concrete. Even after approval of reinforcement as above, it will be the contractor's responsibility to seal that the spacing of reinforcement and arrangements are not tampered with in any way before or during concreting.

The contractor has to supply required steel. He shall produce the test certificate. In addition, actual test shall be carried out according to IS : 432 – 1982 in an approved Proof Consultants or test laboratory and the cost of test shall be borne by the Contractor including all transport etc.

The items includes ...

- a) Cost of labour materials, use of tools, plant and tackle and other incidental items to complete the work satisfactorily.
 - b) Supplying, conveying, cleaning, cutting, bending, binding with (1.63 mm or 1.22 mm diameter – 16 to 18 gauge) wire on spot welding and placing reinforcement in position and maintaining it clean and in position till the concrete is laid.
 - c) Cost of sampling and testing as required.
14. In no case, any foreign material e.g. oil, grease, etc., which prevent bonding between steel and concrete, shall remain on steel on steel bars during placing of concrete.

ITEM OF REFILLING

- 1 After concreting work refilling with available excavated stuff shall be done.

The available excavated stuff shall be laid in layers of 15 cm to 20 cm. Each layer shall be watered and compacted before the upper layer is laid till the required level is reached.

The filling shall be done 30 to 40 cms above natural ground level.

Sinking below the road or ground level, if noticed till the completion of work, shall have to be levelled by the Contractor at his cost.

This item includes....

- a. Cleaning useful excavated material, braking of clods, Removal of stone. Etc.

- b. Conveying the useful excavated material up to 200 M and filling in layers, watering and compacting.
- c. All labour, equipment and other arrangements necessary for the satisfactory compaction and completion of the item.

Surplus excavated material is the property of JMC. Therefore the contractor is not empowered to sell this excavated material to any other agency. However, as per instructions of the Engineer, the Contractor at the place indicated by the Engineer shall dispose off such surplus material.

This disposal will not be considered for initial 200 M lead and so will not be paid for.

The material shall be conveyed by means of suitable devices/manner.

The material conveyed to the place of disposal shall either be stocked or spread as directed by Engineer-in-charge or his representative.

ITEM OF M. S. GRILL WORK

i. GENERAL

The item provides for mild steel grill prepared to the designs shown in the drawings or as directed by the Engineer, for fixing to windows, ventilators, gates etc., including the specified mild steel sections, fabrication, fixing in the frame, fixtures and painting with three coats of oil paint of approved shade.

ii. MATERIALS

The mild steel sections as mentioned in the item shall comply with the relevant PWD specifications. The sections shall be squares, flats, rounds, etc. of the specified dimensions shown in the drawings or as directed by the Engineer. Standard screws, rivets, welding rods etc. shall be used.

Oil paint shall comply with the PWD specifications. The priming coat shall be of red lead and the other two coats shall be of a shade approved by the Engineer.

a. CONSTRUCTION

The fabrication of the specified sections of mild steel shall be according to the PWD specifications.

The grill shall be fabricated to the designs and patterns shown in the drawings or as directed by the Engineer, the weight corresponding to that mentioned in this item and the joints shall be riveted and welded as directed by the Engineer. The grill so formed shall be fixed into the frames of windows, ventilators, etc., before they are erected in position. The out side strip frame of the grill shall be housed to its full thickness into the recess cut into the frame of the windows, ventilators etc. The grill shall be fixed to the frame with screws at the rate of 1 screw per 30 cm of the length of the outer strip subject to a minimum of 2 nos. in each side of the frame or as indicated in the drawings. The screws shall be countersunk and shall be fixed with the tops of their heads flush with the outer face of the frame strip.

The grill shall be painted with one coat of red lead oil paint and 2 coats of oil paint of approved shade when the entire work is completed. Painting shall conform to the PWD specifications

b. ITEM TO INCLUDE

- All materials such as mild steel sections of specified sizes, oil paints, screws, rivets, welding rods etc. including wastage for completing the item satisfactorily.
- All labour for cutting grooves in the frame fabrication of the grill by riveting and welding, fixing the grill into the frame, painting, hoisting, erection etc. for completing the item satisfactorily.
- Use of tools and equipments necessary for the job.

ITEM OF B. B. MASONRY IN SUPERSTRUCTURE

DESCRIPTION

This work shall consist of construction of structures with bricks jointed together by cement mortar in accordance with the details shown on the Drawings or as approved by the Engineer.

APPLICABLE CODES

The following Indian Standard Codes, unless otherwise specified herein, shall be applicable.

In all cases, the latest revision of the codes shall be referred to:

- IS - 1077 Specifications for common burnt clay building bricks
- IS - 1200 Measurements for Building works
- IS - 1725 Specifications for solid cement blocks used in general building construction
- IS - 1905 Code of practice for structural safety of buildings: Masonry walls.
- IS - 2116 Sand for masonry mortars
- IS - 2180 Specification for heavy duty burnt clay building bricks
- IS - 2185 Specification for concrete masonry units: Hollow and solid concrete blocks
- IS - 2212 Code of practice for brick work
- IS - 2222 Specification for burnt clay perforated building bricks
- IS - 2691 Specification for burnt clay facing bricks
- IS - 3115 Specification for lime based blocks
- IS - 3414 Code of practice for design and installation of joints in buildings
- IS - 3466 Specification for masonry cement
- IS - 3861 Method of measurement of plinth, carpet and rentable areas of buildings.
- IS - 3952 Specification for burnt clay hollow blocks for walls and partitions
- IS - 4098 Specification for lime-pozzolana mixture
- IS - 4139 Specification for sand lime bricks
- IS - 4441 Code of practice for use of silicate type chemical resistant mortars.
- IS - 4442 Code of practice for use of sulphur type chemical resistant mortars

Others I.S. Codes not specifically mentioned here but pertaining to the use of bricks for structural purposes form part of these Specifications.

MATERIALS

All materials to be used in the work shall conform to the standard requirements laid down in PWD Specifications.

PERSONNEL

Only trained personnel shall be employed for construction and supervision.

CEMENT MORTAR

Cement and sand shall be mixed in specified proportions given in the Drawings. Cement shall be proportioned by weight, taking the unit weight of cement as 1.44 tonne per cubic metre. Sand shall be proportioned by volume taking into account due allowance for bulking. All mortar shall be mixed with a minimum quantity of water to produce desired workability consistent with maximum density

of mortar. The mix shall be clean and free from injurious type of soil/acid/alkali/organic matter or deleterious substances.

The mixing shall preferably be done in a 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 the Engineer. Where permitted, specific permission is to be given by the Engineer. Hand mixing operation shall be carried out on a clean water-tight platform, where cement and sand shall be first mixed dry in the required proportion by being turned over and over, backwards and forwards several times till the mixture is of uniform colour. Thereafter, minimum quantity of water shall be added to bring the mortar to the consistency of a stiff paste. The mortar shall be mixed for at least two minutes after addition of water.

Mortar shall be mixed only in such quantity as required for immediate use. The mix which has developed initial set shall not be used. Initial set of mortar with ordinary Portland Cement shall normally be considered to have taken place in 30 minutes after mixing. In case the mortar has stiffened during initial setting time because of evaporation of water, the same can be retempered by adding water as frequently as needed to restore the requisite consistency, but this re-tampering shall not be permitted after 30 minutes. Mortar unused for more than 30 minutes shall be rejected and removed from site of work.

SOAKING OF BRICKS

All bricks shall be thoroughly soaked in a tank filled with water for a minimum period of one hour prior to being laid. Soaked bricks shall be removed from the tank sufficiently in advance so that they are skin dry at the time of actual laying. Such soaked bricks shall be stacked on a clean place where they are not contaminated with dirt, earth, etc.

JOINTS

The thickness of joints shall not exceed 10 mm. All joints on exposed faces shall be tooled to give concave finish.

LAYING

All brickwork shall be laid in an English bond, even and true to line, in accordance with the Drawing or as directed by the Engineer, plumb and level and all joints accurately kept. Half and cut bricks shall not be used except when necessary to complete the bond. Closer in such cases shall be cut to the required size and used near the ends of the walls. The bricks used at the face and also at the angles forming the junction of any two walls shall be selected whole bricks of uniform size, with true and rectangular faces.

All bricks shall be laid with frogs up on a full bed of mortar except in the case of tile bricks. Each brick shall be properly bedded as set in position by slightly pressing while laying, so that the mortar gets into all their surface pores to ensure proper adhesion. All head and side joints shall be completely filled by applying sufficient mortar to brick already placed and on brick to be placed. All joints shall be properly flushed and packed with mortar so that no hollow spaces are left. No bats or cut bricks shall be used except to obtain dimensions of the different courses for specified bonds or wherever a desired shape so requires.

The brick work shall be built in uniform layers, and for this purpose wooden straight edge with graduations indicating thickness of each course including joint shall be used. Corners and other advanced work shall be raked back. Brickwork shall be done true to plumb or in specified batter. All courses shall be laid truly horizontal and vertical joints shall be truly vertical. Vertical joints in alternate courses shall come directly one over the other. During construction, no part of work shall rise more than one metre above the general construction level, to avoid unequal settlement and improper jointing. Where this is not possible in the opinion of the Engineer, the works shall be raked back according to the bond (and not toothed) at an angle not steeper than 45 degrees with prior approval of the Engineer. Toothing may also be permitted where future extension is contemplated.

Before laying bricks in foundation, the foundation slab shall be thoroughly hacked, swept clean and wetted. A layer of mortar not less than 12 mm thick shall be spread on the surface of the foundation slab and the first course of bricks shall be laid.

JOINTING OLD AND NEW WORK

Where fresh masonry is to join the masonry that is partially/entirely set, the exposed jointing surface of the set masonry shall be cleaned, roughened and wetted, so as to effect the best possible bond with the new work. All loose bricks and mortar or other material shall be removed.

In the case of vertical or inclined joints, it shall be further ensured that proper bond between the old and new masonry is obtained by interlocking the bricks. Any portion of the brickwork that has been completed shall remain undisturbed until thoroughly set.

In case of sharp corners specially in skew bridges, a flat cutback of 100 mm shall be provided so as to have proper and bonded laying of bricks.

CURING

Green work shall be protected from rain by suitable covering and shall be kept constantly moist on all faces for a minimum period of seven days. Brick work carried out during the day shall be suitably marked indicating the date on which the work is done so as to keep a watch on the curing period. Top of the masonry work shall be left flooded with water at the close of the day. Watering may be done carefully so as not to disturb or wash out the green mortar.

During hot weather, all finished or partly completed work shall be covered or wetted in such a manner as will prevent rapid drying of the brickwork.

During the period of curing of brick work, it will be suitably protected from all damages. At the close of day's work or for other period of cessation, watering and curing shall have to be maintained. Should the mortar perish i.e., become dry, white or powdery, through neglect of curing, work shall be pulled down and rebuilt as directed by the Engineer. If any stains appear during watering, the same shall be removed from the face.

SCAFFOLDING

The Scaffolding shall be sound, strong and safe to withstand all loads likely to come upon it. The holes which provide resting space for horizontal members shall not be left in masonry under one metre in width or immediately near the skew backs of arches. The holes left in the masonry work for supporting the scaffolding shall be filled with dense concrete and made good. Scaffolding shall be got approved by the Engineer. However, the Contractor shall be responsible for its safety.

EQUIPMENT

All tools and equipment used for mixing, transporting and laying of mortar and bricks shall be clean and free from set mortar, dirt or other injurious foreign substances.

FINISHING OF SURFACES

General

All brickwork shall be finished in a workmanlike manner with the thickness of joints, manner of striking or tooling as described in these above Specifications.

The surfaces can be finished by "joining" or "pointing" or by "plastering" as given in the Drawings.

For a surface which is to be subsequently plastered or pointed, the joints shall be squarely raked out to a depth of 15 mm, while the mortar is still green. The raked joints shall be well brushed to remove dust and loose particles and the surface shall be thoroughly washed with water, cleaned and wetted.

The mortar for finishing shall be prepared as per PWD specifications.

Jointing

In jointing, the face of the mortar shall be worked out while still green to give a finished surface flush with the face of the brick work. The faces of brick work shall be cleaned to remove any splashes of mortar during the course of raising the brick work.

Pointing

Pointing shall be carried out using mortar not leaner than 1:3 by volume of cement and sand or as shown on the Drawing. The mortar shall be filled and pressed into the raked joints before giving the required finish. The pointing shall be ruled type for which it shall, while still green, be ruled along the centre with half round tools of such width as may be specified by the Engineer. The super flush mortar shall then be taken off from the edges of the lines and the surface of the masonry shall be cleaned of all mortar. The work shall conform to IS: 2212.

Plastering

Plastering shall be done where shown on the Drawing. Superficial plastering may be done, if necessary, only in structures situated in fast flowing rivers or in severely aggressive environment.

Plastering shall be started from top and worked down. All putlog holes shall be properly filled in advance of the plastering while the scaffolding is being taken down. Wooden screeds 75 mm wide and of the thickness of the plaster shall be fixed vertically 2.5 to 4 meters apart, to act as gauges and guides in applying the plaster. The mortar shall be laid on the wall between the screeds using the plaster's float and pressing the mortar so that the raked joints are properly filled. The plaster shall be finished off with a wooden straight edge reaching across the screeds. The straight edge shall be worked on the screeds with a small upward and sideways motion 50 mm to 75 mm at a time. Finally, the surface shall be finished off with a plasterer's wooden float. Metal floats shall not be used.

When recommencing the plastering beyond the work suspended earlier, the edges of the old plaster shall be scrapped, cleaned and wetted before plaster is applied to the adjacent areas.

No portion of the surface shall be left unfinished for patching up at a later period.

The plaster shall be finished true to plumb surface and to the proper degree of smoothness as directed by the Engineer.

The average thickness of plaster shall not be less than the specified thickness. The minimum thickness over any portion of the surface shall not be less than the specified by more than 3 mm.

Any cracks which appear in the surface and all portions which should hollow when tapped, or are found to be soft or otherwise defective, shall be cut in rectangular shape and re-done as directed by the Engineer.

Curing of Finishes

Curing shall be commenced as soon as the mortar used for finishing has hardened sufficiently not to be damaged during curing. It shall be kept wet for a period of at least 7 days. During this period, it shall be suitably protected from all damages.

Scaffolding for Finishes

Stage scaffolding shall be provided for the work. This shall be independent of the structure.

ACCEPTANCE OF WORK

All work shall be true to the lines and levels as indicated on the Drawing or as directed by the Engineer, subject to tolerances as indicated in these Specifications.

Mortar cubes shall be tested in accordance with IS: 2250 for compressive strength, consistency of mortar and its water retentivity. The frequency of testing shall be one sample for every 2 cubic metres of mortar, subject to a minimum 3 samples for a day's work.

ITEM OF EXTERNAL SAND FACED PLASTER

Sand Faced plaster comprises of a mixture of sand and gravel in specified proportions dashed over a freshly plastered surface.

SCAFFOLDING

For all exposed brick work or tile work, double scaffolding independent of the work having two sets of vertical supports shall be provided. The supports shall be sound and strong, tied together with horizontal pieces over which scaffolding planks shall be fixed.

For all other work in buildings, single scaffolding shall be permitted. In such cases the inner end of the horizontal scaffolding pole shall rest in a hole provided only in the header course for the purpose. Only one header for each pole shall be left out. Such holes for scaffolding shall, however, not be allowed in pillars/columns less than one metre in width or immediately near the skew backs of arches. The holes left in masonry works for scaffolding purposes shall be filled and made good before plastering.

Note: In case of special type of brick work, scaffolding shall be got approved from Engineer in advance.

PREPARATION OF SURFACE

The joints shall be raked out properly. Dust and loose mortar shall be brushed out. Efflorescence if any shall be removed by brushing and scraping. The surface shall then be thoroughly washed with water, cleaned and kept wet before plastering is commenced. In case of concrete surface if a chemical retarder has been applied to the form work, the surface shall be roughened by wire brushing and all the resulting dust and loose particles cleaned off and care shall be taken that none of the retarders is left on the surface.

MORTAR

Mortar of specified mix using the type of sand described in the item shall be used, where coarse sand is to be used, the fineness modulus of the sand shall not be less than 2.5 mm.

APPLICATION OF PLASTER

The plaster base over which rough cast finish is to be applied shall consist of two coats, under layer 12 mm thick and top layer 10 mm.

Ceiling plaster shall be completed before commencement of wall plaster.

Plastering shall be started from the top and worked down towards the floor. All put-log holes shall be properly filled in advance of the plastering as the scaffolding is being taken down. To ensure even thickness and a true surface, plaster about 15 x 15 cm shall be first applied, horizontally and vertically, at not more than 2 metres intervals over the entire surface to serve as gauges. The surfaces of these gauged areas shall be truly in the plane of the finished plaster surface. The mortar shall then be laid on the wall, between the gauges with trowel. The mortar shall be applied in a uniform surface slightly more than the specified thickness. This shall be beaten with thin strips of bamboo about one metre long to ensure through filling of the joints, and then brought to a true surface, by working a wooden straight edge reaching across the gauges, with small upward and side ways movements at a time. Finally the surface shall be finished off true with trowel or wooden float according as a smooth or sandy granular texture is required. Excessive troweling or over working the float shall be avoided. During this process, a solution of lime putty shall be applied on the surface to make the later workable.

All corners, arrises, angles and junctions shall be truly vertical or horizontal as the case may be and shall be carefully finished. Rounding or chamfering corners, arrises, provision of grooves at junctions etc., where required shall be done without any extra payments. Such rounding, chamfering or grooving

shall be carried out with proper templates or battens to the sizes required.

When suspending work at the end of the day, the plaster shall be left, cut clean to line both horizontally and vertically. When recommencing the plastering, the edge of the old work shall be scrapped cleaned and wetted with lime putty before plaster is applied to the adjacent areas, to enable the two to properly joint together. Plastering work shall be closed at the end of the day on the body of wall and not nearer than 15 cm to any corners or arrises. It shall not be closed on the body of the features such as plasters, bands and cornices, nor at the corners of arrises. Horizontal joints in plaster work shall not also occur on parapet tops and copings as these invariably lead to leakages.

No portion of the surface shall be left out initially to be patched up later on.

Top layer

The top layer shall be applied a day or two after the under layer has taken initial set. The latter shall not be allowed to dry out, before the top layer is laid on. The mortar used for applying top layer shall be sufficiently plastic and of rich mix 1:3 (1 cement, 3 fine sand) or as otherwise specified so that the mix of sand and gravel gets well pitched with the plaster surface. In order to make the base plastic, about 10 % of finely grinded hydrated lime by volume of cement, shall be added when preparing mortar for the top layer.

FINISH

It shall be ensured that the base surface which is to receive cast mixture is in plastic state. The rough cast mixture shall consist of sand or gravel or crushed stone of uniform colour from 2.36 mm to 12.5 mm or as specified and in the proportions as specified accurately to the effect required. The mixture shall be wetted and shall be dashed on the plaster base in plastic state by hand scoop so that the mix gets well pitched into the plaster base. The mix shall again be dashed over the vacant spaces if any so that the surface represents a homogeneous surfaces of sand mixed with gravel. A sample of rough cast plaster shall be got approved by the Engineer.

PRECAUTIONS

Any cracks which appear in the surface and all portions which sound hollow when tapped, or are found to be soft or otherwise defective, shall be cut out in rectangular shape and redone as directed by the Engineer.

When ceiling plaster is done, it shall be finished to chamfered edge at an angle at its junction with a suitable tool when plaster is being done. Similarly when the wall plaster is being done, it shall be kept separate from the ceiling plaster by a thin straight groove not deeper than 6 mm drawn with any suitable method with the wall while the plaster is green.

To prevent surface cracks appearing between junctions of column/beam and walls, 150 mm wide chicken wire mesh should be fixed with U nails 150 mm centre to centre before plastering the junction. The plastering of walls and beam/column in one vertical plane should be carried out in one go. For providing and fixing chicken wire mesh with U nails payment shall be made separately.

ITEM OF WHITE CEMENT BASED MARBLE MOSAIC TILE FLOORING

MARBLE MOSAIC TILES

Marble Mosaic tiles shall generally conform to IS: 1237-1980. Unless otherwise specified, the tiles shall be supplied initial grinding and grouting wearing layer.

The size of tiles shall be as given in Table 22-2 or as shown in the Drawings or as required by the Engineer. Half tiles for use with the full tiles shall be such as to make two half tiles when jointed together, match with dimensions of one full tile.

Length	Nominal Breadth	Nominal Thickness not less than
250 mm	250 mm	22 mm

TOLERANCE

1. Tolerances on length and breadth shall be plus or minus one millimeter, and tolerance on

thickness shall be plus 5 mm. The range of dimensions in any one delivery of tiles shall not exceed 1 mm on length and breadth and 3 mm on thickness.

2. The tiles shall be manufactured in a factory under pressure process subjected to hydraulic pressure of not less than 140 kg per square centimeter and shall be given the initial grinding with machine and grouting of the wearing layer before delivery to site. The wearing layer shall be free from projections, depressions, depressions, cracks, holes, cavities and other blemishes. The edges of wearing layer may be rounded.
3. The proportion of cement to aggregate in the backing of tiles shall be not leaner than 1:3 by weight. Where colouring material is used in the wearing layer, it shall not exceed 10 per cent by weight of cement used in the mix.
4. The finished thickness of the upper layer shall not be less than 5 mm for size of marble chips from the smallest upto 6 mm and also, not less than 5 mm for size of marble chips ranging from the smallest upto 12 mm, and not less than 6 mm for size of marble chips varying from the smallest upto 20 mm.

LAYING

Base concrete of RCC slab on which the tiles are to be laid shall be cleaned, wetted and mopped. The bedding for the tiles shall be with lime mortar of any of the following Specifications prepared in conformity with provisions in relevant Clauses of 'Mortar'.

The ingredients shall be thoroughly mixed by volume in dry form. Care shall be taken to ensure that there are no hard lumps present. Water shall then be added and the ingredients thoroughly mixed.

The bedding for tiles shall be cement mortar 1:4 (1 cement: 4 coarse sand) bedding may also be used with prior approval of the Engineer.

The average thickness of the bedding mortar shall be 30 mm and the thickness at any place shall not be less than 10 mm.

Lime mortar bedding shall be spread, tamped and corrected to proper levels and allowed to harden for a day before the tiles are set. If cement mortar is laid in bedding the terrazzo tiles, these shall be set immediately after laying the mortar. Over this bedding neat grey cement slurry of honey like consistency shall be metre over such an area as would accommodate about twenty tiles. Tiles shall be washed clean and shall be fixed in this grout one after another, each tile being gently tapped with a wooden mallet till it is properly bedded, and in level with the adjoining tiles. The joints shall be kept as thin as possible not exceeding 1.5 mm and in straight lines or to suit the required pattern.

The surface of the flooring during laying shall be frequently checked with a straight edge atleast 2 metre long, so as to obtain a true surface with the required slope.

Where full tiles of half tiles cannot be fixed, tiles shall be cut (sawn) from full tiles to the required size and their edges rubbed smooth to ensure a straight and true joint;

Tiles which are fixed in the floor adjoining the wall shall enter not less than 12 mm under the plaster, skirting or dado. The junction between wall plaster and tile work shall be finished neatly and without waviness.

After the tiles have been laid, surplus cement grout that may have come out of the joints shall be cleared off.

CURING, POLISHING AND FINISHING

The day after the tiles are laid all joints shall be cleaned of the grey cement grout with a wire brush or trowel to a depth of 5 mm and all dust and loose mortar removed and cleaned. Joints shall than be

grouted with grey or white cement mixed with or without pigment to match the shape of the topping of the wearing layer of the tiles. The same cement slurry shall be applied to the entire surface of the tiles in a thin coat with a view to protect the surface from abrasive damage and fill the pin holes that may exist on the surface.

The floor shall then be kept wet for a minimum period of 7 days. The surface shall thereafter be grounded evenly with machine fitted with coarse grade grit block (No 60). Water shall be used profusely during grinding. After grinding the surface shall be thoroughly washed to remove all grinding mud, cleaned and mopped. It shall then be covered with a thin coat of grey or white cement, mixed with or without pigment to match the colour of the topping of the wearing surface in order to fill any pinhole that appear. The surface shall be again cured. The second grinding shall then be carried out with machine fitted with fine grade grit block (No.120).

The final grinding with machine fitted with the finest grade grit blocks (No.320) shall be carried out the day after the second grinding described in the preceding para or before handing over the floor, as ordered by the Engineer.

For small areas or where circumstances so require, hand polishing may be permitted in lieu of machine polishing after laying. For hand polishing the following carborundum stones, shall be used:

1. 1st Grinding - Coarse Grade Stone (No.60)
2. Second Grinding - Medium Grade (No.80)
3. Final grinding - Fine Grade (No.120)

In all other respects, the process shall be similar as for machine polishing.

After the final polish, oxalic acid shall be dusted over the surface at the rate of 33 gm per square meter sprinkled with water and rubbed hard with a 'namdah' block (pad of woolen rags). The following day the floor shall be wiped with a moist rag and dried with a soft cloth and finished clean.

If any tile is disturbed or damaged, it shall be refitted or replaced, properly jointed and polished.

The finished floor shall not sound hollow when topped with a wooden mallet.

ITEM OF WATER PROOF CEMENT PAINT

GENERAL

This specification lays down the requirement of applying cement-based paint in specified coats to concrete or masonry surface.

MATERIALS

Cement paint with a base of white Portland cement of approved manufacture. Colour and shade shall be used. Approval quality cement based paint shall be brought to site in original air tight containers with seal intact.

SCAFFOLDING

Wherever scaffolding is necessary, it shall be erected on double supports tied together by horizontal pieces, over which scaffolding planks shall be fixed. No ballies, bamboos or planks shall rest on or touch the surface which is being white washed.

For all exposed brick work or tile work, double scaffolding having two sets of vertical supports shall be provided. The supports shall be sound and strong, tied together with horizontal pieces over which scaffolding planks shall be fixed.

Note: In case of special type of brick work, scaffolding shall be got approved from Engineer in advance.

Where ladders are used, pieces of old gunny bags shall be tied on their tops to avoid damage or scratches to walls.

For white washing the ceiling, proper stage scaffolding shall be erected.

PROTECTIVE MEASURES

Doors, windows, floors, articles of furniture etc. and such other parts of the building not to be white washed, shall be protected from being splashed upon. Splashings and droppings, if any shall be removed by the Contractor at his own cost and the surfaces cleaned. Damages if any to furniture or fittings and fixtures shall be recoverable from the Contractor.

PREPARATION OF SURFACE

The surface to be painted shall be cleaned of all loose dust, and dirt paints and all cracks, holes and surface defects shall be repaired with cement plaster cured and allowed to set hard. Before the painting is commenced the surface is wetted well and water is allowed to run off. Any grease, oil paint, shall be removed by approved methods.

APPLICATION OF PAINT

Mixing of paint and procedure of painting shall be as specified by the manufacture when no specification are following specification shall be generally apply.

The dry cement shall be thoroughly mixed with clean fresh water to produce paint of required consistency (normally that of ordinary paints). The paint shall be kept stirred and used within one hour of mixing hardened or damaged paint shall not be used. Brushes in the manner specified by the manufacturer shall apply the paint.

The number of coats are specified elsewhere of the item. When more than one coat is to be given the subsequent coats shall be applied after the preceding coat has thoroughly hardened inspected and approved.

CURING

Each application of paint should be wetted at the end of the day with a fine water spray, depending on climatic conditions. Wetting shall be done only after an interval of at least 6 to 8 hours after the applications. In dry weather the painted surfaces shall be kept damp for at least two days and provided from direct sun.

ITEM OF WASHABLE OIL BOUND DISTEMPER

GENERAL

This is specification lay down the requirements of applying oil bound distemper in specified coat to concrete or masonry surface.

MATERIAL

Oil emulsion (Oil Bound) washable distemper (IS: 428) of approved brand and manufacture shall be used. The primer where used as on new work shall be cement primer or distemper primer as described in the item. These shall be of the same manufacture as distemper. The distemper shall be diluted with water or any other prescribed thinner in a manner recommended by the manufacturer. Only sufficient quantity of distemper required for day's works shall be prepared.

The distemper and primer shall be brought by the Contractor in sealed tins in sufficient quantities at a time to suffice for a fortnight's work, and the same shall be kept in the joint custody of the Contractor and the Engineering-in-charge. The empty tins shall not be removed from the site of work, till this item of work has been completed and passed by the Engineer.

PREPARATION OF THE SURFACE

For new work the surface shall be thoroughly cleaned of dust, old white or colour wash by washing and scrubbing. The surface shall then be sand papered to give a smooth and even surface. Any unevenness shall be made good by applying putty, made of plaster of Paris mixed with water on the entire surface including filling up the undulations and then sand papering the same after it is dry.

Pitting in plaster shall be made good with plaster of Paris mixed with the colour to be used. The surface shall then be rubbed down again with a fine grade sand paper and made smooth. A coat of the distemper shall be applied over the patches. The patches surface shall be allowed to dry thoroughly before the regular coat of distemper is applied.

APPLICATION OF PRIMING COAT

The priming coat shall be with distemper primer or cement primer, as required in the description of the item. The application of the distemper primer shall be as described in Clause 12.18.2.2.

Note: If the wall surface plaster has not dried completely, cement primer shall be applied before distemping the walls, but if distemping is done after the wall surface is dried completely, distemper primer shall be applied.

APPLICATION OF DISTEMPER COAT

1. For new work, after the primer coat has dried for at least 48 hours, the surface shall be lightly sand papered to make it smooth for receiving the distemper, taking care not to rub out the priming coat. All loose particles shall be dusted off after rubbing. One coat of distemper properly diluted with thinner (water or other liquid as stipulated by the manufacturer) shall be applied with brushes in horizontal strokes followed immediately by vertical ones which together constitutes one coat.
2. The subsequent coats shall be applied in the same way. Two or more coats of distemper as are found necessary shall be applied over the primer coat to obtain as an even shade.
3. A time interval of at least 24 hours shall be allowed between successive coats to permit proper drying of the preceding coat.
3. 15 cm double bristled distemper brushes shall be used. After each days work, brushes shall be thoroughly washed in hot water with soap solution and hung down to dry. Old brushes which are dirty and caked with distemper shall not be used on the work.

ITEM OF ALUMINUM WINDOWS AND VENTILATORS

ALUMINIUM WINDOWS AND VENTILATORS Aluminium Windows and ventilators shall conform to IS:733, IS 1948, IS:1949, and IS:1081 shall be as per drawings issued by the Engineer. The contractor shall submit for EIC's (Engineer-in-charge) approval the shop drawings covering all dimension details of fabrication, construction and installation. After approval of shop drawings the contractor shall submit one or more samples of the fabricated item of each type for the EIC's approval before mass fabrication.

6.1 Material Aluminium Alloy Extruded Sections Aluminium alloy used in the manufacture of doors, windows and ventilators shall conform to IS designation HE 9-WP of IS:733 or HV9-WP of IS 1285. Aluminium Alloy AA 6063 of hardness T5 or T3 which has the following properties is also acceptable,

Density, kg/mm ³	Modulus of Elasticity	Mpa Ultimate Tensile Strength	Mpa Coefficient of Linear Expansion m/m.k	0.2% Proof Stress, Mpa
2.7 x 10 ⁻⁸	69 x 10 ³	185	23 x 10 ⁻⁸	110

The sectional properties of extruded sections shall be as given in IS 733 or as manufactured by Jindal, Hindalco or Boruka. The section shall be uniform in appearance, free from die lines and handling marks

Glass panes

Glass panes shall be annealed or float glass as specified in the drawing and shall weigh at least 7.5 kg / m².

Glass panes shall also be free from flaws, specks or bubbles. All panes shall have properly squared corners and straight edges. The sizes of glass panes for use shall be in accordance with Table I of IS:1948.

Thickness of glazing to be used for various pane sizes shall be as follows:

Size of Pane Thickness of glazing

up to 1.2 sq.m 4 mm float glass

1.2 sq.m to 2.0 sq.m 5.5 mm float glass

above 2.0 sq.m 8 mm float glass

twin style entrance door 12 mm float glass

Heat strengthening or Toughening of glass wherever required shall be as indicated on drgs.

Screws, Fasteners

Screws and fasteners shall be of aluminium alloy or brass oxidised. Screw thread of machine screws used in the manufacture of aluminium doors, windows and ventilators shall conform to the requirement of IS:4218. For opaque portion of shutters panels can be of 12 mm thk marine ply cladded on both sides with 24 gauge aluminium sheet. 6.2 Standard sizes, tolerances and desi

Size

Overall dimension of windows, doors, ventilators, shall be derived from masonry opening minus an allowance of 1.25 cm clearance on all sides for the purpose of fitting. However, type and overall sizes shall be in accordance with IS:1948.

Tolerances

The sizes for doors, windows or ventilator frames shall not vary by more than ± 1.5 mm from overall size as specified in drawing.

Designation

windows and ventilators shall be designated by symbol denoting their width, type and height in succession as per IS : 1948.

Sectional dimensions and weights

Sectional dimensions and weights per unit length of the section shall conform to design drawing. However, uses of specific sections for specified units as per manufacturers' standard may be used with prior approval of Engineer.

Fabrication

Frames

Frames shall be square and flat, the corners of frame being fabricated to a true right angle. Both the fixed and opening frames shall be constructed of sections which have been cut to length, mitered and screwed at the corners.

Shutters

All hinges, pivots, etc. shall be provided and fabricated in accordance with provisions given in IS:1948.

However, reference standards and drawings are also to be read in conjunction with the IS code.

Finishing

The aluminum sections to be used shall be properly buffed, cleaned by using mild acids and water. Then the same shall be anodised to have average anodic film thickness of 25 microns. To prevent damage to metal surfaces, a protective tape shall be applied after manufacturing and same shall be removed at site only after completion of rough trades.

Handling, Storage

The extruded section or the fabricated windows/doors shall be protected against abrasions, waterstains and any other damages caused by acids or alkaline chemicals. Cold metal shall preferably be placed in a dry storage area avoiding contact between it and other metals. Use of wood face shelving racks is recommended. It shall also be kept away from caustics, nitrates, phosphates, acids and cement.

Installation

The fabricated and assembled windows or door units (without glazing) shall be installed in accordance with IS 1081 being fixed in masonry opening properly plastered and finished. Straightness and diagonal dimensions of the opening shall not have tolerance more than ± 2 mm. Aluminium screws or bolts are to be used with teak wood block on the back of the sections to avoid dents and other mechanical damages during tightening of screws/bolts. All gaps between the aluminium section and the masonry surface must be sealed with gun grade polymer based sealant viz., silicone compound, polysulphide compound.

Cement mortar grout or cement mortar finishing of gaps after installation of aluminium units shall strictly be restricted to protect the surface treatments given to the aluminium like anodising, precoating, etc.

All glass panes shall be fixed only after major activities are over in the area. Glazing gaskets for doors and frames shall be EPDM elastomeric extrusions. All screws and miscellaneous fasteners shall be aluminium, stainless steel or zinc plated.

Hardware

Necessary hardware for aluminium doors and windows shall be compatible with the basic material and shall be provided along with the doors, windows and ventilators. Minimum hardware necessary to be provided shall be

as specified in Table

Drawings/Documents

Prior to fabrication, Contractor shall submit shop drawing indicating details of all members, sections and hardware for EIC's approval. All certificates against tests for anodising and other physical properties of material shall be produced to the Engineer for acceptance.

Fitting	Casement Windows	
	Single Shutter	Double Shutter
300mm 1 3 - - Butt Hinges (heavy)	2	4
Two point nose handle with striking plate	1	2
Peg Stay 300mm	1	2

PRODUCT SPECIFICATIONS of Computer Hardware , Software and Peripherals required :
TECHNOLOGY

Printing Method On-demand inkjet (Piezo electric)
Minimum Droplet Size 3 pl, With Variable-Sized Droplet Technology
Ink Technology Dye Ink
Printing Resolution 5,760 x 1,440 dpi

PRINT

Printing Speed ISO/IEC 24734 9.2 Pages/min Monochrome, 4.5 Pages/min Colour
Maximum Printing Speed 33 Pages/min Monochrome (plain paper), 15 Pages/min Colour (plain paper), 69 Seconds per
10 x 15 cm photo (Epson Premium Glossy Photo Paper)
Colours Black, Cyan, Yellow, Magenta
For detailed information on printing speeds please visit <http://www.epson.eu/testing>.

SCAN

Scanning Resolution 1,200 dpi x 2,400 dpi (Horizontal x Vertical)
Scanner type Contact image sensor (CIS)

PAPER / MEDIA HANDLING

Number of paper trays 1
Paper Formats A4, A5, A6, B5, C6 (Envelope), DL (Envelope), No. 10 (Envelope), Letter, 10 x 15 cm, 13 x 18 cm, 16:9, User defined, Legal
Duplex Manual
Paper Tray Capacity 100 Sheets Standard, 100 Sheets maximum, 20 Photo Sheets

GENERAL

Energy Use 11 W (standalone copying, ISO/IEC 24712 pattern), 1.3 W (sleep mode), 3.6 W (Ready), 0.3 W
Product dimensions 482 x 300 x 145 mm (Width x Depth x Height) or compatible
Country of Origin Philippines
Pallet Size Euro 40 Units

HP LaserJet Pro M1213nf Multifunction Printer(CE845A) **or Equivalent**

Functions

Functions

- Print, copy, scan, fax
Multitasking supported
- Yes

Printing specifications

Print speed black:

Normal: Up to 18 ppm

(Exact speed varies depending on the system configuration, software program, and document complexity.)

First page out (ready)

Black: As fast as 8.5 sec

(Exact speed varies depending on the system configuration, software program, and document complexity.)

Duty cycle (monthly, A4)

Up to 8000 pages

(Duty cycle is defined as the maximum number of pages per month of imaged output.)

Recommended monthly page volume

250 to 2000

(HP recommends that the number of pages per month of imaged output be within the stated range for optimum device performance, based on factors including supplies replacement intervals and device life over an extended warranty period.)

Print technology

- Laser
- Print quality black (best)
- Up to 600 x 600 dpi (1200 dpi effective)
- Resolution technology
- HP FastRes 1200, HP FastRes 600
- Print languages
- Host-based
- Display
- 2-line LCD
- Processor speed
- 400 MHz
- Automatic paper sensor
- No
- Replacement cartridges
- HP LaserJet Black Print Cartridge CC388A

(Average introductory cartridge yield 700 standard pages. HP LaserJet Black Print Cartridge CC388A replacement cartridge yields approximately 1500 pages (average cartridge yield 1500 standard pages. Declared yield values in accordance with ISO/IEC 19752).)

Connectivity

HP ePrint capability

- No
- Mobile printing capability
- HP ePrint, Apple AirPrint™
- *(May require a firmware upgrade to be HP ePrint or AirPrint™ compatible, download at <http://www.hp.com/go/support>)*
- Additional information about Eco
- <http://www.hp.com/ecosolutions>
- Wireless capability
- No
- Connectivity, standard
- Hi-Speed USB 2.0 port

- 10/100Base-T Ethernet network port
- RJ-11 Telephone port
- Network ready
- Standard (built-in Ethernet)
- Connectivity, optional
- None
- Minimum system requirements
- Microsoft® Windows® 7, Windows Vista®, Windows® XP, Windows® Server 2003: 1 GHz processor, 1 GB RAM, 700 MB free hard disk space, SVGA 800 x 600 with 16-bit colour display, Internet Explorer 5.5 or higher, USB or Ethernet port

- Mac OS X v 10.4, v 10.5, v 10.6
- PowerPC G3, G4, G5, or Intel processors
- 1 GB RAM
- 200 MB available hard disk space
- CD-ROM drive
- USB or network port
- Compatible operating systems
- Windows 8, Windows 7, Windows Vista, Windows XP, Windows Server 2008, Windows Server 2003
- Mac OS X v10.4, v10.5, v10.6
- Linux (see hplip.net)
- *(For Windows® Server 2003 and Windows® Server 2008, add Print and Scan drivers only)*

Memory specifications

Memory card compatibility

- No
- Memory, standard
- 64 MB
- Maximum memory
- 64 MB

Scanner specifications

Scanner type

- Flatbed, ADF
- Scan file format
- JPEG, TIF (compressed and uncompressed), PDF, GIF, BMP
- Scan resolution, optical
- Up to 1200 dpi
- Scan size (flatbed), maximum
- 216 x 297 mm
- Scan size (ADF), maximum
- 216 x 356 mm
- Scan size ADF (minimum)
- 152 x 114 mm
- Scan speed (normal, A4)
- Up to 7.4 ppm (b&w), up to 3 ppm (color)
- *(Scan speeds measured from ADF. Actual processing speeds may vary depending on scan resolution, network conditions, computer performance, and application software.)*
- Duplex ADF scanning
- No
- Automatic document feeder capacity
- Standard, 35 sheets
- Digital sending standard features
- Scan to E-mail

- scan to application
- scan to file
- File formats, supported
- PDF
- TIF
- BMP
- GIF
- JPG
- Scan input modes
- Scanning via HP LaserJet scan application or TWAIN—or WIA-compliant application software

Copier specifications

- Copy speed (normal)
- Black: Up to 18 cpm
- Copy resolution (black text)
- Up to 600 x 400 dpi
- Copy resolution (color text and graphics)
- Up to 600 x 400 dpi
- Copy reduce / enlarge settings
- 25 to 400%
- Copies, maximum
- Up to 99 copies

Fax specifications

- Faxing
- Yes
- Fax transmission speed
- 33.6 kbps
- (Based on standard ITU-T test image #1 at standard resolution. More complicated pages or higher resolution will take longer and use more memory.)*
- Fax memory
- Up to 500 pages
- Fax resolution
- Up to 300 x 300 dpi
- Speed dials, maximum number
- Up to 100 numbers

S.R No	Particulars
1	Provision for Compound wall along with Brick masonry at OHT's, electric sub station. Raw Water Sump-cum Pump House
2	(A)Provision for Main Gates (i) 35 MLD WTP WTP 2 Nos of size 5 x 2.5m (ii) Raw water Intake well-cum Pump House 1 Nos of size 5 x 2.5m (iii) OHSR's 19 Nos of size 5 x 2.5m
3	Provision for Computers, peripherals & Furniture and other Misc items like telephone connection, internet etc. List of Furniture required OF approved Make in writing by the Enginner-in-Charge)

S.R No	Particulars																						
	1. Working Table---3 No.s 2. Sitting Chairs---6 No.s 3. Computer Table---1 No. 4. Computer Chair --- 1No. 5. Almirah /Steel Cupboard-- 3 No. (The furniture items shall be of Teak wood make for everlasting use as approved by Engineer-in-charge)																						
	Computer hardware and peripherals required(Make—HP) HP Pavilion Slimline s3360in PC (GX748AA) Desktop PC or Equivalent(3 No. Desktops) Product Specification <p style="text-align: center;">Processor, operating system and memory</p> <table> <tr> <td>Processor type</td> <td>Intel® Core™2 Duo processor E4500 • 2.20 GHz, 2MB Advanced Transfer Cache, 800 MHz</td> </tr> <tr> <td>Operating system installed</td> <td>Genuine Windows Latest version</td> </tr> <tr> <td>Chipset</td> <td>NVIDIA® nForce™ 630i chipset</td> </tr> <tr> <td>Standard memory</td> <td>1024 MB</td> </tr> <tr> <td>Memory type</td> <td>DDR2-SDRAM</td> </tr> <tr> <td>Memory slots</td> <td>2 DIMM sockets</td> </tr> </table> <p>Internal drives</p> <table> <tr> <td>Internal hard disk drive</td> <td>320 GB</td> </tr> <tr> <td>Hard disk controller</td> <td>SATA 3G Hard Disk Drive</td> </tr> <tr> <td>Hard disk drive speed</td> <td>(15000 rpm)</td> </tr> <tr> <td>Optical drive type</td> <td>SuperMulti SATA Drive</td> </tr> <tr> <td>Optical drive speed</td> <td>SuperMulti SATA Drive with Lightscribe Technology , Double Layer (8.5GB) 16x</td> </tr> </table>	Processor type	Intel® Core™2 Duo processor E4500 • 2.20 GHz, 2MB Advanced Transfer Cache, 800 MHz	Operating system installed	Genuine Windows Latest version	Chipset	NVIDIA® nForce™ 630i chipset	Standard memory	1024 MB	Memory type	DDR2-SDRAM	Memory slots	2 DIMM sockets	Internal hard disk drive	320 GB	Hard disk controller	SATA 3G Hard Disk Drive	Hard disk drive speed	(15000 rpm)	Optical drive type	SuperMulti SATA Drive	Optical drive speed	SuperMulti SATA Drive with Lightscribe Technology , Double Layer (8.5GB) 16x
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S.R No	Particulars
	<p>DVD+R, 16x DVD-R, 8x DVD+RW, 6x DVD-RW, 8x DVD±R DL, 12x DVD-RAM, 16x DVD-ROM (max speed); 40x CDR, 32x CDRW, 40x CDROM (max speed); data transfer rates up to 6,000 KB/s (CD read/write) and 21,632 KB/s (DVD read/write)</p> <p>System features</p> <p>Memory card device 15in1 memory card reader</p> <p>Network interface Integrated 10/100 BaseT network interface (Broadband Ready)</p> <p>Video capture interface IEEE 1394 FireWire® Interface</p> <p>Video adapter nVIDIA GeForce 7100</p> <p>Video RAM with 64MB shared graphics memory. Up to 319MB Total Available Graphics Memory as allocated by Windows Vista®</p> <p>Internal audio Integrated Intel® High Definition Audio - 5.1 Surround Sound Ready</p> <p>Audio connectors 1 Line-in, 1 Line-out, Headphone, 2 Microphones (1 in front), Side Spkr L/R, Rear Spkr L/R, Central/ Subwoofer, SPDIF-Out, S-Video-Out</p> <p>Keyboard HP low profile Multimedia Cordless keyboard (2.4GHz) with one-touch Command Center and HP Cordless, optical, 2-button scroller mouse</p>

S.R No	Particulars
	<p>External drive bays 1 external optical drive bay, 1 internal HDD bay, 1 Pocket Media Drive bay</p> <p>Expansion slots 1 PCI Express (x16), 1 PCI Express (x1)</p> <p>External I/O ports 6 USB 2.0 ports (2 in front), 1 FireWire® IEEE 1394 ports, 2 PS/2, LAN</p>
	<p style="text-align: center;">Software</p> <p>Software - education / reference / entertainment Cybe rlink Power Cinema: Experience home theater audio and virtual surround sound, Create photo slideshows, rip CDs and listen to music, Watch DVDs with unsurpassed video and audio quality; HP DVD Play</p>
	<p>Software - internet & online Microsoft® Internet Explorer</p>
	<p style="text-align: center;">Dimensions / weight / warranty</p>
	<p>Weight 6.56 kg</p>
	<p>Dimensions (W x D x H) 105 x 340 x 275 mm</p>
	<p>Package dimensions (W x D x H) 322 x 492 x 218 mm</p>
	<p>----BSNL Broadband connection(UNLI MITED) with booster ---PENDRIVES-16 GB(3 No.) ----HP DESKJE</p>

S.R No	Particulars		
	<p>Printer-cum-photocopier and scanner (A-\$) size.</p> <table border="1" style="width: 100%;"> <tr> <td style="width: 30%;">Warranty statement</td> <td>1 year (onsite) limited warranty with up-and-running phone support for first 30 days</td> </tr> </table>	Warranty statement	1 year (onsite) limited warranty with up-and-running phone support for first 30 days
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4	Provision for plantation around OHT and Head works site. including landscaping and beautification of construction site		
5	<p>Providing and fixing M.S. flat iron tree guard 60cm dia. and 2m height above ground level formed of 4 nos. 25x6mm and 8 nos. 25x3mm vertical M.S. flats rivetted to 3 nos. 25x6mm M.S. flat iron rings in two halves, bolted together with 8mm dia. and 30mm long bolts including painting two coats with paint of approved brand and manufacture over a coat of priming, complete in all respects.</p> <p>Plants of Regular varieties of 5 Ft. Height(100 NO.) including Transport</p>		
6.	RCC Roads		
7	<p>Providing and laying cement concrete for plain concrete/ reinforced concrete i/c form work, shuttering complete in as per drawings and specifications including Providing and placing in position cold twisted or un-coated HYSD steel Brand 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</p> <p>(i)WTP site 700m x 4.0m</p>		
8	Desilting & Screen Guard in Existing Jackwell		

GENERAL CONDITIONS RELATED TO FORM F LUMP SUM TENDER

The Contractor shall carry out confirmatory Topographic survey including trial trenching (For location of existing utilities), before commencement of the works. In case, the shifting of any existing, water pipe line/ utility is considered necessary by the Department /Municipal Corporation, such service lines will have to be shifted by the contractor for which the payment shall be made for the actual work done as per approved rate.

The contractor shall set up an office with an access to Jagdalpur Municipal Corporation (JAGDALPUR MUNICIPAL CORPORATION) official with proper seating arrangements.

During the Contract period, the contractor has to procure and install informatory board displacing Name of work (and specific details) at the location given by JAGDALPUR MUNICIPAL CORPORATION at his own cost.

The trial pits/ trenches shall be excavated by the Contractor after mutual agreement and approval of the Engineer along the alignment of the proposed pipelines. The trial pits / trenches including utility survey shall be carried out in advance of the topographic survey for the purpose of satisfying himself as to the location of underground obstructions or conditions.

Necessary permission from the competent authority/ police shall be obtained by the JAGDALPUR MUNICIPAL CORPORATION prior to digging up trial trenches/ pits. For this purpose the contractor

has to pursue with the relevant authority. The Employer may render necessary assistance for getting permission from the different authorities/ police for such excavation. The Contractor shall proceed with caution in any excavation and shall use all means to determine the exact location of underground utilities / structures like water line, sewer lines, conduits and other utilities etc, in the immediate vicinity thereof prior to excavation. The Contractor shall be solely responsible for the cost of protections or repair or replacement of any structure, water line, sewer line, conduit etc, above or below ground which may be broken or otherwise damaged by these operations.

Trial trench/ pits once excavated shall not be left unattended. Once the underground utilities are identified, the trench and pit shall be filled up and compacted to its original level. Any subsequent depression at this location due to vehicular movement shall have to be made good by the Contractor by filling additional borrowed earth. In any case, no inconvenience is to be caused to the vehicular and pedestrian traffic due to such trial trench excavation. Payment shall be made as per relevant items of the BOQ.

The depth of the trial pit/ trench shall be determined by the invert level of the pipeline as given in the data sheet issued by the Engineer in line with the Tender Drawings or as further instructed by the Engineer. A detailed sketch showing plan and sectional elevation view of the existing underground services, depth of sub-surface water level, type of soil based on visual inspection etc. shall be prepared for each pit/ trench and the same shall be submitted to the Engineer within 7 days. This information will form an input for the selection of alignment of proposed pipeline and production of Construction Drawing by the Contractor for approval by the Engineer-in-charge.

The lighting, barricading, guarding of the trenches and the provision of watchman shall be done by the Contractor. Some of the roads may be too narrow to provide barricade along the trenches. In such case the location of the barricades etc. shall be finalized by the Contractor in consultation with the Engineer-in-charge.

Necessary arrangements such as cranes, tripods, chain pulley block for lowering pipes into trench shall be made by the Contractor at his own cost. In no case pipes shall be dropped from a height. All posts and sight rails shall in no case be removed until the trench is excavated, the pipelines are laid and the Engineer gives permission to proceed with the backfilling.

The bedding for pipeline shall be provided as specified in the drawings, standard specifications and or as per direction of the engineer-in-charge.

The placement of bought out items and other construction materials during transit and during placement near the alignment shall be done with utmost care so that they are not damaged. Any damage due to these reasons shall be the Contractor's liability.

All the water lines are to be laid perfectly true to alignment and gradient specified. In case of spigot and socket pipes, the socket end of the pipe line shall face upstream. Properly fitted temporary wooden stoppers shall be provided to close the ends of incomplete water lines. The stoppers shall be removed when pipes are being laid and jointed. Open end of water line at the end of day's work shall be capped and sealed.

Water pipe laying and jointing shall be started and completed only section-wise as per instruction of the Engineer. Hydro-testing / Pressure testing of pipeline shall be done section-wise and as directed

by Engineer. The water lines shall be secured in place with approved backfill material tamped under it and proper care shall be taken during tamping at the socket end of the pipe to ensure that it is not damaged.

Backfilling of the trenches and temporary road restoration shall be taken-up immediately after laying of pipes for which payment shall be made as per contract provision. In case work needs to be suspended after excavation of trenches for any reason, the trench shall be backfilled immediately and re-excavated prior to re-commencing the work. No payment shall be made for backfilling/ excavation under such situation. If any portion of the trench needs to be kept open as per instruction of the Engineer-in-charge, same shall be suitably barricaded.

Installation of valves and pipeline appurtenances shall be taken-up simultaneously with the progress of pipe laying work.

The restoration of road/ footpath shall be done as specified and as per the requirements of the local authorities.

The excess excavated material shall be carried away from the site of works as specified, failing which, in view of public safety and traffic convenience, the Engineer-in-charge may carry out the work by any other agency at the Contractor's risk and cost.

The inspection and testing of all the bought out items (Pipes, Valves, Flow-meters etc), both at factory and site shall be carried out in presence of the Employer/ Engineer-in-charge or his representative unless otherwise directed by the Engineer-in-charge.

In the case of tanks whose external faces are submerged and are not accessible for inspection, such as underground tanks, the tanks shall be filled with water and after the expiry of seven days after the filling; the level of the surface of the water shall be recorded. The level of the water shall be recorded again at subsequent intervals of 24 hours over a period of seven days. The total drop in surface level over a period of seven days shall be taken as an indication of the water tightness of the tank. The Engineer-in-charge shall decide on the actual permissible nature of this drop in the surface level, taking into account whether the tanks are open or closed and the corresponding effect it has on evaporation losses. For many purposes, however, underground tanks whose top is covered may be deemed to be water-tight if the total drop in the surface level over a period of seven days does not exceed 40 mm.

If the structure does not satisfy the conditions of test, and the daily drop in water level is decreasing, the period of test may be extended for a further seven days and if specified limit is then reached, the structure may be considered as satisfactory.

In the rare event that the water retaining structure fails to pass the water tightness test satisfactorily, the Contractor will have to provide a comprehensive plan to identify the leakage areas and plug it by grouting the area with approved water proofing compound and shall demonstrate the water tightness test successfully. The entire operation shall be got done by the Contractor at no extra cost.

The Contractor shall provide for the hydraulic test by making his own arrangements for water filling and disposal of water after the test and shall repeat this test, if necessary, until the requisite test results are obtained without any claim for extra cost or compensation. The tendered rates for hydraulic

structures shall include all costs incurred by the Contractor for water tightness test.

Soil investigation

The Contractor shall carry out Soil Investigation work. The investigation results shall be used to establish the soil and parameters are to be adopted for the design of various structures as per relevant IS codes:

- Soil investigation work shall be carried out for all major structure of Water Treatment Plant.
- The soil investigation is necessary for finalization of the type of foundation of the structure and hence all necessary parameters like SBC, N-Value etc. are required to be determined for design purpose.
- All the Soil Test Reports are to be submitted in a separate booklet containing details of soil characteristics, testing details and results, foundation design and recommendations.

Applicable Standards and Codes

Wherever reference is made in the Contract to specific standards and codes to be met by the materials and other supplies to be furnished, and work performed or tested, the edition or the revised version of such codes and standards current at the date twenty eight (28) days prior to the date of bid submission shall apply, unless otherwise expressly stated in the Contract.

Where such standards and codes are national, other authoritative standards that ensure substantial equivalence to the standards and codes specified will be accepted subject to the Engineer-in-charge prior review and written approval.

Differences between the standards specified (In the contract / codes) and the proposed alternative standards must be fully described in writing by the Contractor and submitted to the Engineer at least 28 days prior to the date when the Contractor desires the Engineers approval. In the event the Engineer determines that such proposed deviations do not ensure substantially equal performance, the Contractor shall comply with the standards specified in the contract documents (or relevant codes as mentioned in the contract documents and or as decided by the Engineer-in-charge).

Quality Control on Works and Materials

The Contractor shall be responsible for the quality of the work in the entire construction work within the contract. He shall, therefore, have his own independent and adequate set-up for ensuring the same.

Quality Control and Tests

The Engineer-in-charge or his representatives shall inspect the work from time to time during and after construction and ascertain the quality of the work tested (by himself, or by his Testing and Quality Control Units or by any other agency deemed fit by him) generally as per the requirements

(outlined in the QA / QC manual). Additional tests may also be conducted where, in the opinion of the Engineer-in-charge, need for such test exists. In the absence of clear indications and frequency of tests for any item in the above mentioned publication, procedures and tests as directed by the Engineer-in-charge shall be followed.

The Contractor shall provide necessary cooperation and assistance in obtaining the samples for tests and carrying out the field tests as required by the Engineer from time to time. This may include provision of labour, attendance, assistance in packing and dispatching and any other assistance considered necessary in connection with the tests.

Quality Assurance Plan

The Contractor shall provide Quality Assurance Plan adhered by the manufacturing units for production of Electro-mechanical components (like Pipes, Specials, Valves, Flow-meters, EOT Cranes, pumps, motors, drives etc) as required prior to the procurement. If required Engineer-in-charge may inspect through self (or designated representative or Third Party Inspector) all manufactured items at the vendor's workshop / factory. After delivery of materials, the same should be visually inspected at site. The Contractor shall supply samples of the material / units, for testing as per the frequency and number of tests specified in the Quality Control Manual and get it tested by independent agency.

All equipments required shall be duly inspected by SGS/RITES.

Unacceptable Works

All defective / deficient Works are liable to be demolished, rebuilt, and defective materials replaced by the Contractor at his own cost. In the event of such Works being accepted by carrying out repairs etc. as specified by the Engineer-in-charge, the cost of repairs will be borne by the Contractor. Defective / deficient works shall also imply non-confirmation to quality standards and mandatory tests that shall guarantee successful completion.

No payment shall be made for rectification / repairs done on account of deficient in quality of materials or service.

Rates of Work items

In the absence of any directions to the contrary, the rates are to be considered as full inclusive rate for finished works covering all labour, materials, wastage, transportation, temporary work, plant, equipment, testing, overhead charges and profit as well as the general liabilities, obligations, insurance and risks. The rates quoted by the contractor shall, unless otherwise specified, also include compliance the activities stated below:

- 1 General works such as survey and setting out, clearance of site before setting out and clearance of works after completion; carrying out soil investigation works, condition assessment reports etc.
- 2 Preparation and submission of detailed Work Program for the construction and completion of the works (using CPM/PERT techniques) giving, in addition to construction activities, detailed

network activities for the submission and approval of materials, procurement of critical materials and equipment, fabrication of special products/equipment and their installation and testing, and for all activities of the Employer that are likely to affect the progress of work, etc., including updating of all such activities on the basis of the decisions taken at the periodic site review meetings or as directed by the Engineer-in-charge.

- 3 Tests to ensure that the material for construction are as per the relevant provisions contained in the Specifications including carrying out necessary test at Works on samples of various materials as proposed to be used on the Work and conducting tests thereon as required as per the provisions of the Contract and or as per codal provisions.
- 4 Design of mixes as per the relevant Clauses of the Specifications giving proportions of ingredients, sources of aggregates and binder along with accompanying trial mixes as per the relevant clauses of the Specification to be submitted to the Engineer-in-charge for his approval before use on the Works.
- 5 Testing of various finished items and materials including cement, concrete, bearings as required under these Specifications and furnishing test reports/certificates;
- 6 Cost of in-built provisions for Quality Control and Quality Assurance activities including of safeguarding/protection of the environment, as required from time to time.
- 7 Cost of Designs, Documents, drawings including necessary as-built drawings and other submittals as required under the specifications. Cost for procurement for necessary software (like Auto-CAD) required for preparation / updating the water supply network drawings, including finalisation of as-built drawings shall be considered to be included within quoted rates.
- 8 Cost incurred on Traffic management plan, including diversion works, accommodation of traffic, including erecting barricading, caution signs, project sign boards, and safety tapes to ensure protection at site.
- 9 Cost of all taxes, duties and royalties, site commissioning and all incidental costs.
- 10 Cost of all operations like storing, erection, moving into final position, etc. necessary to complete and protect the work till handing over to the Employer; and
- 11 Cost for storage of tools, plants and equipment's including office operations, as required from time to time.
- 12 Any other data which may be required as per these Specifications or the conditions of Contract or any other annexes/schedules forming part of the contract;
- 13 Any other items of works which is not specifically provided in the Schedule of Quantities but which is necessary for complying with the provisions of the Contract.

Should there be any detail of construction or materials which have not been referred to in the specifications or in the bill of quantities and drawings but the necessity for which may be implied or inferred wherefrom, or which are usual or essential to the completion of the work in the trades, the same shall be executed and if such work becomes an extra item of work, in the opinion of the Engineer, then it shall be analyzed by the Engineer-in-charge and got approved by the Employer for payment to the Contractor.

General Requirements for building works

Unless otherwise specified, all the building works shall generally comply with the following Employer's Requirements:

- (i) All buildings shall have reinforced concrete framework.

- (ii) 75 mm thick RCC Damp Proofing Course in M15 shall be provided to all building walls.
- (iii) Anti-termite treatment as per IS: 6313 part-III – 1971 with injection of chloropyriousemulsifiable concrete (1%) timber care ground treatment chemically emulsion 1:3 and creating a chemical barrier under and around the column pits, wall trenches, basement excavation, top surface of plinth filling, junction of wall and floor along the external perimeter of building, expansion joints, surrounding of pipes and conduits etc.
- (iv) All external walls shall be in 230 mm thick brick masonry built in cement mortar in (1:4). Transoms and mullions shall be of 115 mm x 230 mm size of cement concrete in M15 with four numbers 6 mm bars and 6 mm links at 150 mm c/c shall be provided to form panels not exceeding 3500 mm x 3500 mm in size.
- (v) All internal partition walls except for toilets shall be in 230 mm thick brick masonry built in cement mortar 1:4 with transoms and mullions as stated above. Toilet partition walls shall be in 115 mm thick brick masonry built in cement mortar 1:4 and shall have transoms and mullions as stated above to form panels not exceeding 1200 mm x 1200 mm size.
- (vi) All internal masonry surfaces shall be finished with 12 mm thick smooth faced cement plaster in cement mortar (1:4).
- (vii) All external masonry surfaces shall be plastered in two coats with sand faced cement plaster in cement mortar (1:4) and shall have total thickness of 20 mm. Waterproofing compound of approved make and quality shall be added to the cement mortar in proportions as specified by the manufacturer.
- (viii) Bathroom/ W.C. floor slab shall be sunk and filled with brickbat coba (broken bricks set in lime) and provided with waterproofing as per the specifications of an approved specialist waterproofing company. The finished floor level in Bathroom / W.C. areas shall be normally 12 mm below the finished floor level on the outer side.
- (ix) The toilet facilities shall include at least:
- 1 No. Water closet with white porcelain Orissa pan minimum 580 mm long with PVC flushing cistern of 10 liters capacity.
 - 1 No. Urinal of sizes 600 mm x 400 mm x 300 mm flat back type in white porcelain separated by a granite stone partition of size 680 mm x 300 mm shall be provided outside toilet.
 - 1 No. Wash basin of size 510 mm x 400 mm in white Porcelain with inlet, outlet with bottle trap.
 - 1 No. Mirror of size 400 mm x 600 mm PVC moulding wall mounted type fitted over washbasins.
 - 1 No. Plastic liquid soap bottles
 - 1 No. Chromium plated brass towel rails minimum 750 mm long.
 - All stopcocks, valves and pillar cocks shall be of chromium-plated brass, heavy duty.
 - All fittings such as 'P' or 'S' traps, floor traps, pipes, down-take pipes etc.
 - The sewage from toilet blocks shall be led to a septic tank with soak pit. The Contractor, at a suitable location, shall provide a septic tank having appropriate capacity, as per specifications.
- (x) Wherever specified, staircases shall be finished with granite Stone skirting or equivalent as approved by Engineer. The rise of stairs shall not exceed 170 mm and minimum width of the tread shall not be less than 275mm. All steps shall have 20mm nosing. R.C.C. stairways shall be provided to permit access between different levels within buildings. All roof tops and tops of overhead tanks shall be made accessible with ladder provision. Vertical ladders fitted with

- landing point extensions will be permitted where considered appropriate by the Engineer or Engineer's authorized Representative to access areas not frequently visited.
- (xi) All floor cutouts and cable ducts, etc. shall be covered with pre-cast concrete covers in outdoor areas and G.I. chequered plates of adequate thickness in indoor areas. All uncovered openings shall be protected with Stainless Steel hand railing fixed with two rails. Top railing and vertical of the Stainless Steel hand railing shall be 40 mm dia. The lower railing shall be 32mm dia. Stainless Steel (SS 316).
 - (xii) All staircases shall be provided with Stainless steel railing . The reinforced concrete roofs shall be made waterproof by application of approved cement/ lime based waterproofing treatment, guaranteed for 10 years. The finished roof surface shall have adequate slope to drain quickly the rainwater to R.W down-take points.
 - (xiii) For roofing drainage, cast iron rainwater down-takes with khurra and door bend with C.I. grating at top shall be provided. For roof areas up to 40 sqm minimum two nos. 100 mm diameter down-take pipes shall be provided. For every additional area of 40 sqm or part thereof, at least one no. 100 mm dia. down take pipe shall be provided. The RW pipes shall be concealed.
 - (xiv) Top surfaces of chajjas and canopies shall be made waterproof by providing a screed layer of adequate slope or application of an approved roof membrane and sloped to drain the rainwater.
 - (xv) Building plinth shall be minimum 450 mm above average finished ground level around building and shall not be less than plinth level of existing buildings.
 - (xvi) All buildings shall have a minimum 1.0 m wide, 100 mm thick plinth protection paving in M15 grade concrete finished with stone slabs/ tiles. All plinth protection shall be supported on well-compacted stratum.
 - (xvii) All concrete channels and ducts used for conveying liquid shall have smooth finish from inside. The width of concrete channels shall not be less than 500 mm. All open channels shall be provided with Stainless Steel (SS 316) hand railings.
 - (xviii) Kerbs to be provided below the hand railing on the catwalks/pathways should be as per relevant sections of the Factory Act.
 - (xix) All rooms in the treatment plant buildings shall be provided with appropriate signboards indicating the function of the rooms involved.
 - (xx) Wherever equipment and machinery is required to be moved for inspection, servicing, replacement etc., suitable movable gantry of required capacity shall be provided.
 - (xxi) The design of buildings shall reflect the climatic conditions existing on site. Process buildings shall as far as possible permit the entry of natural light.
 - (xxii) Emergency exit doorways shall be provided from all buildings in order to comply with local and international regulations. Stairways and paved areas shall be provided at the exit points.
 - (xxiii) Toilet blocks in process building shall be provided with two drinking water taps of 12 mm size and sink with appropriate drainage.
 - (xxiv) All chequered Plates shall be hot dip galvanized.
 - (xxv) Glass shall be minimum 5 mm thick, pin headed or opaque.

Excavation

The depth of excavation will be guided by requirement of stability of foundation, and the hydraulic levels of the various units. The contractor should himself verify this for design of foundation of structure and other hydraulic designs. The foundation shall be filled with bed concrete (leveling

course) in 1:3:6 (M 100) with 40 mm gauge graded metal or by the prescribed mix as proposed by the contractor in his design. But it should not be weaker than 1:3:6. The average plinth level shall be at least 1.0 m above general G.L. The difference of level between the floor of pump house and invert of sump well shall not be more than 2.50m in any case. The proposed treatment plant is having exposed moorum strata.

Foundation for Structures

The minimum depth of foundations for all structures, equipments, buildings and frame foundations and load bearing walls shall be as per IS: 1904.

Care shall be taken to avoid the interference of the foundations or any other component of the new building with the foundations of adjacent buildings or structure. Suitable adjustments in depth, location and sizes may have to be made depending on site conditions. The Engineer or Engineer's authorized Representative shall accept no extra claims for such adjustments. Special attention is drawn to danger of uplift being caused by the ground water table. Base raft for underground structure shall be designed for uplift forces that are likely to be developed.

Where there is level difference between the natural/ existing ground level and the foundations of structure or floor slabs, this difference shall be filled up in the following ways:

- (i) In case of non-liquid retaining structures the natural top soil shall be removed till a firm stratum is reached (minimum depth of soil removed shall be 500 mm.) and the level difference shall be made up by compacted backfill as per specifications. However, the thickness of each layer of the backfill shall not exceed 150 mm. The area of backfilling for floor slabs shall be confined to prevent soil from slipping out during compaction. The safe bearing capacity of this well compacted backfilled soil for design calculations shall not exceed 100 KN/sqm.
- (ii) In case of liquid retaining structures, the natural top soil shall be removed as described above and the level difference shall be made up with Plain Cement Concrete (1:5:10)

All materials used on civil works should be of quality approved by the Engineer-in-charge. Rejected material shall be removed from the site immediately.

Plinth level of Buildings

The average plinth level of all major buildings within the treatment plant area shall be 0.6m above the natural ground level.

The average plinth level of chemical house, filter house and the pump house shall be at least 1.0 m above general ground level. The entry in pump house shall with suitable approach ramp to enable machineries to be transported inside the building by trucks.

Brick Masonry

Brick work shall be done in C.M. 1:3 richer mix in masonry shall be done only if the structural design requires so and with prior approval of the Engineer-in-charge. The width of all walls done with brick-masonry shall be minimum 250mm for all buildings.

Flooring

The flooring of chemical house (Ground floor) shall be done with granite stone and that of first floor shall be done with 30 mm thick kota stone.

Floor around chemical tanks should have acid proof treatment. The floor of pump house portion shall be in M-30 mix with 150 mm thickness having specifications for Industrial use.

The flooring of Administrative Building, Staff quarters, sanitary block and all other places shall be of vitrified tiles.

Plastering

The brick masonry walls of building should be plastered with 1:3 cement mortar. The thickness of plaster from outer face of wall should be 20 mm and on inner face the thickness of plaster should be 13 mm. In chlorine room, sump well and wash water tank, due consideration shall be given to provide protective measures in R.C.C. work plastering etc. to prevent the corrosive effect of chlorine.

Doors and Windows

The opening area (for doors/windows/ventilators) for chemical stores and chlorine tonner storage room shall be 20% of the floor area. For rest of the units this area shall be 30%.

Painting and Colour Washing

Doors and windows except shall be painted inside and outside in two coats after priming coat as per the directions of the Engineer-in-charge. The wall shall be provided with two coats of approved quality emulsion paint with 5 years warranty on the inside and outside as per the direction of the Engineer-in-charge.

Roofing

The roof shall be casted in R.C.C. M-20 mix with 20 mm gauge graded metal as per thickness and reinforcement, details to be shown in the drawings and designs. All roofs and civil structures would be guaranteed for leakages as per relevant I.S.S. suitable treatment for water proofing shall be provided for roof slab.

Fire Extinguishers

Fire extinguishers for each building at every floor shall be provided, and fixed as per the relevant IS Specification.

Horticulture and landscaping

Horticulture and Landscaping shall be done according to the topography of the area and should be planned so as to make the treatment plan area a focal point. The open areas leaving expansion requirements must either be covered by tree plantation or must be suitably grassed. Shadow trees must be planted at a maximum distance of 15 m c/c along the periphery of the campus area and along the roads. The campus must be provided with gardens, with seasonal flowerbeds and decorative plants.

Horticulture operations shall be started on ground previously levelled and dressed to require formation levels and slopes. In case where unsuitable soil is met with, it shall be either removed or replaced or it shall be covered over to a thickness decided by Engineer-in-charge or Engineer's authorized Representative with good earth.

Tree guard

The concrete tree guard of 5' height shall be provided as specified by the Engineer-in-charge or Engineer's authorized Representative.

The planted trees, garden etc. so developed shall be maintained in good condition during the execution and maintenance period of the Contract without any additional costs. The Contractor shall ensure the safety of plants and shall take all the activities such as re-plantation, manuring, use of pesticides, mulching, cutting etc. for growth of trees / plants and maintenance of plants.

Grassing

The area from where the grass roots are to be obtained shall be specified by the Engineer-in-charge or Engineer's authorized Representative at the time of execution of the work. The soil shall be suitable moistened and then the operation of planting grass shall be commenced. Generally planting in either direction at 15 cm, 10 cm spacing is done in the case of large open spaces, at 7.5 cm spacing in residential lawns.

Miscellaneous requirements

Roads and Pathways

Contractor shall construct new Service road of 3.75m wide carriage way and 7.5m total width within the WTP connecting all important buildings, units and connecting the same to the main roads connecting to the premise with all associated CD and other necessary works

The works for roads shall cover site clearance, construction/ preparation of earthen embankment, subgrade, sub-base (granular), base course, pre mix carpet surfacing, Cross Drainage (CD) works, pipe culverts, shoulder construction, road markings, Arboriculture and other associated civil works

The new road shall have 225mm Granular sub-base, 150mm WBM topped with Bituminous Macadam (50mm) and a wearing course (Seal coat). The Contractor shall also provide MS gate at the entry point, as approved by the Engineer-in-charge for stopping unauthorized entry of personnel.

Nameplates and Signboards

Each item of the plant shall have permanently attached to it in a conspicuous position a nameplate, on which shall be engraved or stamped the manufacturer's name, type and serial number, year of manufacture, details of the design capacity etc. Such labels shall be of non-hygroscopic material to be approved by the Engineer or Engineer's authorized Representative. Near by or on each item of the plant, shall be fixed a plate with the name and nomenclature (code) of the item according to the project nomenclature. It shall be visible from a distance of several meters.

The Contractor shall also provide bilingual signboards and instruction tables of durable material,

throughout the plant, for the purposes of operation, maintenance and security:

- Danger and caution signs (English and local language)
- Preventive maintenance schedules (local language)
- Operating instructions (local language)
- Unit names (English and local language)
- Nameplates at the doors to the units (English and local language)

Signboards and plates shall be appropriately sized in relation to the relevant item and its surroundings. Details of the proposed inscription, size, material and colours shall be submitted to the Engineer or Engineer's authorized Representative for approval before any signboards or plates are manufactured. They shall be compatible with the instructions in the operation manual.

All cables shall be provided with clip-on identification numbers on both ends and at all terminations in between, for identification. The nomenclature shall correspond to the electrical as-built drawings.

The nomenclature and labelling of the plant shall be decided in close co-operation with the Engineer-in-charge or Engineer's authorized Representative.

First Aid kits

The first aid kit shall consist of all materials, medicines necessary for treatment of cuts, wounds, burns bad effects of inhalation of chlorine, bad effects on skin due to contact of chemicals acids etc. Following materials in general in sufficient quantities shall be provided.

- (i) Medical cotton, sterile cotton pads
- (ii) Cotton Bandages, elastic bandages
- (iii) Pair of scissors, packet of new shaving blades
- (iv) Sticking plaster for medical use.
- (v) Band aid stripes

Following chemicals/medicines shall be provided in sufficient quantities:

- (i) Tinctures iodine and mercury chrome
- (ii) Burnol ointment
- (iii) Bottles of spirit and of Dettol
- (iv) Toilet soaps

To be procured under medical advice

- (i) Tablets for bad-effects of chlorine inhalation
- (ii) Skin lotions and ointments for burns, acid effects
- (iii) Eye drops for soothing effects

Separate First Aid Kits shall be provided in Raw Water Pump House, Workshop, and Clear Water Pump House. Fire extinguisher and first aid kits shall be provided for the end of the commissioning period only. They shall not be used before and shall be complete.

Waste-water drainage

The foul drainage system shall accept discharge from toilets, washrooms, offices and the laboratory. The foul drainage system shall discharge to a septic tank of appropriate capacity and the supernatant shall discharge into a soak pit.

Safety Requirements at Site

The Contractor shall be responsible for safety of his staff on Site during the execution and O&M services.

The Contractor's duties with respect to Safety shall include the following:

1. Utilize safety awareness procedures in every element of Operation and Maintenance.
2. Give emphasis to site safety including :
 - a) Safe working procedures.
 - b) Cleanliness and care of site as a whole.
 - c) Accident and hazardous conditions reporting.
 - d) Organise Safety discussion meeting with all the personnel weekly.

Formal discussions on safety shall be held with all concerned agencies at least once a month.

The Contractor shall provide Notice Boards/ Display Boards at appropriate location detailing precautions to be taken by Operation and Maintenance personnel in work in conformity to regulation and procedures.

The Contractor shall notify the EIC immediately, if any accident occurs, whether on-site or off-site in which the Contractor is directly involved which results in any injury to any person, whether directly concerned with the Site or a third party. Such initial notification may be verbal and shall be followed by a written comprehensive report within 24 hours of the accident.

The contractor shall have to provide and maintain a suitable First Aid Box at the office. The first aid box shall be equipped but not limited to, with following medicine and first aid materials:

- a) Different sizes of sterilized dressings
- b) Sterilized dressing for burns
- c) 30ml bottle containing 2% alcoholic solution of iodine
- d) 30gm bottle of potassium permanganate crystal
- e) Scissors
- f) Boric cotton
- g) Ointment of burns
- h) A bottle of suitable surgical antiseptic solution

Services and Facilities to be provided by Employer

The Employer shall be liable to the Contractor for the following:

- a) Provide free office accommodation space with attached toilet space for O&M personnel of the Contractor including security room within the WTP Premises.
- b) The charges for power during the O&M period shall be paid by Employer.

Special Conditions

The following special conditions shall be binding on the contractor:

- (a) **Agreement with the Contractor:** Rates for the O&M services shall be governed by the rates quoted by the bidder under Bill No.: (In Volume-II of the bid document) for due consideration of the Employer. The contractor shall sign a separate agreement with the Employer along with the contract for the main works.
- (b) **Performance Security:** The Contractor shall provide a Performance Security for O&M Services in the form of a bank guarantee for an amount of Ten percent (10%) of the contract value of the O&M services issued by a reputable bank including scheduled bank or nationalized bank located in India, acceptable to the Employer in the format enclosed. The Performance Security for O & M services contract shall have to be furnished two months prior to the commencement of the O&M services.
- (c) **Insurance Policies:** The Contractor shall undertake insurance during the operation and maintenance period :
 - (i.) For all Equipment related to the proposed new WTP. The value of the insured equipment shall be considered as 70% of the composite value of the equipment agreed in the Contract for the case of new equipment.
 - (ii.) Against Injury to Persons and Damage to Property
 - (iii.) Contractor's Personnel

The Contractor shall submit evidence of Insurance as per the provisions within 28 days from the date of commencement of the O& M services with the Employer and submit the relevant insurance policies within 45 days from the date of commencement of the O& M services with the Employer.

- (d) **Advance Payment:** No advance payment will be paid for operation and maintenance services.

Other Terms and Conditions

- (a) The personnel engaged by the Contractor shall not be absorbed by the in the Employer in any circumstances.
- (b) The Contractor shall have to ensure timely payment to their personnel and comply with the provisions of all labour legislation and rules.
- (c) In case of any difficulties faced by the Contractor in performing the operation & maintenance activities, the same shall be reported immediately to the concerned EIC for taking necessary action.
- (d) The Employer shall not be responsible for any untoward incident of accidental death, injury, and medical treatment etc. during on-duty hours. The payment of compensation if required

under Workmen Compensation Act, 1923 and any other act, rules shall be borne by the Contractor. This will be statutory obligation on the part of the Contractor.

- (e) The Contractor has to ensure the payment of minimum wages to the deployed personnel as declared by the Labour Department, Govt. of CG from time to time. Any enhancement of minimum wages during the contractual period shall be paid by the Contractor, Such additional charges shall however not be payable to the Contractor by the Employer.
- (f) The working hours of the operation & maintenance, number of shifts and timings of shift for each WTP shall be approved by the EIC. The personnel engaged by the Contractor should follow /abide by the instructions of the EIC.
- (g) The Contractor shall deploy minimum number of operation & maintenance personnel having requisite qualification on each shift of the day as specified approved by the EIC. The same shall be done in such a manner that at no point of time, the pumping station remains inoperative. The Contractor shall ensure that none of the operation and maintenance personnel leaves his duty place unless and until he is relieved by another person deployed by the Contractor for the next shift.
- (h) The O&M personnel deployed by the Contractor shall record their time of attendance and departure on every day/shift in attendance register which is to be maintained at the place of deployment. Such attendance register shall be produced before the concerned EIC for regular checking.
- (i) The Contractor shall not deploy any person as Operation & Maintenance personnel who may be found unsuitable for duty on medical ground because of illness (mental/physical), old age and or infirmity, duly certified by a registered medical practitioner.
- (j) The Contractor shall keep himself informed of the relevant and related laws & ordinances and shall conduct the work in compliance with such laws. Fees for necessary permits, licenses,& taxes required by law shall be paid by the Contractor as per GCC.
- (k) For filling the vacant position on the event of death or otherwise, the Contractor must inform and seek consent from the EIC for the appointment of new worker.
- (l) The Employer reserve the right to terminate the annual operation and maintenance contract of the plant (s) in case of non-performance of the Contractor based on report of the EIC. The termination shall however be governed by the GCC of the contract.
- (m) All other terms and conditions shall be governed by the standard practices prevalent with the Employer.

Penalty for theft, Pilferage

The contractor shall be liable to compensate the Employer for any loss of property of the WTP due to theft, pilferage, damage, etc. caused as a result of negligence, mishandling, wrong operation, etc. on the part of personnel engaged by the contractor for operation and maintenance of the WTP (s). The penalty amount shall be fixed by the Employer or the same shall have to be restored in original condition to the satisfaction of the Employer.

Note: The above scope of work and others details are minimum and not limited and Bidders are advised to visit the JMC office and site in advance to verify the balance scope of work

with concerned Nodal official Amrut Mission Jagdalpur before quoting the rates. Any items/components which may not be mentioned in the scope of work, but are necessarily required for successful commissioning of the Plant/system with desired outputs and complete functions in all respects will be deemed to inclusive in quoted cost by the bidder and nothing extra shall be paid by JMC

ANNEXURE - "E-8"

OPERATION AND MAINTENANCE OF THE SCHEME FOR 5 YEARS

Scope of Services

Operation & Maintenance for 5 Years of existing 09 MLD WTP and proposed 35 MLD WTP including PLC SCADA monitoring & control system (covering all WTPs all RWPs, CWPS, valve actuators, OHSRS, FCVs, & electromagnetic bulk flow meters) and all new RWPS & CWPS including replacement and warranty for 5 years.

The Contractor shall operate and completely maintain the the following installations for 05 years including warranty and replacement :

- 1) Proposed Water Treatment Plant near old WTP (35 MLD) for a period of 05 years (60 months) including all civil, Electro-mechanical equipment including the clear water pump house, PLC –SCADA Automation system including clear water pump house including replacement and warranty.
- 2) Existing Water Treatment Plant (09 MLD) for a period of 05 years (60 months) including all civil, Electro-mechanical equipment including the clear water pump house, PLC –SCADA Automation system including clear water pump house including replacement and warranty.
- 3) Raw water Intake well cum-Pump House including civil structures all pumps and panel etc complete for a period of 5 years including replacement and warranty.
- 4) The complete system which has been executed by the contractor to their rated capacities

For maintenance services of the new installation works including civil works under this Works during the defect liability period, the contractor shall have to carry out all works as per its obligation under the contract free of cost. All necessary repairs shall be made to maintain the WTP during the above period as per the status at taking over. After the successful 12 months Trial Run of the 35 MLD WTP including clear water pump house , Raw water Intake well –cum pump house, the Contractor shall operate and maintain :

The contractor will carry out the complete operation and maintenance of the all the above mentioned installations for 05 years including supply, replacement of electro-mechanical parts/equipment , repairs, repairs to civil structures , distempering and painting of structures at no extra cost to the Municipal Corporation.

The tasks of the Contractor shall broadly be to:

- Operate and maintain the proposed WTP of 35 MLD and 9 MLD existing WTP capacity, raw water Intake well- cum- pump house, for 05 years from the date of taking over (immediately after the 12 months trial run period).
- Operate and maintain PLC SCADA Automation System installed and commissioned in existing 9 MLD WTP in Takiya complete for 05 years including replacement and warranty.
- Keeping the down time of any equipment as low as possible but at least below the desired level including operating the plants at the design capacity.
- Communication and co-ordination with the adjacent related facilities and concerned agencies, as required.

The complete operation and maintenance, services shall be performed according to the following

principles/ specifications:

Minimum down time	<p>The WTP shall never be operated at less than 50% of its design capacity due to maintenance and repair works. Period of such operation shall not exceed more than two consecutive days and not more than three days in a week. The maximum downtime of the whole plant shall not exceed more than 6 continuous hours. In case the downtime continuously in a day exceeds 06 hours, contractor will be penalised Rs.5000 /hour(Rupees five thousand per hour only). Exceeding 06 hour. Further if this downtime exceeding 06 hours takes place more than on 3 no. Occasion in a month a penalty of Rs 10000/-(Rupees ten thousand per event only)event will be imposed. The period for repairs and maintenance has to be communicated to the Engineer-in-Charge (EIC) at least one month in advance.</p> <p>The down time due to non-availability of power or of raw water at Contractor's point of receipt for any reason shall not be included in the above period.</p>
Operation of the plant as per O&M Manual	<p>The WTP shall be operated according to the rules and procedures laid down in the O&M Manual provided by the manufacturers and CPHEEO. The working hours of the plant and the output quality shall be as per IS 10500 given here.</p>
Awareness & Cleanliness	<p>The Contractor and his staff shall maintain a high degree of awareness in operation and maintenance of the WTP (s). At all times the WTP, its equipment and surroundings shall be kept clean and in order including building floors, walls, roof, windows, road, drains etc.</p>
Frequency of Preventive Maintenance	<p>The preventive maintenance will be done according to the recommended preventive maintenance schedule of the manufacturers of the WTP/components of the WTP with prior intimation to the Engineer-in-charge well in advance. The regular staff may be reinforced by short term specialists by the Contractor for special maintenance tasks at the contractor's own expenses.</p> <p>All required equipment, materials, manpower and other resources for the operation, maintenance, and repairs shall be arranged by the contractor.</p>
Repairs	<p>Repairs shall be made as and when needed very promptly on the spot or at the Contractor's workshop; the need of repair on the spot or at the Contractor's workshop has to be defined in co-ordination with the EIC. No extra payment shall be made for any repairs (including E & M, Civil) & replacement.</p>
Equipment, Spare parts, Consumables etc.	<p>The contractor shall arrange all spare parts, equipment, other consumables etc., and their fitment as and when necessary for smooth and efficient operation and maintenance at contractor's own expenses throughout the contract period. The contractor shall always have the spares available in his store as per the list approved by engineer for carrying out repairs properly.</p> <p>Old / worn out part after replacement shall have to be returned to the Employer as per direction of the EIC.</p>
Civil Structures and Civil Works	<p>All existing and proposed civil structures and works shall be maintained by the contractor including all minor and major repairs/works at the contractor's own expenses. The contractor before</p>

	initiating any major works shall obtain approval of the EIC.
Transportation	All necessary transportation required for operation, and maintenance activities to be carried out shall be arranged and made by the Contractor at his own costs.
Consumables	The Contractor has to ensure that there is always sufficient stock of 30 days of the consumables (like alum, grease, lubricant, oil etc) required.

General Obligations

The Contractor shall operate and maintain the WTP including PLC-SCADA Automation system, Raw water Intake well cum pump house, and all the proposed facilities, including roads, plantations, illumination etc., within the premises under this contract for the period specified in the scope of services. Contractor shall submit a detailed Operation and Maintenance plan for approval of Employer one month before taking over. All Operation and Maintenance activities by Contractor shall be carried out strictly in accordance with the approved plan. The General Obligations of the Contractor shall include but not limited to:

- (a) Operation and Maintenance of the proposed WTP including all associated facilities.
- (b) The Contractor shall comply with all safety rules and regulations as per the CPHEEO manual and relevant BIS codes.
- (c) Provide necessary skilled/ unskilled labour/ supervisors/ technicians for maintaining all utility services, sweeping, cleaning of Office room, laboratory, privies, toilets, washroom etc., including cost of all materials and equipment for maintaining the utility services. Personnel employed by the contractor for the services will in no case be absorbed by the Employer.
- (d) Providing necessary labour for cutting of grass, removal of debris, shrubs, development of grassed areas etc as maybe required from time to time. Personnel employed by the contractor for the services will in no case be absorbed by the Employer
- (e) Maintaining strict vigil so as to secure the areas and not allow any trespassers into the area.
- (f) Liaison with concerned Power Supply Agency in case of any voltage trouble (high or low) or breakdown in Power Supply or Low power factor or any other troubles, is the responsibility of the Contractor and the same to be recorded in the Log Book accordingly.
- (g) The contractor shall submit to EIC for approval the calculated power requirement for operating all the facilities, machineries and equipment for the entire services prior to the finalization of the contract including O & M services. The Contractor shall ensure that minimum power requirements are consumed for Operation of the WTP (s). The calculated power demand will be compared with the actual power consumption and if the actual consumption is more than 15% higher than the calculated (expected) consumption, the costs for the same will be deducted from the Contractors monthly bills.
- (h) All maintenance activities shall be recorded in the maintenance register and to be checked and countersigned by the EIC.
- (i) The Contractor shall insure the entire premises against burglary/ theft/ malicious damage/ rust and fire during the tenure of the operation and maintenance activities. The insurance policy shall be endorsed in favour of the Employer. The Contractor shall insure his workmen/ supervisors against all statutory rules and regulation viz. workmen's compensation, third party liability, accidents etc. The Employer shall not bear any

responsibility or cost for any such untoward incident, accident, death, injury, medical treatment etc. The premium shall be borne by the Contractor and shall be considered while quoting the price of operation and maintenance services in the Bill of Quantities.

- (j) The contractor shall be liable to compensate the Employer for any loss of property within the WTP (s) on premises due to theft, pilferage, damage, etc. caused as a result of negligence, mishandling, wrong operation, etc. on the part of personnel engaged by the contractor for operation and maintenance of the WTP (s) and all other existing and proposed facilities. The penalty amount shall be fixed by the Employer or the same shall have to be restored in original condition to the satisfaction of the EIC.
- (k) All prevalent labour laws are to be maintained by the Contractor as per norms.
- (l) Fighting fire with the fire extinguishers in the event of such contingency shall be the responsibility of the contractor. The contractor shall ensure that refilling of fire extinguishers is done as per norms.
- (m) The Contractor must adhere to the regulation of E.S.I., E.P.F., Service tax, labour license etc. The Contractor shall be responsible for depositing the subscription of the E.S.I., E.P.F, Service tax etc. to respective government agencies. The Contractor shall submit their documents regarding payment of E.S.I., E.P.F., Service tax etc, to the EIC as per norms. The monthly claim of the contractor shall enclose proof of month before the previous month's deposition of E.S.I., E.P.F. and related tax.
- (n) At the end of maintenance period, an assessment of the condition of the WTP (s) and all other facilities will be carried out by the Employer. Based on the above assessment the Contractor shall, at no extra cost to the Employer, repair and re-condition all the electro-mechanical equipment in the concluding year of the maintenance contract to a condition so that they are in satisfactory running condition with regular preventive and recommended maintenance as per manufacturers' recommendations and/or as per CPHEEO manual/ standard Engineering practice.
- (o) Hand over the WTP including all associated facilities and also the entire premises, immediately after completion of O&M period, in good, running, and acceptable condition.
- (p) The contractor shall furnish atleast 03 reports
 - (1). At different times of the day daily indicating the raw water & treated water reports highlighting physic-chemical & biological characteristics to engineer-in-charge.
 - (2). Further he will furnish atleast 02 reports at different times of the day daily indicating the incoming and outgoing water characteristics of each treatment units of WTP to the engineer-in-charge. These reports will indicate the efficiency of each treatment unit.

Operational Requirements for 35 MLD WTP including PLC-SCADA Automation System , Raw water Intake well-cum Pump House & PLC-SCADA Automation System for existing 9MLD WTP with clear water P/House.

The operation of the proposed WTP will include running all electro-mechanical equipment uninterrupted for all days (24x7) including all holidays. Operation shall be done in proper coordination and in consultation/direction of the Employer to avoid any malfunctioning of the machineries. During operation, the contractor shall adhere to the following points for smooth operation of the plant:

- a) Operation of all pumps, valves, instrumentation controls at the WTP and allied structures / facilities like Wash water tanks, including all allied electro-mechanical components of the WTP including Clearwater Pump House & Electrical Sub Station as per requirement.

Any sorts of defects, faults in electro-mechanical equipment/components are to be intimated immediately to the EIC and contractor will take corrective action for repairs & replacement without any extra cost.

- b) Operating the valves as necessary on a diurnal basis, considering the inflows or that maybe required from time to time.

Staffing Requirements for Operation and Maintenance of WTP:--

The Contractor shall provide experienced technical, administrative, and non-technical personnel, and labour necessary to operate and maintain the WTP and also to maintain other works under scope of work as stipulated in the contract, properly, safely, and efficiently on a continuous 24 hours basis for the full term of the O&M Period including holidays.

The qualifications and capability of the Contractor's personnel shall be appropriate for the task they are assigned to perform. The staff provided shall be fully trained in the operation and maintenance of the works before being given responsibility for operation of the services. If, in the opinion of the EIC, a member of the Contractors staff is considered to be insufficiently skilled or otherwise inappropriate for the task he is required to perform, he shall be replaced by the Contractor with a person with the appropriate skills and experience for the task, with the approval of the EIC.

The bidder shall propose in its tender a staff management structure for the Operation and Maintenance of all the services under O&M Scope in the Contract. This structure for O&M work shall be expected to include at least but not necessarily be limited to the following personnel:

Position	Minimum Qualification	Nos.	Requirement
Supervisor cum Shift in-charge	Diploma holder in Mechanical/ Electrical / Instrumentation/Telecommunication with knowledge of computer	1 Nos.	In each shift
Operator	ITI qualification and having Supervisory Electrical license preferably with knowledge of computer	2 Nos.	In each shift
Helper	-	1 Nos.	In each shift
Electrician		1 Nos.	In each shift
Mechanic		1 Nos.	In each shift
House Keeping including Jungle cutting, reservoir cleaning	-	2 Nos.	Each day
Security	-	1 Nos.	Each Shift

The above personnel suggested are the minimum requirement. It is expected that the contractor will provide the above personnel for operation and maintenance of all works under the scope of work taking together all three shifts in a day. Necessary stand by provisions shall have to be made to take care of absences / leave.

The shift-in-charge shall be responsible for total management of the operation and maintenance. He shall have authorization to receive instructions from the EIC time to time and acts accordingly. The Contractor shall provide all secretarial support, printing and publishing services, office furniture and office supplies as necessary for entire O&M period. Procurement of office furniture and other utilities will be made under provisional sums before the commencement of O&M services and these shall be the property of the Employer. The list of office furniture to be procured shall be approved by the EIC

before procurement.

The Curriculum Vitae of the Contractor's personnel shall be submitted to the EIC for acceptance at least two months (60 days) before the anticipated commencement of the pre-commissioning. Normal time duty hours for the Contractor's Operation & Maintenance personnel may be modified as necessary and agreed by the EIC. A rotating shift schedule shall be established by the Contractor and approved by the EIC which will ensure that an adequate number of the Contractor's staff will be available for on duty at WTP 24 hours each day, 7 days per week, including all holidays.

The O&M personnel shall dedicate 100% of their time for the specified duties and responsibilities and shall not be diverted to perform Contractor's administrative duties, construction arrangement, office management, or other non-project activities. Adequate support staff shall be provided by the Contractor in order to avoid any such diversion. No claim for idle hour shall be entertained.

Employer shall direct the contractor to remove any or all staff employed for O&M services if in his opinion continued presence of such staff is detrimental to safety or proper O&M. The contractor shall comply with such directions & post suitable substitute(s) thereof. Whenever the EIC has to inform the Contractor in writing that any person on the work is in his opinion unsatisfactory or/incompetent or unfaithful or dishonest, untruthful or disorderly or to be otherwise unsuitable/such person shall be discharged by the Contractor from the work and shall not be reemployed.

No labour below the age of 18 years shall be employed on the work. List of staff is to be given by the agency to the Contractor and advance intimation to be given before deputing/removing any staff from site during the O&M period. Not more than one of the Contractor's key staff shall be absent from the Project site at any given time. In case it is necessary for more than one of the key personnel to be absent at a given time, the Contractor shall provide replacement of equivalent or better qualifications. The CVs of such key staff replacements shall be got approved from Employer in advance.

Recording and Reporting Requirements:----

Contractor shall record quantity and quality of raw water inflows and out flows on a daily basis along filter bed-operation through SCADA. Staff attendance shall also be recorded along with register for cleanliness.

Overall reporting formats will be finalized and approved by EIC and may have to be modified from time to time as required and approved by EIC. Contractor may have to prepare and submit additional reports on particular matter and incidents as and when required by the EIC.

Besides, submission of reports, the contractor shall have to maintain various charts / books / registers recording daily data on operation and maintenance. The following are the charts/books/registers that are required to be maintained other than specific requirements raised by the EIC:

Sl No.	Name of Register/ Log book	Contents	Frequency of Record keeping
1	Attendance book	Attendance of workmen and supervisors	Daily shift wise
2	Log Book for Operation	Parameters of performance of pumps, motors, panel, power factor etc as per the direction of EIC. These shall include but not limited to – Voltage – Current	Hourly

Sl No.	Name of Register/ Log book	Contents	Frequency of Record keeping
		<ul style="list-style-type: none"> - Power - Power factor - Pressure - Water level - Duration of operation of each filter bed - Flow - Other physical, electro-mechanical and hydraulic characteristics. 	
3	Cleanliness Register	Record of cleaning of pumping Machineries, various buildings, office room, control room, floors, toilets and surrounding areas and WTP premises etc	Daily to be submitted to EIC
4	Maintenance book	Record of regular, preventive and breakdown maintenance	Based on requirement
5	Consumption / Consumables book	Record of spares required for equipment	Based on requirement
		Record of fittings, fixtures, etc. required for replacement	Based on requirement
		Record of consumables	Based on requirement supplied by the Department

Maintenance Activities

The scope shall include regular maintenance of all the pumps, motors, starters, circuit breakers, switches, control panel, cranes, valves/gates, flow measuring devices etc. for smooth and efficient operation/performance of the WTP . Regular maintenance of the Treatment plant area shall be taken up with proper cooperation and coordination with the personnel concerned with the operation & maintenance of the said WTP and in consultation/ direction of the concerned EIC. During the maintenance activities the Contractor should adhere to the following points:

- (a) The contractor shall prepare and implement an effective plant maintenance programme in consultation with the EIC. It is the Contractor's responsibility to provide all sorts of maintenance - preventive, minor, major, or break-down in nature. Further, the Contractor shall attend to any defects/repair works that may be required during the tenure of the O&M contract.
- (b) The contractor shall plan and arrange all spares and all consumables including grease, lubricating oil, cleaning agents, etc. Further the contractor shall plan about the requirement well in advance (At least 1 month) and procure the material from the market, thereby maintaining a safe stock of the spares and consumables.
- (c) Regular/periodical maintenance such as insertion/replacement of the packing, greasing of bearings, and replacement of gear oil/lubricating oil shall be carried out according to

standard engineering practice/manufacturer's recommendation. The same shall be intimated to the concerned EIC well in advance.

- (d) The casing / volute cover of the pumps shall be opened twice in a year for thorough inspection of the internal parts/components ensuring smooth operation of the Treatment Units / Plants. However, the above maintenance activities in addition to the mandate above shall be carried out as and when required as per direction of EIC.
- (e) Blown out fuses, indicating lamps, contact points etc. shall be replaced by new ones as and when required.
- (f) The contractor shall cover in his quoted rates cost of replacement of chokes, switches, ballasts, igniters, son lamps, etc. as and when required. No payment shall be made to the contractor for such replacements.
- (g) Cleaning and maintaining of treatment unit and other electro-mechanical equipment shall be taken up as per standard engineering practice, operation & maintenance manual and as per the instructions of the manufacturer of the equipment.
- (h) The tightness of fasteners, bolts and nuts & terminals shall be checked at periodic intervals and necessary tightening done as per necessity.
- (i) The Contractor shall supply consumables like soaps and detergents, jute, cotton waste and cotton flame, napkins, disinfectants, sweeping accessories, polishes, rain-coats, safety shoes, gumboots, site order books with pages in triplicate, candles, torches with battery and matches, forms, log books, quarterly cleanliness log book, attendance register, pen, scale and stationeries as required for day to day O&M activities. The Contractor shall also supply tube lights, incandescent lamps, starters for tube light, indicating lamps, insulating tapes, nut and bolts, screws, cable sockets, grease, oils packing and arrange to replace or fit as per necessity.
- (j) The contractor shall maintain sufficient tools and plants at Treatment plant which shall be required for operation and maintenance. These consists of items like screw drivers, spanners, slide wrench, hammers, chisels, pliers, cutting pliers, hack saw with blade, hand drill, spirit level, measuring tape, scales, etc.
- (k) Repairing works of pumps, motors, panels, switches, circuit breakers, gates, valves and other electro-mechanical machineries of the Treatment plant shall be carried out as per direction of Engineer-in-Charge and as per standard engineering practice.
- (l) Preventive and running maintenance of pipes, valves etc.
- (m) Preventive and running maintenance of control panel, PCC, MCC, relay, etc. for smooth operation of the WTP.
- (n) Preventive and running maintenance of pumps, motors, valves, cranes etc.

Periodic maintenance of the machineries is to be ensured by deploying qualified and trained personnel

Building and Site Maintenance

The Contractor shall be responsible for:

- a) Full maintenance of building electrical, ventilation, plumbing, and drainage installations.
- b) Building and housekeeping maintenance.
- c) Full maintenance of the site, water and wastewater services, cabling and earthing system, together with the site road lighting system, boundary fencing.
- d) Site maintenance including the upkeep of landscaped areas, gardening, plantations
- e) The telephone installations in all buildings.

The building services and housekeeping maintenance shall be undertaken in all buildings and services installations created under this contract and existing. Routine housekeeping maintenance shall be carried out in accordance with the procedures specified in the Operation and Maintenance Manual.

Preventive Maintenance

The Contractor shall prepare a planning of the day-to-day maintenance and the preventive maintenance. This planning must include all equipment and the estimated necessary hours in preventive maintenance and curative maintenance. The Contractor must mention the qualification of the foreseen maintenance personnel required for each case.

The Contractor shall provide the yearly requirement of consumables needed for the operation and maintenance of all equipment. These correspond only to the day-to-day maintenance, preventive maintenance and fore-seen curative maintenance if any. The Contractor shall get the plan approved from the Engineer-in-Charge.

Maintenance of Assets Created

For the first year of maintenance period, all electro-mechanical assets (Like pumps, motors etc) that have been installed / rehabilitated shall follow routine maintenance activities.

Illumination of the WTP

The Contractor shall have to keep the illumination system of the WTP area in full working condition. The Contractor shall maintain the proper illumination level in the office room, security room, pumping stations including outdoor roads. In doing so, he must replace the defective spares like lamps, condensers, igniters, ballasts etc. in proper time for all outdoor luminaries of standard quality.

Safety Requirements at Site

The Contractor shall be responsible for safety of his staff on Site during the O&M services.

The Contractor's duties with respect to Safety shall include the following:

3. Utilize safety awareness procedures in every element of Operation and Maintenance.
4. Give emphasis to site safety including :
 - e) Safe working procedures.
 - f) Cleanliness and care of WTP as a whole.
 - g) Accident and hazardous conditions reporting.
 - h) Organise Safety discussion meeting with all the personnel weekly.

Formal discussions on safety shall be held with all concerned agencies at least once a month.

The Contractor shall provide Notice Boards/ Display Boards at appropriate location detailing precautions to be taken by Operation and Maintenance personnel in work in conformity to regulation and procedures.

The Contractor shall notify the EIC immediately, if any accident occurs, whether on-site or off-site in which the Contractor is directly involved which results in any injury to any person, whether directly concerned with the Site or a third party. Such initial notification may be verbal and shall be followed by a written comprehensive report within 24 hours of the accident.

The contractor shall have to provide and maintain a suitable First Aid Box at the office. The first aid box shall be equipped but not limited to, with following medicine and first aid materials:

- (a) Different sizes of sterilized dressings

- (b) Sterilized dressing for burns
- (c) 30ml bottle containing 2% alcoholic solution of iodine
- (d) 30gm bottle of potassium permanganate crystal
- (e) Scissors
- (f) Boric cotton
- (g) Ointment of burns
- (h) A bottle of suitable surgical antiseptic solution

Services and Facilities to be provided by Employer

The Employer shall be liable to the Contractor for the following:

- a) Provide free office accommodation space with attached toilet space for O&M personnel of the Contractor including security room within the WTP Premises.
- b) The charges for power during the O&M period shall be paid by Employer.

Special Conditions

The following special conditions shall be binding on the contractor:

- (e) **Agreement with the Contractor:** Rates for the O&M services shall be governed by the rates quoted by the bidder in Annexure Price Bid-- for due consideration of the Employer. The contractor shall sign a separate agreement with the Employer along with the contract for the main works.
- (f) **Performance Security:** The Contractor shall provide a Performance Security for O&M Services in the form of a bank guarantee for an amount of Ten percent (10%) of the contract value of the O&M services issued by a reputable bank including scheduled bank or nationalized bank located in India, acceptable to the Employer in the format enclosed. The Performance Security for O & M services contract shall have to be furnished two months prior to the commencement of the O&M services.
- (g) **Insurance Policies:** The Contractor shall undertake insurance during the operation and maintenance period :
 - (i.) For all Equipment related to the proposed new WTP. The value of the insured equipment shall be considered as 70% of the composite value of the equipment agreed in the Contract for the case of new equipment.
 - (ii.) Against Injury to Persons and Damage to Property
 - (iii.) Contractor's Personnel

The Contractor shall submit evidence of Insurance as per the provisions within 28 days from the date of commencement of the O& M services with the Employer and submit the relevant insurance policies within 45 days from the date of commencement of the O& M services with the Employer.

- (h) **Advance Payment:** No advance payment will be paid for operation and maintenance services.

Other Terms and Conditions

- (n) The personnel engaged by the Contractor shall not be absorbed by the in the Employer in any circumstances.

- (o) The Contractor shall have to ensure timely payment to their personnel and comply with the provisions of all labour legislation and rules.
 - (p) In case of any difficulties faced by the Contractor in performing the operation & maintenance activities, the same shall be reported immediately to the concerned EIC for taking necessary action.
 - (q) The Employer shall not be responsible for any untoward incident of accidental death, injury, and medical treatment etc. during on-duty hours. The payment of compensation if required under Workmen Compensation Act, 1923 and any other act, rules shall be borne by the Contractor. This will be statutory obligation on the part of the Contractor.
 - (r) The Contractor has to ensure the payment of minimum wages to the deployed personnel as declared by the Labour Department, Govt. of CG from time to time. Any enhancement of minimum wages during the contractual period shall be paid by the Contractor, Such additional charges shall however not be payable to the Contractor by the Employer.
 - (s) The working hours of the operation & maintenance, number of shifts and timings of shift for each WTP shall be approved by the EIC. The personnel engaged by the Contractor should follow /abide by the instructions of the EIC.
 - (t) The Contractor shall deploy minimum number of operation & maintenance personnel having requisite qualification on each shift of the day as specified approved by the EIC. The same shall be done in such a manner that at no point of time, the pumping station remains inoperative. The Contractor shall ensure that none of the operation and maintenance personnel leaves his duty place unless and until he is relieved by another person deployed by the Contractor for the next shift.
 - (u) The O&M personnel deployed by the Contractor shall record their time of attendance and departure on every day/shift in attendance register which is to be maintained at the place of deployment. Such attendance register shall be produced before the concerned EIC for regular checking.
 - (v) The Contractor shall not deploy any person as Operation & Maintenance personnel who may be found unsuitable for duty on medical ground because of illness (mental/physical), old age and or infirmity, duly certified by a registered medical practitioner.
 - (w) The Contractor shall keep himself informed of the relevant and related laws & ordinances and shall conduct the work in compliance with such laws. Fees for necessary permits, licenses,& taxes required by law shall be paid by the Contractor as per GCC.
 - (x) For filling the vacant position on the event of death or otherwise, the Contractor must inform and seek consent from the EIC for the appointment of new worker.
 - (y) The Employer reserve the right to terminate the annual operation and maintenance contract of the plant (s) in case of non-performance of the Contractor based on report of the EIC. The termination shall however be governed by the GCC of the contract.
 - (z) All other terms and conditions shall be governed by the standard practices prevalent with the Employer.
- (n) Guarantee for equipment : The contractor shall submit indemnity bond towards guarantee of equipments for second rainy season if it does not fail within 12 months after satisfactory commissioning of the Plant. The securities deducted towards this will be released on production of such bond.

(o) Spares parts : The contractor shall give a list of spare parts/items which are essential for two years maintenance with their rates. The Jagdalpur Municipal Corporation would approve the list of spares which is to be submitted by the contractor. Operation and Maintenance for 5 Years

(p) The contractor shall operate and maintain the water treatment plant including all the civil structures, electro-mechanical equipments, pipes, pipe specials, instrumentation provided by him in 35 MLD Water Treatment Plants. He will maintain spares with stores for the proper upkeep of the WTP. List of spares is given below.

LIST OF SPARES:

For repairs and proper upkeep of the WTP in case any repair to any equipment is required, no extra payment will be paid to the contractor.

For non compliance of the water quality parameter a penalty of Rs. 5000/- for one event in a day shall be levied.

ii) **Residual chlorine at outlet of clear water pump house \leq 2 ppm**

(q) PERFORMANCE CAPABILITY:

For rapid gravity filters, the performance standards should be in accordance with para 6.6.8.2 of manual on water supply and treatment published by CPHEEO.

(r) Guarantee for the Equipment:

All the mechanical equipment and appurtenances supplied and erected by the tenderers shall be covered by a guarantee for satisfactory working for a minimum period of 12 months or 2 consecutive rainy season whichever is more. From the date of satisfactory commissioning of the plant. The tenderer at his own cost, such replacement being arranged by tenderer as expeditiously as may be directed by the Executive Engineer shall replace any defective parts detected during this guarantee period.

(s) The tenderer shall supply and deliver a full set of spares for working of the plant, continuously for 2 years. These spares price shall be quoted separately with full details for the parts offered.

(t) Testing and Inspection:

All pipes and other castings subjected to pressures, shall be hydraulically tested to 2 times the designed pressures as directed by the Executive Engineer.

The entire work during manufacturing and erection, shall be subjected to inspections by the departmental staff (i.e. Executive Engineer or his nominees) for which adequate facilities, shall be extended by the tenderers at his cost.

(u) Typical raw water characteristics in the annexure attached.

(v) The WTP process will have arrangement for recycling of used back wash water for its complete treatment so that it becomes Zero Liquid Discharge facility

General Terms

Payment shall be made to the contractor on monthly billing cycle for:

1. Operation of the WTP for a period of 120 months.
2. Maintenance costs for the WTP including associated works and maintenance of existing facilities within the WTP as described for a period of 120 months, after successful completion of the defects liability period.

3. The Contractor shall submit the bill for each month within the fifth working day of the next month to the concerned Engineer-in-charge.

The Monthly Progress Report along with Staff attendance sheet, duly signed by each Staff and countersigned by the Contractor shall be submitted with the monthly bill for operating the WTP (s).

Non-Compliance

The EIC / representative designated by the Employer will make random visits to the WTP to review the operation and maintenance practices including:

- (1). Compliance to operating of the WTP as per agreement
- (2). Compliance for safety
- (3). Review of staff, attendances
- (4). Cleanliness of the Site etc

All field visits must be recorded and outcome of the visit/minutes of the meeting should be signed by Contractor and Employer for compliances.

Non-compliance to Reporting Requirements

All records shall be compiled for the monthly progress report to be submitted to the Employer. The monthly reports shall be submitted on the fifth day of the next month. The monthly report shall generally contain information in prescribed formats that shall be finalized in consultation with Employer.

The Reports shall include:

- Staff attendance for the Month
- Log Book showing Operation of Filter wash / pumps
- Cleanliness Register
- Maintenance book
- Consumption / Consumables book

Non-compliance to submission of the Monthly reports or in maintaining the records shall result in a deduction of 5% of the monthly charges.

Non-Compliance in the event of non-maintenance / repairs

The WTP shall not be operated at less than 50% of its design capacity due to maintenance and repair works. The period of such operation shall not exceed more than two consecutive days and not more than three days in a week. The maximum downtime of the WTP shall not exceed more than 8 continuous hours. The period for repairs and maintenance has to be communicated to the Engineer-in-charge (EIC) at least one month in advance.

In the event of failure to comply with the above operational requirement, the penalty shall result in deduction of 10% of the monthly charges.

Non-compliance to Staffing Requirements

At no point the staff / manpower within the pumping stations shall be less than 75% of the strength required. In no case, the absence of the Shift In-charge and Operator shall be admissible. The applicable rates for reduction on the Monthly Fees for staff / manpower on any day are as presented below:

Sl. No	Staff / Manpower attending to Staff /Manpower Required / Proposed (Whichever is higher)	Reduction in Rate
1	100%	Nil
2	90%	10% of the rates for non-compliance for each day
3	80%	25% of the rates for non-compliance for each day
4	75%	50% of the rates for non-compliance for each day
5	Less than 75%	100% of the rates for non-compliance for each day

Penalty for theft, Pilferage

The contractor shall be liable to compensate the Employer for any loss of property of the WTP due to theft, pilferage, damage, etc. caused as a result of negligence, mishandling, wrong operation, etc. on the part of personnel engaged by the contractor for operation and maintenance of the WTP (s). The penalty amount shall be fixed by the Employer or the same shall have to be restored in original condition to the satisfaction of the Employer.

Note: The above scope of work/conditions and others details are minimum and not limited. Any items/components/spares/staff requirements which may not be mentioned above, but are necessarily required for successful Operation and maintenance of the complete scheme/Plant/system in all respects will be deemed to inclusive in quoted cost by the bidder and nothing extra shall be paid by JMC

Annexure - "F"(Main) : Price Schedule

S. No.	Component of Water Supply Scheme	Percentage Payment to the Contractor wrt Quoted cost (Lumpsum) of Construction cost.
Part A		
I	<p><u>Intake well-cum Pump House</u> Provision of Intake well-cum Pump House[10 m dia and 32 m depth ** & connecting main (DI pipe,Class k-9,length 50m) from Indravati river to Intake well including Site preparation, Preparation of complete Designs, Detailed drawings, including excavation and laying of PCC M-20 complete.</p> <p>Note--** Total depth of Intake well shall be from discharge floor level to founding level as per site requirement.</p>	0.640 %
II	<p><u>Raw Water Pumps</u> (a)Supply, fixing 4 Nos. of Vertical Turbine Pumps of 530. cum/hour at 50 m head[22 hour running] including suction ,delivery , manifold pies, valves, Electrical panel , installation and commission complete with 12 months of trial run in Raw Water Pump House& (b)Provision of Electric Sub Station 33/0.415 KV,500 KVA (2 no.) at Raw Water Intake well-cum-Pump House</p>	1.088 %
III	<p><u>Raw Water Pumping Main</u> Supply, laying, jointing,testing of Raw Water Pumping main from proposed Intake well to proposed WTP of 600 mm DIA DI(Class K-9) pipe of 347 m length including excavation, ancillary civil works, valves,laying,jointing,testing including EPDM rubber gaskets, DI specials, DI fittings, surge protection devices, thrust blocks,including hydro-static testing, road resurfacing complete including installation and commissioning and 12 months of trial run.</p>	0.717 %
IV	<p><u>WTP:</u> (a)Provision of Water treatment Plant of 35 MLD capacity (with 20% overloading of all treatment units) based on lamella Clarifier Near existing WTP of 9MLD) based on Lamella Clarifier, recirculation of water & sludge and clear water sump (636 cun capacity) complete with all electro-mechanical equipment for screen chamber, Flash mixer, Cascade type aerator, Vacuum Type Chlorinators , recirculation of wastewater & sludge complete including installation and commissioning with 12 months of trial run. (b) And For Existing 9 MLD WTP : Provision of additional 2 filter beds 3.5 m X 6.0 m with actual filtration rate of 2500 Lit/Sqm/Hr are proposed for the augmentation to 14.0 MLD capacity besides the existing filter bed recirculation of wastewater & sludge complete including installation and commissioning with 12 months of trial run.</p>	2.717 %

	(c) Demolition of Existing 4.5 MLD WTP- and removal of debris to the disposal site.All electrochemical equipment,pumps,motors, and electric panels shall be handed over to Municipal Corporation officials.	
V	<p>Clear Water Pumps:-</p> <p>A. Supply, fixing 4 Nos. of Clear Water Horizontal Split casting Centrifugal Pumps each of 510cum/hour at 50 m head[22 hour running] at Clear Water P/House including deliver, suction, manifold pipe, valves, electrical panel etc complete including installation and commissioning with 12 months trial run &</p> <p>B. Provision of Electric Sub Station 33/0.415 KV,500 KVA (2 nos) capacity at Clear Water-ump-cum-Pump House</p>	1.088 %
VI	<p>Clear water Pumping Main:--</p> <p>Supply, laying, jointing, testing of Clear Water Pumping main of following pipes For 150 to 600 mm DIA , DI (Class K-9)---5013 m length. including excavation, ancillary civil works, valves, DI specials, DI fittings surge protection devices , road resurfacing complete and 12 months of trial run.</p>	3.078 %
VII	<p>OHSRs:-</p> <p>Provision of RCC Overhead Reservoir with inlet, outlet, wash out and over flow pipe, digital level indicator with sensor including water tightness test , installation and commissioning complete with 12 months of trial run as follows:</p>	
	(i) Dharampura Proposed OHSR of 300 kL at 20 m staging	0.323 %
	(ii) Army Training Centre OHSR of 850 kL at 15 m staging	0.064 %
	(iii) Jaiswal ColonyOHSRof 750 kL at 20 m staging	0.814 %
	(iv) Wardhaman ColonyOHSRof 650 kL at 20 m staging	0.085 %
	(v) Lal Bagh OHSRof 1250 kL at 20 m staging	0.161 %
(vi) Hathkachora OHSRof 650 kL at 20 m staging	0.085 %	
VIII	<p>Water Distribution Network:--</p> <p>Supply, excavation, laying, jointing, testing of DI pipe(Class K-7) for distribution network, --199926.15 m total length, DI specials & fittings, road resurfacing with 12months of trial run</p>	52.201 %
IX	<p>Pipe Pushing using Trenchless Technology:-</p> <p>For National Highway Crossing for NH 16 (2 Locations) & NH 43 (1 Location) using Push Through Method</p>	0.592 %
X	<p>HSCs:-</p> <p>(a)Consumer Metering with House Service Connection (Clamp saddle, (PE-AL-PE) Composite Pressure Pipes, GM or brass ferrules, Brass stop-cock, G.I pipe 15mm dia, MS/PP Meter Box, Compression fittings, with AMR compatible consumer water meters,</p> <p>i. 15 mm DIA-22615 nos</p> <p>ii. 20 mm DIA-730 nos</p> <p>iii. 25 mm DIA-487 nos</p>	23.642%

	<p>Supply and installation of Multi jet,dry dial inferential type,horizontal,magnetically coupled,Class “B” water meters conforming to to IS 779,1994 and ISO 4064: 1993 standard with EEC/MID certification mark with IP 68 protection class copper can register with 5 mm tempered mineral glass cover,successful Life Cycle Test certificate from FCRI and AMR compatibility with 5 years warranty complete with brass nuts and nipples with all accessories and service connection including excavation,dewatering,cost of jointing material,fittings and all other related works.</p> <p>Providing and Supply of clamp Sadle (DI SStrap Saddle) for House Service connection from metal pipe water Distribution mains shall be 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 elastomeric 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 up to pipe sizes of NB 600 and service outlet 15 mm,20mm & 25 mm.fasteners shall be of threaded nut-bolt washer type.The seating between the saddle and mains shall be obtained by using a profiled elastomeric seal mathing to the curvature of the pipe. The seal shall be of elastomeric type,suitable for all portable water application.The material of construction of the body,straps fasteners etc shall be of non corrsive material such as engineering (PE/PP) or stainless or a combination of both.</p> <p>(b)consumer survey, (c)Customer Facility Center, (d) Billing software (of approved make) along with 20 Smart Phones with 12 month trial run for complete item.</p>	
XI	<p>Electromagnetic Bulk Flow Meters [150 mm to 500 mm –46 No.] at various entry points of the System, (b)Electric Valve actuators, [150 to 500 mm dia---46 No.] (c)Pressure Gauges { 100 mm dia---38 No.] & (d)Flow control Valves—42 No.[150 mm to 400 mm Dia]</p>	3.664 %
XII	<p>PLC & SCADA automation, monitoring and control system for exsiting and proposed components including RWPS(existing and proposed),WTP (exsiting and proposed),ESRS/OHSRs (existing and proposed),Bulk flow meters,EMFs,Pts,Level transmitters,Chlorine sensors,,FCVs,Presssure gauges etc with facility of centralized monitoring and control and as per technical specficiations in NIT complete</p>	7.484 %
XIII	<p>Provision of ancillary civil works : Provision of Compound wall – 0.44%,[950 RM] Chain link mesh fencing – 0.05%, [1050 sqm] Steel Main Gates – 0.04%, [22 No.] Misc items – 0.03,[computers, peripherals, furniture , broadband connection] Plantation at OHT & WTP site, tree guard,plants of regular varities – 0.14%, Roads WTP site – 0.21%, [RCC road—1600 sqm]</p>	1.559 %

	Copper lightening conductor – 0.02% Desilting & Screen Guard in Existing Jackwell – 0.07%	
	TOTAL A	100.00 %
S. No.	Component-B	Percentage Payment wrt Quoted cost (LumpSum) of 5 years Operation and Maintenance by contractor
	Operation & Maintenance for 5 Years of existing 09 MLD WTP and proposed 35 MLD WTP including PLC SCADA monitoring & control system (covering all WTPs all RWPs,CWPS, valve actuators,OHSRS,FCVs,& electromagnetic bulk flow meters) and all new RWPS & CWPS including replacement and warranty for 5 years. O & M per Year ----	
	For first Year	18%
	For Second Year	19%
	For Third Year	20%
	For fourth Year	21%
	For fifth Year	22%
	TOTAL B	100%

IMPORTANT NOTE

The payment of R.A. Bills shall be made as per actual work done at site and as certified by Engineer-in Charge.

For pipe line works payment shall be made as per SOR 2013 for Pipe line works (PHED, PWD & WRD with percentage below or above of contractor's lumpsum offer with respect to PAC. However, in any case, the total payment made to the contractor shall not exceed the amount fixed by percentage of pipe line works. The final payment shall be equal to the amount fixed by percentage of pipe line works.

**Annexure - "F-1(RCC Raw Water Intake well-cum-Pump House)" : Price
Schedule**

TABLE-A

PERCENTAGE Break-up of payment for the Construction of RCC Raw Water Intake well-cum-Pump House with connecting main (For 0.640 % of Lumpsum offer)

Sl. No	Description	Percentage amount for the Reservoir on completion
	Design, Construction, , topographical survey ,geotechnical investigation (determination of SBC)Testing, Commissioning of RCC Raw Water Intake –well-cum-pump House including providing pipes, valves, testing, and commissioning all complete as per specifications at:	
1.	Approval of structural drawing & design by PDMC including topographical survey ,geotechnical investigation (determination of SBC),excavation, dewatering etc and laying of PCC 1:2:4 at bottom	3 %
2.	Excavation, Dewatering and Cofferdam	5 %
3.	Civil work (Raw Water Sump- cum- Pump House) Construction of foundation	7 %
4.	After casting of all columns and beams Upto half height of the discharge floor level	11 %
5.	After casting upto and including discharge floor slab	11 %
6.	Casting of motor floor slab	11 %
7.	Completion of pump house with RCC roof slab	11 %
8.	Connecting Main from Indravati river to Intake well of dia 900mm	20 %
9.	Mechanical & electrical works installation and commissioning including approval by Third party Inspection[SGS/RITES]	7 %
10.	Inside & outside oil bound distemper	7%
11.	On testing of structure & all other equipments etc. Including 12 months trial period	7 %
	TOTAL	100 %

Note: **The payment of R.A. Bills shall be made as per actual work done at site and as certified by Engineer-in Charge.**

**Commissioner
Municipal Corporation Jagdalpur**

**Annexure - "F-2 (Clear water Pumps and Raw water Pumps)" : Price
Schedule**

PERCENTAGE Break-up of payment for Clear water Pumps, Raw water Pumps and Electric Sub-Station (For 2.176 % of Lumpsum offer)

BREAK UP :

- A. **On supply of equipment at site - 85%| Duly approved by Third Party Inspection(SGS/RITES) |**
- B. **On erection of equipment at site - 10%**
- C. **On testing and commissioning - 5%**

Total:- **100%**

The percentage cost of work for intermediate payment at different stages of work shall be as follows:-

PART- A

SCHEDULE FOR ITEMS FOR RAW WATER VT PUMP SET (PROPOSED)

S. No.	Particulars.	Qty.	% Payment of work
	DESIGN, SUPPLY, FIXING, COMMISSIONING, TRIAL RUN OF FOLLOWING AS PER DETAILED SPECIFICATIONS GIVEN ON ANNEXURE "E"		
1.	V.T pump for 148LPS at 51 Mtr. total head as per detail specification along with column pipe of size 300 (pipe)x 43 (shaft) mm column assembly of 15 MTR length I/c bowl assembly, Foundation bolts for above pump set along with suitable HP VHS Electric Motor 3 phase, 415 volts, as per detail specification. Pump efficiency minimum 80% at duty point.	4 Nos.	12.4%
2.	Vertical Hollow Shaft motor, SPD, 1450 RPM suitable to operate on 415V + 10%, 3P, 50Hz, AC supply having 'F' class insulation temp. rise limited to 'B' class with continuous duty, conforming to IS-325	4 Nos.	8.0%
3.	Butterfly valve electrically operated of PN 1.0 size 300mm for delivery side of pump as per detail specification.	4 Nos.	0.4%
4.	Sluice valve of PN 1.0 size 300mm for delivery pipe as per detail specification.	4 Nos.	0.4%
5.	Non-Return valve of PN 1.0 size 300mm for delivery side of pump as per detail specification.	4 Nos.	0.4%
6.	Sluice valve of PN 1.0 size 500mm for manifold pipe line as per detail specification.	1 Nos.	0.3%
7.	Non-Return valve of PN 1.0 size 500mm for common manifold as per detail specification.	1 No.	0.3%
8.	D/f Flow meter of electromagnetic type for installation on manifold pipe as per detail specification.	1 No.	0.4%

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9.	Pressure gauge of dial size 150mm dia for 0-7kg/cm ² delivery side of pump as per detail specification	4 Nos.	0.1%
10.	M.S./ CI Dismantling Joint of 300 mm for delivery side of pump as per detail specification.	4 Nos.	0.2%
11.	M.S./ CI Dismantling Joint of 500 mm for common manifold pipe.	1 No.	0.2%
12.	M.S. D/F Pipe for delivery of 300mm size of 8 mm thickness along with flanges hardware like Nut, Bolts, Washers & Rubber Sheet, complete for joining pipes, valves, etc.	400Kg	0.2%
13.	M.S. C.I. D/F 300 x 500mm as per distance prices delivery side	4 Nos.	0.1%
14.	M.S. S/F 300 mm Bend of 90/45 deg for jointing to common main fold and pump outlet.	4 Nos.	0.1%
15.	M.S. D/F Pipe for common manifold of 500mm size of 8 mm thickness and of lengths as required along with flanges & hardware like Nut, Bolts, Washers & Rubber Sheet complete for joining pipes, valves, etc.	2500 Kg	1.5%
16.	3½ core x 400sq.mm Aluminum Armored cable from MCCB to pump hose MCCB including accessories like lugs, gland. For connection of Transformer MCCB Panel to Motor Panel.	300 Mtr.	0.5%
17.	3½ core x 185sq.mm Aluminum Armored cable from Panel to motor including accessories like lugs, gland. For connection of Panel to Motor.	250 Mtr.	0.4%
18.	EOT Crane 3 Ton capacity of approved make complete as per specification.	1 Set	2.0%
19.	MOTOR CONTROL PANEL: Motor control panel shall be as per detail specification alongwith soft starters 4 Nos. As per specification.	1 Set	3.5%
20.	Earthing work using G.I. Plate of 600 x 600 x 6mm, G.I. Strip 25 x 3 mm, Complete hardware of earthing like coal, salt, galvanized nut-bolts, funnels, G.I. Pipes etc., and main hole cover for earthing pit. Complete	4 Nos.	0.3%
21.	Tools accessories as per specification.	1 Set	0.2%
22.	Installation and commissioning of all above items including painting, trial run of 12 months and testing	1 Job	1.0%
		TOTAL	32.90%

Note: The payment of R.A. Bills shall be made as per actual work done at site and as certified by Engineer-in Charge.

PART - B

SCHEDULE FOR ITEMS FOR CLEAR WATER PUMPSET. (PROPOSED)

S.No	Particulars.	Qty.	% Payment of work
	DESIGN, SUPPLY, FIXING, COMMISSIONING, TRIAL RUN OF FOLLOWING AS PER DETAILED SPECIFICATIONS GIVEN ON ANNEXURE "E"		
1.	Centrifugal pump for 142LPS at 50 M total head with positive as per detail specification along with Coupling, Coupling guard, Base Plate & Foundation bolts for above pump along with suitable HP Electric Motor as per detail specification. Pump efficiency minimum 80% at duty point.	4 Nos.	12.4%
2.	Suitable HP Electric motor 3 phase, 415V, foot mounted type TEFC, 1450 RPM as per detail specification.	4 Nos.	8.0%
3.	Sluice valve of PN 1.0 size 350mm for suction side of pump as per detail specification.	4 Nos.	0.4%
4.	Sluice valve of PN 1.0 size 300mm for delivery side as per detail specification.	4 No.	0.4%
5.	Non-Return valve of PN 1.6 size 300mm for delivery side of pump as per detail specification.	4 Nos.	0.4%
6.	Sluice valve of PN 1.0 size 500mm for manifold pipe line as per detail specification.	1 No.	0.3%
7.	Non-Return valve of PN 1.0 size 500mm for common manifold pipe line as per detail specification.	1 No.	0.3%
8.	Pressure gauge of dial size 150mm, 0-14 kg/cm ²	4 Nos.	0.1%
9.	D/F Flow meter of electromagnetic type size 500mm for installation on manifold pipe as per detail specification.	1 No.	0.4%
10.	M.S. D/F Pipe for suction as per site requirement of 350mm size along with flanges hardware like Nut, Bolts , Washers & Rubber Sheet complete for joining pipes, valves, etc.	800 Kg	0.3%
11.	M.S./ CI Dismantling Joint of 350 mm for suction side of pump as per detail specification.	4 Nos.	0.3%
12.	M.S. D/F Pipe for delivery of 300 size along with hardware like Nut, Bolts , Washers & Rubber Sheet complete for joining pipes, valves, etc.	600 Kg	0.2%
13.	M.S. D/F 300mm Bend of 45°/90° for jointing to common main fold and pump outlet.	4 Nos.	0.2%
14.	M.S. D/F Pipe for common manifold of 500 mm size and of following lengths along with flanges & hardware like Nut, Bolts , Washers & Rubber Sheet complete for joining pipes, valves, etc.	2500 Kg	1.5%
15.	3½ core x 400sq.mm Aluminum Armored cable including accessories like lugs, glands. For connection of Transformer MCCB panel to Motor Panel.	300 Mtr.	0.4%
16.	3½ core x 240 sq.mm Aluminum Armored cable from starter to motor including accessories like lugs, gland. for panel to Motor.	200 Mtr.	0.4%
17.	EOT Crane of 3 Ton capacity with 6 mtr. span& 6mtr. lift of chain & 40 x 40 mm sq. bar etc. complete as per specification.	1 Set	0.2%
18.	MOTOR CONTROL PANEL: Motor control panel shall be as per detail specification, along with 4 Nos, soft starters as per specification.	1 Set	2.0%
19.	Earthing work using G.I. Plate of 600 x 600 x 6mm, G.I. strip 25 x 3mm, Complete hardware of earthing like coal, salt, galvanized nut-bolts, funnels, G.I. Pipes etc., and main hole cover for earthing pit. Complete, as per IE Rule.	4 Nos.	3.5%
20.	Accessories as per specification.	1 Set	0.2%
21.	Installation and commissioning of all above items including painting, trial run of 12 months and testing	1 Job	1.0%
		TOTAL	32.90%

Note: The payment of R.A. Bills shall be made as per actual work done at site and as certified by Engineer-in Charge.

PART – C - 1

SCHEDULE OF ITEMS FOR CLEAR WATER PUMPING STATION SUB STATION.

S.No	Particulars.	Qty.	% Payment of work
	DESIGN, SUPPLY, FIXING, COMMISSIONING, TRIAL RUN OF FOLLOWING AS PER DETAILED SPECIFICATIONS GIVEN IN ANNEXURE “E”		
1	33/0.415 kV 500 KVA Transformer having as per detail specification.	2 No.	10.2%
2	33 kV Lightning Arrestor.	6 Set.	0.25%
3	33 kV DO Fuse Unit.	4 Set.	0.10%
4	33 kV A.B. Switch Complete with Rod/ Handle.	2 Set	0.25%
5	ACRS Conductor.	200 MTR.	0.36%
6	33 kV Pin Insulator.	18 Nos.	0.30%
7	33 kV DISC Insulator.	54 Set.	0.30%
8	Hardware kit, complete for laying of ACSR Conductor & inter connection from A/B Set, L/A Set, D/O Set, Pin & Disc Insulator upto transformer.	2 Set.	0.36%
9	3½ core x 400 sq.mm Aluminum Armored cable from Transformer to MCCB panel including accessories like lugs, glands.	150 Mtr.	0.42%
10	Main panel having 400 Amp MCCB for fixing near transformer.	2 Set	0.25%
11	Earthing work using G.I. Plate of 600 x 600 x 6mm, G.I. Strip 25 x 5 mm, Complete hardware of earthing like coal, salt, galvanized nut-bolts, funnels, G.I. Pipes etc., and main hole cover for earthing pit. Complete	14 Nos.	0.18%
12	I Section 200 x 100 - Length as required . Channel 100 x 50 , etc. – as required.	4700 Kg.	2.50%
13	Fencing work using 50 x 50 x 5mm size vertical post of 3 Mtr. length and 50 x 50 x 5mm size struts for even corner of 3 Mtr., Wire mesh of 3mm thick with netting size of 100 x 100mm of height 2 Mtr., M.S. Flats of size 25 x 3mm size for vertical & horizontal support. Hardware material, like Nut, Bolt, G.I. Wire, etc. for fencing., Gate of 3.5 Mtr. Wide & height of 1.5 Mtr. of Iron Steel.	51 Rmtr	0.50%
14	Metalling	1 Lot.	0.10%
15	Street lighting poles of height – 8.5 Mtr. Sodium Vapor Lamp of 250 Watts & fitting for Sodium Vapor lamp with hardware complete.	4 Nos.	0.28%
16	Cables of 2.5sq.mm x 2 core copper armored cable for street lighting load.	300 Mtr.	0.10%
17	Drawing preparation for sub – station and approval from safety electrical inspector.	1 Job	0.05%
18	Charging permission for sub – station and approval from safety electrical inspector.	1 Job	0.05%
19	All civil work relating to erection of poles, fencing work, construction of platform for transformer, earth pit chambers.	1 Job	0.20%
20	Installation and commissioning of all above items including painting, trial and testing	1 job	0.25%

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21	ACCESSORIES		0.10%
	Rubber Hand Gloves.	1 Set.	
	Ball Pin Hammer with Wooden Handle.	1 Set.	
	Screw Driver 8" & 12"	1 Set.	
	Shock Treatment Chart.	4 Nos.	
	Danger Notice Board.	1 Nos.	
	Fire Stand with Fire Bucket in sub-station.	1 Nos.	
	Insulated Player.	1 Set.	
	Fire extinguisher 4.5 Kg.	1 Set.	
	D.O. Operating rod 33 kV fiber H.D.	1 Set.	
	Discharge rod with accessories fiber.	1 Nos.	
	Helmet H.D.	1 Set.	
	Total percentage of Part C-1		17.1%

Note: **The payment of R.A. Bills shall be made as per actual work done at site and as certified by Engineer-in Charge.**

PART – C - 2

SCHEDULE OF ITEMS FOR CLEAR WATER PUMPING STATION SUB STATION.

S.No	Particulars.	Qty.	% Payment of work
	DESIGN, SUPPLY, FIXING, COMMISSIONING, TRIAL RUN OF FOLLOWING AS PER DETAILED SPECIFICATIONS GIVEN IN ANNEXURE “E”		
1	33/0.415 kV 500 KVA Transformer having as per detail specification.	2 No.	10.2%
2	33 kV Lightning Arrestor.	6 Set.	0.25%
3	33 kV DO Fuse Unit.	4 Set.	0.10%
4	33 kV A.B. Switch Complete with Rod/ Handle.	2 Set	0.25%
5	ACRS Conductor.	200 MTR.	0.36%
6	33 kV Pin Insulator.	18 Nos.	0.30%
7	33 kV DISC Insulator.	54 Set.	0.30%
8	Hardware kit, complete for laying of ACSR Conductor & inter connection from A/B Set, L/A Set, D/O Set, Pin & Disc Insulator upto transformer.	2 Set.	0.36%
9	3½ core x 400 sq.mm Aluminum Armored cable from Transformer to MCCB panel including accessories like lugs, glands.	150 Mtr.	0.42%
10	Main panel having 400 Amp MCCB for fixing near transformer.	2 Set	0.25%
11	Earthing work using G.I. Plate of 600 x 600 x 6mm, G.I. Strip 25 x 5 mm, Complete hardware of earthing like coal, salt, galvanized nut-bolts, funnels, G.I. Pipes etc., and main hole cover for earthing pit. Complete	14 Nos.	0.18%
12	I Section 200 x 100 - Length as required . Channel 100 x 50 , etc. – as required.	4700 Kg.	2.50%
13	Fencing work using 50 x 50 x 5mm size vertical post of 3 Mtr. length and 50 x 50 x 5mm size struts for even corner of 3 Mtr., Wire mesh of 3mm thick with netting size of 100 x 100mm of height 2 Mtr., M.S. Flats of size 25 x 3mm size for vertical & horizontal support. Hardware material, like Nut, Bolt, G.I. Wire, etc. for fencing., Gate of 3.5 Mtr. Wide & height of 1.5 Mtr. of Iron Steel.	51 Rmtr	0.50%
14	Metalling	1 Lot.	0.10%
15	Street lighting poles of height – 8.5 Mtr. Sodium Vapor Lamp of 250 Watts & fitting for Sodium Vapor lamp with hardware complete.	4 Nos.	0.28%
16	Cables of 2.5sq.mm x 2 core copper armored cable for street lighting load.	300 Mtr.	0.10%
17	Drawing preparation for sub – station and approval from safety electrical inspector.	1 Job	0.05%
18	Charging permission for sub – station and approval from safety electrical inspector.	1 Job	0.05%
19	All civil work relating to erection of poles, fencing work, construction of platform for transformer, earth pit chambers.	1 Job	0.20%
20	Installation and commissioning of all above items including painting, trial and testing	1 job	0.25%
21	ACCESSORIES		0.10%
	Rubber Hand Gloves.	1 Set.	

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	Ball Pin Hammer with Wooden Handle.	1 Set.	
	Screw Driver 8” & 12”	1 Set.	
	Shock Treatment Chart.	4 Nos.	
	Danger Notice Board.	1 Nos.	
	Fire Stand with Fire Bucket in sub-station.	1 Nos.	
	Insulated Player.	1 Set.	
	Fire extinguisher 4.5 Kg.	1 Set.	
	D.O. Operating rod 33 kV fiber H.D.	1 Set.	
	Discharge rod with accessories fiber.	1 Nos.	
	Helmet H.D.	1 Set.	
	Total percentage of Part C		17.1%

Note: The payment of R.A. Bills shall be made as per actual work done at site and as certified by Engineer-in Charge.

Annexure - "F-3 (Raw Water , Clear Water Rising Mains and Distribution Network, Push through for road crossing, House Service Connections &Bulk flow meters)" : Price Schedule

Raw water Rising mains

Break-up for Raw water Rising Main					
Sr. No.	Item of work	Quantity	Rate	Unit	Amount (Rs.)
1	2	3	4	5	6
1	Earth work in excavation for pipe trench in ordinary soil areas including dressing, watering and ramming and disposal of excavated earth lead up to 50 meters and lift up to 1.5m, disposal earth to be levelled, neatly dressed.	699.55	144.00	Cum	100735.20
	<i>PHE-SOR/2013/Item 2.1</i>				
2	Cutting of WBM road including disposal of material within 50 m lead				
	Within 50m lead (for total length)	347.00	236.00	Cum	81892.00
	<i>PHE-SOR/2013/Item 2.17</i>				
	Extra for carriage upto 5 kms	347.00	99.75	Cum	34613.25
	<i>PHE-SOR/2013/carriage of material 1.1.2</i>				
3	Cutting of Bituminous road including disposal of material within 50m lead				
	Within 50m lead (80 % of total length)	277.60	317.00	Cum	87999.20
	<i>PHE-SOR/2013/Item 2.18</i>				
	Extra for carriage upto 5 kms	277.60	99.75	Cum	27690.60
	<i>PHE-SOR/2013/carriage of material 1.1.2</i>				
4	Filling with murum/river sand for pipe bedding or over the pipe including supply .	347	620.00	Cum	215140.00
	<i>PHE-SOR/2013/Item 2.11</i>				
	Transportation from 25 kms (Kakadi Ghat)	393.18	197.35	Cum	77594.07
	<i>PHE-SOR/2013/Item 2.1.1</i>				
5	Providing, laying and jointing socket & spigot centrifugally cast (Spun) Ductile Iron 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 including testing of joint (laying Conforming to IS 12288 : 1987)				
	DI K - 9				
	600 mm	347	9479.00	Rmt	3289213.00
	<i>PHE-SOR/2013/Item 6.51 (Amendment No. 04/2015-16)</i>				
6	Labour for laying in position socket & spigot Ductillron (k-9) pressure pipes. [Conform to IS 12288:1987]				
	DI K - 9				

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	600 mm	-		Rmt	Deleted
	<i>PHE-SOR/2013/Item 6.4</i>				
7	Providing & Supplying D.I. Specials & Fittings For all types of specials, bends, tees.. etc.				
	350mm and above dia	175.00	109.00	Kg	19075.00
	<i>PHE-SOR/2013/Item 6.49.1</i>				
8	Supply of DI D/F Sluice Valves Slanted/Straight seated with metallic, corrosion proof and wear resistant seat faces, body and disc of ductile cast iron GGG 50/SG Iron 420/12 or equivalent grade as per IS 3896 (part-2) - 1985 and subsequent revisions. Shafts of stainless steel, shaft bearing of zinc free bronze and seat faces with nickel weld over lay, micro finished. All the inside and outside of the body is to be coated with double coating of Epoxy liquid. Drilled as per IS:1538.				
	600 mm dia Sl. Valve (600 mm dia DI)	1	113715.0	No	113715.00
	<i>PHE-SOR/2013/Item 8.37(Amendment No. 04/2015-16)</i>				
9	Labour for laying & fixing of cast iron butterfly valves including jointing & testing but without cost of jointing materials				
	600 mm dia Sl. Valve (600 mm dia DI)	1	1148.00	Nos	1148.00
	<i>PHE-SOR/2013/Item 8.13</i>				
10	Providing & fixing cast iron double air valves, flanged without in-built 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				
	150 mm Dia	1	5660.00	Nos	5660.00
	<i>PHE-SOR/2013/Item 8.40 (Amendment No. 04/2015-16)</i>				
11	Labour for laying and fixing of Cast Iron double air valves, flanged without in-built isolating valve. (PN- 1.0/ PN-1.6)				
	150 mm Dia	1	96.00	Nos	96.00
	<i>PHE-SOR/2013/Item 8.18</i>				
12	Supply of DI Dismantling joint with MS. Nut Stud & washers coated for rust prevention & internal rubber rings etc. complete assembly set as per type design inclusive of all taxes and duties, insurance, loading/ unloading & stacking FOR at site complete.				
	600 mm dia Sl. Valve (600 mm dia DI)	1	39891.00	Nos	39891.00
	<i>PHE-SOR/2013/Item 8.53 (Amendment No. 04/2015-16)</i>				
13	Providing & laying 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 nominal diameter/sizes with external bitumen coating and internal cement mortar lining. (laying Conforming to IS 12288 : 1987)				

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	600 mm	5	19894.00	Nos	99470.00
	<i>PHE-SOR/2013/Item 6.11</i>				
14	Construction of RCC valve chamber with RCC precast covers 100mm to 600mm dia For 300mm - 800 mm dia	1	117536.0	Nos	117536.00
15	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	493.00	59.00	Cum	29087.00
	<i>PHE-SOR/2013/Item 2.10.1</i>				
16	Extra for disposal of surplus earth upto 5Kms	206.33	100.00	Cum	20632.62
	<i>PHE-SOR/2013/carriage of material 1.1.2</i>				
17	Chamfering ductile iron pipes of all types and classes to make suitable for tyton joints.				
	600.00	10.00	722.00	No	7220.00
	<i>PHE-SOR/2013/Item 32.8</i>				
18	Chamfering cast iron pipes of all types and classes to make suitable for tyton joints.				
	600.00		430.00	No	
	<i>PHE-SOR/2013/Item 32.7</i>				
19	Granular Sub-base as per Table:- 400-1 Construction of granular sub-base by providing graded Material, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface watering, rolling and compacting with vibratory power roller at OMC to achieve the desired density, complete as per clause 401				
	For Sub-base cum drainage layer or upper sub-base with Grading-VI Material	43.72	1363.00	cum	59593.09
	<i>PWD-Roads SOR/2015/Item 4.1</i>				
20	Wet Mix Macadam (Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density as per clause 406.)	43.72	1434.00	cum	62697.35
	<i>PWD-Roads SOR/2015/Item 4.10</i>				
21	Prime coat (Providing and applying primer coat with oil based bitumen emulsion (SS-1, grade confirming to IS:8887) on prepared surface of granular Base including clearing of road surface and spraying primer using mechanical means	437.22	64.00	sq.m	27982.08
	<i>PWD-Roads SOR/2015/Item 5.1</i>				

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22	Bituminous Macadam (Providing and laying bituminous macadam as per clause 504 with mixed prepared in minimum 40-60 TPH capacity hot mix plant using crushed aggregates of specified grading premixed with bituminous binder, transported to site, laid over a previously prepared surface with paver finisher to the required grade, level and alignment and rolled to achieve the desired compaction)				
	With mechanical paver finisher				
	(ii) for Grading-II(19 mm nominal maximum size, bitumen content 3.40%)	13.88	6255.00	cum	86819.40
	<i>PWD-Roads SOR/2015/Item 5.3</i>				
23	Semi-Dense Bituminous Concrete (Providing and laying semidense bituminous concrete with minimum 40-60 TPH capacity using crushed aggregates of specified grading, premixed with bituminous binder @ 4.50 to 5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORT&H specification clause No. 508 complete in all respects)				
	With mechanical paver finisher				
	for Grading II (10 mm nominal size) with bitumen 5.0 %	6.94	8468.00	cum	58767.92
	<i>PWD-Roads SOR/2015/Item 5.20</i>				
24	Providing & laying mechanically mixed cement concrete 20mm maximum size graded crushed stone excluding cost of centring & shuttering.				
	Thrust block (M-20) <i>PHE-SOR/2013/Item 2.21.1</i>	23.33	4484.00	cum	104611.72
				Total A	4773774.00
				(-)7.16% B	341802.00
				Amount C= (A-B)	4431972.00

Deduction of 7.16 % shall be done as mentioned above to match the the agreed amount with previous Contractor.

Note: **The payment of R.A. Bills shall be made as per actual work done at site and as certified by Engineer-in Charge.**

Clear water Rising mains

Break-up for Clear water Rising Main					
Sr. No.	Item of work	Quantity	Rate	Unit	Amount (Rs.)
1	2	3	4	4	6
1	Earth work in excavation for pipe trench in ordinary soil areas including dressing, watering and ramming and disposal of excavated earth lead up to 50 meters and lift up to 1.5m, disposal earth to be levelled, neatly dressed. <i>PHE-SOR/2013/Item 2.1</i>	6407.72	144.00	Cum	922711.82
2	Cutting of WBM road including disposal of material within 50 m lead Within 50m lead (for total length), Avg B = 0.88m <i>PHE-SOR/2013/Item 2.17</i>	1413.67	236.00	Cum	333625.18
	Extra for carriage upto 5 kms <i>PHE-SOR/2013/carriage of material 1.1.2</i>	1413.67	99.75	Cum	141013.18
3	Cutting of Bituminous road including disposal of material within 50m lead Within 50m lead (80 % of total length) <i>PHE-SOR/2013/Item 2.18</i>	753.96	317.00	Cum	239003.80
	Extra for carriage upto 5 kms <i>PHE-SOR/2013/carriage of material 1.1.2</i>	753.96	99.75	Cum	75207.03
4	Filling with murum/river sand for pipe bedding or over the pipe including supply . Transportation from 25 kms (Kakadi Ghat) <i>PHE-SOR/2013/Item 2.11</i>	706.83	620.00	Cum	438236.46
		706.83	197.35	Cum	139493.49
5	Providing, laying and jointing socket & spigot centrifugally cast (Spun) Ductile Iron 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 including testing of joint (laying Conforming to IS 12288 : 1987) DI K - 9				
	150 mm	682.00	1357.00	Rmt	925474.00
	200 mm	1725.00	1888.00	Rmt	3256800.00
	250 mm	65.00	2509.00	Rmt	163085.00
	300 mm	1669.00	3194.00	Rmt	5330786.00
	350 mm	-	4354.00	Rmt	
	400 mm	872.00	4842.00	Rmt	4222224.00
	450 mm	-	6074.00	Rmt	
	500 mm	-	7220.00	Rmt	
	600 mm	-	9479.00	Rmt	
	<i>PHE-SOR/2013/Item 6.51(Amendment No. 04/2015-16)</i>				
6	Labour for laying in position socket & spigot Ductillron(K-9) pressure pipes. [Conform to IS 12288:1987]				

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	DI K - 9				
	150 mm				
	200 mm				
	250 mm				
	300 mm				
	350 mm				
	400 mm				
	450 mm				
	500 mm				
	600 mm				
	<i>PHE-SOR/2013/Item 6.4</i>				
7	Providing & Supplying D.I. Specials & Fittings For all types of specials, bends, tees.. etc.				
	100mm to 300mm dia	2070.50	70.00	Kg	144935.00
	350mm and above dia	436	109.00	Kg	47524.00
	<i>PHE-SOR/2013/Item 6.49.1</i>				
8	Supply of DI D/F Sluice Valves Slanted/Straight seated with metallic, corrosion proof and wear resistant seat faces, body and disc of ductile cast iron GGG 50/SG Iron 420/12 or equivalent grade as per IS 3896 (part-2) - 1985 and subsequent revisions. Shafts of stainless steel, shaft bearing of zinc free bronze and seat faces with nickel weld over lay, micro finished. All the inside and outside of the body is to be coated with double coating of Epoxy liquid. Drilled as per IS:1538.				
	150 mm dia Sl. Valve (150 mm dia DI)	1	8293.00	No	8293.00
	200 mm dia Sl. Valve (200 mm dia DI)	1	10414.00	No	10414.00
	250 mm dia Sl. Valve (250 mm dia DI)	1	19686.00	No	19686.00
	300 mm dia Sl. Valve (300 mm dia DI)	1	29430.00	No	29430.00
	350 mm dia Sl. Valve (350 mm dia DI)	-		No	
	400 mm dia Sl. Valve (400 mm dia DI)	1	67686.00	No	67686.00
	450 mm dia Sl. Valve (400 mm dia DI)		83235.00	No	
	600 mm dia Sl. Valve (400 mm dia DI)		113715.00	No	
	<i>PHE-SOR/2013/Item 8.37(Amendment No. 04/2015-16)</i>				
9	Labour for laying & fixing of cast iron butterfly valves including jointing & testing but without cost of jointing materials				
	150 mm dia Sl. Valve (150 mm dia DI)	1	83.00	Nos	83.00
	200 mm dia Sl. Valve (200 mm dia DI)	1	129.00	Nos	129.00
	250 mm dia Sl. Valve (250 mm dia DI)	1	185.00	Nos	185.00
	300 mm dia Sl. Valve (300 mm dia DI)	1	244.00	Nos	244.00
	350 mm dia Sl. Valve (350 mm dia DI)	-	-	Nos	
	400 mm dia Sl. Valve (400 mm dia DI)	1	534.00	Nos	534.00
	450 mm dia Sl. Valve (400 mm dia DI)		-	Nos	
	600 mm dia Sl. Valve (400 mm dia DI)		-	Nos	
	<i>PHE-SOR/2013/Item 8.13</i>				

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SUPPLY SCHEME UNDER AMRUT MISSION GOVERNMENT OF CHHATTISGARH

10	Providing & fixing cast iron double air valves, flanged without in-built 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				
	50 mm dia Sl. Valve	1.00	2157.00	Nos	2157.00
	80 mm dia Sl. Valve	2.00	3098.00	Nos	6196.00
	100 mm dia Sl. Valve				
	150 mm dia Sl. Valve				
	<i>PHE-SOR/2013/Item 8.40(Amendment No. 04/2015-16)</i>				
11	Labour for laying and fixing of Cast Iron double air valves, flanged without in-built isolating valve. (PN-1.0/ PN-1.6)				
	50 mm dia Sl. Valve	1.00	42.00	Nos	42.00
	80 mm dia Sl. Valve	2.00	51.00	Nos	102.00
	100 mm dia Sl. Valve				
	150 mm dia Sl. Valve				
	<i>PHE-SOR/2013/Item 8.18</i>				
12	Supply of DI Dismantling joint with MS. Nut Stud & washeres coated for rust prevention & internal rubber rings etc. complete assembly set as per type design inclusive of all taxes and duties, insurance, loading/ unloading & stacking FOR at site complete.				
	150 mm dia Sl. Valve (150 mm dia DI)	1	4318.00	Nos	4318.00
	200 mm dia Sl. Valve (200 mm dia DI)	1	6066.00	Nos	6066.00
	250 mm dia Sl. Valve (250 mm dia DI)	1	8266.00	Nos	8266.00
	300 mm dia Sl. Valve (300 mm dia DI)	1	10723.00	Nos	10723.00
	350 mm dia Sl. Valve (350 mm dia DI)				
	400 mm dia Sl. Valve (400 mm dia DI)	1	19586.00	Nos	19586.00
	450 mm dia Sl. Valve (400 mm dia DI)			Nos	
	600 mm dia Sl. Valve (400 mm dia DI)			Nos	
	<i>PHE-SOR/2013/Item 8.53 (Amendment No. 04/2015-16)</i>				
13	Providing & laying 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 nominal diameter/sizes with external bitumen coating and internal cement mortar lining. (laying Conforming to IS 12288 : 1987)				
	150 mm	10	2451.00	Nos	24510.00
	200 mm	10	3071.00	Nos	30710.00
	250 mm	10	4651.00	Nos	46510.00
	300 mm	10	5458.00	Nos	54580.00
	350 mm			Nos	
	400 mm	10	11514.00	Nos	115140.00
	450 mm				
	500 mm				
	600 mm				
	<i>PHE-SOR/2013/Item 6.11</i>				
14	Construction of RCC valve chamber with RCC precast covers 100mm to 600mm dia For 300mm - 800 mm dia	4	37984.47	Nos	151937.88

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15	Providing & Fixing C.I. road box including loading, unloading and carting to site of work ncluding all necessary excavation in all types of strata and fixing in murum packing, etc. complete.	1	2684.00	No	2684.00
	<i>PHE-SOR/2013/Item 23.12</i>				
16	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	5277	59.00	Cum	311343.00
	<i>PHE-SOR/2013/Item 2.10.1</i>				
17	Extra for disposal of surplus earth upto 5Kms	1131.67	100.00	Cum	113100.11
	<i>PHE-SOR/2013/carriage of material 1.1.2</i>				
18	Chamfering ductile iron pipes of all types and classes to make suitable for tyton joints.				
	150 mm	6	301.00	No	1806.00
	200 mm	16	378.00	No	6048.00
	250 mm	1	414.00	No	414.00
	300 mm	15	461.00	No	6915.00
	350 mm				
	400 mm	8	535.00	No	4280.00
	450 mm				
	500 mm				
	600 mm				
	<i>PHE-SOR/2013/Item 32.8</i>				
19	Granular Sub-base as per Table:- 400-1 Construction of granular sub-base by providing graded Material, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface watering, rolling and compacting with vibratory power roller at OMC to achieve the desired density, complete as per clause 401				
	For Sub-base cum drainage layer or upper sub-base with Grading-VI Material	376.98	1363.00	cum	513820.47
	<i>PWD-Roads SOR/2015/Item 4.1</i>				
20	Wet Mix Macadam (Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density as per clause 406.)	376.98	1434.00	cum	540585.88
	<i>PWD-Roads SOR/2015/Item 4.10</i>				
21	Prime coat (Providing and applying primer coat with oil based bitumen emulsion (SS-1, grade confirming to IS:8887) on prepared surface of granular Base including clearing of road surface and spraying primer using mechanical means	3769.78	64.00	sq.m	241265.66
	<i>PWD-Roads SOR/2015/Item 5.1</i>				

TENDER DOCUMENT FOR AUGMENTATION & REORGANISATION TO JAGDALPUR WATER
SUPPLY SCHEME UNDER AMRUT MISSION GOVERNMENT OF CHHATTISGARH

22	Bituminous Macadam (Providing and laying bituminous macadam as per clause 504 with mixed prepared in minimum 40-60 TPH capacity hot mix plant using crushed aggregates of specified grading premixed with bituminous binder, transported to site, laid over a previously prepared surface with paver finisher to the required grade, level and alignment and rolled to achieve the desired compaction)				
	With mechanical paver finisher				
	(ii) for Grading-II(19 mm nominal maximum size, bitumen content 3.40%)	160.42	6255.00	cum	1003427.00
	<i>PWD-Roads SOR/2015/Item 5.3</i>				
23	Semi-Dense Bituminous Concrete (Providing and laying semidense bituminous concrete with minimum 40-60 TPH capacity using crushed aggregates of specified grading, premixed with bituminous binder @ 4.50 to 5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORT&H specification clause No. 508 complete in all respects)				
	With mechanical paver finisher				
	for Grading II (10 mm nominal size) with bitumen 5.0 %	80.21	8468.00	cum	679218.3
	<i>PWD-Roads SOR/2015/Item 5.20</i>				
24	Providing & laying mechanically mixed cement concrete 20mm maximum size graded crushed stone excluding cost of centring & shuttering.				
	Thrust block (M-20) <i>PHE-SOR/2013/Item 2.21.1</i>	16.88	4484.00	cum	75689.92
				Total A	20498163.37
				(-) 7.16% B	1467668
				Amount C= (A-B)	19030494.87

Deduction of 7.16 % shall be done as mentioned above to match the the agreed amount with previous Contractor.

Note: **The payment of R.A. Bills shall be made as per actual work done at site and as certified by Engineer-in Charge.**

DISTRIBUTION NETWORK

Break-up for Distribution Network					
Sr. No.	Item of work	Quantity	Rate	Unit	Amount (Rs.)
1	3	4	5	6	7
1	Earth work in excavation for pipe trench in ordinary soil areas including dressing, watering and ramming and disposal of excavated earth lead up to 50 meters and lift up to 1.5m, disposal earth to be levelled, neatly dressed.	151436.60	144.00	Cum	21806870.00
	<i>PHE-SOR/2013/Item 2.1</i>				
2	Cutting of WBM road including disposal of material within 50 m lead				
	Within 50m lead (for total length), Avg B = 0.88m	53980.07	236.00	Cum	12739296.19
	<i>PHE-SOR/2013/Item 2.17</i>				
	Extra for carriage upto 5 kms	53980.07	99.75	Cum	5384511.84
	<i>PHE-SOR/2013/carriage of material 1.1.2</i>				
3	Cutting of Bituminous road including disposal of material within 50m lead				
	Within 50m lead (80 % of total length)	28789.37	317.00	Cum	9126230.26
	<i>PHE-SOR/2013/Item 2.18</i>				
	Extra for carriage upto 5 kms	28789.37	99.75	Cum	2871739.65
	<i>PHE-SOR/2013/carriage of material 1.1.2</i>				
4	Filling with murum/river sand for pipe bedding or over the pipe including supply .	26990.03	620.00	Cum	16733821.27
	Transportation from 25 kms (Kakadi Ghat)	26990.03	197.35	Cum	5326483.27
	<i>PHE-SOR/2013/Item 2.11</i>				
5	Providing, laying and jointing 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 including testing of joint (laying Conforming to IS 12288 : 1987)				
	DI K - 7				
	100 mm	131466.82	720.00	Rmt	94656110.40
	150 mm	35220.18	1051.00	Rmt	37016409.18
	200 mm	16488.79	1608.00	Rmt	26513974.32
	250 mm	10418.10	2125.00	Rmt	22138462.50
	300 mm	4372.53	2631.00	Rmt	11504126.43
	350 mm	892.25	3346.00	Rmt	2985468.50
	400 mm	1014.44	4280.00	Rmt	4341803.20
	450 mm	53.07	4986.00	Rmt	264607.02
	<i>PHE-SOR/2013/Item 6.50(Amendment No. 04/2015-16)</i>				
6	Labour for laying in position socket & spigot DuctIron(K-7) pressure pipes. [Conform to IS 12288:1987]				
	DI K - 7				
	100 mm				
	150 mm				
	200 mm				

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	250 mm				
	300 mm				
	350 mm				
	400 mm				
	450 mm				
	<i>PHE-SOR/2013/Item 6.2</i>				
7	Providing & Supplying D.I. Specials & Fittings For all types of specials, bends, tees.. etc.				
	100mm to 300mm dia	72929.64	70.00	Kg	5105075
	350mm and above dia	979.88	109.00	Kg	106807.00
	<i>PHE-SOR/2013/Item 6.49.1</i>				
8	Supply of DI D/F Sluice Valves Slanted/Straight seated with metallic, corrosion proof and wear resistant seat faces, body and disc of ductile cast iron GGG 50/SG Iron 420/12 or equivalent grade as per IS 3896 (part-2) - 1985 and subsequent revisions. Shafts of stainless steel, shaft bearing of zinc free bronze and seat faces with nickel weld over lay, micro finished. All the inside and outside of the body is to be coated with double coating of Epoxy liquid. Drilled as per IS:1538.				
	80 mm	2	5000.00	No	10000.00
	100 mm	66	5194.00	No	342804.00
	150 mm	23	8293.00	No	190739.00
	200 mm	11	10414.00	No	114554.00
	250 mm	7	19686.00	No	137802.00
	300 mm	3	29430.00	No	88290.00
	450 mm	1	83235.00	No	83235.00
	<i>PHE-SOR/2013/Item 8.37(Amendment No. 04/2015-16)</i>				
9	Labour for laying & fixing of cast iron butterfly valves including jointing & testing but without cost of jointing materials				
	80 mm	2	50.00	Nos	100.00
	100 mm	66	56.00	Nos	3696.00
	150 mm	23	83.00	Nos	1909.00
	200 mm	11	129.00	Nos	1419.00
	250 mm	7	185.00	Nos	1295.00
	300 mm	3	244.00	Nos	732.00
	450 mm	1	596.00	Nos	596.00
	<i>PHE-SOR/2013/Item 8.13</i>				
10	Supply of DI Dismantling joint with MS. Nut Stud & washeres coated for rust prevention & internal rubber rings etc. complete assembly set as per type design inclusive of all taxes and duties, insurance, loading/ unloading & stacking FOR at site complete.				
	80 mm	2	2500.00	Nos	5000.00
	100 mm	66	2550.00	Nos	168300.00
	150 mm	23	4318.00	Nos	99314.00
	200 mm	11	6066.00	Nos	66726.00
	250 mm	7	8266.00	Nos	57862.00
	300 mm	3	10723.00	Nos	32169.00
	450 mm	1	23492.00	Nos	23492.00

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SUPPLY SCHEME UNDER AMRUT MISSION GOVERNMENT OF CHHATTISGARH

	PHE-SOR/2013/Item 8.53 (Amendment No. 04/2015-16)				
11	Providing & laying 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 nominal diameter/sizes with external bitumen coating and internal cement mortar lining. (laying Conforming to IS 12288 : 1987)				
	80 mm	75	1201.00	Nos	90075.00
	100.00	50	1459.00	Nos	72950.00
	150.00	40	2451.00	Nos	98040.00
	200.00	25	3071.00	Nos	76775.00
	250.00	15	4651.00	Nos	69765.00
	300.00	6	5458.00	Nos	32748.00
	350.00	5	9366.00	Nos	46830.00
	400.00	5	11514.00	Nos	57570.00
	450.00	5	13238.00	Nos	66190.00
	<i>PHE-SOR/2013/Item 6.11</i>				
12	Construction of RCC valve chamber with RCC precast covers 100mm to 600mm dia For 300mm - 800 mm dia (cost as per annexure II enclosed)	25	37984.47	Nos	949611.75
	<i>PHE-SOR/2013/Item 23.10.2</i>				
13	Providing & Fixing C.I. road box including loading, unloading and carting to site of work including all necessary excavation in all types of strata and fixing in murum packing, etc. complete.	68	2684.00	No	182512.00
	<i>PHE-SOR/2013/Item 23.12</i>				
14	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	148076	59.00	Cum	8736484.00
	<i>PHE-SOR/2013/Item 2.10.1</i>				
15	Extra for disposal of surplus earth upto 5Kms	3360.71	100.00	Cum	336071.00
	<i>PHE-SOR/2013/carriage of material 1.1.2</i>				
16	Chamfering ductile iron pipes of all types and classes to make suitable for tyton joints.				
	100.00	1195.00	301.00	No	359695.00
	150.00	320.00	301.00	No	96320.00
	200.00	150.00	378.00	No	56700.00
	250.00	95.00	414.00	No	39330.00
	300.00	40.00	461.00	No	18440.00
	350.00	8.00	461.00	No	3688.00
	400.00	9.00	535.00	No	4815.00
	<i>PHE-SOR/2013/Item 32.8</i>				
17	Granular Sub-base as per Table:- 400-1 Construction of granular sub-base by providing graded Material, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface watering, rolling and compacting with vibratory power roller at OMC to achieve the desired density, complete as per clause 401				

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	For Sub-base cum drainage layer or upper sub-base with Grading-VI Material	14394.68	1363.00	cum	19619948.80
	<i>PWD-Roads SOR/2015/Item 4.1</i>				
18	Wet Mix Macadam (Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density as per clause 406.)	14394.68	1434.00	cum	20641971.1
	<i>PWD-Roads SOR/2015/Item 4.10</i>				
19	Prime coat (Providing and applying primer coat with oil based bitumen emulsion (SS-1, grade conforming to IS:8887) on prepared surface of granular Base including clearing of road surface and spraying primer using mechanical means	143946.85	64.00	sq.m	9212598.4
	<i>PWD-Roads SOR/2015/Item 5.1</i>				
20	Bituminous Macadam (Providing and laying bituminous macadam as per clause 504 with mixed prepared in minimum 40-60 TPH capacity hot mix plant using crushed aggregates of specified grading premixed with bituminous binder, transported to site, laid over a previously prepared surface with paver finisher to the required grade, level and alignment and rolled to achieve the desired compaction)				
	With mechanical paver finisher				
	(ii) for Grading-II(19 mm nominal maximum size, bitumen content 3.40%)	585.44	6255.00	cum	3661927.2
	<i>PWD-Roads SOR/2015/Item 5.3</i>				
21	Semi-Dense Bituminous Concrete (Providing and laying semidense bituminous concrete with minimum 40-60 TPH capacity using crushed aggregates of specified grading, premixed with bituminous binder @ 4.50 to 5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORT&H specification clause No. 508 complete in all respects)				
	With mechanical paver finisher				
	for Grading II (10 mm nominal size) with bitumen 5.0 %	292.72	8468.00	cum	2478752.96
	<i>PWD-Roads SOR/2015/Item 5.20</i>				
22	Providing & laying mechanically mixed cement concrete 20mm maximum size graded crushed stone excluding cost of centring & shuttering.				
	Thrust block (M-20) <i>PHE-SOR/2013/Item 2.21.1</i>	147.16	4484.00	cum	659865.44
				Total A	347676244.47
				(-) 7.16% B	24893619.10
				Amount C= (A-B)	322782625.37

Deduction of 7.16 % shall be done as mentioned above to match the the agreed amount with previous Contractor.

Note: **The payment of R.A. Bills shall be made as per actual work done at site and as certified by Engineer-in Charge.**

National Highway Crossing

Break-up for National Highway Crossing (In NH 16 & NH 43)					
SR.NO.	Discription of Item	Quantity	Rate	Unit	Amount
1	Excavation in all types of soils including all lifts and leads.				
	For NH Crossing	432	144	Cum.	62208
	(CG PHE SOR P.19 It.No. 2.1)				
2	Providing and laying PCC in situ Concrete of grade M-150 for bed concreting.				
		21.6	3823	Cum.	82577
	(CG PHE SOR P.20 It.No. 2.20.1.4)				
3	Proving and supplying of MS Pipe as per relevent IS of following Diameters.				
	For NH Crossing (Casing & Carriage)				
	a) 200 mm Dia. / 10 mm Tk.	30	3045.00	Rmt.	91350
	b) 250 mm Dia / 10mm Tk.(casing)	30	3771.00	Rmt.	113130
	c) 300 mm Dia. / 10 mm Tk.	30	4496.00	Rmt.	134880
	e) 600 mm Dia. / 10 mm Tk.	30	8862.00	Rmt.	265860
	f) 500 mm Dia / 10mm Tk.(casing)	30	7403.00	Rmt.	222090
	g) 400 mm Dia. / 10 mm Tk.	30	5952.00	Rmt.	178560
	(CG PHE SOR It.No. 17.12.1 to 20)				
4	Labour Only for lowering & laying of M.S. Pipes on pedestals or chairs upon prepared formation including all site arrangements complete..				
	a) 200 mm Dia. / 10 mm Tk.	30	228	Rmt.	6840
	b) 250 mm Dia / 10mm Tk.(casing)	30	269	Rmt.	8070
	c) 300 mm Dia. / 10 mm Tk.	30	269	Rmt.	8070
	e) 600 mm Dia. / 10 mm Tk.	30	350	Rmt.	10500
	f) 500 mm Dia / 10mm Tk.(casing)	30	350	Rmt.	10500

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	g) 400 mm Dia. / 10 mm Tk.	30	350	Rmt.	10500
5	Providing and applying of anti corrosive Epoxy painting to outer and inner surface of the casing and carrier pipe of approved make in two coats.				
	For NH Crossing (CSR I.No.6 P,no. 255)	147.05	581.9	Sqm.	85566
6	Jacking of MS casing pipe with all necessacery men and machinery with all the arrangements such as jacks etc. complete.				
	For pipe upto 300 mm dia For NH Crossing (CSR I.No.14 P,no.47)	86	28435	Rmt.	2445410
7	Steel work is welded in built-up section tee & frame i/c cutting hoisting/fixing and painting with red lead paint. (i) In R.S. Joint in flat iron /angle / channel / bar.				
	For NH Crossing (CG PHE SOR P.23 It.No. 2.25.4)	135	71	Kgs.	9585
8	Refilling the surplus excavatedstuff to the place as directed by the Engineer-Incharge.				
	For NH Crossing (CG PHE SOR P.23 It.No. 2.25.4)	432	59	Cum.	25488
				Total A	3943146.2
				(-) 7.16% B	282329.26
				Amount C= (A-B)	3662817

Deduction of 7.16 % shall be done as mentioned above to match the the agreed amount with previous Contractor.

Note: **The payment of R.A. Bills shall be made as per actual work done at site and as certified by Engineer-in Charge.**

Consumer Meters with House Service connection

S.No.	Description	Qty	Unit	Rate	Amount
1	Earth work excavation for pipe trench in all kinds of soil and WBM in areas including dressing, watering and ramming and disposal of Excavated earth lead upto 50 meters and lift upto 1.5m, disposal of earth to be leveled, neatly dressed	5719.7	cum	144	823633.92
	<i>PHE SOR 2013 Item No. 2.1</i>				
2	Refilling pipeline trenches and foundation with selected available earth from trench excavation including watering, consolidation in layers of 15cms thick including disposing of the surplus earth etc., complete with all lead and lift and as directed by the Engineer-in-charge				
	Refilling HSC Pipeline trenches	5719.7	cum	59	337461.12
	<i>PHE SOR 2013 Item No. 2.10.1</i>				
3	Providing & supply of clamp saddle for House service connections from PE/DI pipe water distribution mains shall be of fastened strap types with threaded outlet for service connection. Clamp saddle should be suitable for nominal size of distribution mains pipe line. The strap shall be elastomer coated(insulated) type for fine grip on pipe and as well as to protect the coating on pipe and to insulate the identical metals. The saddle shall be single strap type upto pipe sizes of NB 600 and service outlet 15m,20mm&25mm. Fasteners shall be of Threaded net 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 metal such as engineering plastic (PP/PE) or stainless steel or a combination of both				
	<i>PHE SOR 2013 Item No. 11.5</i>				
	100 NB x 15mm, 20mm, 25mm	23589.0	Nos	1097	25877133.00
	150 NB x 15mm, 20mm, 25mm	243.0	Nos	1296	314928.00
4	Providing & fixing Polyethelene – Aluminium - Polyethelene (PE-AL-PE) Composite Pressure Pipes conforming to IS – 15450 - 2004 U.V. stabilized with carbon black having thermal stability for hot & cold water supply, capable to withstand temperature up to 80oC with pipe in trenches, refilling and testing of joints complete as per direction of the engineer in				

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	charge. (External work)				
	<i>PHE SOR 2013 Item No. 32.25</i>				
	1620 (20 mm OD) Pipe	226150	RM	161	36410150.00
	2025 (25 mm OD) Pipe	7300.0	RM	210	1533000.00
	2532 (32 mm OD) Pipe	4870.0	RM	309	1504830.00

5	Providing and fixing GM or brass ferrules Conforming to IS- 2692 / 1984 (Reaffirmed 2005), tested to 21.00kg/sq.cm. i/c boring and tapping the main				
	<i>PHE SOR 2013 Item No. 9.9</i>				
	15mm	22615.0	Nos	350	7915250.00
	20mm	730.0	Nos	617	450410.00
	25mm	487.0	Nos	820	399340.00
6	Providing and supply of Brass stop-cock 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 all taxes related to central, state, municipal inspection charges, transportation upto site, transit insurance, loading, unloading, stacking etc. Complete				
	<i>DSR 2014 Item No. 1342</i>				
	Brass stop-cock 15 mm dia	22615.0	Nos	210	47,49,150
	Brass stop-cock 20 mm dia	730.0	Nos	280	204400.00
	Brass stop-cock 25 mm dia	487.0	Nos	360	175320.00
7	Supply laying, installation of G.I pipe 15mm dia for House Service Connection pipes at places of drainage crossings including all special fittings of composite material (engineering plastic blend and brass inserts wherever required) e.g. elbows, tees, reducers, couplers & connectors etc., with trenching, refilling and testing of joints complete as per direction of the engineer in Charge.	243.0	RM	186.25	45258.75
	<i>DSR 2014 Item No. 18.12</i>				
8	Providing and Fixing MS/PP Meter Box of Required Size to accommodate the meter with opning and Locking arrangement etc complete.	23832.0	Nos.	650	1,54,90,800

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9	Providing & Supply of Compression fittings, PN1.6 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, all taxes related to central, state & municipal, inspection charges, transportation up to site, transit insurance, loading, unloading, stacking etc. complete				
	<i>PHE SOR 2013 Item No. 11.3</i>				
	Compression Fittings				
	Metal inserted Compression Female Threaded Adaptor with SS 304 Material				
	20x15mm	22615.0	Nos.	170	38,44,550
	25x20mm	730.0	Nos.	219	1,59,870
	32x25mm	487.0	Nos.	299	1,45,613
	Metal inserted Compression Male Threaded Adaptor with SS 304 Material				
	20x15mm	22615.0	Nos.	170	38,44,550
	25x20mm	730.0	Nos.	219	1,59,870
	32x25mm	487.0	Nos.	299	1,45,613
	Coupling 20x20	67845.0	Nos.	100	67,84,500
	Coupling 25x25	2190.0	Nos.	100	2,19,000
	Coupling 32x32	1461.0	Nos.	100	1,46,100
	Compression 90 Deg. Elbow				
	20mm	45230.0	Nos.	110	49,75,300
	25mm	1460.0	Nos.	150	2,19,000
	32mm	974.0	Nos.	194	1,88,956
10	Supply and Installation of Multi Jet, dry dial, inferential type, horizontal, Magnetically coupled , class 'B' water meters Conforming to IS- 779 : 1994 and ISO 4064: 1993 standard with EEC/ MID certification mark , with IP 68 protection class copper can register with 5 mm tempered mineral glass cover, successful Life Cycle Test Certificate from FCRI and AMR compatibility with 5 years warranty complete with brass nuts and nipples.				
	<i>PHE SOR 2013 Item No. 30.1</i>				
	15 mm	27387.0	Nos.	1203	3,29,46,561
	20 mm	730.0	Nos.	1975	14,41,750
	25 mm	487.0	Nos.	3827	18,63,749

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11	Digitization of satellite image includes collection of DGPS points of important level marks geo referencing of satellite image, creation of base map by interpretation & digitization from the satellite data creating road network, rivers, water bodies, building land use etc in different layer cleaning of digitized map topology building overlaying of water supply features such as pipes, nodes, valves, tanks, reservoirs, pump etc. generating unique ID's for each properties / features which has been mapped. Generation of hard copy plot for consumer survey / field survey work handing over the two sets of soft copies of maps created from satellite image in shape file format as per direction of Engineer-in charge.				
		34.00	sqkm	6250	2,12,500
12	Carrying out consumer survey in order to collect identification details, socio economic characteristics details of consumers connection details of consumption of water usage, preparing database systems including all the attribute tables of consumers data, matching of consumer survey data with billing data, integration of consumer survey with GIS layer, showing coverage of water supply scheme on digitised map using different annotations, attaching the attribute tables to the point feature representing consumer in appropriate GIS software etc complete as per prescribed format as per direction Engineer-in charge and detailed specification etc complete.	28604.0	consumer	50	14,30,200
13	Provision for customer facilitated center with redressal facilities and collection center				500000.00
14	Provision for Billing software with creating mobile application and training to AMC staff and providing 20 smart phones with above application including trial run period of three months etc. complete				2000000.00
				Total A	157458746.79
				(-) 7.16% B	11274046
				Amount C= (A-B)	146184700.52

Deduction of 7.16 % shall be done as mentioned above to match the the agreed amount with previous Contractor.

Note: The payment of R.A. Bills shall be made as per actual work done at site and as certified by Engineer-in Charge.

Break-up for Bulk Flow Meters, Valve Actuators & FCV

S.No.	Description	Unit	Quantity	Rate	Total
1	Electromagnetic Bulk Flow Meters 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: 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, sumtotalizer, Perfection category : IP 65 Output : One current output (4-20 mA) one scalable pulse output with remote reading facility.				
	(CG PHE SOR P.309 It.No. 30.5)				
	150mm	Nos.	17	134255.00	2282335.00
	200 mm		4	171631.00	686524.00
	250 mm		8	201165.00	1609320.00
	300 mm		4	222597.00	890388.00
	350 mm		8	302267.00	2418136.00
	400mm		3	377936.00	1133808.00
	500 mm		2	522646.00	1045292.00
	2	Providing & Laying Ductile Iron Double Socket Reducer Conforming to IS-9523/2000 having dimension as per table 21 of IS-9523/2000 in the nominal diameter/sizes with external bitumen coating and internal cement mortar lining with finishing as per clause 13 of IS9523/2000. (laying Conforming to IS 12288 : 1987) (All sizes in mm)			
PHE-SOR/2013/Item 6.25					
200 x 150		Nos.	34	1437.00	48858.00
250x 200			8	1833.00	14664.00
300 x 250			16	2510.00	40160.00
350 x 300			8	4490.00	35920.00
400 x 350			16	5473.00	87568.00
450 x 400			6	6867.00	41202.00
600 x 500	4		12190.00	48760.00	

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3	Providing and constructing Brick masonry valve chamber with 15cm thick 1:3:6 proportion PCC bedding excluding excavation, Brick masonry in C.M. 1:5 proportion 12mm thick cement plaster in cm 1:4 proportion on both sides with providing and fixing C.I. manhole frame and cover in RCC 1:2:4 coping or RCC 1:2:4 proportion x 15cm thick slab, etc complete as directed by Engineer-in-Charge. (Note :- Wall thickness : 0.23 M for depth of 1.2M and 0.35 M for balance depth exceeding 1.2M).				
	For Bulk Flow meter, 150 mm				
	Size 1.2m x1.2m, depth 1.2 M with 53 cm dia F&C,90 Kg		17	14152.00	240584.00
	For Bulk Flow meter, 200 mm				
	Size 1.5m x 1.5m, depth 1.5 M with 53 cm dia F&C,90Kg		4	20348.00	81392.00
	For Bulk Flow meter, 250 mm				
	Size 1.5m x 1.5m, depth 1.5 M with 53 cm dia F&C,90Kg		8	20348.00	162784.00
	For Bulk Flow meter, 300 mm				
	Size 1.5m x 1.5m, depth 1.5 M with 53 cm dia F&C,90Kg	Nos.	4	20348.00	81392.00
	For Bulk Flow meter, 350 mm				
	Size 1.5m x 1.5m, depth 1.5 M with 53 cm dia F&C,90Kg		8	20348.00	162784.00
	For Bulk Flow meter, 400 mm (RCC)				
	(SIZE 1.8 M. X 1.8 M. X 2.2 M.)		3	37984.47	113953.41
	For Bulk Flow meter, 500 mm (RCC)				
	(SIZE 2.5 M. X 2.5 M. X 3.5 M.)		2	166327.30	332654.59
	PHE-SOR/2013/Item 23.10.2			1175544.00	
4	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 two torque and four limit switches with S.S. flap and operated with gear driven cams and of rating 250 Volts, 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 atleast 1.5 times max. torque required for opening and closing valve. Electric Valve Actuator for non rising spindle type Sluice Valve, PN 1 & PN 1.6 rating with integral starter				
	150mm		17	100000.00	1700000.00
	200 mm		4	100000.00	400000.00
	250 mm	Nos.	8	100000.00	800000.00
	300 mm		4	100000.00	400000.00
	350 mm		8	222106.00	1776848.00

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	400mm	Nos.	3	298197.00	894591.00
	500 mm		2	298197.00	596394.00
				6567833.00	
5	Supplying and installing pressure gauge of 100 mm Ø, 0-300 PSI or 0-21 kg per cm square fitted with 12/15 mm Ø. pad cock valve, and G.I. pipe, elbow etc. as per requirement in approved manner.	Nos.	38	750.00	28500.00
6	Provision of flow control valve				
	150 mm	Nos.	3	200000.00	600000.00
	200 mm		13	239904.00	3118752.00
	250 mm		4	354620.00	1418480.00
	300 mm		1	473620.00	473620.00
	400 mm		1	745920.00	745920.00
				Total A	24401432
				(-) 7.16% B	1747143.00
				Amount C= (A-B)	22654289.00

Deduction of 7.16 % shall be done as mentioned above to match the agreed amount with previous Contractor.

Note: **The payment of R.A. Bills shall be made as per actual work done at site and as certified by Engineer-in Charge.**

Annexure –“F-4(Water Treatment Plant-35 MLD)”: Price Schedule

PERCENTAGE Break-up of payment of 2.717 % of LUMP SUM OFFER FOR WTP

S. No.	Description	Breakup of Percentage
1.	Design , Construction , Testing and commissioning of 35 MLD Water Treatment Plant including Clear sump cum pump House based on Lamella Clarifier and recirculation of used back wash water at Jagdalpur including trial run of 06 months - And For Existing 9 MLD WTP : Additional 2 filter beds 3.5 m X 6.0 m with actual filtration rate of 2500 Lit/Sqm/Hr are proposed for the augmentation to 14.0 MLD capacity besides the existing filter bed including installation and commissioning with 12 months of trial run. - Demolition of Existing 4.5 MLD WTP	100%
GRAND TOTAL		100%

Annexure: F-4/1: Design, Construction, Testing and Commissioning of 35 MLD WTP & 2 filter beds atJagdalpur including trial run

S. No.	Component	Break Up (As % of LUMP SUM offer for 35 MLD WTP& 2 filter beds)
1	Civil Works	45%
2	Electro-Mechanical Works[duly approved by Third Party Inspection(SGS/RITES) based on approved QAP]	40%
3	Installation, Commissioning, testing and trial run for 12 months	15%
TOTAL		100%

Annexure: F-4/2: Detailed Breakup for Civil Works

Item No.1: Aeration cascade, Inlet channel &Parshall flume

(10% of civil work of total lump sum offer for Civil Works Part)

Sl.	Sub-component	% of Sub-component
1	After submission of structural design including topographical survey ,geotechnical investigation (determination of SBC)	5%
2	Excavation	10%
3	Foundation	20%
4	100% Shaft complete	25%
5	100% Aerator complete	25%
6	Inlet channel & measuring flume	13%
7	Remaining works & after three months trial run	2%

	Total	100%
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Item No.2: Chemical House, Office --

(18% of civil work of total lump sum offer for Civil Works Part)

Sl.	Sub-component	% of Sub-component
1	After submission of structural design.	5%
2	Excavation	10%
3	P.C.C.	10%
4	Foundation	20%
5	1st. Floor complete column & slab	20%
6	2 nd floor complete column & slab	15%
7	Complete Brick masonry, doors, windows & Sanitation	18%
8	Complete plastering & painting work & all remaining items	2%
Total		100%

Item No.3: Flash Mixers(2No.)

(5% of civil work of total lump sum offer for Civil Works Part)

Sl.	Sub-component	% of Sub-component
1	After submission of structural design.	5%
2	Excavation	20%
3	P.C.C.	20%
4	Foundation complete	20%
5	Walling complete	33%
6	Hydraulic testing & all remaining works	2%
Total		100%

Item No.4: Two Lamella Plate or Tube Settler / Clarifiers --

(15% of civil work of total lump sum offer for Civil Works Part)

Sl.	Sub-component	% of Sub-component
1	After submission of structural design.	5%
2	Excavation	15%
3	P.C.C.	10%
4	Complete foundation	38%
5	Complete walling	30%
6	Hydraulic testing and all remaining works	2%
Total		100%

Item No.5: Filter House & Additional 2 Filter beds

(15% of civil work of total lump sum offer for Civil Works Part)

Sl.	Sub-component	% of Sub-component
1	After submission of structural design.	5%
2	Excavation complete	15%
3	P.C.C. complete & base slab	10%
4	Foundation complete	23%
5	Walling complete	23%
6	Filter house complete including doors & windows	22%

7	Hydraulic testing and painting & all remaining works	2%
	Total	100%

Item no.6: Construction of Clear Water Reservoir

(12% of civil work of total lump sum offer for Civil Works Part)

Sl.	Sub-component	% of Sub-component
1	After submission of structural design.	5%
2	Excavation	15%
3	P.C.C. complete	10%
4	Foundation complete	30%
5	Complete height o vertical wall	26%
6	Roof slab	12%
7	Hydraulic testing	2%
	Total	100%

Item no.7: Wash water Tank

(10% of civil work of total lump sum offer for Civil Works Part)

Sl.	Sub-component	% of Sub-component
1	After submission of structural design.	5%
2	P.C.C. & Excavation	10%
3	Foundation	20%
4	Complete supporting structure up to bottom slab	20%
5	Bottom slab	20%
6	Vertical wall	20%
7	Roof slab	13%
8	Hydraulic testing & all remaining work	2%
	Total	100%

Item No.8: Clear Water Pump House

(10% of civil work of total lump sum offer for Civil Works Part)

Sl.	Sub-component	% of Sub-component
1	After submission of structural design.	5%
2	Excavation complete	10%
3	P.C.C.	10%
4	Foundation	18%
5	Complete columns & beams	25%
6	Complete brick masonry, doors, windows & sanitation	30%
7	Complete plastering & painting work & all remaining items	2%
	Total	100%

Item No.9: Chlorine room / Tonner stone

(5% of civil work of total lump sum offer for Civil Works Part)

Sl.	Sub-component	% of Sub-component
1	After submission of structural design.	5%
2	Excavation complete	10%
3	P.C.C.	10%
4	Foundation complete	30%

5	Column & beam complete	21%
6	On its complete construction	22%
7	All remaining works	2%
		100%

Annexure: F-4/3: Detailed Breakup for Electro-Mechanical Works

S.No.	Component	Percentage	Cumulative percentage
1	PARSHAL FLUME & Ultramagnetic Flow Meter(1 No.) --- Flow measuring instrument-----1.5% --- Bypass arrangement ----- 0.5%	2%	2%
2	FLASH MIXER (2 NO.)- ----Agitator with drive complete-----4% ----De-sludge pipes & valves complete-----1%	5%	7%
3	Lamella Clarifier (2 NO.)— (a) Flocculator with paddle drive complete-----10% (b) Lamella Clarifier complete-----10% (c) Sludge pipes with specials complete- -----10%	30%	37%
4	FILTERS AND FILTER HOUSE (DUAL MEDIA FILTER) (a) C.I. Pipes & specials for Inlet, Outlet & Drain & Air wash complete-----5% (b) Under drain pipes & specials complete-----5% (c) Rate of flow & loss of Head Indicators complete-----5% (d) Complete Filter Media complete- -----5 % (as per CPHEEO Manual)	20%	57%
5.	CHEMICAL HOUSE : (a) Alum agitators with drive and dosing equipmen बवउचसमजम.t-----3 % (b) Lime agitators with drive and dosing equipment बवउचसमजम.-----3 % (c) Vacuum type Chlorinators बवउचसमजम.-----3 % (with one standby) (d) Chlorine Tonners (6 No.)-----3 % (e) Handling equipment बवउचसमजम.-----3 %	15%	72%
6	CLEAR WATER SUMP(515 kL) & PUMP HOUSE with EOT 5 Ton Gantry Crane -----5%)	5%	77%
7.	Recirculation System for used back wash water (a) Recirculation pumps बवउचसमजम.-----3% (b) Recirculation piping बवउचसमजम.-----1.0 % (c) Centrifuge बवउचसमजम.-----3 % (d) Sludge Thickener बवउचसमजम.-----3 %	10%	87%

8.	Electrification of Buildings of WTP site including (a) Panel Board and Power wiring complete----- --5% (b) Illumination work(with LEDs for producing 300 LUX illumination) complete----- -2%	7%	94%
7	LABORATORY EQUIPMENT , glass ware & chemicals	2.5%	96.5%
9	PLC-SCADA Automation, monitoring and control system work for all new and existing Raw Water Pumps & Clear Water Pumps & all treatment Units of Proposed WTP based on Lamella Clarifier & recirculation of wastewater withprovision and to cover distribution system including OHSRs , electro magnetic bulk flow meters.	3.5%	100%
Total			100%

On supply of Mechanical & Electrical equipments (90% of Electrical Mechanical work)

On erection of above item, 10% payment shall be made for the items erected as per specification.

<u>Note</u> 1. On supply of Mechanical and Elecrical. Equipment	---	90%
2. On Erection, testing and commissioning & Trial run of Equipment	-----	10%

Note: The payment of R.A. Bills shall be made as per actual work done at site and as certified by Engineer-in Charge.

**Commissioner
Municipal Corporation
Jagdalpur**

**List of Laboratory Equipments/Glassware/Chemicals required for 35 MLD Water
Treatment Plant**

S.N.	Name of Equipments	Quantity
01.	Digital Electronic Precision Weighing balance	01
02.	Magnetic Stirrer with Hot plate- capacity 5 liters	01
03.	Water Proof Multiparameter Portable Meter P ^H / mV/Ion/ Conductivity / TDS/ Resistivity/ Salinity/ Dissolved Oxygen/ Temp. without ION ELECTRODES	01
04.	Fluoride Ion Electrode	01
05.	Vertical Autoclave	01
06.	Turbidity Meter Water Proof-IR Source	01
07.	Water Distillation Unit-4 liter/ hour(Wall Type)	01
08.	Micro- Processor Based Photo Colorimeter	01
09.	Bacteriological Incubator-	01
10.	Hot air oven (Medium size)	01
11.	Refrigerator (290 Ltr)	01
12.	Digital Colony Counter	01
13.	Centrifuge	01
14.	Jar test apparatus	01
Other Accessories		
15.	Steel Vessel (S.S. for Autoclave) Capacity-5lts	02
16.	Test Tube Stand (15 Hole) 18X150mm ss	05
17.	Test Tube Stand (15 Hole) 18X150mm pvc	05
18.	Nessler Tube Stand (100 mm dia)	02
19.	Cruable Tongs ss 18"	02
20.	Cruable Tongs ss 24"	02
21.	Beaker Tongs ss 12"	02
22.	Flask Tongs ss 18"	02
23.	Tissue Paper	05 pkt

**Commissioner
Municipal Corporation
Jagdalpur**

LABORATORY GLASSWARE TO BE SUPPLIED BY THE CONTRACTOR

S.N.	Particulars	Capacity	Qty.
01.	Beaker	50ml	12
		100ml	24
		250ml	24
		500ml	12
02.	Burette	10ml	06
		25ml	06
		50ml	06
03.	Pipette	01ml	12
		05ml	12
		10ml	12
04.	Conical Flask	100ml	18
		250ml	24
		500ml	12
		01 lts	6
05.	Measuring Cylinder	25ml	2
		50ml	2
		100ml	2
		250ml	2
		500ml	2
06.	Volumetric Flask	100ml	06
		250ml	06
		500ml	12
		01Lts.	12
07.	Wash Bottle (Polythene)	01 Lts.	2
08.	Sample Bottle	250ml	18
		500ml	18
10	Reagent Bottle	1Lts.	12
		2 Lts.	6
11.	Dishes Crystallizing	100x 50mm	4
12.	Petridish (withcover)	80mm	8
13.	Durham Tube	1"x 3/8"x6/16", 3" 1/16"	300
14.	Nessler Tube	100ml	24
15.	Test Tube (Rimless)	(size 6"x3/4")	300
16.	Glass Rod		12
17.	Funnel	50mm	6
		100mm	6
18.	Distilled Water Bottle	2.5 lts.	6
19.	Burette Stand		2
20.	Pipette Stand Horizontal		4
21.	Whatman Fiter		01

TENDER DOCUMENT FOR AUGMENTATION & REORGANISATION TO JAGDALPUR WATER
SUPPLY SCHEME UNDER AMRUT MISSION GOVERNMENT OF CHHATTISGARH

(1) NO. 40 ,15 cm	100 nos	01pkt
(2) NO. 1, 15 cm	100 nos	01pkt
(3) No. 540, 12.5 cm	100 nos	01pkt

**Commissioner
Municipal Corporation
Jagdalpur**

LABORATORY CHEMICALS TO BE SUPPLIED BY THE CONTRACTOR

S.N.	Particulars	Capacity	Quantity
01	O – Toludine	500 gm	06 nos.
02	Phenolphthalein Indicator Solution	125 ml	06 nos.
03	Phenol Red	125 ml	06nos.
04	Potassium Dichromate	500 gms	02 nos.
05	Potassium Chromate	500 gms	02nos.
06	Potassium Hydroxide (P)	500 gms	02 nos.
07	Potassium Chloride	500 gms.	02 nos.
08	Potassium Thicyanate	500 gms.	02 nos.
09	Potassium Iodide	250 gms.	02 nos.
10	1-10 Phenanthroline	25 gms	02 nos.
11	Buffer Tab P ^H 4.0	20 tablets	01 no.
	Buffer Tab P ^H 7.0	20 tablets	01 no.
	Buffer Tab P ^H 9.2	20 tablets	01 no.
12	Phenol Di-sulphonic acid	500 ml	02 nos.
13	Potassium Metaperiodate	100 gms	01 nos.
14	Ammonia Solution 0.91-25%	2.5 liters	02 nos.
15	Ammonia Buffer Solution	500 ml	02.nos
16	Acetic Acid glacial	500 ml	02 nos.
17	Ammonium Acetate	500 gms.	01 no.
18	Ammonium per sulphete	500 gms	02 nos.
19	Aluminum Hydroxide	500 gms.	02 nos.
20	Hydrochloric Acid	2.5 liters	01 no.
21.	Sulphuric Acid	2.5 liters	01no.
22.	O-Phosphoric Acid 85%	500 ml	01 no
23	Nitric Acid	2.5 liters	01 no.
24.	Murexide	5gm	02 nos.
25.	Eriochrome Black T	25 gm	04 nos.
26.	Sodium Hydroxide	500 gms.	02 nos.
27	Sodium Chloride	500 gms	02 nos.
28.	Silver Nitrate	25 gms.	04 nos.

TENDER DOCUMENT FOR AUGMENTATION& REORGANISATION TO JAGDALPUR WATER
SUPPLY SCHEME UNDER AMRUT MISSION GOVERNMENT OF CHHATTISGARH

29	SPANDA AR	5 gm	02 nos.
30.	Sodium Carbonate	500gms.	02 nos.
31.	Starch Soluble	500 gms.	02.nos
32	Silver Suphate	25 gms	02 nos.
33	Sodium Fluoride	500 gms.	01 no.
34	Sodium Acetate Anhydrous.	500 gms.	01 no.
35	Chloroform	500 gms.	01 no.
36.	Methyl Orange	125 ml	03 nos.
37	Glycerol 98%	500 ml	01 no.
38	Barium Chloride	500 gms.	01 no.
39	Ethanol Absolute	500 ml	01 no.
40	Hydrazine sulphate	100 gms.	05 no.
41	Mac Conkey Broth	500 gms.	02 nos.
42	Glass Wool	250 gms.	02 nos.
41	Mac Conkey Broth	500 gms.	02 nos.
42	Glass Wool	250 gms.	02 nos.
41	Ferrous Ammonium Sulphate	500 gms.	01 no.
42	Sodium Thio Sulphate	500 gms	01 no.
43	Magnesium Suplhate	500 gms.	01 no.
44	Hydrogen peroxide 30%	500 ml	01 no.
45	Ammonium Chloride	500 gms.	01 no.
46	Copper Sulfate	500 gms.	01 no.
47	Sodium Azide	500 gmas.	01 no.
48	Calcium Carbonate	500 gms.	01 no.
49	Hexamine GR	500 gms	01 no.
50	Sulphanilamide AR	500 gms.	01 no.
51	Potassium Nitrate	500 gms.	01 no.
52	Hydroxylamine	500 gms.	01 no.
53	EDTA	500 gms	02 nos.
54	Zirconiumoxy chloride	500 gms.	02 nos.
55	Potassium per magnet	100 gms.	02 nos.
56	Sodium Sulphate	100 gms.	02 nos.
57	Sodium Arsinat	100 gms.	02 nos.
58	Sodium oxalate	100 gms.	02 nos.
59	Murcuric Suphate	500 gms.	01 nos.

Commissioner
Municipal Corporation
Jagdalpur

Annexure - "F-5(OHSRs)" : Price Schedule

TABLE-A

PERCENTAGE Break-up of payment of 1.531% of LUMP SUM OFFER for 6No. OHSRs

Sl. No	Description	Percentage amount for the OHSR on completion
1	Design, Construction, , topographical survey ,geotechnical investigation (determination of SBC)Testing, Commissioning of Overhead Service reservoir including providing pipes, valves, flow-meters, water tightness testing, disinfection and commissioning all complete as per specifications at:	
(i)	Dharampura Proposed OHSR of 300 kL at 20 m staging	0.323%
(ii)	Army Training Centre OHSR of 850kL at 15 m staging	0.064%
(iii)	Jaiswal Colony OHSR of 750 kL at 20 m staging	0.814%
(iv)	Wardhaman Colony OHSR of 650 kL at 20 m staging	0.085%
(v)	Lal Bagh OHSR of 1250 kL at 20 m staging	0.161%
(vi)	Hathkachora OHSR of 650 kL at 20 m staging	0.085%
Total		1.531%

TABLE-B

Break up of Payment Schedule for Individual OHSR

Sl. No	Description	Percentage Payment admissible
1	Geotechnical investigations for determination of SBC including approval of Design and Drawings by PDMC and construction of of levelling course of PCC(1:2:4) for foundation of OHSR complete	5%
2	After casting of foundation including columns upto GL	10%
3	After casting of 50% of RCC complete staging	12%
4	After completion of casting of complete RCC staging	13%
5	After completion of castin of Ring Beam & Bottom Slab	15%
6	After completion of casting of vertical walls of reservoir/container complete	15%
7	After completion of casting of staircase , top dome /slab	10%

Sl. No	Description	Percentage Payment admissible
8	On supply and fixing of pipes & specials , valves , water level indicators, railing , lightening arrestor & Earthing (as per IS-3043) complete at site including approval by the Third Party Inspection.	15%
9	After finishing, distempering and painting & successful water tightness testing of work and commissioning followed by 12 months trial run.	5%

Note: **The payment of R.A. Bills shall be made as per actual work done at site and as certified by Engineer-in Charge.**

**Commissioner
Municipal Corporation
Jagdalpur**

Annexure - "F-6 -PLC – SCADA Automation, Monitoring and Control
System": Price Schedule

Break up of Payment Schedule for PLC & SCADA 7.483% of LUMP SUM OFFER

S.no	Description	Percentage payment on completion of work
1	Design, Construction, installation of PLC SCADA automation., monitoring and Control system	
i	Designs preparation and submission of system drawing & its approval by PDMC with list of procured hardware	5%
ii	Supply & Installation of system components[duly approved by Third Party Inspection (SGS/RITES) based on approved QAP] with complete hardware, electrical installation, cabling and system kick off	60%
iii	After three months of complete system operation with all the components running to their rated capacities	25%
iv	After completion of 12 Months trial run	10%
	Total	100%

Note: The payment of R.A. Bills shall be made as per actual work done at site and as certified by Engineer-in Charge.

Annexure - "F-7 (Civil Ancillary Works)" : Price Schedule

Break up of Payment for the 1.559% of Lump sum offer for "Civil Ancillary Work"

S.R No	Particulars	Qty	Rate	Per	Amount (Rs. In lacs)
1	Provision for Compound wall along with Brick masonry at OHT's, electric sub station. OHT's 50 x 19 = 950m Supplying and erecting chain link mesh fencing for electric sub-station switch yard of 2.5 m approx. height from ground level using angle iron size 50 X 50 X 6 mm erected in C.C. foundation 15 X 15 X 40 cm deep at every 2 metre fitted with flat iron support of size 25 X 6 mm on top, bottom and mid way and chain link mesh 50 x 50 mm aparture and 4 mm dia G.I. hard wire securing and screwing with 2mm dia G.I. wire, G.I. staples, G.I.U-nails or steel pins to the angle iron at every distance of 30 cms, by iron studs complete duly painted with one coats of red oxide and two coats of approved colour paint	950	4997.33	per	47.47
				Mtr.	
	CG PWD SOR 2015 24.10	1050	507	sqm	5.32
	420 x 2.50 =				
2	Provision for Main Gates WTP 2 Nos of size 5 x 2.5m Head works 1 Nos of size 5 x 2.5m OHT's 19 No of size 5.0 x 2.5m Total 275 Sqm x 25 Kg per Sqm (CG PHE USOR P.No. 23 I.No. 2.25.4	6875	71		4.88
3	Provision for Computers, peripherals & Furniture and other Misc items like telephone connection, internet etc.				2.50
4	Provision for plantation around OHT and WTP site. including landscaping and beautification of construction site	2	5	Each	10.00
	Providing and fixing M.S. flat iron tree guard 60cm dia. and 2m height above ground level formed of 4 nos. 25x6mm and 8 nos. 25x3mm vertical M.S. flats rivetted to 3 nos. 25x6mm M.S. flat iron rings in two halves, bolted together with 8mm dia. and 30mm long bolts including painting two coats with paint of approved brand and manufacture over a coat of priming, complete in all respects.	100	1643	Each	1.64
	CG Building SOR 2013 Chapter Chapter XXIII				
5	Pg. No. 194 It. No. 23.15 Plants of Regular varieties of 5 Ft. Height including Transport	100	160	Each	0.16
6	Digging holes in ordinary soil and refilling the same with the excavated earth mixed with manure Holes 1.2 m dia and 1.2 m deep.	100	170	Each	0.17

TENDER DOCUMENT FOR AUGMENTATION& REORGANISATION TO JAGDALPUR WATER
SUPPLY SCHEME UNDER AMRUT MISSION GOVERNMENT OF CHHATTISGARH

	CC Roads				
7	Providing and laying cement concrete for plain concrete/ reinforced concrete i/c form work, shuttering complete in as per drawings and specifications.(For Village roads)				
	WTP site 400m x 4.0m	1600	1129.6	sqm	18.07
8	Providing and placing in position cold twisted or un-coated HYSD steel barand 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. (PHE SOR I. No. 2.25.1(2.25.1.1) of P. No. 23) Sub Structure				
	0.7% of CC Road Quantity	11200	55	kg	6.16
9	Providing and fixing in position copper lightening conductor as per IS 3070 - 1965 (with up to date amendment) including copper rod of 20mm dia as per upper terminal 1.5M long with a knob at end and with conical spike at top, copper tape conductor 20x3mm size, copper earth plate of 3mm thick and 0.81 sqm. in area, clamps at 1 M centre to centre including, necessary excavation, laying and fixing the conductor, providing and fixing 40mm G.I. pipe upto 3 M height from ground and 0.5M below ground including making all connections, filling the earthing pit with charcoal, salt, etc. and refilling and watering, etc. complete as per specifications laid down in I.S. codes 3070.	19	9109	Each	1.74
	<i>Desilting & Screening in Existing Jackwell</i>				
10	Desilting the Supply Well, Intake Well / Head Works, sump of water supply/ sewerage works etc For every additional lift beyond initial lift of 9.0 M and lead up to 150M as required beyond the work site, stacking, spreading, including necessary guarding, etc. complete, as directed by Engineer- in-charge.				
	$\frac{\pi}{4} \times 10 \times 3$	235.6	162	Cum	0.39
	<i>PHE-SOR/2013/Item 2.36</i>				
	For Additional lift and transportation	1	200000	LS	2.00
11	Dewatering charges for estimation purpose for head works in river basin or dam :				
	Intake well	1	210264	Rmt	2.11
	<i>PHE-SOR/2013/Item 24.16</i>				
12	Providing & supplying & fixing screen guard on mouth of the connecting main including fabrigating cost of mechanical work including & cost of mechanical joint, labour etc, complete.				
	Mesh	1.00	50000.00	LS	0.50
				Total A	103.83
				(-)7.16% B	7.43
				Amount C= (A-B)	96.40

Deduction of 7.16 % shall be done as mentioned above to match the the agreed amount with previous Contractor.

Note: The payment of R.A. Bills shall be made as per actual work done at site and as certified by Engineer-in Charge.

**Annexure - "F-8
(O & M FOR FIVE YEARS)": Price Schedule**

PART B

S.No.	Name of Subwork			
	Operation & Maintenance for 5 Years of existing 09 MLD WTP and proposed 35 MLD WTP including PLC SCADA monitoring & control system (covering all WTPs all RWPs,CWPS, valve actuators,OHSRS,FCVs,& electromagnetic bulk flow meters etc) and all new RWPS & CWPS etc including replacement and warranty for 5 years. For First Year 18% For Second Year 19% For Third Year 20% For Fourth Year 21% For Fifth Year 22%			

ANNEXURE- "G-I"

GUARANTEE BOND

(To be used by approved scheduled banks)

1. In consideration of Municipal Corporation Jagdalpur (here in after called the Corporation) having agreed to exempt..... (herein after called the said contractor(s) from the demand under the terms and conditions of an agreement dated made between and Municipal Corporation for the work of..... (here after chatted the said Agreement)

Indicate name of work) notified vide N.I.T. N..... Dated issued by the Executive Engineer. Municipal Corporation. Jagdalpur (herein after called the said Agreement) of earnest money deposited for the due fulfilment, by the said contractor(s) of the terms and conditions contained in the said agreement on production of a Bank Guarantee for Rs (Rupees only.) We to the as "The Bank" at the request of the said contractor(s) do hereby undertake to pay the Municipal Corporation (an amount not exceeding Rs against any loss or damage caused to or suffered or would be caused to or suffered by the Municipal Corporation by the reason of any breach by the said contractor (s) of the terms or condition contained in the said agreement.

2. We (') Bank Ltd.. do hereby under -take to pay the amounts due and payable under this guarantee without any demur merely on a demand from the Municipal Corporation stating that the amount claimed is due by way of loss or damage caused to or suffered by the Municipal Corporation by reason of any breach by said contractor {s) of any of the terms or conditions contained in the said agreement or by reason of the contractor (s) failure to perform the said agreement. Any such demand made on the Bank shall be conclusive, as regards the amount due and -payable by the bank under this guarantee However, our liability this guarantee shall be restricted to an amount not exceeding Rs.....

3. We Bank limited further agree with the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said agreement and that if shall continue to be enforceable till all dues of corporation under or by virtue of said

agreement have been fully paid and its claims satisfied or till ..
..... department certifies that the terms of the said agreement have been fully and properly carried out by the said contractor (s) and accordingly discharges the guarantee unless a demand or claim under this guarantee is made on us in writing on or before the we shall be discharged from all Liability under this guarantee thereafter,

4. We (*)
Further agree that the guarantee herein contained shall remain in full force and affect during the period that would be taken for the performance of the said agreement and that shall continue to be enforceable till all the dues of the Municipal Corporation under or by virtue of the said agreement have been fully paid and its claims satisfied or discharged or till the Executive Engineer, Municipal Corporation certify that the terms and conditions of the said agreement have been fully and properly carried out by the said contractor (s) and accordingly discharges this guarantee. Unless a demand or claim under this guarantee is made on us in writing on or before the (*w)..... we shall be discharged from all liability under this guarantee.

5. We..... ("").....
..... further agree with the Municipal Corporation that Municipal Corporation shall be The fullest liberty without effecting in any manner our obligation hereunder to vary any of the terms and conditions or the said agreement to extend time of performance by

*(indicate name of the bank)

**Here write a date beyond 9 months of the prescribed date of opening of tenders,

The said contractor(s) from time to Time or to postpone for any time or for time to time, any of the power exercisable by the Government against the said contractor(s) and to forebear or enforce any of the terms and conditions relating to the said agreement and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said contractor(s) or any

Forbearance act or commission on the part of the Municipal Corporation or any indulgence by the Commissioner municipal Corporation to the said contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties, would but for this provision have effect of so relieving us.

6 . This guarantee which not be discharged due to the change in the Constitution of the Bank or the an tractors)

7. We.....(*) Bank Limited, lastly undertake not to revoke this guarantee it currency except with The previous consent of the Municipal Corporation, in writing datedday of

or..... (indicate the name of the Bank) indicate The name of the Bank

ANNEXURE- "G-II"

(Revised form of Bank Guarantee Bond)

GUARANTEE BOND

(in lieu of Security Deposit)

(To be used by approved scheduled Bank)

1. In consideration of Jagdalpur Municipal corporation (here in after called the Government) having _____ agreed _____ to exempt..... (herein after ailed the said contractors) from the demand under the terms and conditions of an agreement datedmade between for the work (Name of work) (Herein after called the said Agreement) of security deposit for' the due fulfillment by the said contractors) of the Terms and conditions in The said agreement On production of a Bank Guarantee for Rs

.....Rupees.....only.....
..... (*)(herein after referred to as "The Bank" (at the request of the said contractors) do here by undertakes to pay to The Municipal Corporation and a amount not exceeding Rsagainst any loss or damage caused to or suffered or would be caused to or suffered b^y the Municipal Corporation, by reason of any breach by the said contractor (s) of the terms or conditions contained in the said agreement in cache said contractor and the Government for the work of
..... (indicate name of work) notified vide N.I.T. No.....
Dated issued by the Executive Engineer, Municipal Corporation, Jagdalpur (herein after called the said Agreement) of earnest money for the due fulfillment by the said contractor (s) of the germs and condition.

2 . We (*)do hereby undertake to pay the amounts due and payable under this guarantee without any demur merely on a demand from The Municipal Corporation stating that the amount claimed is due by way of loss or damage caused to or suffered by The Municipal Corporation by reason of any breach by said contractor(s) of any of the terms or conditions contained in is said agreement or by reason or The contractor(s) failure to perform the said agreement. Any such remand made on the Bank shall be conclusive as regards the amount due and payable by the bank under _____ is guarantee. However, our liability under this Guarantee shall be restricted to an amount not exceeding Rs.....

3. We undertake to pay To the Municipal Corporation any money so demanded not withstanding any dispute or disputes raised by the contractor(s) in any suit or proceedings pending before any court or Tribunal relating thereto, our liability under this present being absolute and unequivocal.

4. We (*) further agree That the guarantee herein contained shall remain in full force and effect during the period That would be

taken for the performance of ne said agreement and That is shall continue to be enforceable till all the dues of the Municipal Corporation under or by virtue of the said agreement have been fully paid and its chums satisfied or :is charged or till the Executive Engineer, Municipal Corporation, Jagdalpur certified That the terms and conditions of the said agreement have been fully and properly carried out by the said contractor(s) and accordingly discharged this guarantee. Unless a demand or claim under this guarantee Is made or lJtR in writing on or before The (here indicated a date which*%M falls 9 months beyond the due date of completion of the work)we shall be discharged from all liability under this guarantee.

5 . Me (*) further agree with the Municipal Corporation shall have that fullest liberty without our consent and with effecting in any y manner our obligations here under to vary any of the terms and conditions of the said agreement to extend, try e of performance by the said contractors) from time to time or to postpone for any of the powers exercise able by the Municipal Corporation against the said contractors) and to forebear or enforce any of the, terms and conditions relating to the said agreement and we shall not be relieved from our liability by reasons of any such variations, or extension being granted to the said contractor(s) or forbearance, actor commission on the part or the Municipal Corporation or any indulgence by The Municipal Corporation to the said contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provision have effect of so relieving us.

6. This guarantee will not be discharged due to, the change in the Constitution of the Bank or the contractor(s).

7. We (*) lastly undertake not to revoke this guarantee it currency except with the previous consent of the Municipal Corporation, in writing

Dated the Day of
.....
For (*)

.....
(* In indicate the name of the Bank
.....
.....

ANNEXURE H

SPECIAL CONDITIONS OF N.I.T

- 1) “Additional performance security (APS) shall be deposited by the successful bidder at the time of signing of agreement when the bid amount is seriously unbalanced i.e. less than the estimated cost by more than 10% in such an event the successful bidder will deposit the Additional performance security (APS) to the extent of difference of 90 % of the PAC and bid amount in the shape of FDR, in favor of the Commissioner before signing the agreement. The same shall be refunded along with the normal S.D. after completion of the work. If the contractor fails to complete the work or left the work incomplete, & the additional performance security (APS), Shall be forfeited by the department, & the agreement shall be terminated and action shall be taken in accordance with Contract Agreement. In case the tendered/contractor refuses to deposit Additional performance security (APS) then his bid will be rejected by the sanctioning authority and earnest money shall be forfeited”
- 2) If the tendered, whose tender has been accepted, and after signing the agreement, (i) does not start regular actual physical items of work within 25% (twenty five percent) of the time allowed for completion, or abnormally slowdown the work or (iii) abandons the work, or (iv) merely goes on applying for extension or time, the Commissioner shall serve a “show cause” notice with details to the contractor in this regard and if the contractor dose not reply, or if his reply is considered not satisfactory (at the sole discretion of the Commissioner), his earnest money and the performance security money or the Bank Guarantee in this regard shall be forfeited in favour of the JAGDALPUR MUNICIPAL CORPORATION. if the contractor has committed a similar default on earlier occasion (s) in previous three consecutive years the contractor shall be debarred from participating in any future tender of JAGDALPUR MUNICIPAL CORPORATION for a period of 2 (two) years from the date of such order, by the authority which had registered him/her.
Such orders & action shall be final binding and conclusive
- 3) **Detailed program Construction:**
 - (i) Within 15 days of issue of order to star work, the contractor shall submit in the prescribed Performa a detailed construction programme month wise mentioning start and completion or each item/event involved in the due performance of the contract for contract more than 10 Crores Contractor shall also submit detailed proramme month wise for
 - (a) Materials procurement
 - (b) Their transport arrangement to work site with details of No. of truck/tippers
 - (C) Detailing of construction plants & equipments
 - (d) Cash flow/revised Cash flow
 - (ii) The contractor shall submit in the first week of each month a statement of “target vis-à-vis actual performance” of each item/event with slippage, if any mentioning reasons of slippage and proposal for revised construction programme to complete the same in targeted date or validly extended date. Failure to submit this monthly statement for 4 (Four) months can be

treated as “Fundamental Breach of Contract” and can result in invoking clause 3 of the conditions of contract.

- 4) Extension of Validity period of Bank guarantee(s):- If required, the Executive Engineer/Nodal shall ask the contractor to extend the validity period of the bank guarantee (s) for such period which he considers it proper and the contractor shall extend the validity period of such bank guarantee accordingly. If the contractor fails to extend the period accordingly, the Commissioner shall encase the B.G. before the expiry of the validity period.
- 5) The contractor shall have to carry out all necessary “ Rectification” of defects noticed, caused due to any reasons at his own cost within such reasonable period mentioned in such communication notice from the Executive engineer to him.
- 6) Failure of the contractor to rectify the defects properly in the given period, it shall be open for the Executive Engineer/Assistant Engineer to get the defect (s) rectified either departmentally or through other agency (without calling any tender/quotation) and recover the actual cost plus 15% (Fifteen Percent) of such cost from the contractor from any sum, in any form, and available with the department or can be recovered as “Arrears of Land Revenue”
- 7) The tendered/contractor shall give in advance authority letter (s) in favour of the Commissioner, authorizing him to get all bank’s fixed deposit receipts, Bank Guarantees (either normal security deposit and or for performance security) to get these bank receipts and guarantee deeds verified and got confirmed from the concerned bank. It will be only after getting such confirmation that the Commissioner shall pay any amount accordingly or refund the equal amount for which BG submitted has been duly verified and confirmed.
- 8) The contractor shall not remove minor mineral from borrow areas, quarries without prior payment of Royalty charges.

TENDER DOCUMENT FOR AUGMENTATION& REORGANISATION TO JAGDALPUR WATER
SUPPLY SCHEME UNDER AMRUT MISSION GOVERNMENT OF CHHATTISGARH

Municipal Corporation Jagdalpur

Name of Contractor

Date of work order

Due date of completion

Detail work programme – Original/1st Revision/2nd Revision/ Revision)

Work Items

Sr. No.	Items	Unit	Months							
			1	2	3	4	5	6	7	8
1										
2										
3										
4										
5										
6										

Approved

Executive Engineer

Signature

MONTHLY TARGET Vs. ACTUAL ACHEVEMENT

Cumulative Achievement of item of work for the month ending of

Agt. No. Name of Work
 Length Date of W.O.

 Date of
 Completion.....

Sr. No.	Items	Cumulative Work Programme			Cumulative Achievemtnt actual	Slipage if any (Period)	Reason for slippage (Use add sheet if needed)
		As per Original	1St Revision	Last No. Revision			
1	2	3 (a)	3 (b)	3 C	4	5	6

Comments of Executive Engineer if any

Cash Flow for performing the contract (applicable fro works cost)

Name of Division Name of Contractor

 Period of Contract
 Value

(A)	Investment	1st Month	2nd Month	3rd Month	4th Month	5th Month	6th Month
(I)	Initial (E.M.) P.G. Insurance (Establish Site Office)						
(II)	Advance for Procurement of Material (if any)						
(III)	Advance for Procurement of labour (if any)						

TENDER DOCUMENT FOR AUGMENTATION& REORGANISATION TO JAGDALPUR WATER
SUPPLY SCHEME UNDER AMRUT MISSION GOVERNMENT OF CHHATTISGARH

(IV)	Purchase of New Equipment (if any)						
(V)	Other overheads staff including head office						
(VI)	Other if any (Furnish details)						
Total Investment(x)							
(B)	Receipt						
(I)	Gross Bill Amount						
	Deductions.						
a	S.D.						
b	Advance						
c	TDS						
d	Other recoveries if any						
(y) Total Receipt							
Net cash flow (x-y)							

- Note:** - (1) This Should co-relate to work programme/progress of work during the month.
(2) Running bill will be expected to be paid within 15 days of the receipt and checking of measurement, quality and quality of items
(3) Investment less net receipt for 1st 15 days and then during.
(4) (Final bills is expected to be paid within 2 months of satisfactory completion work.
(5) Total investment less Total Receipt (-) be shown in bracket.

**Commissioner
Municipal Corporation
Jagdalpur**

ANNEXURE-I

Guidelines for bidders on using Integrated eProcurement System Govt. of Chhattisgarh. <https://eproc.cgstate.gov.in>

Note: These conditions will over-rule the conditions stated in the tender document(s), wherever relevant and applicable.

1. Vendor / Bidder Registration on the e-Procurement System:

All the Users / Bidders (Manufacturers / Contractors / Suppliers / Vendors / Distributors etc.) registered with and intending to participate in the Tenders of various Govt. Departments / Agencies / Corporations / Boards / Undertakings under Govt. of Chhattisgarh processed using the Integrated e-Procurement System are required to get registered on the centralized portal <https://eproc.cgstate.gov.in> and get approval on specific class (e.g. A, B, C, D, UGE, UDE) from Public Works Department (in case to participate in tenders restricted to vendors / bidders in a particular class).

The non – registered users / bidders who are also eligible to participate in the tenders floated using the e-Procurement system are also required to be registered online on the e-Procurement system.

Vendors are advised to complete their online enrolment / registration process on the portal well in advance to avoid last minute hassle, it is suggested to complete enrolment at least four days before the last date of bid submission date, failing which may result in non-submission of bids on time for which vendor/end user shall be solely responsible.

For more details, please get in touch with e-Procurement system integrator, M/s. Mjunction Services Limited, Raipur – 492 001 on Toll free 1800 258 2502 or email helpdesk.eproc@cgswan.gov.in.

2. Digital Certificates:

The bids submitted online must be signed digitally with a valid Class II / Class – III Digital Signature Certificate to establish the identity of the bidders submitting the bids online. The bidders may obtain pair of Encryption & Signing Class – II / Class – III Digital Certificate issued by an approved Certifying Authority (CA) authorized by the Controller of Certifying Authorities (CCA), Government of India.

Note: It may take upto 7 to 10 working days for issuance of Class-II / Class-III Digital Certificate, Therefore the bidders are advised to obtain it at the earliest. It is compulsory to possess a valid Class-II / Class-III Digital Certificate while registering online on the above mentioned e-Procurement portal. A Digital Certificate once mapped to an account / registration cannot be remapped with any other account / registration however it may be inactivated / deactivated.

Important Note: bid under preparation / creation for a particular tender may only be submitted using the same digital certificate that is used for encryption to encrypt the bid data during the bid preparation / creation / responding stage. However bidder may prepare / create and submit a fresh bid using his/her another / reissued / renewed Digital Certificate only within the stipulated date and time as specified in the tender.

In case, during the process of a particular bid preparation / responding for a tender, the bidder loses his/her Digital Certificate because of any reason they may not be able to submit the same bid under preparation online, Hence the bidders are advised to keep their Digital Certificates secure to be used whenever required and comply with IT Act 2000 & its amendments and CVC guidelines.

The digital certificate issued to the authorized user of an individual / partnership firm / private limited company / public limited company / joint venture and used for online bidding will be considered as equivalent to a no-objection certificate / power of attorney to the user.

Unless the certificate is revoked, it will be assumed to represent adequate authority of the specific individual to bid on behalf of the organization / firm for online tenders as per Information Technology Act 2000. This authorized user will be required to obtain a valid Class-II / Class-III Digital Certificate. The Digital Signature executed through the use of Digital Certificate of this authorized user will be binding on the organization / firm. It shall be the responsibility of management / partners of the concerned organization / firm to inform the Certifying Authority, if the authorized user changes, and apply for a fresh digital certificate for the new authorized user.

3. Online Payment: As the bid is to be submitted only online, bidders are required to make online payment(s) of the Registration fee / Transaction or Service fees / EMD using the online payments gateway services integrated into the e-Procurement system using various payment modes like Credit Card / Debit Card / Internet Banking / Cash Card / NEFT / RTGS etc.

For the list of available online modes of electronic payments that are presently accepted on the online payments gateway services, please refer the link '**Payments accepted online**' on the e-Procurement portal <https://eproc.cgstate.gov.in>.

4. Setup of User's Computer System: In order to operate on the e-Procurement system for a bidder / user, the computer system / desktop / laptop of the bidder is required to have Java ver. 765, Internet Explorer 9 / 11, latest Mozilla Firefox with IE Tab V2 (Enhanced IE Tab) or any other latest browser. A detailed step by step document on the same is available on the home page. Also internet connectivity should be minimum one MBPS.

5. Publishing of N.I.T.: For the tenders processed using the e-Procurement system, only a brief advertisement notice related to the tender shall be published in the newspapers and the detailed notice shall be published only on the e-Procurement system. Bidders can view the detailed notice, tender document and the activity time schedule for all the tenders processed using the e-Procurement system on the portal <https://eproc.cgstate.gov.in>.

6. Tender's Critical Dates & Time/Tender Time Schedule: The bidders are strictly advised to follow the tender time for their side for tasks / activities and responsibilities to participate in the tender, as all the activities / tasks of each tender are locked before the start time & date and after the end time & date for the relevant activity of the tender as set by the concerned department official.

7. Download Tender Document(s): The tender document and supporting document(s) if any can be downloaded only online. The tender document(s) will be available for download to concerned bidders after online publishing of the tender and up to the stipulated date & time as set in the tender.

8. Submit Online Bids: bidders have to submit their bid online after successful filling of

forms within the specified date and time as set in the tender.

The encrypted bid data of only those bidders who have submitted their bids within the stipulated date & time will be accepted by the e-Procurement system. It is expected that the bidder complete his bid ad submit within timeline, a bidder who has not submitted his bid within the stipulated date & time will not be available during opening.

Bid documents uploading during bid preparation should be less than five MB (for individual document) and over all bid documents should be less than fifty MB.

9. Submission of Earnest Money Deposit: The bidders shall submit their EarnestMoney Deposit Either as in usual physically sealed Earnest Money Deposit envelope and the same should reach the concerned office OR Online using payment gateway as stated in the Notice Inviting Tender/ Tender document. Bidders also have to upload scanned copy of Earnest Money Deposit instrument OR Online Payment /NEFT/RTGS receipt along with the reference details online.

10. Opening of Tenders: The concerned department official receiving the tenders orhis duly authorized officer shall first open the online Earnest Money Deposit envelope of all the bidders and verify the same uploaded by the bidders. He / She shall check for the validity of Earnest Money Deposit as required. He / She shall also verify the scanned documents uploaded by the bidders, if any, as required. In case, the requirements are incomplete, the next i.e. technical and commercial envelopes of the concerned bidders received online shall not be opened.

The concerned official shall then open the other subsequent envelopes submitted online by the bidders in the presence of the bidders or their authorized representatives who choose to be present in the bid opening process or may view opened details online.

11. Briefcase: Bidders are privileged to have an online briefcase to keep theirdocuments online and the same can be attached to multiple tenders while responding, this will facilitate bidders to upload their documents once in the briefcase and attach the same document to multiple bids submitting.

For any further queries / assistance, bidders may contact:

1. The Service Integrator of e-Procurement system, M/s. Mjunction Service Ltd. on Help Desk Toll free No. 1800 258 2502 or email helpdesk.eproc@cgswan.gov.in.
2. Mr. Shailesh Kumar Soni, Sr. Manager, Chhattisgarh Infotech & Biotech Promotion Society (CHiPS) on Tel. No. 0771 - 4014158 or email: pro-chips@nic.in.

Annexure – ‘J’
Pre contract Integrity Pact

1. GENERAL

1.1 This pre-bid contract Agreement (herein after called the Integrity Pact) is made on.....day of the month.....20.....between, theJAGDALPUR MUNICIPAL CORPORATION acting through Shri.....(Designation of the officer , Department) JAGDALPUR MUNICIPAL CORPORATION (hereinafter called the “BUYER” which expression shall mean and include, unless the context otherwise requires, his successors in the office and assigns) and the First Party , proposes to procure (name of the Stores / Equipment /Work/Service) and M/srepresented by ShriChief Executive Officer (hereinafter called the “BIDDER/Seller” which expression shall mean and include , unless the context otherwise requires, his successors an permitted assigns) and the Second Party, Is willing to offer/has offered.

1.2 WHEREAS the BIDDER is a Private Company/Public Company/Government Undertaking/Partnership/Registered Export Agency, constituted in accordance with the relevant law in the matter and the BUYER is a Ministry/Department of the Government, performing its function on behalf of the JAGDALPUR MUNICIPAL CORPORATION.

2. OBJECTIVES

NOW , THEREFORE the BUYER and the BIDDER agree to enter into this pre-contract agreement , hereinafter referred to as Integrity Pact, to avoid all forms of corruption by following a system that is fair, transparent and free from any influence/prejudiced dealings prior to during and subsequent to the Contract to be entered into with a view to :-

2.1 Enabling the BUYER to obtain the desired Stores/Equipment /Work/Service at a competitive price in conformity with the defined specifications by avoiding the high cost and the distortionary impact of corruption on public procurement, and

2.2 Enabling BIDDERS to abstain from bribing or indulging in any corrupt practices in order to secure the contract by providing assurance to them that their competitors will also abstain from bribing any corrupt practices and the BUYER will commit to prevent corruption, in any form, by its official by following transparent procedures.

3. COMMITMENTS OF THE BUYER

The BUYER commits itself to the following :-

3.1 The BUYER undertakes that no official of the BUYER, connected directly or indirectly with the contract, will demand, take promise for or accept, directly or through intermediaries, any bribe, consideration, gift, reward, favors or any material or immaterial benefit or any other advantage from the BIDDER, either for themselves or for any person, organization or third party related to the contract in exchange for an advantage in the bidding process, bid evaluation, contracting or implementation process related to the contract.

3.2 The BUYER will, during the pre-contract stage, treat BIDDERS alike, and will provide to all BIDDERS the same information and will not provide any such information to any particular BIDDER which could afford an advantage to that particular BIDDER in comparison to the other BIDDERS.

3.3 All the officials of the BUYER will report the appropriate JAGDALPUR MUNICIPAL CORPORATIONoffice any attempted or completed breaches of the above commitments as well as any substantial suspicion of such a breach.

In case any such preceding misconduct on the part of such official(s) is reported by the BIDDER to the BUYER with the full and verifiable facts and the same *prima facie found* to be correct by the

BUYER, necessary disciplinary proceedings, or any other action as deemed fit, including criminal proceedings may be initiated by the BUYER and such a person shall be debarred from further dealings related to the contract process. In such a case while an enquiry is being conducted by the BUYER the proceedings under the contract would not be stalled.

4. COMMITMENTS OF BIDDERS

The BIDDER commits itself to take all measures necessary to prevent corrupt practices, un fair means an illegal activities during any stage of its bid or during any pre-contract or post- contract stage in order to secure the contract or in furtherance to secure it and in particular commit itself to the following :-

4.1 The BIDDER will not offer, directly or through intermediaries, any bribe, gift, consideration, reward, favour any material or immaterial benefit or other advantage, commission, fees, brokerage or inducement to any official of the BUYER, connected directly or indirectly with the bidding process, or the any person, organization or third party related to the contract in exchange for any advantage in the bidding, evaluation, contracting and implementation of the contract.

4.2 The BIDDER further undertakes that it has not given, offered or promised to give, directly or indirectly any bribe, gift, consideration, reward, favour , any material or immaterial benefit or other advantage, commission, fees, brokerage, or inducement to any official of the BUYER or otherwise in procuring the Contract of forbearing to do or having done any act in relation to the obtaining or execution of the contract or any other contract with the JAGDALPUR MUNICIPAL CORPORATION for showing or forbearing to show favour or disfavor to any person in relation to the contract or any other contract with the Government.

4.3 The BIDDER further confirms and declares to the BUYER that the BIDDER in the original Manufacture/Integrator/Authorized JAGDALPUR MUNICIPAL CORPORATION sponsored export entity of the stores and has not engaged any individual or firm or company whether Indian or foreign to intercede, facilitate or in any way to recommend to the BUYER or any of its functionaries, whether officially or unofficially to the award of the contract to the BIDDER, nor has any amount been paid, promised or intended to be paid to any such individual, firm or company in respect of any such intercession, facilitation or recommendation.

4.4 The BIDDER, either while presenting the bid or during pre-contract negotiations or before signing the contract, shall disclose any payment he has made, is committed to or intends to make to officials of the BUYER or their family members, agents, brokers or any other intermediaries in connection with the contract and the details of services agreed upon for such payments.

4.5 The BIDDER will not collude with other parties interested in the contract to impair the transparency, fairness and progress of the bidding process, bid evaluation , contracting and implementation of the contract.

4.6 The BIDDER will not accept any advantage in exchange for any corrupt practice, unfair means and illegal activities.

4.7 The BIDDER shall not use improperly, for purpose of competition or personal gain, or pass on to others, any information provided by the BUYER as part of the business relationship, regarding plans, technical proposal and business details, including information contained in any electronic data carrier. The BIDDER also undertakes to exercise due and adequate care lest any such information is divulged.

4.8 The BIDDER commits to refrain from giving any complaint directly or through any other manner without supporting it with full and verifiable facts.

4.9 The BIDDER shall not instigate or cause to instigate any third person to commit any of the acts mentioned above.

5. PREVIOUS TRANSGRESSION

5.1 The BIDDER declares that no previous transgression occurred in the last three years immediately before signing of this Integrity Pact with any other company in any country in respect of any corrupt practices envisaged hereunder or with any Public Sector Enterprise in India or any JAGDALPUR MUNICIPAL CORPORATION Department in India that could justify BIDDER's exclusion from the tender process.

5.2 If the BIDDER makes incorrect statement on this subject, BIDDER can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason.

6. EARNEST MONEY (SECURITY DEPOSIT)

6.1 Every BIDDER while submitting commercial bid, shall deposit an amount as specified in RFP as Earnest Money/Security Deposit, with the BUYER through any of the following instruments :

(i) Bank Draft or a Pay Order in favour of

(ii) A confirmed guarantee by an Indian Nationalised Bank, promising payment of the guaranteed sum to the(BUYER)on demand within three working days without any demur whatsoever and without seeking any reasons whatsoever, The demand for payment by the BUYER shall be treated as conclusive proof of payment.

(iii) Any other mode or through any other instrument (to be specified in the RFP).

6.2 The earnest Money/Security Deposit shall be valid up to a period of five years or the complete conclusion of the contractual obligations to the complete satisfaction of both the BIDDER and BUYER, including warranty period, whichever is later.

6.3 In the case of successful BIDDER a clause would also be incorporated in the Article pertaining to Performance Bond in the Purchase Contract that the provisions of Sanctions for violation shall be applicable for forfeiture of Performance Bond in case of a decision by the BUYER to forfeit the same without assigning any reason for imposing sanction for violation of this Pact.

6.4 No Interest shall be payable by the BUYER to the BIDDER on Earnest Money/Security Deposit for the period of its currency.

7. SANCTIONS FOR VIOLATIONS

7.1 Any breach of the aforesaid provisions by the BIDDER or any one employed by it or acting on its behalf (whether with or without the knowledge of the BIDDER) shall entitle the BUYER to take all or any one of the following actions, wherever required :-

(i) To immediately call off the pre contract negotiations without assigning any reason or giving any compensation to the BIDDER. However, the proceeding with the other BIDDER (s) would continue.

(ii) To forfeit fully or partially the Earnest Money Deposit (in pre-contract stage) and/or Security Deposit/Performance Bond (after the contract is signed), as decided by the BUYER and the BUYER shall not be required to assign any reason therefore.

(iii) To immediately cancel the contract, if already signed, without giving any compensation to the

BIDDER.

(iv) To recover all sums already paid by the BUYER, and in case of the Indian BIDDER with interest thereon at 2% higher than the prevailing Prime lending Rate while in case of a BIDDER from a country other than India with Interest thereon at 2% higher than the LIBOR. If any outstanding payment is due to the BIDDER from the BUYER in connection with any other contract such outstanding payment could also be utilized to recover the aforesaid sum and interest.

(v) To encase the advance bank guarantee and performance bond/warranty bond, if furnished by the BIDDER, in order to recover the payments, already made by the BUYER, along with interest.

(vi) To cancel all or any other contracts with the BIDDER and the BIDDER shall be liable to pay compensation for any loss or damage to the BUYER resulting from such cancellation / rescission and the BUYER shall be entitled to deduct the amount so payable from the money (s) due to the BIDDER

(vii) To debar the BIDDER from participating in future bidding processes of the JAGDALPUR MUNICIPAL CORPORATION for a minimum period of five years, which may be further extended at the discretion of the BUYER.

(viii) To recover all sums paid in violation of this Pact by BIDDER (s) to any middlemen or agent or broken with a view to securing the contract.

(ix) In cases where irrevocable Letters of Credit have been received in respect of any contract signed by the BUYER with the BIDDER, the same shall not be opened.

(x) If the BIDDER or any employee of the BIDDER or any person acting on behalf of the BIDDER, either directly or Indirectly, is closely related to any of the officers of the BUYER, or alternatively if any close relative of an officer of the BUYER has financial interest/stake in the BIDDER's firm, the same shall be disclosed by the BIDDER at the time of filling of tender Any failure to disclose the interest involved shall entitle the BUYER to rescind the contract without payment of any compensation to the BIDDER.

The term 'close relative for this purpose would mean spouse whether residing with the JAGDALPUR MUNICIPAL CORPORATIONservant or not, but not include a spouse separated from the JAGDALPUR MUNICIPAL CORPORATIONservant by a decree or order of a competent court, son or daughter or step son or step daughter and wholly dependent upon JAGDALPUR MUNICIPAL CORPORATIONservant but does not include a child or step child who is no longer in any way dependent upon the JAGDALPUR MUNICIPAL CORPORATIONservant, or of whose custody the JAGDALPUR MUNICIPAL CORPORATIONservant has been deprived of by or under any law, any other person related, whether by blood or marriage, to the JAGDALPUR MUNICIPAL CORPORATIONservant or to the JAGDALPUR MUNICIPAL CORPORATIONservant's wife or husband and wholly dependent upon JAGDALPUR MUNICIPAL CORPORATIONServant.

(xi) The BIDDER shall not lend to or borrow any money from or enter into any monetary dealings or transactions, directly or indirectly with any employee of the BUYER, and if he does so, the BUYER shall be entitled forth with to rescind the contract and all other contracts with the BIDDER The BIDDER shall be liable to pay compensation for any loss or damage to the BUYER resulting from such rescission and the BUYER shall be entitled to deduct the amount so payable from the money(s) due to the BIDDER.

7.2 The decision of the BUYER to the effect that a breach of the provisions of this pact has been committed by the BIDDER shall be final and conclusive on the BIDDER However, the BIDDER can approach the Monitor (s) appointed for the purpose of this Pact.

8. FALL CLAUSE

8.1 The BIDDER undertakes that if has not supplied /is not supplying similar product/systems or subsystems at a price lower than that offered in the present bid in respect of any other Department of the JAGDALPUR MUNICIPAL CORPORATION or PSU and if it is found at any stage that similar product/systems or sub systems was supplied by the BIDDER to any other Department of the JAGDALPUR MUNICIPAL CORPORATION or a PSU at a lower price, then that very price, with due allowance for elapsed time, will be applicable to the present case and the difference in the cost would be refunded by the BIDDER to the BUYER, if the contract has already been concluded.

9. INDEPENDENT MONITORS

9.1 The BUYER will appoint Independent Monitors (hereinafter referred to as Monitors) for this Pact.

9.2 The task of the Monitors shall be to review independently and objectively, whether and to what extent the parties comply with the obligations under this Pact.

9.3 The Monitors shall not be subject to instructions by the representatives of the Parties and perform their functions neutrally and independently.

9.4 Both the parties accept that the Monitors have the right to access all the documents relating to the project/procurement including minutes of meetings. The Monitor shall be under contractual obligation to treat the information and documents of the BIDDER/Subcontractor(s) with confidentiality.

9.5 As soon as the Monitor notices, or has reason to believe, a violation of this Pact , he will so inform the Authority designated by the BUYER.

9.6 The Monitor will submit a written report to the designated Authority of BUYER/Secretary in the Department/within 8 to 10 weeks from the date of reference or intimation to him by the BUYER/BIDDER and, should the occasion arise, submit proposals for correcting problematic situations.

10. FACILITATION OF INVESTIGATION

In case of any allegation of violation of any provisions of this Pact or payment of commission, the BUYER or its agencies shall be entitled to examine all the documents including the Books of Accounts of the BIDDER and the BIDDER shall provide necessary information of the relevant documents and shall extend all possible help for the purpose of such examination.

11. LAW AND PLACE OF JURISDICTION

This Pact is subject to Indian Law, the place of performance and jurisdiction shall be the seat of the BUYER.

12. OTHER LEGAL ACTIONS

The actions stipulated in this Integrity Pact are without prejudice to any other legal action that may follow in accordance with the provisions of the any other law in force relating to any civil or criminal proceedings.

13. VALIDITY

13.1 The validity of this Integrity Pact shall be from the date of its signing and extend up to 5 years or the complete execution of the contract to the satisfaction of both the BUYER and the BIDDER/Seller whichever is later. In case BIDDER is unsuccessful , this Integrity Pact shall expire after six months

from the date of the signing of the contract.

13.2 If one or several provisions of this Pact turn out to be invalid ; the remainder of this Pact shall remain valid. In such case, the parties will strive to come to an agreement to their original intentions.

The parties hereby sign this Integrity Pact aton.....

BUYER

Name of the Officer
Designation
Department /PSU

Witness

1).....
.....
2).....
.....

BIDDER

COMMISSIONER

Witness

1)
.....
2)
.....

ENVIRONMENTAL MANAGEMENT PLAN

The Contractor shall comply with all applicable national, provincial, and local environmental laws and regulations.

The Contractor shall (a) establish an operational system for managing environmental impacts (b) carry out all of the monitoring and mitigation measures set forth in the [Initial Environmental Examination ("IEE")] or [Environmental Management Plan ("EMP")] and (c) allocate the budget required to ensure that such measures are carried out. The Contractor shall submit semi-annual reports on the carrying out of such measures to the Employer.

More particularly, the Contractor shall comply with (i) the measures and requirements set forth in the initial environmental examination and the environmental management plan attached hereto as Appendix [1 & 2]; and (ii) any corrective or preventative actions set out in safeguards monitoring reports that the Employer will prepare from time to time to monitor implementation of the initial environmental examination and the environmental management plan. The Contractor shall allocate a budget for compliance with these measures, requirements and actions.

POTENTIAL NEGATIVE IMPACTS	MITIGATION MEASURES
Pre-Construction Activities by Contractor	
Construction Camps – Location, Selection, Design and Layout	<p>The construction camps will be located at least 500m away from habitations at identified sites.</p> <p>Locate in barren / waste lands and not fertile agricultural land</p> <p>All fuel oil / lubricants loading and unloading areas shall be paved; and have separate storm water collection system for separation of oil / lubricants prior to discharge.</p> <p>Provide adequate water supply, sanitation, septic tanks, soak pits of adequate capacity.</p> <p>Restore the site to its original state after Use.</p> <p>Proper training of labourers and management of waste, if any</p> <p>Prepare a waste management plan for the camps, including an appropriate sanitation and drainage system</p> <p>Approval should be taken from PWD/PHED for contractors location, selection design and layout of construction camps.</p>
Drinking water availability and water arrangement	<p>The contractor shall be responsible for arrangement of water in every workplace at suitable and easily accessible place for the whole construction period. Sufficient supply of cold potable water (as per IS: 10500) to be provided and maintained. If the drinking water is obtained from an intermittent public water supply then, storage tanks will be provided.</p>
Identification of disposal sites	<p>Location of disposal sites shall be finalized only after the Engineer shall certify that these are not located within designated environmentally sensitive zones and confirm that:</p>

	<ul style="list-style-type: none"> <input type="checkbox"/> Disposal of the material does not impact natural drainage courses <input type="checkbox"/> No endangered / rare flora is impacted by such material <p>Not in the vicinity of settlements and sensitive landuses.</p>
Quarry Operations	<p>It has to be ensured that materials are obtained from licensed quarries having environmental clearance. Quality and legality to be examined by the Contractor and copies of environmental clearances for these needs to be submitted prior to sourcing of material.</p>
Construction	
<p>Excavation will produce large quantity of waste soil, which needs proper disposal. <i>Description.</i> Laying of pumping mains and distribution network is estimated to produce about 19,500 m³ of waste soil, which needs proper disposal. This soil shall be disposed off in the borrow pits of the road section</p>	<p>Utilize surplus soil for following activities in order priority:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Utilise for filling deep borrow pits along roads section. Utilize for raising the ground level of WTP <p>Provide waste soil to local people for filling up low laying areas.</p>
Water accumulation in trenches during rains and related impacts	<p>Avoid scheduling of excavation work during the monsoon months</p> <ul style="list-style-type: none"> <input type="checkbox"/> Complete pipe laying work in excavated stretches and refill before onset of monsoon <input type="checkbox"/> In unavoidable circumstances, protect open trenches from entry of rain water by raising earthen bunds with excavated soil and ensure that drains are not blocked with excavated soil
Sign Boards, Name boards showing project details at site	<p>Put up visible signs showing duration of construction activities, contact details of focal persons from HSRDC and contractor, contact numbers in case of complaints/grievances</p>
<p>Dust nuisance due to construction <i>Description.</i> Earthwork excavation, refilling, handling and transportation of construction materials (like sand and aggregate), and handling, transportation and disposal of waste soil will produce dust if it is not done properly.</p>	<p>Cover or damp down by water spray on the excavated mounds of soil to control dust generation;</p> <ul style="list-style-type: none"> <input type="checkbox"/> Apply water prior to leveling or any other earth moving activity to keep the soil moist throughout the process; <input type="checkbox"/> Bring the material (aggregate) as and when required; <input type="checkbox"/> Ensure speedy completion of work – trench excavation, laying of pipe and refilling, to remove surplus soil as soon as

	<p>possible;</p> <ul style="list-style-type: none"> <input type="checkbox"/> Use tarpaulins to cover loose material that is transported to and from the site by truck. <input type="checkbox"/> In case of surplus soil is provided for other departments or private persons, it will be the responsibility of contractor to ensure that it proper handling, transport &utilization <input type="checkbox"/> Use tarpaulins to cover loose material/soil that is transported to and from the site by truck <input type="checkbox"/> Control dust generation while unloading the loose material (particularly aggregate) at the site by sprinkling water and unloading inside the barricaded area <input type="checkbox"/> Clean wheels and undercarriage of haul trucks prior to leaving construction site <input type="checkbox"/> Stabilize surface soils where loaders, support equipment and vehicles will operate by using water and maintain surface soils in a stabilized condition where loaders, support equipment and vehicles will operate <input type="checkbox"/> Don't allow access in the work area except workers to limit soil
<p>Generation of Pollution/noise and vibrations from excavation <i>Description.</i> High noise/vibration activities like rock blasting/pile construction are not anticipated. However, activities like breaking of CC/BT road surface using pneumatic drillers for laying pipelines may creates noise & vibration</p>	<p>Provide prior information to the local public about the work schedule</p> <ul style="list-style-type: none"> <input type="checkbox"/> Do not conduct noise generating activities in the night <input type="checkbox"/> Ensure that there are no old and sensitive buildings that may be in risk due to use pneumatic drills <input type="checkbox"/> Employ manual methods, whererequired <input type="checkbox"/> Clean up the affected area immediately at own cost of contractor andto the satisfaction of the PWD<input type="checkbox"/>PHED, andshall pay full compensation to any affected parties.
<p>Loss of fertile top soil</p>	<p>Remove the top soil for a depth of 0.3 m (1 feet) and stock separately</p> <ul style="list-style-type: none"> <input type="checkbox"/> This may be used within the site or on demand it may be provided to local farmers
<p>Cutting of trees. Pipelines will be laid avoiding trees; alignment will be altered slightly to save the trees, wherever possible</p>	<p>No trees shall be cut/pruned for laying pipeline</p> <ul style="list-style-type: none"> <input type="checkbox"/> Plant and maintain
<p>Impacts due to improper mining for construction materials <i>Description.</i> Large quantities of construction material like sand and aggregate will be required for WTP and reservoir constructions. As the excavated soil will</p>	<p>Ensure that construction materials (sand, aggregate and gravel) are obtained from quarries licensed by GoH (Directorate of Geology and Mining).</p>

<p>be used for refilling trenches, pipeline construction will require minor quantities.</p>	
<p>Shops and other business may loose income if costumer's access is impeded,sites of social/cultural importance and residential areas</p>	<p>Consult local people: inform them of work in advance</p> <ul style="list-style-type: none"> <input type="checkbox"/> Leave spaces for access between mounds of soil <input type="checkbox"/> Provide walkways and metal sheets to maintain access across trenches for people and vehicles where required <input type="checkbox"/> Increase workforce in these areas to finish work quickly <input type="checkbox"/> Informing all residents and businesses about the nature and duration of any work well in advance so that they can make preparations if necessary <input type="checkbox"/> Storage facilities and other temporary structures on site shall be located such that they have as little visual impact as possible <input type="checkbox"/> Special attention shall be given to the screening of highly reflective materials on site <input type="checkbox"/> In areas where the visual environment is particularly important or privacy concerns for surroundings exist, the site may require screening. This could be in the form of shade cloth, temporary walls, or other suitable materials prior to the beginning of construction. <input type="checkbox"/> The signs and barriers shall be adequately illuminated at night and kept clean and legible at all times <input type="checkbox"/> For the duration of the works the contractor shall at all times provide convenient access to paths, steps, bridges, crossings or drives for all entrances to property abutting the site and maintain them clear, tidy and free from mud and objectionable matter and <input type="checkbox"/> Before setting out for the work the contractor shall inform the inhabitants of the area through appropriate means (bill board display, leaflet distribution, announcement on radio and TV, publishing in the widely circulated daily newspapers) atleast 7 days (or as directed by the PWDPHED) before commencement of any work.
<p>Water scarcity for the residents during replacement of pipe line Description: During replacement of existing pipe lines, residents will be intimated about the work and supply necessary water for 2</p>	<p>During replacement of pipe work the disconnected consumers have to be provided with alternative water source sufficient to meet their daily requirement.</p> <ul style="list-style-type: none"> <input type="checkbox"/> The consumers have to be well informed

days storage capacity	about the arrangement.
Excavation could damage existing infrastructure <i>Description.</i> Water supply lines will be laid along/within the road avoiding telephone/electricity infrastructure. As in most of the areas, water supply lines already exist, and therefore there is no major interference with the other infrastructure. But it cannot be altogether avoided.	<p>identify the services to be affected in each zone</p> <ul style="list-style-type: none"> <input type="checkbox"/> Coordinate with respective agencies (telephone & electricity department) in shifting those infrastructure <input type="checkbox"/> Provide prior public information about the likely disruption of services <input type="checkbox"/> Provide alternate arrangements for services like water supply in the event of disruption beyond reasonable time, for instance, through tankers
Traffic, people and activities could be disturbed due to laying of water supply lines <i>Description.</i> No alignment of the pipes is passing through the town area. It is to be laid along road network leading to various villages, which does not have much of Commercial activity. Yet, construction work will affect the people, activities and business for a small period.	<p>Provide information to the public through media – daily news papers and local cable television (TV) services, about the work (nature & schedule) likely disturbances, and need and schedule of road closure if any, and alternative routes This shall provide locality/village wise information (where & when the work will be taken up and when it will be completed)</p> <ul style="list-style-type: none"> <input type="checkbox"/> Ensure that the work is completed as scheduled; ensure that well experienced contractors are engaged and discourage delays by suitable penalties built into the Contracts <input type="checkbox"/> Plan work such that trench excavation, pipe laying, and refilling including compacting, at a stretch is completed in a minimum possible time <input type="checkbox"/> Avoid complete closure of road; ensure that work is conducted onto edge of the road; allow traffic to move on one line <input type="checkbox"/> Do not deploy heavy/large equipment, which will occupy & disturb traffic/people movement; if necessary use only during light traffic hours (6 AM – 10 AM) <input type="checkbox"/> In unavoidable circumstances of road closure, provide alternative routes, and ensure that public is informed about such traffic diversions <input type="checkbox"/> At all works sites public information/caution boards shall be provided (name of the project, cost, schedule, contractor name, implementing & executing agency, schedule of work at that locality, details of traffic diversion, responsible officer for implementation and receiving complaints)
Increase in traffic due to trucks carrying construction material & waste	<p>Plan routes to avoid narrow streets, congested roads, and places of religious importance</p> <ul style="list-style-type: none"> <input type="checkbox"/> Plan work to avoid peak traffic hours
Site of social/cultural importance (schools, hospitals and religious places)	<p>avoid work at sensitive times, such as religious and cultural festivals</p> <ul style="list-style-type: none"> <input type="checkbox"/> Remove waste quickly, cover/spray

may be distributed by noise, dust, and impeded access during laying of pipelines.	<ul style="list-style-type: none"> stockpiles, cover soil/sand on trucks <input type="checkbox"/> Increase workforce to finish work quickly <input type="checkbox"/> Use wooded planks and metal sheets to allow access (people/vehicles) <input type="checkbox"/> Use modern vehicles/machinery & maintain as specified to reduce noise and exhaust emissions
Workers and public at risk from accidents on site <i>Description.</i> Excavations for distribution lines will be mostly limited to 1.1 m except few which may 1.4 m deep. Rising main – 1.3 m to 2 m. Excavations for foundations (WTP) may go to a depth of 5-10 m. Public will be at risk as trenches for pipelines will be located along the roads.	<p>Follow standard and safe procedures for all activities – such as provision of shoring in trenches of 2 m or more</p> <ul style="list-style-type: none"> <input type="checkbox"/> Consulting the town authorities to identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills for cutting roads; <input type="checkbox"/> Excluding the public from the site – enclose the construction area, provide warning/sign boards <input type="checkbox"/> Ensuring that all workers are provided with and use appropriate Personal Protective Equipment (helmet, hand gloves, boots, masks etc); <input type="checkbox"/> Report accident and maintain records
Economic benefits for people employed in workforce	Ensure that most of the workforce is from local communities

Environmental Monitoring Plan

Mitigation measures	Location	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring
Pre-Construction				
Air Quality		SPM and RSPM, NOx, CO	Once prior construction	AMC-PHE
Noise	At two locations along the rising main alignment and two locations where WTP is proposed and networks to be developed	Decibels	Once prior construction	AMC-PHE
Water Quality	At water source	Surface water	Once prior to construction	AMC-PHE

		quality		
Site for quarries and borrow pits	All sites identified for quarries, borrow pits, waste and construction labour camps and offices	The site situation <input type="checkbox"/> for rehabilitation, photographs	Once prior to construction	AMC-PHE
Vegetation removal	Locations that are to be cleared off trees for construction activities	Vegetative survey to identify type and amount of vegetation that requires to be replaced	Once prior to construction	AMC-PHE
Construction				
Air Quality	along the rising main alignment and two locations – at WTP and where networks to be developed	SPM and RSPM, NO _x ,CO The monitoring results shall be compared with baseline values (prior to start of construction) of respective parameters; this will be threshold and any increase of value requires a corrective action by contractor	Thrice annually	AMC-PHE
Noise	At two locations along the rising main alignment and two locations – at WTP and where networks to be developed	Decibels The monitoring results shall be compared with baseline noise levels (prior to start of construction); this will be threshold and any increase of	Thrice annually	AMC-PHE

TENDER DOCUMENT FOR AUGMENTATION & REORGANISATION TO JAGDALPUR WATER
SUPPLY SCHEME UNDER AMRUT MISSION GOVERNMENT OF CHHATTISGARH

		value requires a corrective action by contractor		
Water Quality	At two water body locations along the rising main	Surface water quality The monitoring results shall be compared with baseline values (prior to start of construction) of respective parameters; this will be threshold and any increase of value requires a corrective action by contractor	Thrice annually	AMC-PHE
Site for borrow pits, construction camps	Quarries, borrow pits, labour camps and office sites	Post construction – After construction activity over – if rehabilitated	After completion of construction activities at site	AMC-PHE
following activities in order priority: <input type="checkbox"/> Utilise for filling of deep borrow pits of road section. Utilize for raising the ground level of construction sites <input type="checkbox"/> Provide to local people for filling up	Rising main, Supply & distribution network sites	Observations on <input type="checkbox"/> site/offsite;	Weekly	AMC-PHE

TENDER DOCUMENT FOR AUGMENTATION& REORGANISATION TO JAGDALPUR WATER
SUPPLY SCHEME UNDER AMRUT MISSION GOVERNMENT OF CHHATTISGARH

lowlaying areas.				
Water accumulation in trenches during rains and related impacts <input type="checkbox"/> Avoid scheduling of excavation work during monsoon <input type="checkbox"/> Complete work in excavated stretches before monsoon <input type="checkbox"/> Regulate drainage by earthen bunds, if required <input type="checkbox"/> Cover or damp down soil mounds to control dust <input type="checkbox"/> Apply water prior to leveling/ any earth moving activity <input type="checkbox"/> Bring the material (aggregate) as and when required <input type="checkbox"/> Ensure speedy completion of work <input type="checkbox"/> Use tarpaulins to cover loose material in transport <input type="checkbox"/> In case of surplus soil is provided for other departments or private persons, it will be the responsibility of contractor to	All construction sites	Observations on <input type="checkbox"/> site/offsite;	Weekly	AMC-PHE

<p>ensure that it proper handling, transport & utilization</p> <ul style="list-style-type: none"> <input type="checkbox"/> Use tarpaulins to cover loose material/soil that is transported to and from the site by truck <input type="checkbox"/> Control dust generation while unloading the loose material particularly aggregate) at the site by sprinkling water and unloading inside the barricaded area <input type="checkbox"/> Clean wheels and undercarriage of haul trucks prior to leaving construction site where loaders, support equipment and vehicles will operate by using water and maintain surface soils in a 				
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1.0 Special Conditions

1.1 Services and Facilities to be provided by Employer

The Employer shall be liable to the Contractor for the following:

- a) Provide free office accommodation space with attached toilet space for O&M personnel of the Contractor including security room within the WTP Premises.
- b) The charges for power during the O&M period shall be paid by Employer.

- c) The following special conditions shall be binding on the contractor:
- i. **Agreement with the Contractor:** Rates for the O&M services shall be governed by the rates quoted by the bidder under Bill No.: for due consideration of the Employer. The contractor shall sign a separate agreement with the Employer along with the contract for the main works.
 - ii. **Performance Security:** The Contractor shall provide a Performance Security for O&M Services in the form of a bank guarantee for an amount of Ten percent (10%) of the contract value of the O&M services issued by a reputable bank including scheduled bank or nationalized bank located in India, acceptable to the Employer in the format enclosed. The Performance Security for O & M services contract shall have to be furnished two months prior to the commencement of the O&M services.
 - iii. **Insurance Policies:** The Contractor shall undertake insurance during the operation and maintenance period :
 - (i.) For all Equipment related to the proposed new WTP. The value of the insured equipment shall be considered as 70% of the composite value of the equipment agreed in the Contract for the case of new equipment.
 - (ii.) Against Injury to Persons and Damage to Property
 - (iii.) Contractor's Personnel
- The Contractor shall submit evidence of Insurance as per the provisions within 28 days from the date of commencement of the O& M services with the Employer and submit the relevant insurance policies within 45 days from the date of commencement of the O& M services with the Employer.
- iv. **Advance Payment:** No advance payment will be paid for operation and maintenance services.

1.2 Other Terms and Conditions

- (a) The personnel engaged by the Contractor shall not be absorbed by the in the Employer in any circumstances.
- (b) The Contractor shall have to ensure timely payment to their personnel and comply with the provisions of all labour legislation and rules.
- (c) In case of any difficulties faced by the Contractor in performing the operation & maintenance activities, the same shall be reported immediately to the concerned EIC for taking necessary action.
- (d) The Employer shall not be responsible for any untoward incident of accidental death, injury, and medical treatment etc. during on-duty hours. The payment of compensation if required under Workmen Compensation Act, 1923 and any other act, rules shall be borne by the Contractor. This will be statutory obligation on the part of the Contractor.
- (e) The Contractor has to ensure the payment of minimum wages to the deployed personnel as declared by the Labour Department, Govt. of CG from time to time. Any enhancement of minimum wages during the contractual period shall be paid by the

Contractor, Such additional charges shall however not be payable to the Contractor by the Employer.

- (f) The working hours of the operation & maintenance, number of shifts and timings of shift for each WTP shall be approved by the EIC. The personnel engaged by the Contractor should follow /abide by the instructions of the EIC.
- (g) The Contractor shall deploy minimum number of operation & maintenance personnel having requisite qualification on each shift of the day as specified approved by the EIC. The same shall be done in such a manner that at no point of time, the pumping station remains inoperative. The Contractor shall ensure that none of the operation and maintenance personnel leaves his duty place unless and until he is relieved by another person deployed by the Contractor for the next shift.
- (h) The O&M personnel deployed by the Contractor shall record their time of attendance and departure on every day/shift in attendance register which is to be maintained at the place of deployment. Such attendance register shall be produced before the concerned EIC for regular checking.
- (i) The Contractor shall not deploy any person as Operation & Maintenance personnel who may be found unsuitable for duty on medical ground because of illness (mental/physical), old age and or infirmity, duly certified by a registered medical practitioner.
- (j) The Contractor shall keep himself informed of the relevant and related laws & ordinances and shall conduct the work in compliance with such laws. Fees for necessary permits, licenses,& taxes required by law shall be paid by the Contractor as per GCC.
- (k) For filling the vacant position on the event of death or otherwise, the Contractor must inform and seek consent from the EIC for the appointment of new worker.
- (l) The Employer reserve the right to terminate the annual operation and maintenance contract of the plant (s) in case of non-performance of the Contractor based on report of the EIC. The termination shall however be governed by the GCC of the contract.
- (m) All other terms and conditions shall be governed by the standard practices prevalent with the Employer.

1.3 Payment Terms -

Payment shall be made to the contractor on monthly billing as per measurement:

1.4 Penalty for theft, Pilferage

The contractor shall be liable to compensate the Employer for any loss of property of the WTP due to theft, pilferage, damage, etc. caused as a result of negligence, mishandling, wrong operation, etc. on the part of personnel engaged by the contractor for operation and maintenance of the WTP (s). The penalty amount shall be fixed by the Employer or the same shall have to be restored in original condition to the satisfaction of the Employer.

Performance Security for Works Contract Period

Option 1: (Demand Guarantee)

[Insert Guarantor letterhead or SWIFT identifier code]

Beneficiary:*[Insert name and Address of the Employer]*

Date:*[Insert date of issue]*

PERFORMANCE GUARANTEE No.:*[Insert guarantee reference number]*

Guarantor: *[Insert name and address of place of issue, unless indicated in the letterhead]*

We have been informed that *[insert name of Contractor, (hereinafter called "the Applicant")]* has entered into Contract No. *[insert reference number of the contract]* dated *[insert date]* with the Beneficiary, for the execution of *[insert name of the contract and brief description of the Works]* (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, a performance guarantee is required.

At the request of the Applicant, we as Guarantor, hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of *[insert amount in figures]([insert amount in words])*,¹ such sum being payable in the types and proportions of currencies in which the Contract Price is payable, upon receipt by us of the Beneficiary's complying demand supported by the Beneficiary's statement, whether in the demand itself or in a separate signed document accompanying or identifying the demand, stating that the Applicant is in breach of its obligation(s) under the Contract, without the Beneficiary needing to prove or to show grounds for its demand or the sum specified therein.

This guarantee shall be valid until the date of issue of the **Works Contract Completion Certificate**.

This guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010 Revision, ICC Publication No. 758, except that the supporting statement under Article 15(a) is hereby excluded.

[signature(s)]

[Note: All italicized text (including footnotes) is for use in preparing this form and shall be deleted from the final product.]

¹ *The Guarantor shall insert an amount representing the percentage of the Accepted Contract Amount specified in the Letter of Acceptance, less provisional sums, if any, and denominated either in the currency(cies) of the Contract or a freely convertible currency acceptable to the Beneficiary.*

Performance Security for O&M Contract Period

Option 1: (Demand Guarantee)

[Insert Guarantor letterhead or SWIFT identifier code]

Beneficiary: *[Insert name and Address of the Employer]*

Date: *[Insert date of issue]*

PERFORMANCE GUARANTEE No.: *[Insert guarantee reference number]*

Guarantor: *[Insert name and address of place of issue, unless indicated in the letterhead]*

We have been informed that *[insert name of Contractor, (hereinafter called "the Applicant")]* has entered into Contract No. *[insert reference number of the contract]* dated *[insert date]* with the Beneficiary, for the execution of *[insert name of the contract and brief description of the Works]* (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, a performance guarantee is required.

At the request of the Applicant, we as Guarantor, hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of *[insert amount in figures]* (*[insert amount in words]*),¹ such sum being payable in the types and proportions of currencies in which the Contract Price is payable, upon receipt by us of the Beneficiary's complying demand supported by the Beneficiary's statement, whether in the demand itself or in a separate signed document accompanying or identifying the demand, stating that the Applicant is in breach of its obligation(s) under the Contract, without the Beneficiary needing to prove or to show grounds for its demand or the sum specified therein.

This guarantee shall be valid until the date of issue of the **Final Contract Completion Certificate**.

This guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010 Revision, ICC Publication No. 758, except that the supporting statement under Article 15(a) is _____ hereby _____ excluded. _____

[signature(s)]

[Note: All italicized text (including footnotes) is for use in preparing this form and shall be deleted from the final product]

APPENDIX-1

Qualification Information

1.1	<i>Constitution or legal status of Bidder/attach copy]</i>				
	<i>Place of registration of Firm/ Company (in case of other than individuals)</i>				
	<i>Principal place of business:</i>				
	<i>Name of Power of attorney holder of signatory of Bid (bidder)/attach copy]</i>				
1.2	<i>Total annual volume of civil engineering construction work executed and payments received each year in the immediate five years preceding the year in which tenders are invited. (Attach certificate from Chartered Accountant)- indexed @ 10% (ten percent) compounded per year</i>	<i>Financial Year</i>	<i>(Rs. in crores)</i>		
			<i>"Civil engineering construction work" Turn over in the year</i>	<i>Add for indexing</i>	<i>Total</i>

Note :

1.1 Preparatory firm, partnership firm with the certificate of registration by register/artocle and Memorandum of Association with Certificate of Incorporation.

1.2 Mention and highlights the year, which the tendered considers for evaluation for the Committee

APPENDIX -2

Information regarding minimum one similar work

- (i) **One Work completed as similar work during last ten years**
(ii) **Or being executing one such similar work**

Sno	Project	Name of Employer	Value of Contract	Contract No.	Date of Issue of Work Order	Stipulated Date of Completion	Actual Date Of Completion	Value of Work Done	Remarks Explaining reasons for Delay, if any and the amount of Deductions due to delay Also mention if any Claim or dispute is Pending in any forum.
1	2	3	4	5	6	7	8	9	10

Note :-

- (i) Attach certificates from the Engineer in charge not below the rank of Examiner or equivalent.
(ii) Tendered may attach certified copies of work order and completion certificate issued by Engineer in charge not below the rank of Executive Engineer

APPENDIX - 3

Work Performed on all classes of Civil Engineering Construction Works over the last ten years

Sno	Project Name	Name of Employer	Description of Work	Value of Contract	Contract No.	Date of Issue of Work Order	Stipulated Date of Completion	Actual Date of Completion	Year wise value of work done as per certificate of employer Rs. In Lacs	Remarks explaining Reasons for Delay if Any and the amount Of deductions due to Delay also mention if Any claim or dispute Is pending in any Forum.					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Note :-

- (iii) Attach certificates from the Engineer in charge not below the rank of Examiner or equivalent.
- (iv) Tendered may attach certified copies of work order and completion certificate issued by Engineer in charge not below the rank of Executive Engineer

APPENDIX - 4

Existing commitments and on going all classes of civil engineering construction works.

Sl No	Project Name	Description of Work	Contract No & Year	Name & Address of the Employer	Value of Contract (Rs. Lakhs.)	Date of Issue of Work Order	Stipulated Date of Completion	Stipulated period of Completion in Months	Anticipate A date of Completion	Value of Work done Up to date Of issue Of N.I.T (Rs. Lakhs)**	Probable value of Works Remaining To be Completion (Rs. Lakhs) **	Anticipate Months Required Completion Of balance works	Value of Claims Or Dispute If Any pending
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Note –

- ** Enclose certificates from Engineer (s) in charge (Not below the rank of Executive Engineer or equivalent) for value of work remaining to be completed, value of work done, anticipated date of completion.
- Tendered may attach certified copies of work order issued by Engineer in charge not below the rank of Executive Engineer

APPENDIX - 5

Availability of Major items of Contractor's Equipment proposed for carrying out the Works. List all information requested below.

Item of equipment	Total number available	Description n, make, and age (Years), and capacity	Condition (new, good, poor) and number available	Nos. (i)Owned, (ii) leased, or (iii) to be purchased	If these are in use in some work, mention the details.	No. of equipments proposed to be utilized <i>in this work</i> (Out of total Nos.)
1	2	3	4	5	6	7

APPENDIX – 6

Qualifications of consultants /each technical personnel proposed for the Contract.

Position	Name	Qualify action	Date from which they are working in the bidders organization	Years of experience				Remark
				Road Works	Building Works	Bridge works	Others	
1	2	3	4	5(a)	5(b)	5(c)	5(d)	6

Note :

- I. If any personal is proposed to be engaged, furnish details here under:- (if necessary use separate sheet for each -for C. V.) (Enclose certificates)
- II. If any technical persons are to be changed during the construction periods, than it can be changed with prior intimation to the Engineer in charge.

APPENDIX – 7

Financial reports for the immediate previous five years: balance sheets, profit and loss statements, audited auditors' reports, etc., list below and attach copies.

Year	Income Tax Clearance Certificate (optional)	Balance Sheet	Profit & loss statement	Reserve brought forward in any	Net credit Balance if any [for debit show (-)]	Auditors Report	Other information if the bidder wishes to submit
1	2	3	4	5	6	7	8

APPENDIX – 8

Information on current claims, arbitration, litigation in which the Bidder is involved.

SI. no.	Name of Other party(s)	Agt. No. date year and Deptt.	Brief of cause of claims, arbitration /dispute (give reference of contract details)	Where Litigation pending (in the department/Court/a arbitration) (mention Deptt./Court /Arbitration)	Amount Involved/ claimed

Can use separate sheets for each agreements if necessary.

APPENDIX – 9

**List of key plant & Equipment to be deployed on Contract Work to be filled
by the Contractors**

Sl.	Type of Equipment	Maximum age as on 1.04.14 (years)	Contract Package Size			
			From Rs. 3 Crores to Rs.10 Crores	From Rs. 10 Crores to Rs.30 Crores	From Rs. 30 Crores to Rs.50 Crores	From Rs Rs.50 Crores , above
1	2	3	4	5	6	7
	Total					



APPENDIX – 10

List of key plant & Equipment to be deployed on Contract Work

Sr. No.	Type of Equipment	Maximum age as on 1.04.12 (years)	Contract Package Size			
			From Rs. 3 Crores to Rs.10 Crores	From Rs. 10 Crores to Rs.30 Crores	From Rs. 30Crores to Rs.50 Crores	Fron Rs..5 Crores abov'
1						
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
	Total					

Note: - The list & other Details of the equipment and plants as mentioned above are tentative. S.E. of the Nagar Nigam/Joint Director Office/ Directorate can modified the above list of the plant and equipment as per their requirements.

List of Technical person to be deployed on Contract work

Sl.	Personnel	Qualification	Contract Package Size			
			From Rs. 3 Crores to Rs.10 Crores	From Rs. 1 Crores to Rs.30 Crores	From Rs. 31 Crores to Rs.50 Crores	From Rs. Rs.51 Crores & above
1	2	3	4	5	6	7
1	Project Manager	B.E. Civil+15years Exp in Water Supply Scheme. (5 years as manager)		1	1	1
2	Site Engineer	B.E. Civil+ 10 years Exp. (5 years in Water Supply.)	1	1	2	4
3	Plant Engineer	B.E. Mech.+10 Years Exp. or Dip. Mech+15 years Exp.	1	1	1	2
4	Quantity Surveyor	B.E. Civil+7 Years Exp. or Dip. Civil+ 10 Years Exp.	1	1	1	2
5	Soil & Material Engineer	B.E. Civil +10 years Exp.	1	1	1	2
6	Survey Engineer	B.E. Civil +5 years Exp. or Dip. Civil+8 years Exp.	1	1	1	2
		Total				

Note' - The list of (he Technical persons Qualification &Experience as mentioned above are tentative. S.E. of the Nagar Nigam/Joint Director Office/ Directorate can modified the above list as per their requirements.

CONTACT PERSONS

(Clients for whom the work has been carried out by the bidder)

SI No.	Name of Executive Engineer of the Division	Divisional	STD Code	Phone No. Office/ residence	Name District
1	2	3	4	5	6

APPENDIX - 13

Affidavit

I..... S/o.....
Aged..... years.....resident..... of.....
.....(address.....)

(For and on behalf of.....), do

here by and herewith solemnly affirm / state on oath that: -

1. All documents and Information's furnished are correct in all respects to the best of my knowledge and belief
2. I have not suppressed or omitted any information as is required.
3. **I am/ We are neither black listed nor debarred by Govt. of India / Other State Govt. Departments/ Chhattisgarh State Govt. Departments/Urban Local Body.**
4. I hereby authorize the Nagar Nigam/Nagar Palika/Nagar panchayat Officials to get all the documents verified from appropriate source(s).

Deponent

(.....
.....)

Authorized signatory / for and on behalf of

.....

(Affix Seal)

Verification

I..... S/o..... do here by affirm
that the contents stated in Para 1 to 4 above are true to the best of my knowledge and believe
and are based on my / our record.

Verified that this date of 200... at (Place).....

Deponent

Seal of attestation by a Public

Notary with date Authorized signature / for and on behalf of.....

Appendix-14- UNDERTAKING (ON FIRM'S LETTERHEAD)

I, the undersigned, do hereby undertake on the behalf of M/s....., that I/We have visited and inspected the site carefully and have acquainted myself/ourselves with full and complete knowledge of the site, prevailing conditions, balance/leftover work and, availability of equipments, materials etc,.

I/We, hereby also affirm that if any items/components which may not be mentioned in the tender, but are necessarily required for successful commissioning of the Plant/system/scheme with desired outputs and complete functions in all respects will be deemed to inclusive in our quoted Price and no further extra charges consequent on misunderstanding or otherwise will be claimed.

(Signed by Authorised representative of the Firm)

(Affix seal)

Name:

S/o

Designation:

Firm Name:

Appendix-15

APPENDIX - 15

(1)

Store Detail at Intake well Jagdalpur

S.NO.	ITEM	QTY	UNIT
1	D.I. Specials & Fittings For all types of specials, bends, tees.. etc.		
	100mm to 300mm Dia	4251	KG
	350mm & above	1203	KG
2	MS/PP Meter Box of Required Size	1400	Nos.
3	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 nominal diameter/sizes with external bitumen coating and internal cement mortar lining. (laying Conforming to IS 12288 : 1987)		
	80 mm	4	Nos
	150 mm	2	Nos
	200 mm	4	Nos
	250 mm	2	Nos
	300 mm	1	Nos
4	HOT Crane 3 Ton capacity with 6 mtr. span & 6 mtr. lift of chain & 40 x 40 mm sq. bar etc. complete as per specification.	1	Nos
5	V.T pump for 148LPS at 51 Mtr. total head as per detail specification along with column pipe of size 300 (pipe) x 43 (shaft) mm column assembly of 15 MTR length 1/2 bowl assembly, Foundation bolts for above pump set along with suitable HP VHS Electric Motor 3 phase, 415 volts, as per detail specification. Pump efficiency minimum 80% at duty point.	4	Nos
6	Vertical Hollow Shaft motor, SPDP, 1450 RPM suitable to operate on 415V + 10%, 3P, 50Hz, AC supply having 'F' class insulation temp. rise limited to 'B' class with continuous duty, conforming to IS-325	4	Nos
7	Electromagnetic Bulk Flow Meters (CG PHE SOR P.309 II.No. 30.5)		
	150mm	17	Nos
	200 mm	4	Nos
	250 mm	8	Nos
	300 mm	4	Nos
	350 mm	8	Nos
	400mm	3	Nos
	500 mm	2	Nos

IPF Global Limited
IPF

IPF Global Limited
IPF

[Handwritten Signature]

कोष अधिकारी
पिन योजना
जगदलपुर

Comptroller
Municipal Corporation
JAGDALPUR (C.R.)

Store Detail at 35MLD WTP Jagdalpur

SNO.	ITEM	QTY	UNIT
1	Centrifugal pump for 142LPS at 50 M total head with positive as per detail specification along with Coupling, Coupling guard, Base Plate & Foundation bolts for above pump along with suitable HP Electric Motor as per detail specification. Pump efficiency minimum 80% at duty point.	4	Nos
2	Suitable HP Electric motor 3 phase, 415V, foot mounted type TEFC, 1450 RPM as per detail specification.	4	Nos
3	Electro-mechanical works		
	PARSHAL FLUME & Ultramagnetic Flow Meter(1 No.) 1. Bypass arrangement		
	FLASH MIXER (2 NO.)- 1. Agitator with drive complete 2. De-sludge pipes & valves complete		
	Lamella Clarifier (2 NO.)— 1. Flocculator with paddle drive complete 2. Lamella Clarifier complete 3. Sludge pipes with specials complete		
	CHEMICAL HOUSE : 1. Vacuum type Chlorinators complete		




(Handwritten mark)


13/11/20
(M.S.D.)
नोडल अधिकारी
मिशन अमृत योजना
नगर पालिक निगम जगदलपुर

13/11/20
Comptroller
Municipal Corporation
JAGD. - J.PUR (C.G.)

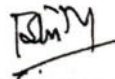
Physical Quantity of Water Supply Pipes


S NO.	LOCATION	DIA	K7/K9	NOS	PER METER LENGTH	TOTAL LENGTH
1	WTP	600	K9	7	5.5	38.5
2	MISSION GROUND	600	K9	25	5.5	137.5
		400	K7	31	5.5	170.5
		500	K9	22	5.5	121
3	PHE NIGAM	400	K9	41	5.5	225.5
		400	K7	59	5.5	324.5
		600	K9	45	5.5	247.5
4	SUBHAS GARDEN W09	600	K9	19	5.5	104.5
5	INTAKE	600	K9	5	5.5	27.5
		350	K7	12	5.5	66
6	BHANGARAM GARDEN	200	K9	7	5.5	38.5
		300	K7	3	5.5	16.5
		350	K7	16	5.5	88
7	CE PWD HOUSE	200	K9	40	5.5	220
8	OHSR LALBHAG	300	K9		5.5	0
9	OHSR LALBHAG SHOPPING MALL	200	K9	10	5.5	55
		350	K9	3	5.5	16.5
10	BEHIND BHODHGATE POLICE STATION	400	K9	66	5.5	363
11	GURU GOVIND CHK	400	K9	4	5.5	22
		300	K9	4	5.5	22
12	GEDAM ROAD	300	K9	6	5.5	33
13	DHARAMPURA MP HOUSE	200	K9	14	5.5	77
14	GARAMIN BANK DHARAMPURA	200	K9	2	5.5	11
15	JAISWAL COLONY	200	K7	8	5.5	44
		400	K7	28	5.5	154
TOTAL				477		2623.5


 Mr. (Tusher Dewangan)
 Support Engineer, PDMC
 Address :- Plot No. 18 Mohan
 Nagar Jagdalpur


 Mr. (P. Sagar)
 Support Engineer, PDMC
 Address :- Mother teresa
 ward Jagdalpur

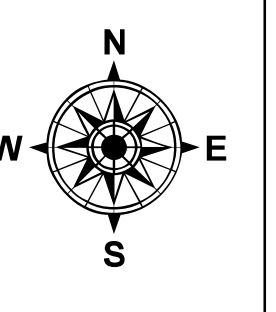

 Mr. (Amar Singh)
 Asst. Nodal Officer
 Municipal Corporation
 Jagdalpur


 Mr. (S.B. Sharma)
 Nodal Officer
 Municipal Corporation
 Jagdalpur

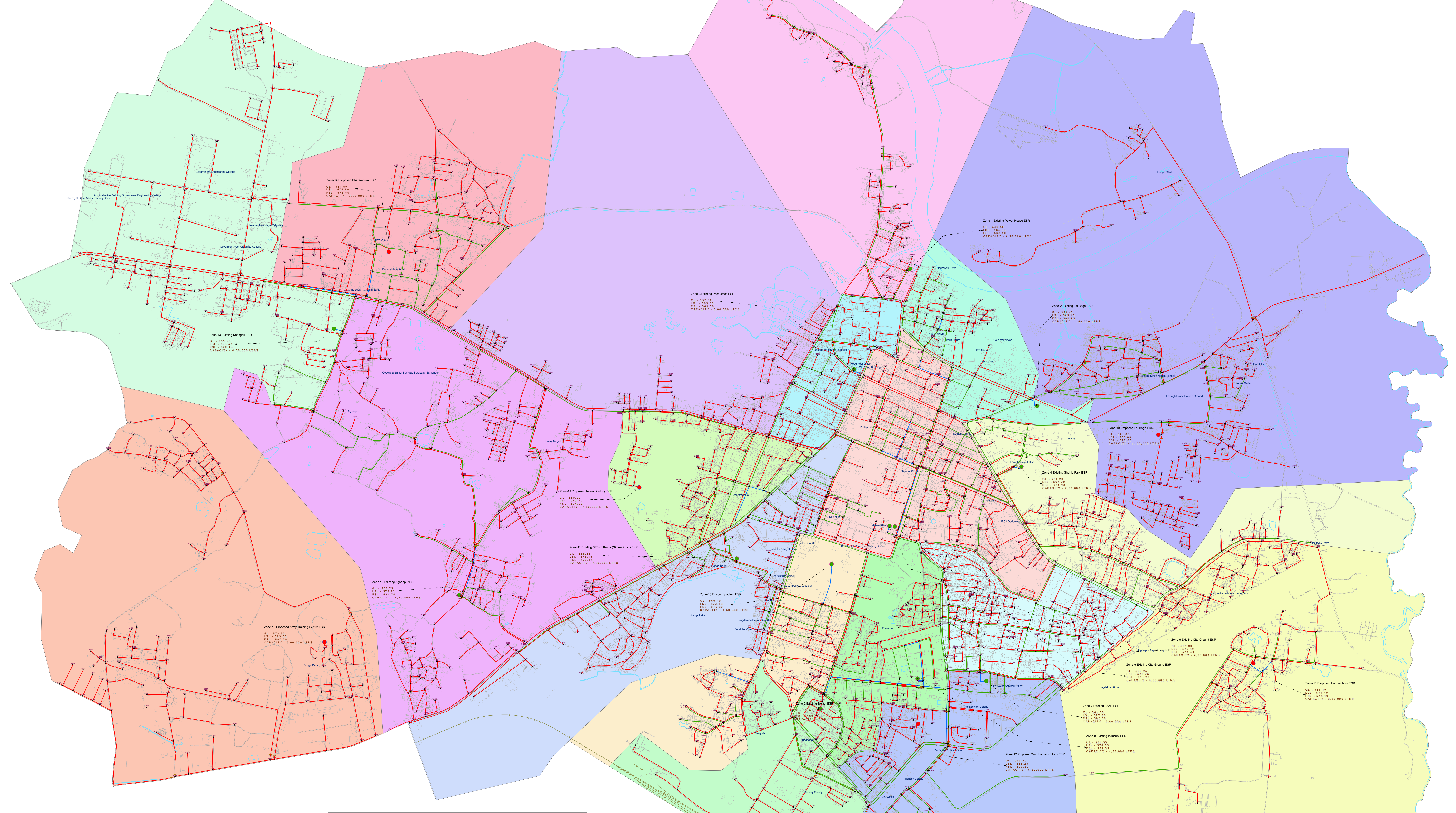

 Commissioner
 Municipal Corporation
 JAGDALPUR (C.I.)



JAGDALPUR MUNICIPAL CORPORATION, JAGDALPUR
WATER DISTRIBUTION NETWORK

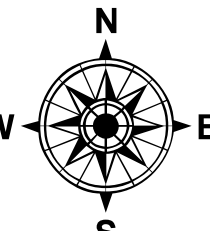


No.	Material	Quantity	Unit	Rate	Amount
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98
99
100
Grand Total



Project		AUGMENTATION OF JAGDALPUR WATER SUPPLY SCHEME UNDER AMRUT MISSION	
Client		STATE URBAN DEVELOPMENT AGENCY, CHHATTISGARH	
Drawn	AN	Title	WATER DISTRIBUTION NETWORK
Date	20/01/2017		
Chkd.	SD		
Appr.	SB		
Date	20/01/2017		
Project No.	Drawing No.	SCALE	Rev. No. Sheet No.
GISG16028	ADCC/JAGDALPUR/HM	1:7,000 0	1 OF 1
ADCC INFOCAD LTD.			
<small>CHMI SVC/S1 BSE-SME Listed 10/5, IT Park, Opp. VNIT, Nagpur-22 PH: 0712-2249-033/358/930</small>			

Legend	
• Junction	Zone-1 Existing Power House ESR
• Valve	Zone-2 Existing Lal Bagh ESR
• Existing	Zone-3 Existing Post Office ESR
• Proposed	Zone-4 Existing Shahid Park ESR
• Pipe Status	Zone-5 Existing City Ground ESR
Existing	Zone-6 Existing City Ground ESR
Proposed	Zone-7 Existing BSNL ESR
Replaced	Zone-8 Existing Industrial ESR
Water_Bodies	Zone-9 Existing Tekadi ESR
Railway_Line	Zone-10 Existing Stadium ESR
Road_Centerline	Zone-11 Existing ST/SC Thana (Gidam Road) ESR
Road_Edge	Zone-12 Existing Aghampur ESR
Building	Zone-13 Existing Khangol ESR
Zone Boundary	Zone-14 Proposed Dharampura ESR
	Zone-15 Proposed Jaiswal Colony ESR
	Zone-16 Proposed Army Training Centre ESR
	Zone-17 Proposed Wardhaman Colony ESR
	Zone-18 Proposed Hathkachora ESR
	Zone-19 Proposed Lal Bagh ESR



Sr. No.	Material	Diameter in MM	Zone - 1	
			Existing	Proposed
1	CI	80	950.2	
2		225		
3	DI	100	743.05	4287.61
4		150		747.07
5		200	508.17	616.44
6		250	181.73	641.98
7		300	202.36	188.42
8		350		
9		400		
10		450		
Total			2585.51	6481.52
Grand Total			9067.03	

Zone-1 Existing Power House ESR
 Q1 - 849.82
 Q2 - 184.50
 P1 - 184.50
 CAPACITY - 4,10,000 LTRs

Legend

Zone Boundary: [Dashed line symbol]

Junction: [Black dot symbol]

Valve: [Yellow dot symbol]

Tank Status

Existing: [Green dot symbol]

Proposed: [Red dot symbol]

Distribution Network

Pipe Status:

- Existing: [Green line symbol]
- Proposed: [Red line symbol]
- Replaced: [Blue line symbol]

Water Bodies: [Light blue area symbol]

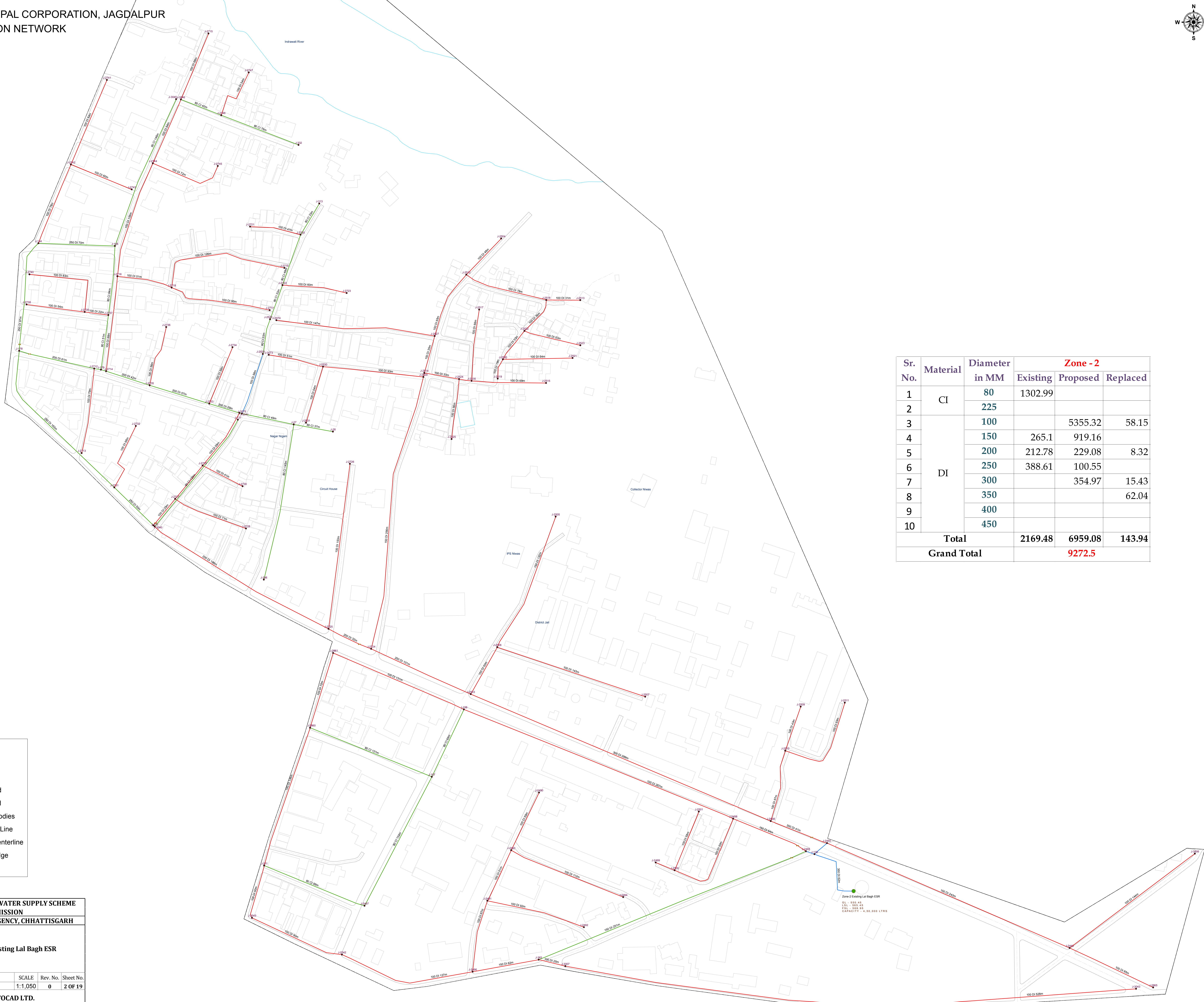
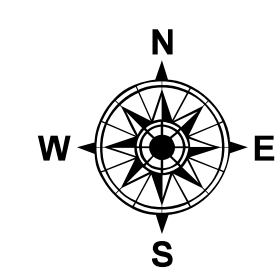
Railway_Line: [Grey line symbol]

Road_Centerline: [Grey line symbol]

Road_Edge: [Grey line symbol]

Building: [Grey outline symbol]

Project	AUGMENTATION OF JAGDALPUR WATER SUPPLY SCHEME UNDER AMRUT MISSION								
Client	STATE URBAN DEVELOPMENT AGENCY, CHHATTISGARH								
Drawn	AN	Title	Zone-1 Existing Power House ESR						
Date	20/01/2017								
Chkd.	SD								
Appr.	SB								
Date	20/01/2017								
Project No.	GISG16028	Drawing No.	ADCC/JAGDALPUR/HM	SCALE	1:2,300	Rev. No.	0	Sheet No.	1 OF 19
		ADCC INFOCAD LTD.							
CHMI/SVC/31 BSE-SME Listed		10/5, IT Park, Opp. VNIT, Nagpur-22			PH : 0712-2249-033/358/930				



Sr. No.	Material	Diameter in MM	Zone - 2		
			Existing	Proposed	Replaced
1	CI	80	1302.99		
2		225			
3	DI	100		5355.32	58.15
4		150	265.1	919.16	8.32
5		200	212.78	229.08	
6		250	388.61	100.55	
7		300		354.97	15.43
8		350			62.04
9		400			
10		450			
Total			2169.48	6959.08	143.94
Grand Total				9272.5	

Legend

Zone Boundary: Dashed line

Pipe Status

- Existing: Green line
- Proposed: Red line
- Replaced: Blue line

Tank Status

- Existing: Green circle
- Proposed: Red circle

Distribution Network

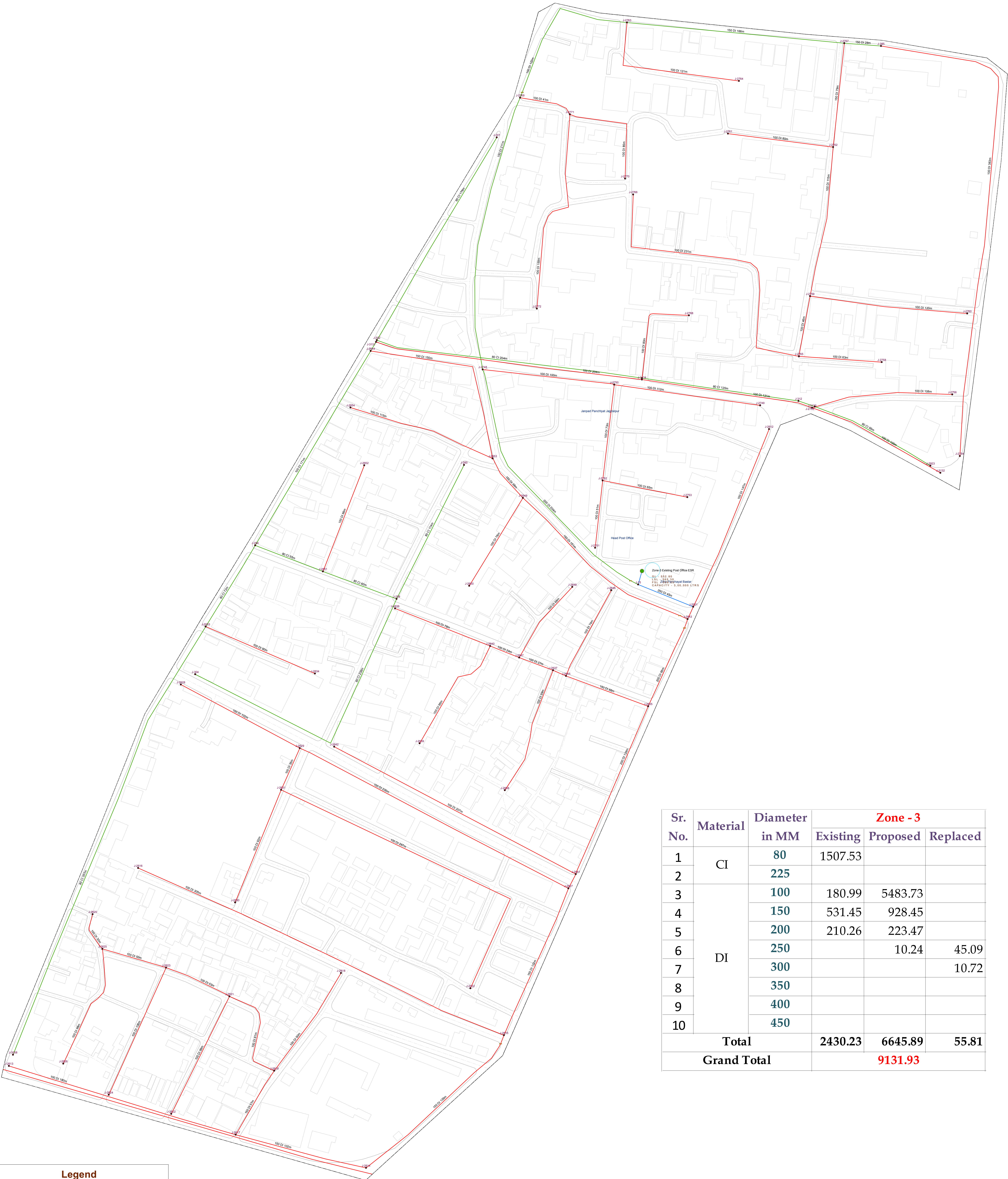
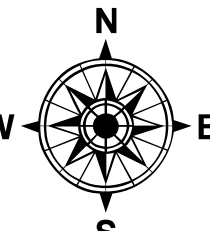
- Water Bodies: Light blue area
- Railway Line: Yellow dashed line
- Road_Centerline: Grey line
- Road_Edge: Dotted grey line
- Building: Grey outline

Other Symbols:

- Junction: Black dot
- Valve: Yellow star

Project		AUGMENTATION OF JAGDALPUR WATER SUPPLY SCHEME UNDER AMRUT MISSION			
Client		STATE URBAN DEVELOPMENT AGENCY, CHHATTISGARH			
Drawn	AN	Title	Zone-2 Existing Lal Bagh ESR		
Date	20/01/2017				
Chkd.	SD				
Appr.	SB				
Date	20/01/2017				
Project No.	ADCC/JAGDALPUR/HM	Drawing No.	SCALE	Rev. No.	Sheet No.
GISG16028			1:1,050	0	2 OF 19
ADCC INFOCAD LTD.					
CHMI SVCS BSE, SME Listed 10/5, IT Park, Opp. VNIT, Nagpur-22 PH: 0712-2249-033/358/930					

Zone 2 Existing Lal Bagh ESR
 O.L. 350.41
 S.L. 350.45
 P.S.L. 350.45
 CAPACITY - 1.0, 02,000 LTR/D



Sr. No.	Material	Diameter in MM	Zone - 3		
			Existing	Proposed	Replaced
1	CI	80	1507.53		
2		225			
3	DI	100	180.99	5483.73	
4		150	531.45	928.45	
5		200	210.26	223.47	
6		250		10.24	45.09
7		300			10.72
8		350			
9		400			
10		450			
Total			2430.23	6645.89	55.81
Grand Total			9131.93		

Legend

Zone Boundary
 Zone Boundary

Junction
 Junction

Valve
 Valve

Tank Status
 Existing
 Proposed

Distribution Network
 Road_Centerline
 Road_Edge
 Building

Pipe Status
 Existing
 Proposed
 Replaced
 Water_Bodies
 Railway_Line

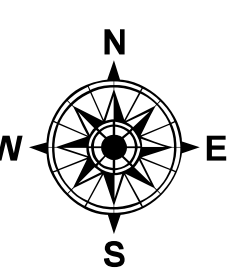
Project: AUGMENTATION OF JAGDALPUR WATER SUPPLY SCHEME UNDER AMRUT MISSION
 Client: STATE URBAN DEVELOPMENT AGENCY, CHHATTISGARH
 Drawn: AN
 Date: 20/01/2017
 Chkd: SD
 Appr: SB
 Date: 20/01/2017

Title: Zone-3 Existing Post Office ESR

Project No: GISG16028
 Drawing No: ADCC/JAGDALPUR/HM
 SCALE: 1:900
 Rev. No: 0
 Sheet No: 3 OF 19

ADCC
Infocad Limited
ADCC INFOCAD LTD.

CHMI SVC/31 BSE-SME Listed | 10/5, IT Park, Opp. VNIT, Nagpur-22 | PH. : 0712-2249-033/358/930



Legend

Zone Boundary
 - Junction
 - Valve

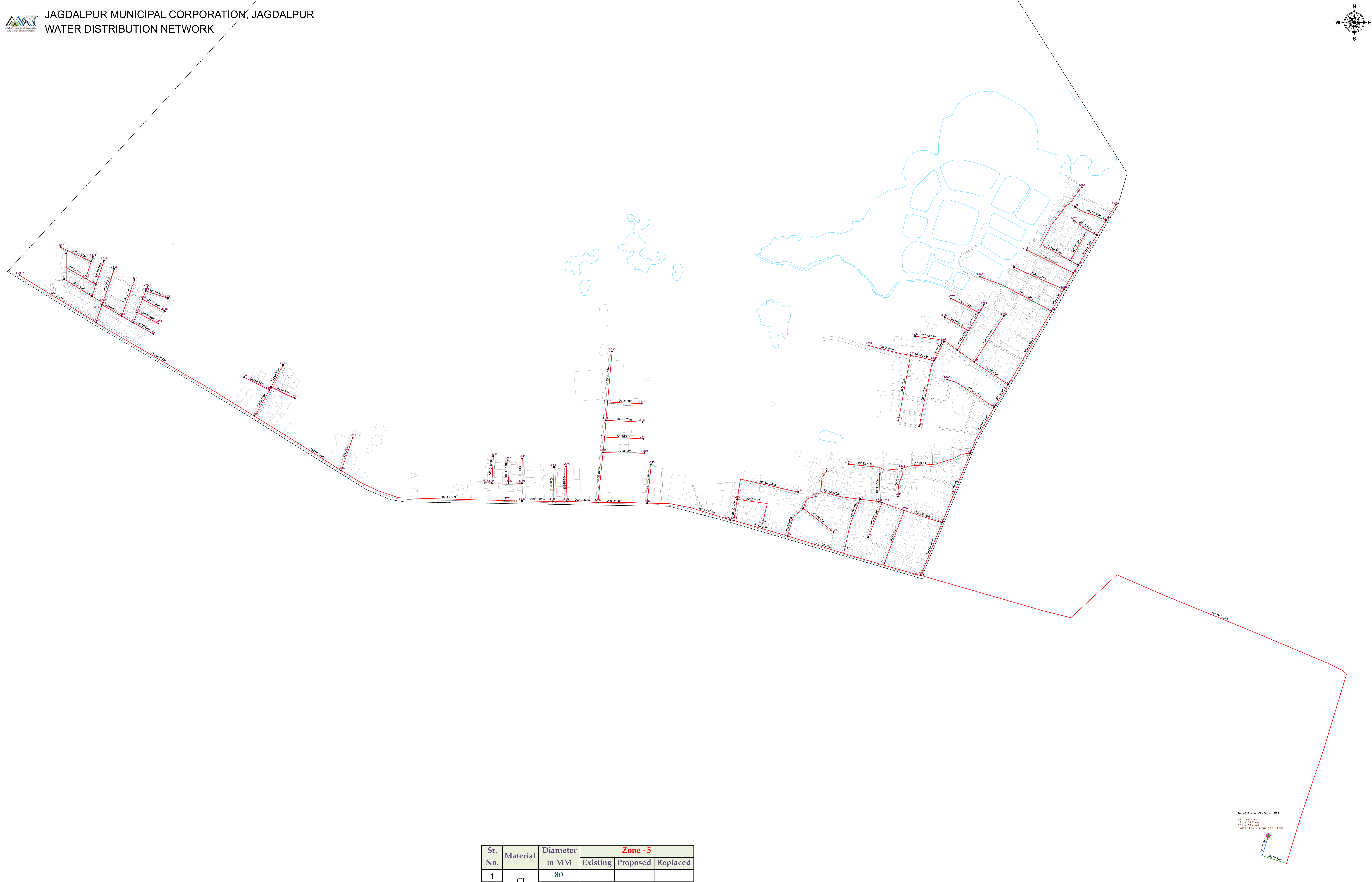
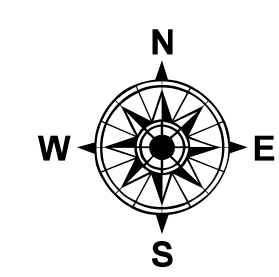
Tank Status
 - Existing
 - Proposed

Distribution Network
 - Road_Centerline
 - Road_Edge
 - Building

Pipe Status
 - Existing
 - Proposed
 - Replaced
 - Water_Bodies
 - Railway_Line
 - Road_Centerline

Sr. No.	Material	Diameter in MM	Zone - 4		
			Existing	Proposed	Replaced
1	CI	80	2230.52		
2		225			
3	DI	100	1417.42	7294.72	
4		150	1963.76	1103.91	
5		200		253.28	
6		250		591.96	
7		300		419.76	
8		350			
9		400			57.59
10	450				
Total			5611.7	9663.63	57.59
Grand Total			15332.92		

Project	AUGMENTATION OF JAGDALPUR WATER SUPPLY SCHEME UNDER AMRUT MISSION								
Client	STATE URBAN DEVELOPMENT AGENCY, CHHATTISGARH								
Drawn	AN	Title	Zone-4 Existing Shahid Park ESR						
Date	20/01/2017								
Chkd.	SD								
Appr.	SB								
Date	20/01/2017								
Project No.	GISG16028	Drawing No.	ADCC/JAGDALPUR/HM	SCALE	1:1,700	Rev. No.	0	Sheet No.	4 OF 19
ADCC Infocad Limited		ADCC INFOCAD LTD.							
CHMI SVC/31 BSE-SME Listed		10/5, IT Park, Opp. VNIT, Nagpur-22			PH : 0712-2249-033/358/930				



Legend

Zone Boundary

- Zone Boundary

Junction

- Junction

Valve

- Valve

Tank Status

- Existing
- Proposed

Distribution Network

- Road_Centerline
- Road_Edge
- Building

Pipe Status

- Existing
- Proposed
- Replaced

Water Bodies

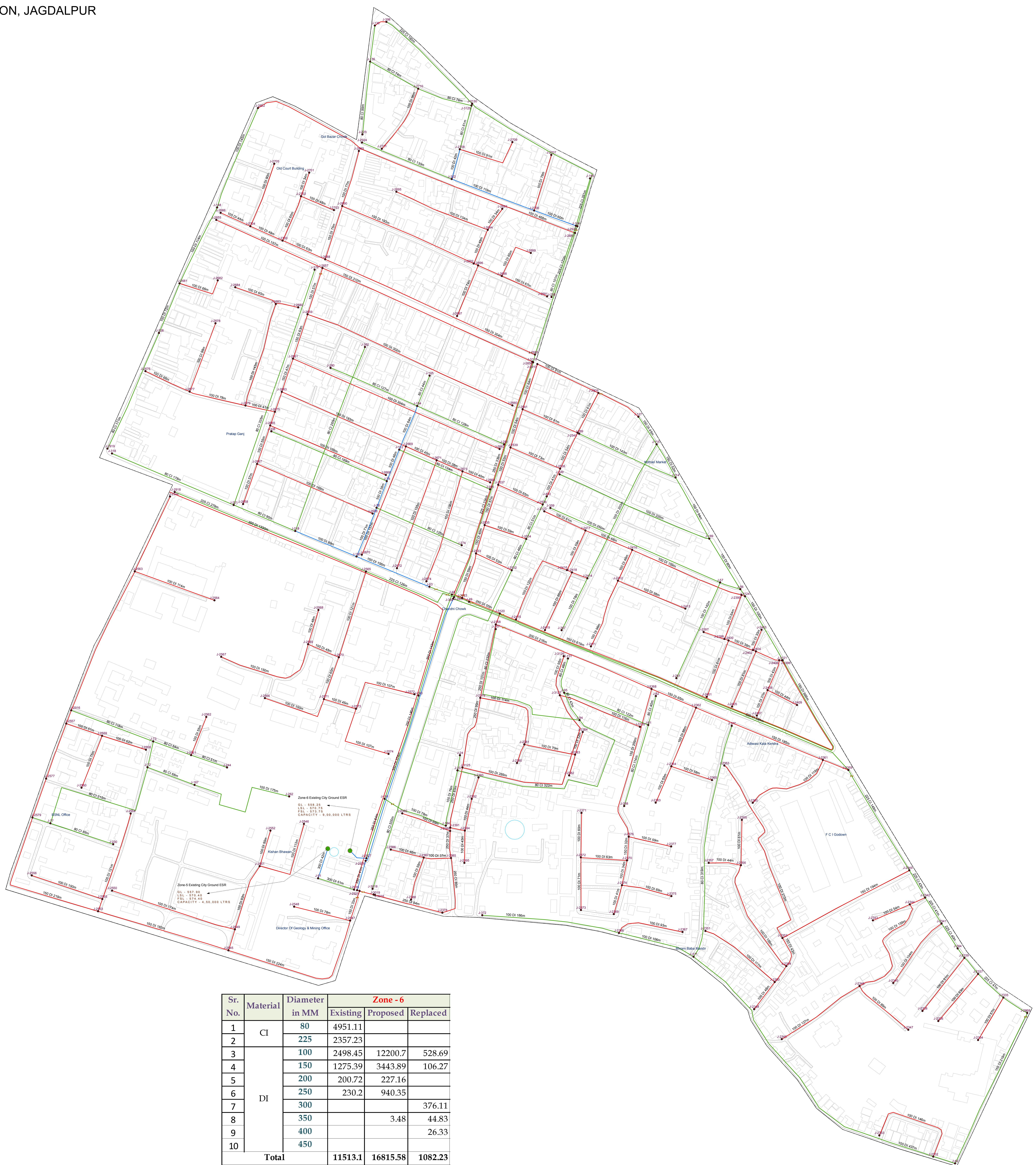
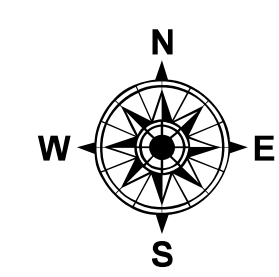
- Water_Bodies

Railway_Line

- Railway_Line

Sr. No.	Material	Diameter in MM	Zone -5		
			Existing	Proposed	Replaced
1	CI	80			
2		225			
3	DI	100		5106.71	
4		150		1836.52	
5		200		649.3	
6		250		752.94	
7		300	50.81	1329.8	41.99
8		350			
9		400			
10		450			
Total			50.81	9675.27	41.99
Grand Total				9768.07	

Project	AUGMENTATION OF JAGDALPUR WATER SUPPLY SCHEME UNDER AMRUT MISSION								
Client	STATE URBAN DEVELOPMENT AGENCY, CHHATTISGARH								
Drawn	AN	Title	Zone-5 Existing City Ground ESR						
Date	20/01/2017								
Chkd.	SD								
Appr.	SB								
Date	20/01/2017								
Project No.	GISG16028	Drawing No.	ADCC/JAGDALPUR/HM	SCALE	1:2,300	Rev. No.	0	Sheet No.	5 OF 19
ADCC Infocad Limited		ADCC INFOCAD LTD.							
CHMI SVC/3 BSE-SME Listed		10/5, IT Park, Opp. VNIT, Nagpur-22			PH : 0712-2249-033/358/930				



Legend

Zone Boundary
 - Zone Boundary (dashed line)

Junction
 - Junction (black dot)

Valve
 - Valve (yellow dot)

Tank Status
 - Existing (green dot)
 - Proposed (red dot)

Distribution Network
 - Road_Centerline (grey line)
 - Road_Edge (grey line)
 - Building (grey outline)

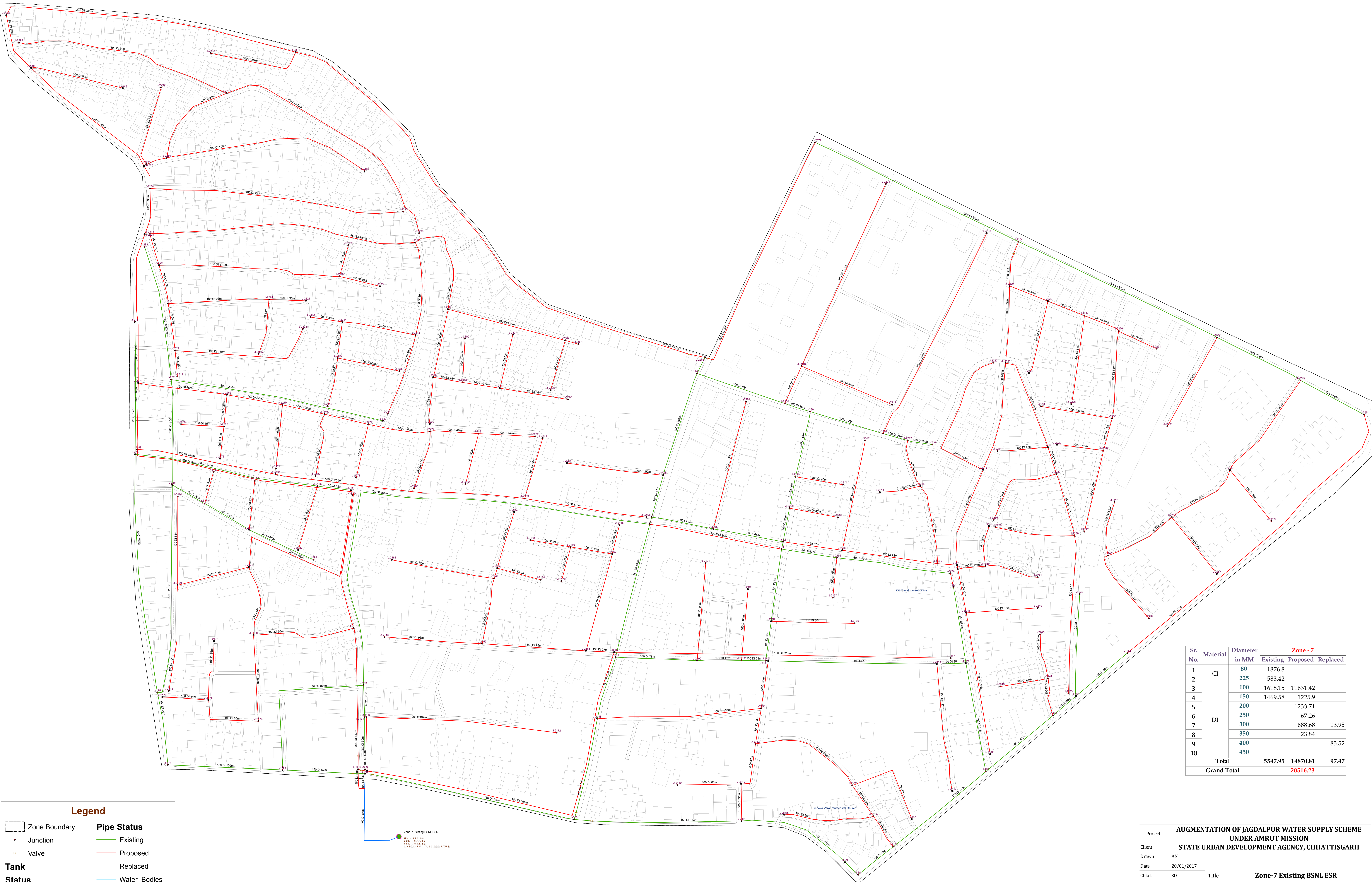
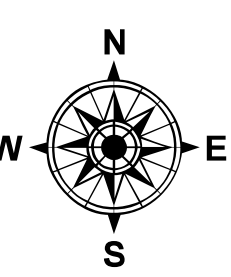
Pipe Status
 - Existing (green line)
 - Proposed (red line)
 - Replaced (blue line)

Water Bodies
 - Water_Bodies (light blue area)

Railway_Line
 - Railway_Line (black line with cross-ticks)

Sr. No.	Material	Diameter in MM	Zone - 6		
			Existing	Proposed	Replaced
1	CI	80	4951.11		
2		225	2357.23		
3		100	2498.45	12200.7	528.69
4	DI	150	1275.39	3443.89	106.27
5		200	200.72	227.16	
6		250	230.2	940.35	
7		300			376.11
8		350		3.48	44.83
9		400			26.33
10		450			
Total			11513.1	16815.58	1082.23
Grand Total			29410.91		

Project	AUGMENTATION OF JAGDALPUR WATER SUPPLY SCHEME UNDER AMRUT MISSION					
Client	STATE URBAN DEVELOPMENT AGENCY, CHHATTISGARH					
Drawn	AN	Title	Zone-6 Existing City Ground ESR			
Date	20/01/2017					
Chkd.	SD					
Appr.	SB					
Date	20/01/2017					
Project No.	GISG16028	Drawing No.	ADCC/JAGDALPUR/HM	SCALE	Rev. No.	Sheet No.
				1:1,800	0	6 OF 19
ADCC Infocad Limited		ADCC INFOCAD LTD.				
CHMI SVCS BSE-SME Listed		10/5, IT Park, Opp. VNT, Nagpur-22		PH : 0712-2249-033/358/930		

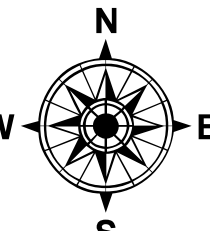


Legend

- Zone Boundary
- Junction
- Valve
- Existing Tank
- Proposed Tank
- Existing Pipe
- Proposed Pipe
- Replaced Pipe
- Water Bodies
- Railway_Line
- Road_Centerline
- Road_Edge
- Building

Sr. No.	Material	Diameter in MM	Zone - 7		
			Existing	Proposed	Replaced
1	CI	80	1876.8		
2		225	583.42		
3		100	1618.15	11631.42	
4	DI	150	1469.58	1225.9	
5		200		1233.71	
6		250		67.26	
7		300		688.68	13.95
8		350		23.84	
9		400			83.52
10		450			
Total			5547.95	14870.81	97.47
Grand Total				20516.23	

Project: AUGMENTATION OF JAGDALPUR WATER SUPPLY SCHEME UNDER AMRUT MISSION				
Client: STATE URBAN DEVELOPMENT AGENCY, CHHATTISGARH				
Drawn: AN	Title: Zone-7 Existing BSNL ESR			
Date: 20/01/2017				
Chkd: SD				
Appr: SB				
Date: 20/01/2017				
Project No. GISG16028	Drawing No. ADCC/JAGDALPUR/HM	SCALE: 1:1,100	Rev. No. 0	Sheet No. 7 OF 19
ADCC Infocad Limited		ADCC INFOCAD LTD.		
CHMI SVC/3 BSE-SME Listed		10/5, IT Park, Opp. VNT, Nagpur-22 PH : 0712-2249-033/358/930		



Legend

Zone Boundary
 Zone Boundary

Junction
 Junction

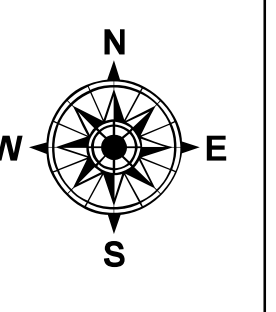
Valve
 Valve

Tank
 Existing
 Proposed

Distribution Network
 Existing
 Proposed
 Replaced
 Water_Bodies
 Railway_Line
 Road_Centerline
 Road_Edge
 Building

Sr. No.	Material	Diameter in MM	Zone - 8		
			Existing	Proposed Replaced	
1	CI	80	1989.88	311.03	
2		225			
3		100	1709.84	5826.57	898.71
4	DI	150	1802.19	65.29	
5		200	8.58	1342.51	
6		250		296.06	
7		300		30.08	
8		350		44.06	
9		400			
10		450			
Total			3708.3	9267.33	1349.17
Grand Total			14324.8		

Project	AUGMENTATION OF JAGDALPUR WATER SUPPLY SCHEME UNDER AMRUT MISSION								
Client	STATE URBAN DEVELOPMENT AGENCY, CHHATTISGARH								
Drawn	AN	Title	Zone-8 Existing Industrial ESR						
Date	20/01/2017								
Chkd.	SD								
Appr.	SB								
Date	20/01/2017								
Project No.	GISG16028	Drawing No.	ADCC/JAGDALPUR/HM	SCALE	1:1,150	Rev. No.	0	Sheet No.	8 OF 19
		ADCC INFOCAD LTD.			CHMI/SVC/31 BSE-SME Listed				
10/5, IT Park, Opp. VNIT, Nagpur-22 PH : 0712-2249-033/358/930									



Legend

Zone Boundary: Dashed line

Junction: Black dot

Valve: Yellow dot

Tank Status

Existing: Green dot

Proposed: Red dot

Pipe Status

Existing: Green line

Proposed: Red line

Replaced: Blue line

Water Bodies: Light blue area

Railway_Line: Grey line

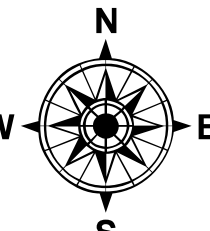
Road_Centerline: Dashed grey line

Road_Edge: Solid grey line

Building: Grey outline

Sr. No.	Material	Diameter in MM	Zone - 9	
			Existing	Proposed
1	CI	80	1698.55	
2		225		
3	DI	100	1082.59	6652.66
4		150		2491.15
5		200		669.13
6		250		243.22
7		300		10.24
8		350		
9		400		
10	450			
Total			2781.14	10066.4
Grand Total			17880.6	

Project	AUGMENTATION OF JAGDALPUR WATER SUPPLY SCHEME UNDER AMRUT MISSION								
Client	STATE URBAN DEVELOPMENT AGENCY, CHHATTISGARH								
Drawn	AN	Title	Zone-9 Existing Tekadi ESR						
Date	20/01/2017								
Chkd.	SD								
Appr.	SB								
Date	20/01/2017								
Project No.	GISG16028	Drawing No.	ADCC/JAGDALPUR/HM	SCALE	1:1,500	Rev. No.	0	Sheet No.	9 OF 19
ADCC Infocad Limited		ADCC INFOCAD LTD.							
CHMI SVC/3 BSE-SME Listed		10/5, IT Park, Opp. VNIT, Nagpur-22			PH : 0712-2249-033/358/930				

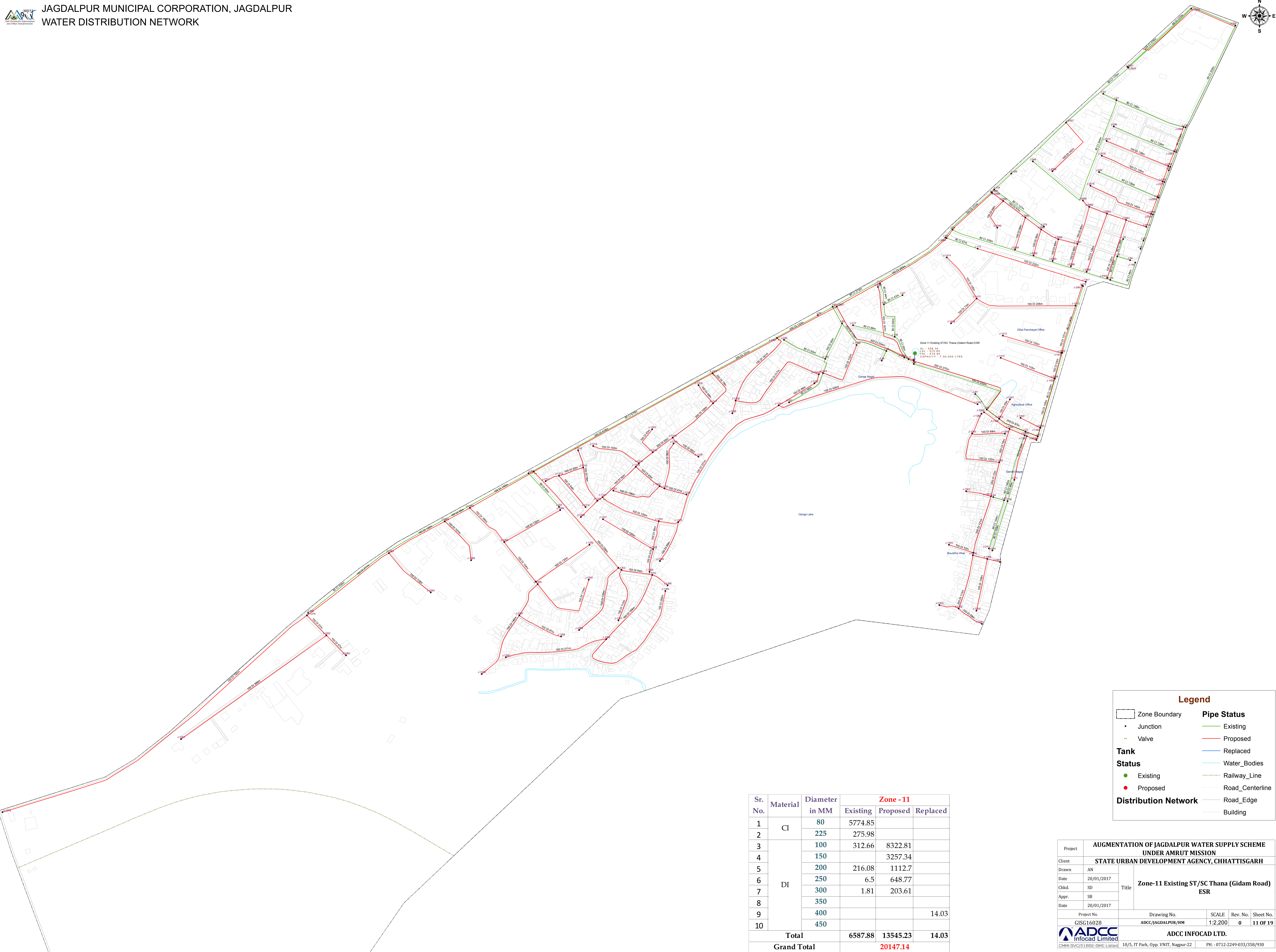
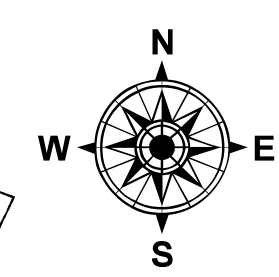


Legend

	Zone Boundary		Existing
	Junction		Proposed
	Valve		Water Bodies
	Existing		Railway Line
	Proposed		Road Centerline
	Distribution Network		Road Edge
			Building

Sr. No.	Material	Diameter in MM	Zone - 10		
			Existing	Proposed	Replaced
1	CI	80	3261.11		
2		225			
3		100	1769.69	5521.13	195.72
4	DI	150	2.26	1217.36	
5		200		609.58	
6		250		653.33	
7		300		254.54	2.85
8		350			233.67
9		400			
10		450			
Total			5033.06	8255.94	432.24
Grand Total				8688.18	

Project: AUGMENTATION OF JAGDALPUR WATER SUPPLY SCHEME UNDER AMRUT MISSION				
Client: STATE URBAN DEVELOPMENT AGENCY, CHHATTISGARH				
Drawn: AN	Title: Zone-10 Existing Stadium ESR	Project No.:		
Date: 20/01/2017		Drawing No.:		
Chkd. SD		SCALE: 1:1,250		
Appr. SB		Rev. No. 0		
Date: 20/01/2017	Sheet No. 10 OF 19			
ADCC Infocad Limited		ADCC INFOCAD LTD.		
10/5, IT Park, Opp. VNIT, Nagpur-22		PH : 0712-2249-033/358/930		

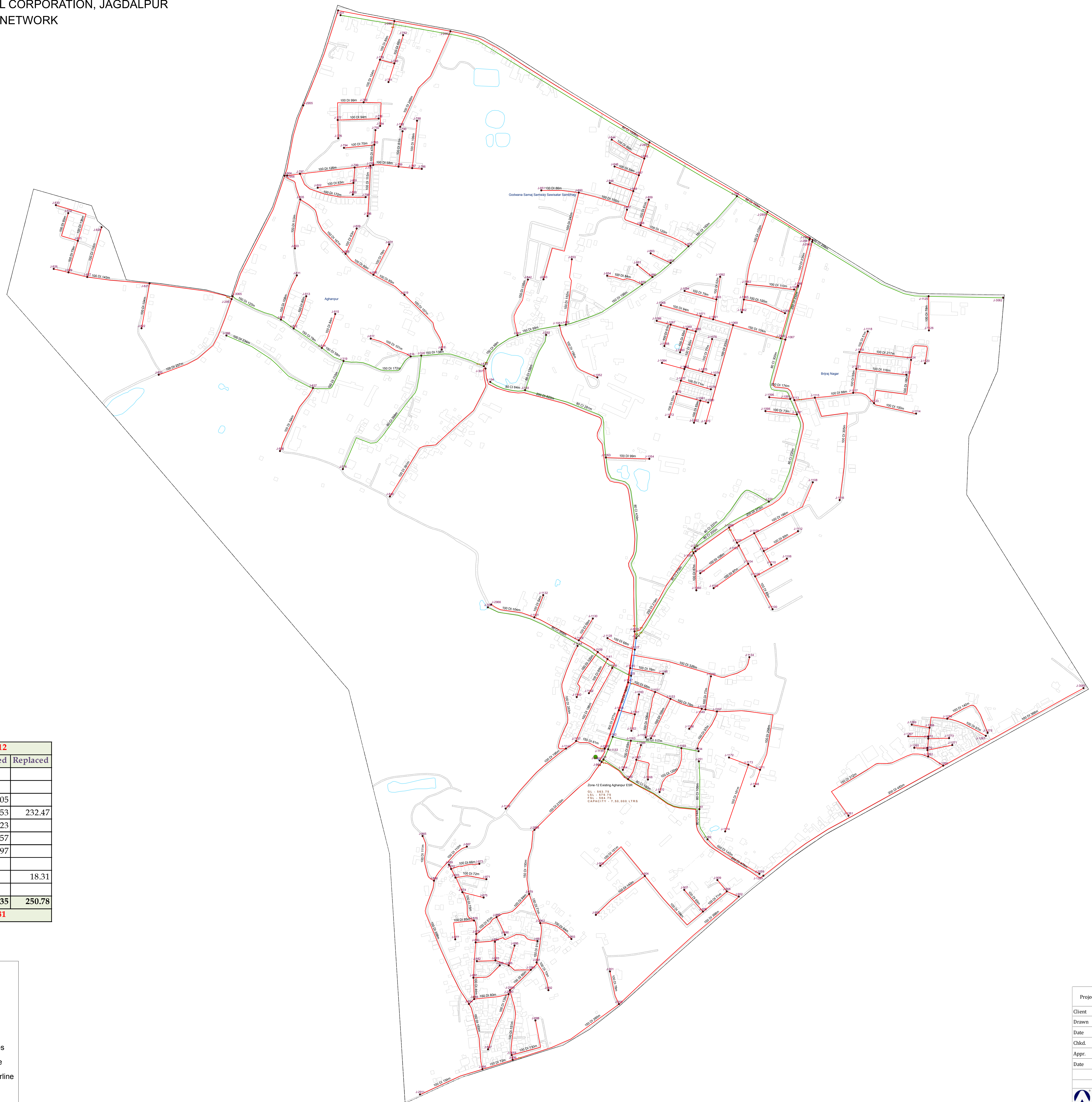
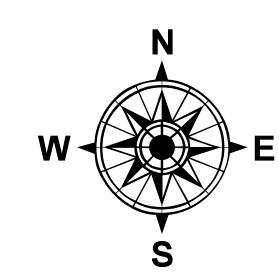


Legend

- Zone Boundary
- Junction
- Valve
- Tank Status: Existing (Green), Proposed (Red)
- Pipe Status: Existing (Green), Proposed (Red), Replaced (Blue)
- Water Bodies
- Railway_Line
- Road_Centerline
- Road_Edge
- Building

Sr. No.	Material	Diameter in MM	Zone - 11		
			Existing	Proposed	Replaced
1	CI	80	5774.85		
2		225	275.98		
3		100	312.66	8322.81	
4	DI	150		3257.34	
5		200	216.08	1112.7	
6		250	6.5	648.77	
7		300	1.81	203.61	
8		350			
9		400			14.03
10		450			
Total			6587.88	13545.23	14.03
Grand Total			20147.14		

Project: AUGMENTATION OF JAGDALPUR WATER SUPPLY SCHEME UNDER AMRUT MISSION				
Client: STATE URBAN DEVELOPMENT AGENCY, CHHATTISGARH				
Drawn: AN	Title: Zone-11 Existing ST/SC Thana (Gidam Road) ESR	Project No.:		
Date: 20/01/2017		Drawing No.:	SCALE:	Rev. No.:
Chkd. SD		ADCC/JAGDALPUR/HM	1:2,200	0
Appr. SB		ADCC INFOCAD LTD.		
Date: 20/01/2017	ADCC Infocad Limited		PH : 0712-2249-033/358/930	



Sr. No.	Material	Diameter in MM	Zone - 12		
			Existing	Proposed	Replaced
1	CI	80	5225.76		
2		225			
3	DI	100	343.33	18548.05	
4		150	1357.37	3519.53	232.47
5		200	63.22	3063.23	
6		250		1121.57	
7		300		307.97	
8		350			
9		400			18.31
10		450			
Total			6989.68	26560.35	250.78
Grand Total			33800.81		

Legend

Zone Boundary

- Junction
- Valve

Tank Status

- Existing
- Proposed

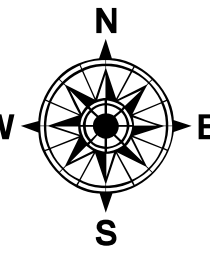
Distribution Network

- Water_Bodies
- Railway_Line
- Road_Centerline
- Road_Edge
- Building

Pipe Status

- Existing
- Proposed
- Replaced

Project	AUGMENTATION OF JAGDALPUR WATER SUPPLY SCHEME UNDER AMRUT MISSION								
Client	STATE URBAN DEVELOPMENT AGENCY, CHHATTISGARH								
Drawn	AN	Title	Zone-12 Existing Aghanpur ESR						
Date	20/01/2017								
Chkd.	SD								
Appr.	SB								
Date	20/01/2017	Project No.	ADCC/JAGDALPUR/HM	SCALE	1:2,900	Rev. No.	0	Sheet No.	12 OF 19
GISH16028		ADCC		ADCC INFOCAD LTD.					
ADCC Infocad Limited		10/5, IT Park, Opp. VNIT, Nagpur-22		PH. : 0712-2249-033/358/930					



Sr. No.	Material	Diameter in MM	Zone - 13		
			Existing	Proposed	Replaced
1	CI	80			
2		225			
3		100	652.07	12057.13	
4	DI	150	1221.77	4782.32	
5		200		1754.66	1.43
6		250		378.24	296.86
7		300		210.32	49.47
8		350			
9		400			
10		450			
Total			1873.84	19182.67	347.76
Grand Total			21404.27		

Legend

- Zone Boundary
- Junction
- Valve
- Tank Status: Existing, Proposed
- Distribution Network: Water_Bodies, Railway_Line, Road_Centerline, Road_Edge, Building
- Pipe Status: Existing, Proposed, Replaced

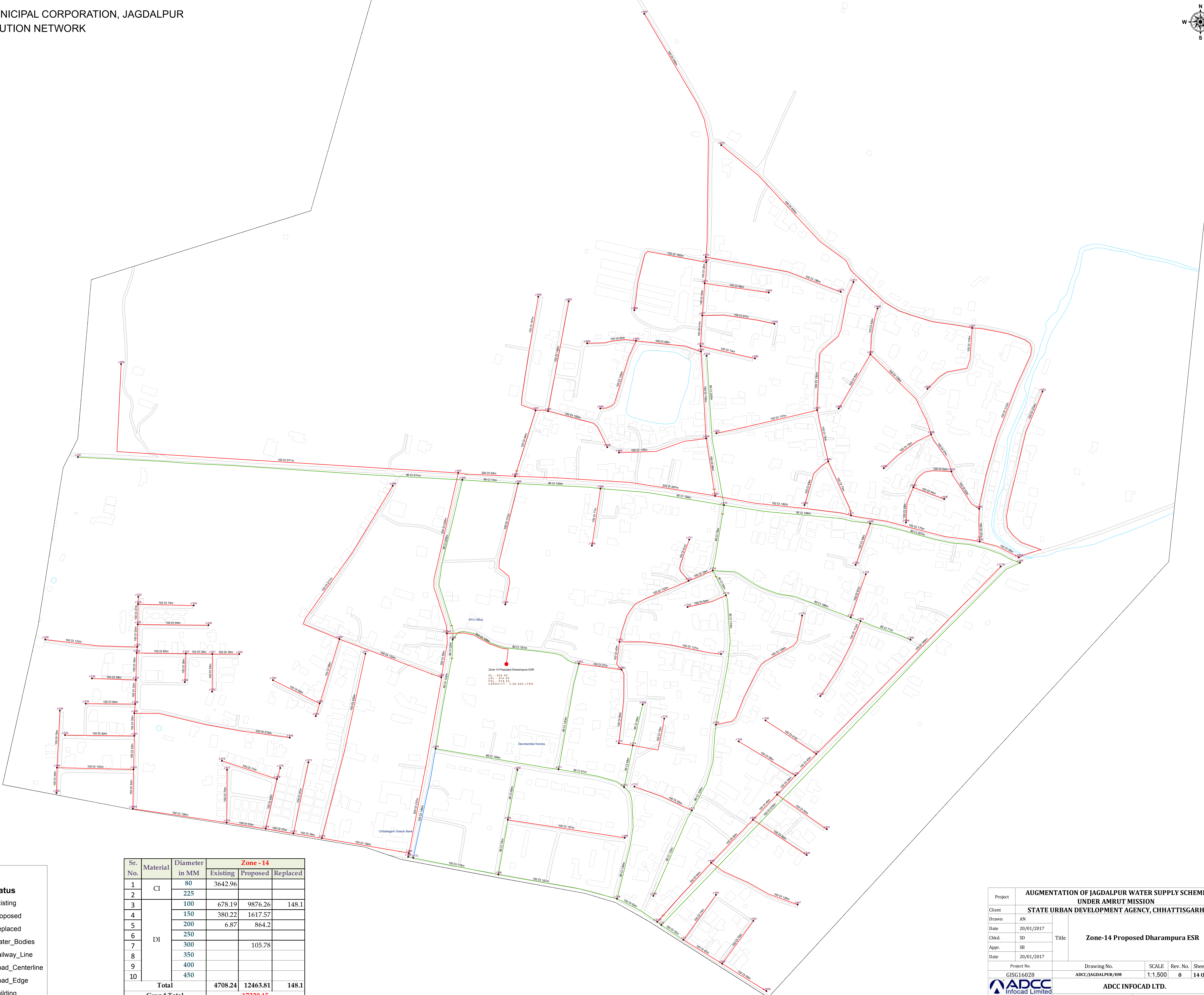
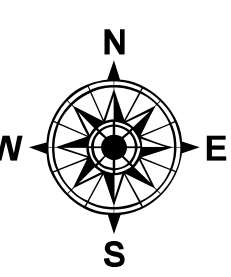
Project AUGMENTATION OF JAGDALPUR WATER SUPPLY SCHEME UNDER AMRUT MISSION
Client STATE URBAN DEVELOPMENT AGENCY, CHHATTISGARH

Title Zone-13 Existing Khangoli ESR

Project No.	Drawing No.	SCALE	Rev. No.	Sheet No.
GISG16028	ADCC/JAGDALPUR/HM	1:1,900	0	13 OF 19

ADCC Infocad Limited
ADCC INFOCAD LTD.

CMCI:SVG/31 BSE:GME Listed | 10/5, IT Park, Opp. VNT, Nagpur-22 | PH: 0712-2249-033/358/930



Legend

Zone Boundary
 - Junction
 - Valve

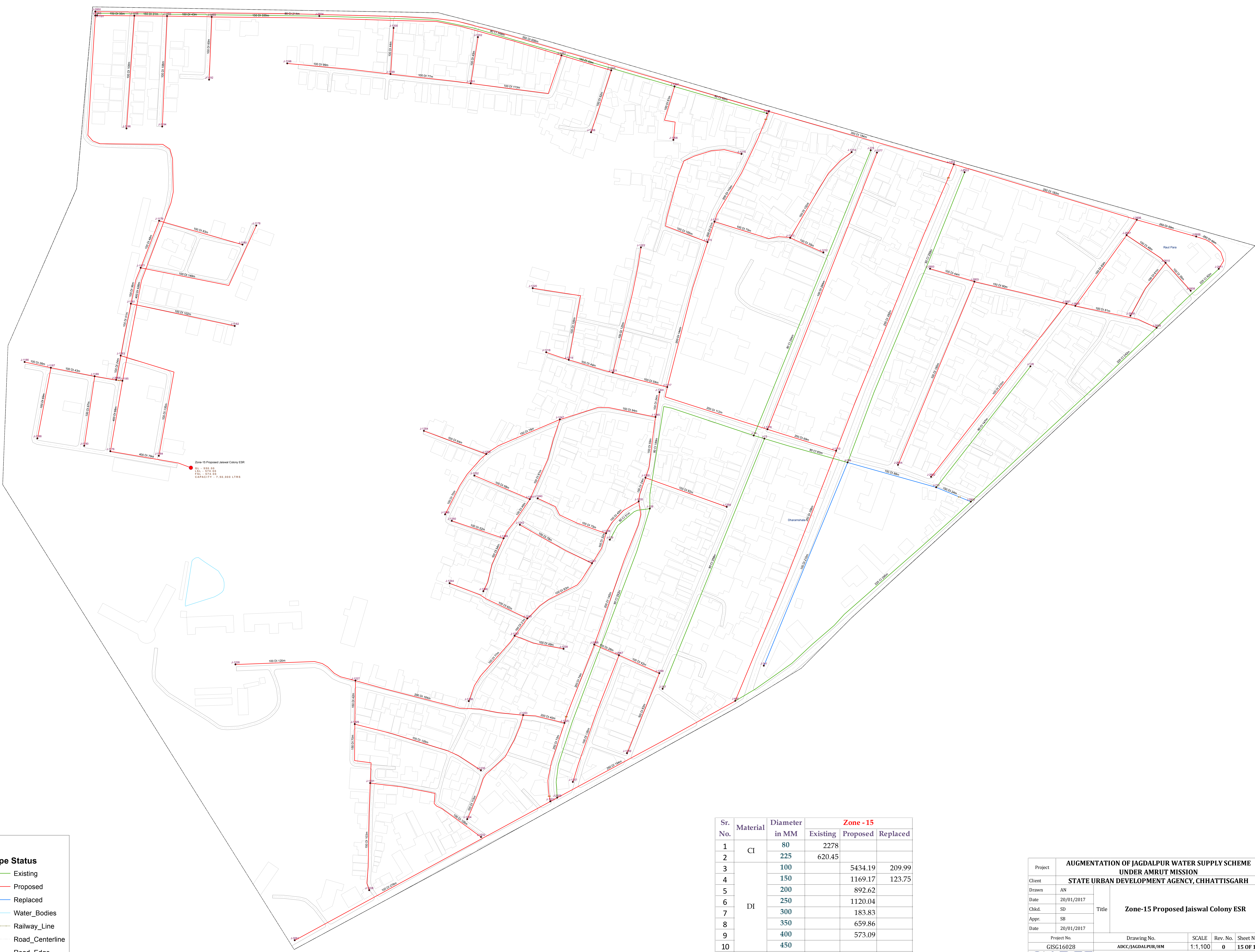
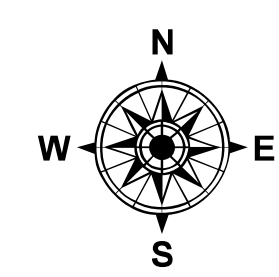
Tank Status
 - Existing
 - Proposed

Distribution Network
 - Road_Centerline
 - Road_Edge
 - Building

Pipe Status
 - Existing
 - Proposed
 - Replaced
 - Water_Bodies
 - Railway_Line
 - Road_Centerline

Sr. No.	Material	Diameter in MM	Zone - 14		
			Existing	Proposed	Replaced
1	CI	80	3642.96		
2		225			
3	DI	100	678.19	9876.26	148.1
4		150	380.22	1617.57	
5		200	6.87	864.2	
6		250			
7		300		105.78	
8	350				
9	400				
10	450				
Total			4708.24	12463.81	148.1
Grand Total				17320.15	

Project	AUGMENTATION OF JAGDALPUR WATER SUPPLY SCHEME UNDER AMRUT MISSION								
Client	STATE URBAN DEVELOPMENT AGENCY, CHHATTISGARH								
Drawn	AN	Title	Zone-14 Proposed Dharampura ESR						
Date	20/01/2017								
Chkd.	SD								
Appr.	SB								
Date	20/01/2017	Project No.	ADCC/JAGDALPUR/HM	SCALE	1:1,500	Rev. No.	0	Sheet No.	14 OF 19
ADCC Infocad Limited		ADCC INFOCAD LTD.							
CMMI SVC/3 BSE-SME Listed		10/5, IT Park, Opp. VNIT, Nagpur-22			PH : 0712-2249-033/358/930				



Zone-15 Proposed Jaiswal Colony ESR
 D.L. ₹ 52.00
 S.L. ₹ 12.00
 CAPACITY - 1,50,000 LTRS

Legend

Zone Boundary

Junction

Valve

Tank Status

- Existing
- Proposed

Distribution Network

Road_Centerline

Road_Edge

Building

Pipe Status

- Existing
- Proposed
- Replaced

Water_Bodies

Railway_Line

Sr. No.	Material	Diameter in MM	Zone -15		
			Existing	Proposed	Replaced
1	CI	80	2278		
2		225	620.45		
3		100		5434.19	209.99
4	DI	150		1169.17	123.75
5		200		892.62	
6		250		1120.04	
7		300		183.83	
8		350		659.86	
9		400		573.09	
10		450			
Total			2898.45	10032.8	333.74
Grand Total			13264.99		

Project: AUGMENTATION OF JAGDALPUR WATER SUPPLY SCHEME UNDER AMRUT MISSION
 STATE URBAN DEVELOPMENT AGENCY, CHHATTISGARH

Client: STATE URBAN DEVELOPMENT AGENCY, CHHATTISGARH

Drawn: AN

Date: 20/01/2017

Chkd: SD

Appr: SB

Date: 20/01/2017

Title: Zone-15 Proposed Jaiswal Colony ESR

Project No. GISG16028

Drawing No. ADCC/JAGDALPUR/HM

SCALE: 1:1,100

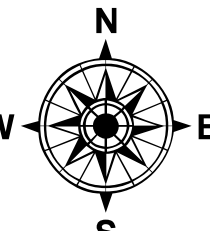
Rev. No. 0

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ADCC Infocad Limited

ADCC INFOCAD LTD.

10/5, IT Park, Opp. VNIT, Nagpur-22 PH. : 0712-2249-033/358/930



Legend

Zone Boundary
 Zone Boundary

Junction
 Junction

Valve
 Valve

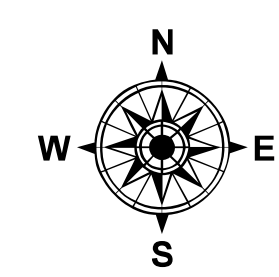
Tank Status
 Existing
 Proposed

Distribution Network
 Road_Centerline
 Road_Edge
 Building

Pipe Status
 Existing
 Proposed
 Replaced
 Water_Bodies
 Railway_Line

Sr. No.	Material	Diameter in MM	Zone - 16 Proposed
1	CI	80	
2		225	
3		100	11043.24
4	DI	150	4316.73
5		200	2632.38
6		250	
7		300	295.87
8		350	
9		400	
10		450	
Total			18288.22
Grand Total			18288.22

Project			
AUGMENTATION OF JAGDALPUR WATER SUPPLY SCHEME UNDER AMRUT MISSION			
STATE URBAN DEVELOPMENT AGENCY, CHHATTISGARH			
Client	ADCC/JAGDALPUR/HM		
Drawn	AN	Title	Zone-16 Proposed Army Training Centre ESR
Date	20/01/2017		
Chkd.	SD		
Appr.	SB		
Date	20/01/2017		
Project No.	GISG16028	Drawing No.	ADCC/JAGDALPUR/HM
SCALE	1:2,150	Rev. No.	0
Sheet No.	16 OF 19		
		ADCC INFOCAD LTD.	
CHMI SVC/3 BSE-SME Listed		10/5, IT Park, Opp. VNT, Nagpur-22	
		PH : 0712-2249-033/358/930	



Legend

Zone Boundary

- Junction
- Valve

Tank Status

- Existing
- Proposed

Distribution Network

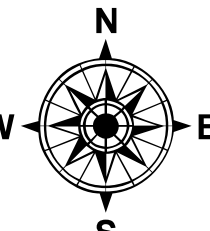
- Road_Centerline
- Road_Edge
- Building

Pipe Status

- Existing
- Proposed
- Replaced
- Water_Bodies
- Railway_Line

Sr. No.	Material	Diameter in MM	Zone -17		
			Existing	Proposed	Replaced
1	CI	80	4105.48		
2		225			
3		100	4318.06	6391.49	179.49
4	DI	150	770.86	2109.03	
5		200		183.45	
6		250		548.3	
7		300			
8		350			
9		400		324.82	
10		450			
Total			9194.4	9557.09	179.49
Grand Total			18930.98		

Project	AUGMENTATION OF JAGDALPUR WATER SUPPLY SCHEME UNDER AMRUT MISSION					
Client	STATE URBAN DEVELOPMENT AGENCY, CHHATTISGARH					
Drawn	AN	Title	Zone-17 Proposed Wardhaman Colony ESIR			
Date	20/01/2017					
Chkd.	SD					
Appr.	SB					
Date	20/01/2017	Project No.	Drawing No.	SCALE	Rev. No.	Sheet No.
		GISG16028	ADCC/JAGDALPUR/HM	1:1,400	0	17 OF 19
ADCC Infocad Limited		ADCC INFOCAD LTD.				
CMMI SVC/3 BISE-SME Listed		10/5, IT Park, Opp. VNT, Nagpur-22 PH. : 0712-2249-033/358/930				



Sr. No.	Material	Diameter in MM	Zone - 18		
			Existing	Proposed	Replaced
1	CI	80	2265.37		
2		225			
3	DI	100		9591.85	182.16
4		150		1968.15	
5		200		990.95	
6		250		1922.2	
7		300		352.06	
8		350		35.87	
9		400			
10		450			
Total			2265.37	14861.08	182.16
Grand Total			17308.61		

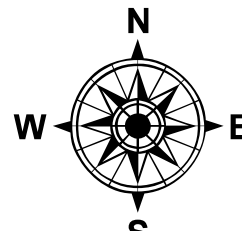
Legend

- Zone Boundary
- Junction
- Valve
- Tank Status
 - Existing
 - Proposed
- Distribution Network
 - Railway_Line
 - Road_Centerline
 - Road_Edge
 - Building
- Pipe Status
 - Existing
 - Proposed
 - Replaced
 - Water_Bodies

AUGMENTATION OF JAGDALPUR WATER SUPPLY SCHEME UNDER AMRUT MISSION STATE URBAN DEVELOPMENT AGENCY, CHHATTISGARH

Project No. GISG16028 | Drawing No. ADCC/JAGDALPUR/HM | SCALE 1:2,000 | Rev. No. 0 | Sheet No. 18 OF 19

ADCC Infocad Limited
ADCC INFOCAD LTD.
10/5, IT Park, Opp. VNT, Nagpur-22 | PH : 0712-2249-033/358/930



Legend

Zone Boundary	Pipe Status
Junction	Existing
Valve	Proposed
Tank Status	Replaced
Existing	Water Bodies
Proposed	Railway Line
Distribution Network	Road_Centerline
Road_Edge	Building

Sr. No.	Material	Diameter in MM	Zone -19	
			Existing	Proposed
1	CI	80	265.16	
2		225		
3		100	3762.4	13667.81
4	DI	150		4395.18
5		200		1333.18
6		250		1589.29
7		300		626.29
8		350		
9		400		36.06
10		450		685.07
Total			4027.56	22332.88
Grand Total			26360.44	

Project					AUGMENTATION OF JAGDALPUR WATER SUPPLY SCHEME UNDER AMRUT MISSION				
Client					STATE URBAN DEVELOPMENT AGENCY, CHHATTISGARH				
Drawn	AN	Title	Zone-19 Proposed Lal Bagh ESR						
Date	20/01/2017								
Chkd.	SD								
Appr.	SB								
Date	20/01/2017	Project No.		Drawing No.		SCALE	Rev. No.	Sheet No.	
GISG16028		ADCC/JAGDALPUR/HM		1:3,000		0		19 OF 19	
		ADCC INFOCAD LTD.							
CHMI SVC/3 BSE-SME Listed		10/5, IT Park, Opp. VNT, Nagpur-22		PH : 0712-2249-033/358/930					